Planning Application to An Bord Pleanála in Respect of a Strategic Infrastructure Development
(A proposed Electricity Transmission Development)

# Environmental Impact Assessment Report

## Proposed 110 kV GIS substation compound and associated and ancillary works, Arklow, Co. Wicklow

Prepared by

**AWN Consulting**
**December 2020**

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Planning Application to An Bord Pleanála in Respect of a Strategic Infrastructure Development
(A proposed Electricity Transmission Development)

# Non-Technical Summary of Environmental Impact Assessment Report

## Proposed 110 kV GIS substation compound and associated and ancillary works, Arklow, Co. Wicklow

Prepared by

**AWN Consulting**
**December 2020**

# NON-TECHNICAL SUMMARY

## 1.0 INTRODUCTION

This Environmental Impact Assessment (EIA) Report has been prepared on behalf of Crag Digital Avoca Ltd (herein referred as 'the Applicant') to accompany a planning application to An Bord Pleanála (ABP) for planning permission for the provision of a 110 kV GIS substation compound along with associated and ancillary works as described in Chapter 2 (Description of the proposed development). This development will hereafter be referred to as the 'proposed development'. EirGrid will be the transmission system operator (TSO). ESB Networks will be the transmission asset owner (TAO).

Figure 1.1 shows the location and site setting of the proposed development.

The wider landholding is subject to an extant permission (Wicklow County Council (WCC) Planning Application No. 18940) for 3 no. data storage facilities and associated site infrastructure (hereafter referred as the 'permitted development').

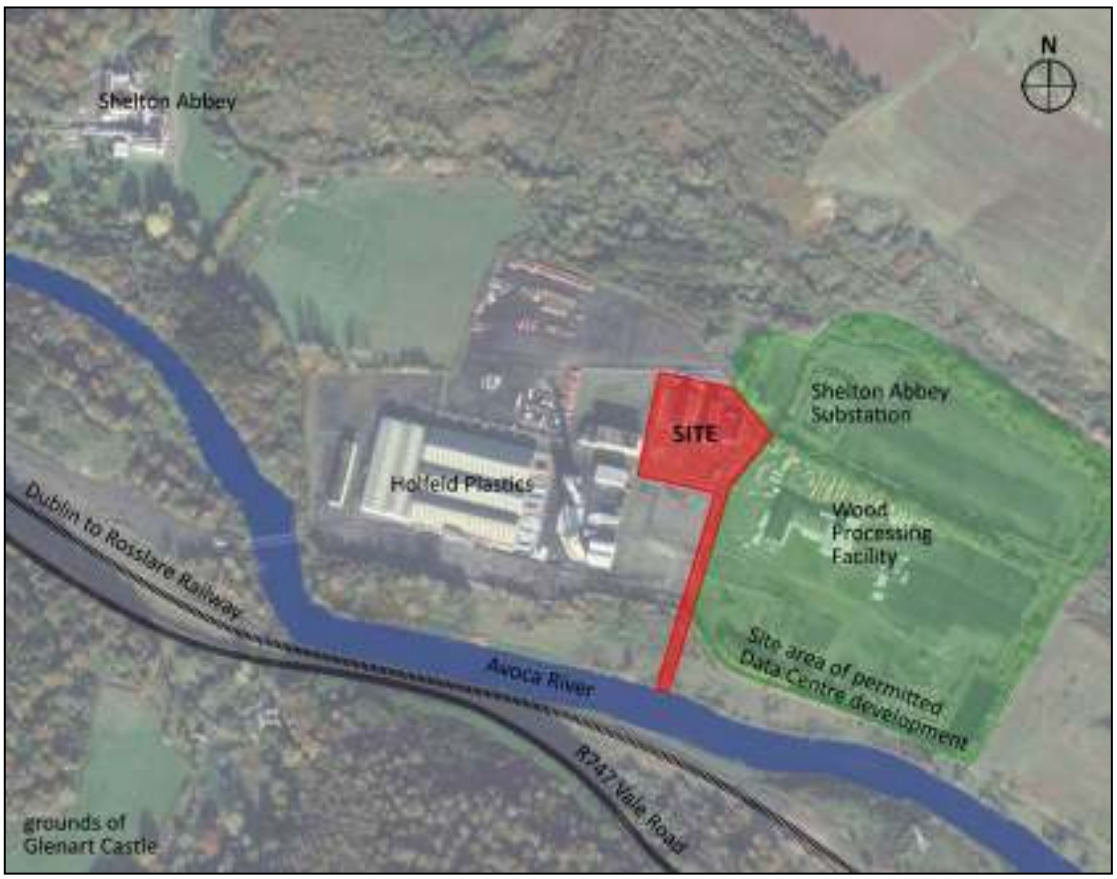



***Figure 1.1*** Location of the proposed development

### *Requirement for an EIA*

The requirement for EIA for certain types and scales of development is set out in the EIA Directives (85/337/EEC, 97/11/EC, 2003/35/EC, 2008/1/EC and most recently 2014/52/EU) and given primary effect in Ireland by the European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018, European Communities (Environmental Impact Assessment) Regulations 1989-2006, Planning

and Development Act 2000 (as amended) and the Planning and Development Regulations 2001-2019. It should be noted that this EIA Report is prepared in accordance with the 2014 EIA Directive (2014/52/EU) and associated Irish legislation (referred to above).

The EIA Directives list those projects for which an EIA is mandatory (Annex I) and those projects for which an EIA may be required (Annex II). With regard to Annex II projects, Member States can choose to apply thresholds or use case by case examination or a combination of both to assess where EIA is required. In Ireland, a combination of both has been applied. The proposed development is not listed under Annex I EIA Directives. An EIA Report has been provided as the proposed development is required to provide the permanent power supply for the permitted data storage facility developments (WCC Planning Application No. 18940).

The main objective of an EIA, as set out in Article 3(1) of the 2014 EIA Directive, is to identify, describe, and assess the direct and indirect significant impacts of a project on population and human health, biodiversity, land, soils, water, air & climate (including noise), material assets, cultural heritage and the landscape and the interaction between the aforementioned factors. The EIA Report (previously referred to as an Environmental Impact Statement or EIS) reports on the findings of the EIA process to date and informs the Planning Authority, statutory consultees, other interested parties and the public in general about the likely effects of the project on the environment.

***The Operator***

EirGrid will be the transmission system operator (TSO). ESB Networks will be the transmission asset owner (TAO).

**Consultation**

The Applicant met with An Bord Pleanala (ABP) to confirm the proposed development was a SID application and to discuss the scope for the planning application. Consultation has also been undertaken with Eirgrid and ESB Networks to ensure the proposed development design meets their requirements.

In addition, the relevant specialists and project engineers Malachy Walsh and Partners have liaised with typical statutory bodies (including WCC) by correspondence during the course of the EIA Report preparation.

AWN Consulting Limited (hereafter referred to as AWN) and the other respective EIA contributors have incorporated advice and comments received from consultees into the relevant chapters of this EIA Report.

***Contributors to the EIA Report***

The preparation and co-ordination of the EIA Report has been completed by AWN in conjunction with specialist subcontractors. The role and responsibility of each contributor, their qualifications and relevant experience are detailed in Chapter 1 (Introduction) of the EIA Report.

## 2.0 DESCRIPTION OF THE PROPOSED DEVELOPMENT

***Description of the Site***

The site of the proposed development comprises approximately 1.65 hectares of land and is located to the north of the Avoca River, in Avoca River Park, approximately 2.5

km northwest of Arklow town centre, Co. Wicklow. The wider landholding comprises a large primarily brownfield site which is served by existing roads infrastructure implemented as part of the setting out of the Industrial Park. The wider landholding is subject to an extant permission (Planning Application No. 18940) for a data storage facility and ancillary development.

***Proposed Development Description***

The proposed development primarily comprises a 110kV GIS substation and associated development. Figure 2.1 presents an overall site layout plan and compound layout. The proposed substation compound is subdivided into two parts. The northern part of the compound will accommodate a two storey 110kV GIS substation building (with a gross floor area of c. 1,377 sq.m). The southern part of the compound will accommodate four transformers and a single storey client control building (with a gross floor area of c. 416 sq.m) and associated underground services. Both parts of the substation compound will be enclosed within 2.6-metre-high security fencing. The northernl compound will be enclosed within a property fence 1.4 metres in height. The 110kV GIS Substation building will comprise a two -storey over partial basement structure. The MV Control Building will comprise a single storey building with a basement of approximately 1.8 metre depth. The site also comprises associated transformers and 18-metre-high lightning protection masts.

The development includes access paths, landscaping, security fencing, provision of access roads car parking within the GIS substation compound, provision of a rural supply electricity connection (connecting to existing electrical services to the east of the proposed substation compound) for the GIS substation building, a unit substation, lightning masts, drainage and attenuation systems, services, all associated construction works, and all ancillary works. The works will also include installation of three cable ducts: two for connection to the offsite overhead towers and one for an underground connection to the existing Shelton Abbey 110kV. Offsite connection will be undertaken by EirGrid/ESB.

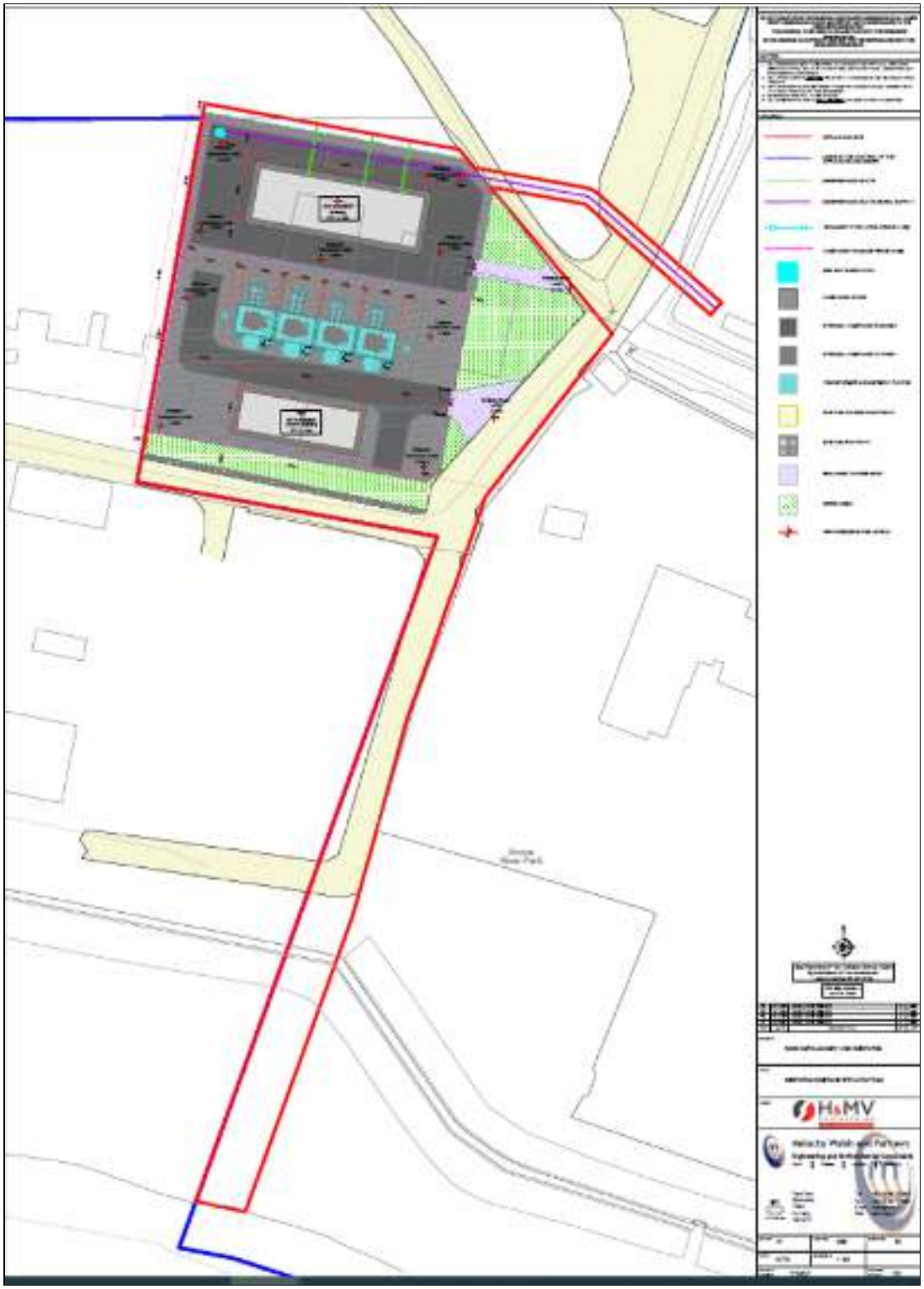


***Figure 2.1.*** Site layout - proposed development (*Outline in red)*

***Phases of the Project***
Under the current EPA Draft EIA Report Guidelines 2017 Draft EPA Guidelines on the information to be contained in EIA Reports, the description of the existence of the project is required to define all aspects of the proposed lifecycle of the proposed development under the following headings:

- Construction;
- Commissioning;
- Operation;
- Decommissioning; and
- Description of Other Developments.

***Construction***
*The construction schedule based on receipt of planning is as follows:*

- Application for Planning Permission – January 2021
- Commence Site Construction works (subject to grant of planning permission) – Start of Q2 2021
- Completion of Construction and Commissioning – Q3 2021.

The total peak construction population on site is estimated to be of the order of c. 30 staff (average 15-20). Site staff will include management, engineers, construction crews, supervisors and indirect staff.

A temporary construction compound will be set up at commencement to facilitate office, portable sanitary facilities, equipment storage, parking etc. for contractors. It will be used for the duration of the works. The site will have site security throughout construction works.

It is proposed to demolish the existing building onsite as part of the enabling works for this project. The total ground floor area of structures to be demolished is approximately 2,200$m^2$.

The site preparation phase for the GIS substation will involve site clearance, excavations and levelling of the site to the necessary base level for construction, surveying and setting out for structures and any rerouting of services/connections to services.

It is envisaged that all of the spoil generated during site preparation/levelling will be removed from site. It is anticipated that the top 1000mm to the west of the site and 300mm to the east of the site will be stripped of topsoil/organic material amounting to approximately 6,500 $m^3$. It is also anticipated that excavation for foundations, basements and ancillary drainage and structural components will amount to approximately 2,000 $m^3$. All material from the demolished buildings is to be exported off site. It is envisaged that approximately 750 tonne of concrete, 350 tonne of steel and 150 tonnes of timber and other material is to be exported off site after demolition. It is envisaged that approximately 10,000$m^3$ of stone fill material will be required on site to build up to the required levels.

***Commissioning***
Once the construction of the proposed development is completed, ESB Networks will be mobilised to complete the commissioning. Commissioning will be carried out over

a period of months. Commissioning works primarily involve a suitably qualified individual connecting the relevant cables to a switchgear within the substations. Following this, energisation can take place.

As there is no requirement for chemicals usage and minimal access to the route by personnel there is no likely environmental effect as a result of commissioning.

***Operation***

The Gas Insulated Switchgear (GIS) Substation and MV Control buildings will be 16.8 metres and 6 metres respectively. There will be a palisade fence separating the two buildings and separate access gates provided to each respected compound. The substation compound will be bounded by a palisade fence 2.6 metres in height and the northern compound will be bounded within a property fence 1.4 metres in height.

The 110kV Substation building will comprise a typical industrial form, with a structural steel frame clad with profiled metallic sheet wall and roof cladding, internal walling of masonry will be adopted where applicable. The roof will be shallow pitched and constructed of profiled metal decking on purlins spanning between rafters. The MV Control Building will comprise a typical structure for buildings of this type- cavity wall construction, concrete floor slab and reinforced concrete roof slab.

The existing developments within the Avoca River Park attenuate stormwater on site by means of drainage channels and attenuation ponds before discharging to the local River Avoca. The proposed development will have a drainage system which consists of a piped network, underground attenuation system, petrol interceptor and a hydrobrake. The hydrobrake will limit the rate of discharge from the site to a suitable outflow rate. The outflow rate will be calculated using the IH124 method developed by the UK Institute of Hydrology with further guidance adopted from the Greater Dublin Strategic Drainage Study (GDSDS). The proposed substation will be served by a single 150mm diameter foul sewer which will discharge into a storage tank on site. The storage tank is to be designed for 5 maintenance personnel being present on site 6-8 times per month with the system emptied about approximately twice per annum.

It is proposed to install a rainwater harvesting unit to supply non-potable water that is suitable for flushing toilets and washing hands.

The substation will be powered by a 49 kVA domestic supply to service the substation. This supply will be taken from an existing ESB Networks medium voltage substation within the industrial estate.

There is a small requirement for oil storage within the transformers c. 36 $m^3$ and the transformers will be housed within concrete bunds which are greater than 110% of the storage capacity. Diesel (1 $m^3$) is stored for an emergency back-up house generator to provide back-up power to the GIS building.

EirGrid will be the transmission system operator (TSO) and ESB Networks will be the transmission asset owner (TAO). EirGrid will operate transmission stations, including the proposed new GIS substation, remotely from their control centres. However, ESB Networks will carry out all local operations on Eirgrid's behalf.

The ESB Networks will undertake local operational activities from the substations with only interim inspections along the transmission line and MV cable installation.

There are no full-time staff required for operation. However, maintenance of the substation will be required by ESB Networks, including a routine weekly inspection, and a more comprehensive inspection once per year.

***Decommissioning***

The lifespan of the proposed development is not defined but it is anticipated that it will be maintained, and periodic upgrading undertaken over a long lifetime to meet future demand and upgrade in technology.

If the GIS substation is no longer required over the long term, then full decommissioning in accordance with prevailing best practice will be undertaken. Retirement of any cables will involve decoupling the cable from the switchgear. An excavation pit of approximately 10m$^2$ will then be established. The cable to be retired will be identified within this excavation pit and spiked (to ensure that decoupling from the switchgear has been successful and the cable is not live). The cable will then be cut and capped to protect the exposed cable. The excavated pit can be reinstated using the excavated material, with no import of fill required. The retired cable can remain in situ in the ground, with the potential for it to be returned to operation should it be required in the future.

***Description of other Developments***

A list of the other developments the vicinity of the proposed development, is provided in Chapter 3 Planning and Alternatives of this EIA Report. The majority of these are relatively small scale. An EIAR for a data storage facility on the subject site was previously published in August 2018 (reference 'Avoca River Park, Environmental Impact Assessment Report', AECOM, reference 60568620, 08 August 2018) and planning approval (Reference 18940). However, due to subsequent design modifications a new planning submission (concurrent application) has been submitted to WCC ( 'Avoca River Park, Environmental Impact Assessment Report', AECOM, (Planning Application No.201285).

***Sustainability, Energy Efficiency and Resource Use***

Eirgrid and ESB Networks are committed to running their businesses in the most environmentally friendly way possible. ESB Networks is a subsidiary within ESB Group. The ESB Group has identified energy efficiency as a strategic priority within its Brighter Future strategy. ESB Group is a commercial semi-state-owned company (95% state-owned) and is committed to supporting and being exemplar in the delivery of Ireland's 2020 public sector targets. These targets, outlined in the fourth National Energy Efficiency Action Plan (2017 – 2020) (NEEAP), include an energy efficiency target of 33% for the public sector.

***Major Accidents/Disasters***

The 2014 EIA Directive and associated Draft EPA EIA Guidelines requires that the vulnerability of the project to major accidents, and/or natural disasters (such as earthquakes, landslides, flooding, sea level rise etc.) is considered in the EIA Report. The site has been assessed in relation to the external natural disasters; landslides, seismic activity and volcanic activity and sea level rise/flooding as outlined below. The potential for major accidents to occur at the data storage facility has also been considered with reference to Seveso/COMAH. Overall it is concluded that there is only a potential impact on the receiving environment as a result of minor accidents/leaks of fuel/oils during the construction and operational phases. However, the implementation of the mitigation measures set out in Chapters 6 and 7 and withing the construction environmental management plan (CEMP) will ensure the risk of minor accidents/leaks of fuel/oils is low and that the residual effect on the environment is imperceptible.

## 3.0 PLANNING AND ALTERNATIVES

Following consultation with An Bord Pleanála (ABP) it was confirmed that the proposed development meets the relevant criteria and constitutes a Strategic Infrastructure Development (SID) under Section 182A & 182B of the Planning and Development Act 2000 (as amended).

The site for the proposed development is situated within the administrative area of WCC, and therefore the Planning and Development Framework with which the proposed development complies is defined by the Wicklow County Development Plan 2016 – 2022.

The WCC online planning tool was used to generate a list of relevant planning permissions from the surrounding areas of the proposed development within the previous five years. This search omitted individual residential dwellings and works to residential dwellings. The outcome of this search is presented in Table 3.4 of Chapter 3.

The proposed development is intended to support the power demand of the Permitted Data Storage Development (WCC Planning Application No. 18940).

Chapter 3 of the EIA Report concludes that the proposed development will be in keeping with all of the aspects of the relevant policy documents and will deliver a key piece of supporting infrastructure. The proposed development will be situated on suitably zoned lands in the Arklow area.

The policies and objectives of WCC regarding the conservation, protection and enhancement of environmental resources and assets of the region will not be contravened by this proposed development, as will be described in the relevant chapters in this EIA Report.

## 4.0 ALTERNATIVES

EIA legislation and the prevailing EPA Draft Guidelines (August 2017) and best practice require that EIA Reports consider ‘alternatives’ for projects with regard to their environmental effects addressing the do nothing alternative and consideration of alternatives

As stated above, it is intended that the proposed development will provide power supply for the permitted development. In the event that the proposed development does not proceed, the permitted development would require alterative power supply. There are no environmental effects associated with the do-nothing scenario apart from residual soil contamination will stay in place while the proposed development will remove.

The proposed development is based on a functional specification provided by EirGrid and as required by their connection agreement. As such the scale and size is determined by their specification.

The location of the proposed GIS substation was chosen with respect to the permitted development on site. The location of the proposed GIS substation is deemed to be the most logical location on the site for such a development.

The works will also include installation of cable ducts for three 110 kV underground cable (UGC), one to each of the two new OHL towers and one adjacent to the existing

Shelton Abby 110kV Substation, The external works which include connection to overhead lines and underground grid connections will be undertaken by EirGrid.

Various alternative routes for the cable ducts were assessed, but given the length of the ducting required, and taking into the environmental context of the location of the cable ducting, each alternative was found to have a negligible effect on the environment. The routes chosen for the cable ducts are the shortest and most logical routes for the cable ducts.

The works will also include a domestic supply to service the substation. The design of the 49kVA underground cable will comprise a looped 10kV circuit installed underground in uPVC ducting.

In terms of the proposed processes, the proposed GIS substation and new cable bays will employ the same electricity generation and transmission processes that are used by the Operator at their other facilities in Ireland and represents the most up-to-date and state of the art processes currently available. As appropriate, alternative processes are considered on an ongoing basis by the Operator as a part of each of their operations based on many factors including technical feasibility, environmental impact, efficiency, security, reliability and cost. Therefore, from a "process design" point of view, the flexibility to select alternative processes for integrating into the current national grid is not available to the Applicant.

In conclusion, it is considered that the proposed development and design is the most suitable choice to provide the support required to meet the power requirements of the permitted development.

## 5.0 POPULATION AND HUMAN HEALTH

This chapter evaluates the impacts if any, of the proposed development on population and human health. In accordance with the Draft EPA EIA Report Guidance (2017), this chapter has considered the *"existence, activities and health of people"* with respect to *"topics which are manifested in the environment such as employment and housing areas, amenities, extended infrastructure or resource utilisation and associated emissions"*.

This chapter also follows European Commission guidelines (2017; *Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report*) and examines the health effects relevant to the proposed development as they relate to a relevant, defined study area. The effects of the proposed development on the population and human health are analysed in compliance with the requirements of the EPA Draft EIA Report Guidelines 2017.

Issues examined in this chapter include demography, population, employment, social infrastructure, landscape, amenity and tourism, natural resources, air quality, noise and vibration, material assets, traffic and health and safety.

***Impact Assessment***

It is predicted that there will be a very slight positive impact on local business activity during the construction phase with the increased presence of up to 30 no. construction workers using local facilities. The positive impact during the operational phase will be less with c. 5 staff on site at any given time for maintenance works.

The best practice dust mitigation measures that will be put in place during construction of the proposed development will ensure that the impact of the proposed development complies with all EU ambient air quality legislative limit values which are based on the

protection of human health. Therefore, the impact of construction of the proposed development in relation to dust is likely to be short-term and imperceptible with respect to human health. The proposed cables will be underground and will have no impact air quality in relation to human health once operational. In addition, the proposed substation does not have the potential for any emissions which could impact air quality in terms of human health during operation.

There will be some impact on nearby noise sensitive properties due to noise emissions from site activity and traffic. The application of noise limits and limits on the hours of operation, along with implementation of appropriate noise and vibration control measures, will ensure that noise and vibration impact is kept to a minimum. In addition, due to the distance between the site and the nearest sensitive locations, vibration impacts generated during construction are expected to be negligible. Therefore, the noise and vibration impact of the construction phase of the proposed development is likely to be temporary to short term and slight negative with respect to human health because of the temporary to short-term construction phase. The operation of the proposed development has negligible noise impacts. The cumulative noise impacts of the proposed development and other relevant developments have been assessed in Chapter 10. The resultant noise impact is negative, not significant and long-term. The proposed development will not generate any perceptible levels of vibration during operation and will have a negligible significance of effect with respect to human health. Therefore, there will be no impact from vibrations on human health.

The location of the proposed development within an industrial park area and adjacent to a national motorway will have a minimal impact on the local landscape amenity.

The traffic assessment indicates that the proposed development is not likely to result in significant adverse impacts either alone or in combination with any likely future projects.

The proposed development has the potential for an impact on the health and safety of workers employed on the site, particularly during the construction phase. The activities of contractors during the construction phase will carried out in accordance with the Safety, Health and Welfare at Work (Construction) Regulations 2013 (S.I. No. 291 of 2013) to minimise the likelihood of any impacts on worker's health and safety. The health and safety planning for the construction phase of the proposed development will consider any appropriate measures to safeguard workers' health and safety with regards to Covid-19. During the operational phase of the development, the operator will implement an Environmental Safety and Health Management System and associated procedures at the facilities.

Mitigation measures proposed to minimise the potential impacts on human health in terms of air quality and climate and noise and vibration are discussed in Chapters 9 and 10 of the EIA Report, respectively. Mitigation measures to reduce the impact of additional traffic movements to and from the development are set out in Chapter 13 of the EIA Report.

Overall, it is expected that the proposed development will have a *positive* and *long-term* impact on the immediate hinterland through continued employment opportunities and the associated economic and social benefits.

## 5.0 LAND, SOILS, GEOLOGY AND HYDROGEOLOGY

This chapter of the EIA Report assesses and evaluates the potential impacts of the proposed development on the land, soils, geological and hydrogeological environment.

The aquifer underlying the study area is a major gravel aquifer which has been classified by the Geological Survey of Ireland (GSI) as a Locally Important (Lg) Gravel Aquifer. The aquifer vulnerability following GSI guidelines is designated as having a 'Moderate' aquifer vulnerability. Site investigations found that the depth to bedrock varies from 9.8 to 25.5mbgl with a depth of 23.6 mbgl in the immediate vicinity to the subject site.

The Groundwater Body (GWB) underlying the site is the Wicklow GWB (EU Groundwater Body Code: IE_EA_G_076). Currently, the EPA (2019) classifies the Wicklow GWB status as *'Good'*. with a current WFD risk score under 'Review'.

Overall, the soil and water quality results (collected on the adjacent site) indicate that the underlying gravel aquifer has been impacted by the historical use as a fertiliser factory located in the adjacent site with elevated levels of ammonia, potassium, sulphate and sulphur in the samples collected.

The hydrogeological features at this site are rated as *High Importance*. This is based on the assessment that the attribute has a medium quality significance or value on a local scale. The aquifer is a locally important (Lg) gravel aquifer over site and is used ugradient of the site for public water supply in Arklow.

Subsoil stripping and localised stockpiling of soil will be required during construction. The importation of engineering fill will be required to facilitate construction. It is anticipated that the top 1,000mm to the west of the site and 300mm to the east of the site will be stripped of topsoil/organic material amounting to approximately 6500m$^3$. It is also anticipated that excavation for foundations, basements and ancillary drainage and structural components will amount to approximately 2,000m$^3$.

The potential for impact on soil and water is low based on assessment of the potential impacts during construction and operation. Mitigation measures have been identified to further minimise risk of impact further and are included in the Construction Environmental Management Plan (CEMP) for the proposed development. Mitigation measures include;

- Management of run-off waters containing suspended solids to ensure adequate settlement of solids and appropriate earthwork handling protocol.
- There is minimal fuel requirement tanks shall be stored in designated areas, and bunded to a volume of 110% of the capacity of the tank within the bund. Refuelling of construction vehicles and the addition of hydraulic oils or lubricants to vehicles, will take place in a designated area which will be away from surface water gulley's or drains.
- Soil sampling has indicated that the soil may not be suitable for reuse on site. Further testing will be required should any soils be required to be removed from site. All soils removed from site will be disposed of by a licenced contractor to a licenced facility. In the event that potentially contaminated soils are encountered, they should be segregated, tested and classified as hazardous or non-hazardous in accordance with the EPA Guidance Document: *Waste Classification – List of Waste and Determining if Waste is Hazardous or Non-*

*Hazardous* (2015) and *Council Decision 2003/33/EC*. It should then be removed from site by a suitably permitted waste contractor to an authorised waste facility.

Following implementation of mitigation measures detailed in Chapter 5 of the EIA Report and the CEMP, the predicted impact during construction of the proposed development will be short-term, imperceptible and neutral.

During the operational phase, there are limited activities that could potentially impact on the land soils, geological and hydrogeological environment. There is a small potential for leaks from the minor fuel storage for transformers on site. However, the volumes stored is small and tanks are bunded and on hardstand areas. In addition to this there is a potential for leaks and spillages from the small number of vehicles which enter this area. Hydrocarbon interceptors will be installed to capture any potential hydrocarbon contamination prior to discharge into the attenuation system on site. This together with hardstand cover will minimise the potential for any impact to the underlying aquifer

The land is located within the Avoca River Park which is a developed site. The predicted impact on lands soils geology and hydrogeology during operation of the proposed development, following implementation of mitigation measures detailed in Chapter 5 of the EIA Report will be long-term, imperceptible and neutral.

## 6.0 HYDROLOGY

This chapter of the EIA Report assesses and evaluates the potential impacts of the proposed development on the surrounding water & hydrological environment. The Avoca River is the primary watercourse/surface water body in the local region. The Avoca is situated approximately 230 m south of the site and flows west to east.

The water quality at the nearest gauging station which was tested in 2019 (Avoca Br, RS10A030700, 6.5 Km upstream) is classified as 2-3 (moderately polluted) – Bad WFD Status. The Avoca Estuary (1.5 km downstream of the site) has a ‘Moderate’ status and is ‘At risk of not achieve Good status’

The importance of the hydrological features at this site is rated as ‘Medium Importance’. This is based on there is direct connectivity with the Avoca river. The nearest European sites to the proposed development Buckroney-Brittas Dunes and Fen SAC (Site Code 000729) which is located approximately 5km to the north of the discharge point of the Avoca River.

The potential risk of flooding on the site was also assessed. A Stage 1 Flood Risk Assessment was completed for the site (Appendix 6.2 of the EIA Report) and identified no flood hazards for the proposed development. The development resides within Flood Zone C which is suitable for the nature of the development and is not at risk of flooding from a 1% or 0.1% Annual Exceedance Potential (AEP) event. Attenuation is included in the design to ensure no offsite flooding will occur as a result of the proposed development.

The potential impacts of construction and mitigation measures proposed have been identified and are included in the CEMP for the proposed development. The implementation of mitigation measures detailed in Chapter 6 of the EIA Report will ensure that the potential impacts on the surface water environment do not occur during

the construction phase and that the residual impact will be short-term-imperceptible-neutral.

During operation, there is very limited storage of bulk chemicals on site. The fuel for the transformers is fully contained and located on hardstand which drains to an interceptor. Foul water is collected and stored prior to disposal by a licenced contractor. As such during the operational phase, there is a low potential for contamination of stormwater run-off. The implementation of mitigation measures highlighted in Chapter 6 will ensure protection of the surface water environment during the operational phase and that the predicted impact will be long-term-imperceptible-neutral.

## 7.0 BIODIVERSITY

This chapter provides an assessment of the impacts of the proposed development in question on the ecological environment, i.e. flora and fauna.

The proposed development is to take place on a brownfield site within the catchment of the Avoca River which discharges to the Irish Sea at Arklow downstream with limited connectivity to European Sites in Dublin Bay.

The proposed development area currently comprises spoil and bare ground and buildings to be demolished. No structures in the site are likely to hold roosting value for bat species with industrial buildings of low bat roost potential.

There is no potential for otter habitats on site. There will be no direct or indirect impact on otters downstream on the Avoca River. There will be no direct or indirect impact on badgers. There will be no direct or indirect impact on birds.

There are no rare or protected habitats recorded in the study area. The site development areas are considered of Low Local Ecological Value.

The proposed development will have no predicted significant impacts on biodivesity therefore cumulative impacts can be ruled out.

The conclusion of a report for AA Screening is that the possibility of any adverse effects on the integrity of the European Sites considered, or on the integrity of any other European Site (having regard to their conservation objectives), arising from the proposed development, either alone or in combination with other plans or projects, can be excluded

## 9.0 AIR QUALITY AND CLIMATE

This chapter evaluates the impacts which the proposed development may have on air quality & climate.

### *Air Quality*

In terms of the existing air quality environment, data available from similar environments indicates that levels of particulate matter less than 10 microns and particulate matter less than 2.5 microns ($PM_{10}$/$PM_{2.5}$) are, generally, well within the National and European Union (EU) ambient air quality standards.

An assessment of the potential dust impacts as a result of the construction phase of the proposed development was carried out based on the UK Institute of Air Quality Management (IAQM) guidance. This established the sensitivity of the area to impacts from construction dust in terms of dust soiling of property and human health effects. It was determined that the area was considered of low sensitivity to dust impacts. The sensitivity of the area was combined with the dust emission magnitude for the site under four distinct categories: demolition, earthworks, construction and trackout (movement of vehicles) in order to determine the mitigation measures necessary to avoid significant dust impacts.

Once mitigation measures, such as dust and traffic management, are implemented the impacts to air quality during the construction of the proposed development are considered, short-term, localised, negative and imperceptible.

Emissions associated with maintenance vehicles accessing the site and emissions from an emergency back-up generator on site will have an imperceptible impact on air quality during operation. There are no emissions of significance to atmosphere associated with the proposed development, the operational phase is considered long-term and imperceptible in terms of air quality.

***Climate***

The existing climate baseline can be determined by reference to data from the EPA on Ireland's total greenhouse gas (GHG) emissions and compliance with European Union's Effort Sharing Decision "EU 2020 Strategy" (Decision 406/2009/EC). The EPA state that Ireland had total GHG emissions of 60.93 Mt $CO_2$eq in 2018. This is 5.59 Mt $CO_2$eq higher than Ireland's annual target for emissions in 2018. Emissions are predicted to continue to exceed the targets in future years.

Based on the scale and temporary nature of the construction works, the potential impact on climate change from the construction of the proposed development is deemed to be temporary and not significant in relation to Ireland's obligations under the EU 2030 target. Operational phase impacts are deemed long-term and imperceptible as there are no emissions of significance associated with the operation of the proposed development.

***Human Health***

The best practice dust mitigation measures that will be put in place during construction of the proposed development will ensure that the impact of the proposed development complies with all EU ambient air quality legislative limit values which are based on the protection of human health. Therefore, the impact of construction of the proposed development is likely to be short-term, localised, negative and imperceptible with respect to human health. In addition, the proposed substation does not have the potential for any emissions which could impact air quality in terms of human health during operation.

A dust minimisation plan will be implemented during the construction phase of the proposed development to ensure that no significant dust nuisance occurs outside the site boundary, measures include the development of a documented system for managing site practices with regard to dust control, monitoring and assessment of dust. No mitigation is required during operation.

If the mitigation measures outlined in this assessment are implemented, there will be no residual impacts of significance on air quality or climate from the construction or operational phases of the proposed development.

## 10.0 NOISE AND VIBRATION

This chapter assesses the anticipated noise and vibration impact associated with the proposed development at nearby noise sensitive locations.

The existing noise climate has been surveyed at nearby noise sensitive receptors over the course of typical day and night-time periods. Road traffic movements, both distant and local, were noted as the most significant source of noise during both daytime and night-time periods.

When considering a development of this nature, the potential noise and vibration impact on the surroundings must be considered for each of two distinct stages: the short -term impact of the construction phase and the longer-term impact of the operational phase.

During the construction phase of the proposed development there will be some impact on nearby noise sensitive properties due to noise emissions from site activity and traffic. The application of noise limits and limits on the hours of operation, along with implementation of appropriate noise and vibration control measures, will ensure that noise and vibration impact is kept to a minimum. The resultant impact is slight, negative and temporary.

In relation to the operational phase, it is concluded that there will be no significant noise emissions from the operation of the cable installations and substation. The resultant vibration impact is imperceptible, not significant, and long-term.

No significant sources of vibration will be present during the operational phase. There are therefore no predicted vibration impacts at neighbouring dwellings during the operational phase. The resultant vibration impact is imperceptible, neutral and long-term.

The cumulative noise impacts of the proposed development and the permitted development have been assessed including modelling in the Chapter 10 assessment. The resultant noise impact is negative, not significant and long-term.

There are no operational vibration impacts associated with the proposed development or the permitted development, hence cumulative impacts do not arise in this instance.

## 11.0 ARCHAEOLOGICAL, ARCHITECTURAL AND CULTURAL HERITAGE

This chapter assesses the predicted impacts of the proposed development on archaeological, architectural and cultural heritage using a number of sources including the Record of Monuments and Places, the National Inventory of Architectural Heritage, the Wicklow County Council Development Plan 2016-2022, the Excavations Database, cartographic and documentary sources.

The construction phase of the proposed development will not impact directly on any sites included in the Record of Monuments and Places, the National Inventory of Architectural Heritage or the Register or Protected Structures for the county.

Although sited within the grounds of the Shelton Abbey Demesne, recent development relating to the Avoca River Park has significantly altered the demesne landscape and if previously unrecorded sub-surface archaeological features had existed, they would have been removed during the course of groundworks relating to previous development.

However, the portion of the proposed development comprising the storm water runoff, which traverses previously undeveloped land, should be archaeologically monitored under license to the National Monuments Service of the Department of Culture, Heritage and the Gaeltacht. Should archaeological features be encountered, provision should be made for works to cease until the archaeological team has assessed these features and agreed a strategy for their excavation with the National Monuments Service.

Should these mitigation measures be applied, the impact of the proposed development on the archaeological, architectural and cultural heritage is deemed to be neutral and imperceptible.

## 12.0 LANDSCAPE AND VISUAL

The site of the proposed Pollahoney 110kV substation is located west of the M11 motorway and just north of the Avoca River, the R747 and the Dublin-Rosslare railway line.

The site is within a larger industrial facility which is part of the former Shelton Abbey. Shelton Abbey is a late 18$^{th}$ century mansion and protected structure (RPS No. 16404005) which was sold in the early 1950's and NET Irish Fertiliser Industries built a facility the low lying grounds which were the eastern part of the demesne. Shelton Abbey became an open prison facility.

The fertiliser facility was closed in 2003 and much of the infrastructure was demolished or dismantled, leaving the prilling and drying towers and a number of smaller structures together with extensive areas of flat tarmac marshalling and storage areas. Today, Holfeld Plastics have a factory on the western part of the lands, and a wood processing facility operates in part of the eastern portion of the lands. The Shelton Abbey substation is located centrally along the northern side of the lands and Shelton Abbey remains in use as an open prison.

The Avoca River lies along the southern edge of the lands, and the Dublin to Rosslare railway and the R747 Vale Road run to the south of the river. The northern and southern sides of the valley rise steeply from the low lying (3.0 to 6.0m OD) industrial lands to the north and south of the Avoca River valley and are mostly in mixed woodland. The M11 motorway spans the valley and river c. 375m to the east of the industrial lands and is elevated is elevated. An existing 220 kV overhead powerline crosses the valley to the east of the site and a number of medium and lower voltage powerlines are apparent in the wider locality as they converge on the Arklow substation located at Kilbride to the north of Arklow.

There are limited residences along the Vale Road in the vicinity of the site. North of the site on the more elevated agricultural land, there are some individual houses on private roads and clusters of dwellings L2180 just over 1 km to the north of the site.

The lands are within the designated *Urban Area Landscape Character Area* (LCA) as identified in the Wicklow County Development Plan 2016-2022 and described as being

of *Low Vulnerability*. The adjoining landscape includes the M11 *East Corridor Area* LCA, *South Eastern Mountain Lowlands Area of High Amenity* LCA and the *Rolling Lowlands* LCA. Along the coast to the north of Arklow, the *Southern Coastal Area AONB* LCA leads northwards to Brittas Bay.

By virtue of the industrial site area being low lying and substantially secluded within the Avoca River valley, the zone of visual influence of the lands and the proposed development site is localised to more immediate area of the R747 Vale Road and the M11 overbridge.

The proposed development includes a GIS substation building, a client control building and four transformers set within two adjoining site compound areas. The GIS substation building is the largest structure however it is moderate in size compared to the existing Holfeld Plastics factory. The development site area will be along the northern side of the industrial lands where the north face of the valley affords a high degree of screening and immediately west of the existing Shelton Abbey substation.

The northbound carriageway of the M11 has the most open aspect towards the industrial lands, however, the proposed development will be readily absorbed within the context of existing larger industrial buildings and structures set along the northern side of the river valley.

From the portion of the R747 Vale Road along the southern side of the industrial lands, the proposed site area is substantially screened by the elevated railway line and intervening landscaping and landscape and visual effects of the proposed development will be imperceptible or minor.

From the elevated lands to the north and south of the valley, the proposed development site is not visible as it is set low within the valley corridor.

In summary, the proposed development is moderate of scale and will be located within an established industrial area which is substantially screened within its wider landscape setting by virtue of being low lying along the Avoca River corridor. The proposed development will be sited and has been designed to take maximum advantage of the screening characteristics of the valley topography and of the established industrial character of the site area. Landscape and visual effects of the proposed development will not be significant.

## 13.0 TRAFFIC AND TRANSPORTATION

The proposed site is located in the Avoca River Park. The site is accessible from the R772 near Junction 20 of the M11 northwest of Arklow town via local rural road network. The Avoca River Park Access Road is a c.7 metre wide carriageway with no existing with no existing footways or cycle lanes. The proposed development will not require significant regular staffing.

At the construction stage the site will generate a maximum of 25 operatives' vehicle visits per day together with up to 70 HGV movements over a very short period of the six month construction programme. At operational stage there will be a maximum of 20 two-way van trips to and from the site per week, with other infrequent site visits for less regular maintenance tasks.

All traffic will access the site via the Avoca River Park Access Road and onwards to the R772. Within the site there will be accesses to two dedicated ESB/operator compounds which will have sufficient parking space for vehicles.

The site is on reasonably flat terrain and services are provided along the existing road network adjacent to the site. Construction activities will therefore be largely contained within the boundary of the site. There will be a requirement for haulage of unsuitable soil and demolition waste from the site. Additionally, construction materials will need to be brought to the site as will specialist plant and equipment. It is anticipated that deliveries will occur throughout the day. The traffic movements at peak hour are anticipated to exceed those of the operational phase but will readily be accommodated within the capacity of the existing road junctions. The estimated increase in traffic associated with the construction phase of the proposed development will be short term, not significant and of neutral effect.

The generated trips to and from the site throughout the operational phase of the development, will not result in a material impact upon the surrounding road network and junctions in terms of capacity. Overall, the impact of the development on the traffic and transportation environment will be long term in duration of imperceptible neutral effect.

## 14.0 MATERIAL ASSETS

This chapter of the EIA Report evaluates the impacts, if any, which the proposed development may have on Material Assets. The Draft EPA EIA Guidelines (2017) state that material assets are now taken to mean built services and infrastructure, roads and traffic and waste management. The Draft EPA Advice notes also give the following examples of material assets; assimilative capacity of air, ownership and access and tourism. In the EIA Report, the impacts on the various material assets described above have been considered in the following chapters of this EIA Report as follows:

- Chapter 4 Population and Human Health;
- Chapter 8 Air Quality & Climate;
- Chapter 13 Traffic & Transportation; and
- Chapter 15 Waste Management.

***Ownership and Access***
The site of the proposed development is owned by the Applicant.

The main site access is along the northern boundary of the Avoca River Park. Construction traffic will enter and exit the site via the access for Avoca River Park (the R772 via Beech Road, Kilbride Road and Shelton Abbey). The site access would be located to the west of the site. Site security will be put in place adjacent to the entrance and will be in place for all phases of work.

***Power and Electrical Supply***
The substation will be powered by a 49 kVA domestic supply to service the substation. This supply will be taken from an existing ESB Networks medium voltage substation within the industrial estate.

In a separate future development, ESB networks will undertake works to run a 110kV cable to the proposed development. This is illustrated in Figure 3.4 of Chapter 3.

***Surface Water, Wastewater and Water Supply Infrastructure***
The proposed development will be served by an internal foul sewer which will discharge into a storage tank on site. The tank is to be fitted with an alarm which will advise when emptying is required thereby avoiding potential for overflow. It is proposed to install a rainwater harvesting unit to supply non-potable water that is suitable for flushing toilets and washing hands. The rainwater harvesting unit is to be Molloy Environmental Systems H+ Tank or similarly approved. The tank is to supply a minimum volume of 3,500 litres capacity catering for 5 users (reserve supply for 10 days for 5 people). Potable water, when required, will be supplied in bottle form.

## 15.0 WASTE MANAGEMENT

This chapter has been prepared to address the issues associated with waste management during the construction and operational phases of the proposed development.

An assessment was carried out of the potential impacts associated with resource consumption and waste management during the construction and operational phases of the proposed development. The receiving environment is largely defined by WCC as the local authority responsible for setting and administering waste management activities in the area through regional and development zone-specific policies and regulations.

During the construction phase, typical construction waste materials will be generated which will be source segregated on-site into appropriate skips/containers and removed from site by suitably permitted waste contractors to authorized waste facilities. Where possible, materials will be reused on-site to minimize raw material consumption. Source segregation of waste materials will improve the re-use opportunities of recyclable materials off-site. Construction of foundations and services will require the excavation and removal of c. 8,500$m^3$ of material for offsite reuse, recovery and/or disposal at a suitably authorised facility.

A carefully planned approach to waste management and adherence to the site-specific Construction and Demolition Waste Management Plan during the construction phase will ensure that the effect on the environment will be short-term, neutral and imperceptible.

Mitigation measures are outlined in Chapter 15 and are in line with those detailed in the project specific C&D WMP which has been prepared for the proposed development. Some of the measures include waste minimisation, on-site segregation of waste and the appointment of a waste manager.

The residual impact will be neutral and imperceptible.

## 16.0 INTERACTIONS – INTERRELATIONSHIPS BETWEEN THE ASPECTS

This chapter of the EIA Report addresses potential interactions and inter-relationships between the environmental factors discussed in the preceding chapters. This covers both the construction and operational phase of the proposed development.

The majority of EIA Report chapters assess potential interactions between environmental aspects however this section presents a summary and assessment of

the identified interactions. The majority of interactions are found to have a neutral impact on the environment.

# 1.0 INTRODUCTION

## 1.1 PROPOSED DEVELOPMENT

This Environmental Impact Assessment (EIA) Report has been prepared on behalf of Crag Digital Avoca Ltd (herein referred as 'the Applicant') to accompany a planning application to An Bord Pleanála (ABP) for planning permission for the provision of a 110 kV GIS substation compound along with associated and ancillary worksas described in Chapter 2 (Description of the Proposed Development). This development will hereafter be referred to as the 'proposed development'.

EirGrid will be the transmission system operator (TSO). ESB Networks will be the transmission asset owner (TAO). The company background and roles of the TSO and TAO are summarised in Section 1.3.

Figure 1.1 shows the location of the proposed development.

A full description of the proposed development is provided in Chapter 2 (Description of the Proposed Development).

The proposed development will be designed to provide a permanent power supply for the extant permission on site (Wicklow County Council (WCC) Planning Application No. 18940) for a 3 no. data storage facilities and associated site infrastructure, (hereafter referred as the 'permitted development'). Permission for the permitted development was granted on 15th February 2019.

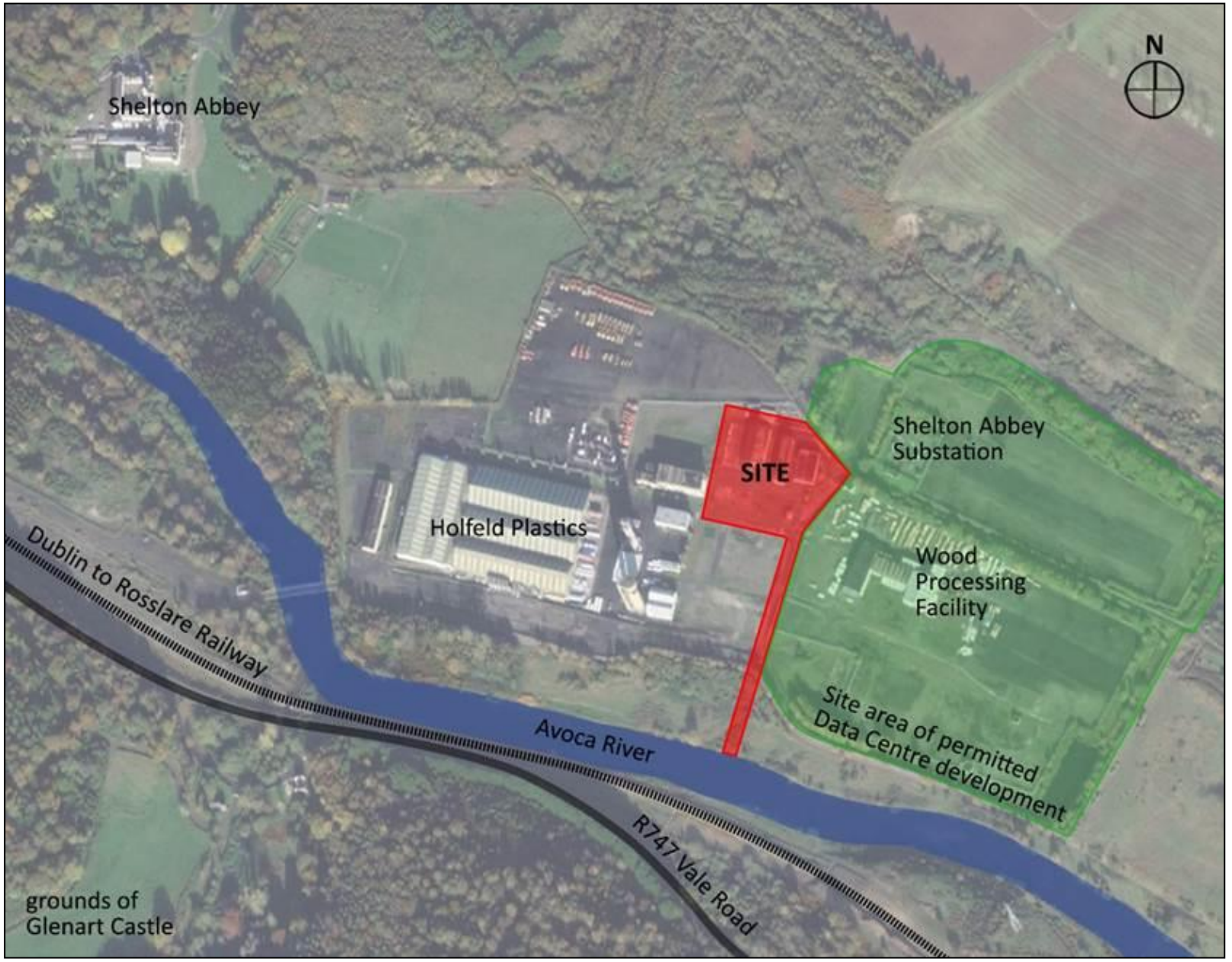



***Figure 1.1*** Location of the proposed development

## 1.2 CONTEXT

### 1.2.1 Legislative Requirements

This application is being made under the Planning and Development (Strategic Infrastructure) Act 2006, Section 182A to 182E.

The requirement for EIA for certain types and scales of development is set out in the EIA Directives (85/337/EEC, 97/11/EC, 2003/35/EC, 2008/1/EC and most recently 2014/52/EU) and given primary effect in Ireland by the European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018, European Communities (Environmental Impact Assessment) Regulations 1989-2006, Planning and Development Act 2000 (as amended) and the Planning and Development Regulations 2001-2019. It should be noted that this EIA Report is prepared in accordance with the 2014 EIA Directive (2014/52/EU) and associated Irish legislation (referred to above).

The EIA Directives list those projects for which an EIA is mandatory (Annex I) and those projects for which an EIA may be required (Annex II). With regard to Annex II projects, Member States can choose to apply thresholds or use case by case examination or a combination of both to assess where EIA is required. In Ireland, a combination of both has been applied. The proposed development is not listed under Annex I EIA Directives. An EIA Report has been provided as the proposed development is required to provide the permanent power supply for the permitted data storage facility developments (WCC Planning Application No. 18940).

The main objective of an EIA, as set out in Article 3(1) of the 2014 EIA Directive, is to identify, describe, and assess the direct and indirect significant impacts of a project on population and human health, biodiversity, land, soils, water, air & climate (including noise), material assets, cultural heritage and the landscape and the interaction between the aforementioned factors. The EIA Report (previously referred to as an Environmental Impact Statement or EIS) reports on the findings of the EIA process to date and informs the Planning Authority, statutory consultees, other interested parties and the public in general about the likely effects of the project on the environment.

### 1.2.2 Format of the EIA Report

This EIA Report has been prepared in accordance with the requirements of EIA Directives (2011/92/EU and 2014/52/EU). It is prepared in a format following the guideline structure set down in the Environmental Protection Agency (EPA) Draft "*Guidelines on the Information to be Contained in Environmental Impact Assessment Reports" (*2017) (herein referred to as the EPA Draft EIA Report Guidelines 2017).

The "*Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment"* (August 2018) and the European Commission "*Guidance on the preparation of the Environmental Impact Assessment Report"* have been considered in the preparation of the EIA report.

Using the format following the guidelines in the EPA Draft EIA Report Guidelines 2017, this EIA Report examines each environmental aspect in a separate chapter. Each chapter generally covers the following:

- Receiving Environment
- Characteristics of the proposed development

- Potential Impacts of the proposed development
- Do-Nothing Scenario
- Remedial and Mitigation Measures
- Predicted Impacts of the Development
- Residual Impacts

A Non-Technical Summary of the findings of the EIA Report is provided as a separate document.

Cumulative impacts for each environmental topic are assessed in each chapter of this EIA Report.

Interactions (i.e. the interrelationships between each environmental aspect), are assessed as they occur in each chapter. The final chapter of the EIA Report, Chapter 16, shows where interactions have been identified and how they have been addressed.

### 1.2.3 Need for the Proposed Development

As stated in Section 1.1, permission was granted by WCC in February 2019 for the construction of 3 no. data storage facilities to the south east of the proposed development site. The proposed development will be designed to provide a permanent power supply for the extant planning permission for a data storage facility adjacent to the proposed development site (WCC Planning Application No. 18940).

## 1.3 COMPANY BACKGROUND

The Applicant provides data storage, management and dissemination. To date, the Applicant has developed a number of data facilities in Ireland.

As noted in Section 1.1, Eirgrid is the transmission system operator (TSO). Since 2006, Eirgrid has operated and developed the national high voltage electricity grid in Ireland. EirGrid is a state-owned company. EirGrid is independent from ESB. They operate the flow of power on the grid and plan for its future, while ESB Networks (the TAO) is responsible for carrying out maintenance, repairs and construction on the grid. The grid moves wholesale power around the country. Eirgrid brings energy from generation stations to heavy industry and high-tech users. They also supply the distribution network operated by ESB Networks that powers every electricity customer in the country.

As noted in Section 1.1, ESB Networks are the transmission asset owner (TAO). ESB Networks is a subsidiary within ESB Group. ESB Networks finances, builds, and maintains the transmission system through which electricity flows from generation stations to bulk supply points near Ireland's cities and towns. It does this under a TAO licence granted by the Commission for Regulation of Utilities (CRU). ESB Networks performs its transmission related functions under the direction of Eirgrid.

In summary EirGrid operates the transmission system (TSO) while ESB Networks carries out construction, maintenance, and repairs (TAO) under the direction of EirGrid. For this development, EirGrid will operate transmission stations, including the existing Corduff substation and the proposed new GIS substation, remotely from their control centres. However, ESB Networks will carry out all local operations on Eirgrid's behalf. Eirgrid and ESB Networks are committed to running their businesses in the most environmentally friendly way possible.

## 1.4 CONSULTATION

The Applicant met with ABP to confirm the proposed development was a SID application and to discuss the scope for the planning application. Consultation has also been undertaken with Eirgrid and ESB Networks to ensure the proposed development design meets their requirements.

In addition, the relevant specialists and project engineers (Malachy Walsh and Partners) have liaised with typical statutory bodies (including WCC) by correspondence during the course of the EIA Report preparation.

AWN Consulting Limited (hereafter referred to as AWN) and the other respective EIA contributors have incorporated advice and comments received from consultees into the relevant chapters of this EIA Report.

## 1.5 REGULATORY CONTROL

The proposed transmission of electricity is not an EPA regulated activity in terms of the Industrial Emissions Directive (Directive 2010/75/EU) (which replaced the IPPC directive). The TSO and TAO will ensure the relevant regulatory requirements relating to power activities are met.

## 1.6 CONTRIBUTORS TO THE EIA REPORT

The preparation and co-ordination of this EIA Report has been completed by AWN in conjunction with specialist subcontractors. Specialist inputs were provided by the as per the schedule of contributors provided in Table 1.1.

***Table 1.1*** Roles and Responsibilities in the EIA Report

| **Role** | | **Company** |
|---|---|---|
| EIA Project Management | | AWN – Teri Hayes and Elaine Neary |
| Engineering Design | | Clifton Scannell Emerson Associates (CSEA) |
| **EIA Chapter No.** | **Chapter Title** | **Company & Consultant** |
| | Non-Technical Summary | AWN – Input from each specialist |
| Chapter 1 | Introduction | AWN – Teri Hayes & Emma Carroll |
| Chapter 2 | Description of the Proposed Development | AWN – Teri Hayes & Emma Carroll |
| Chapter 3 | Planning and Alternatives | AWN – Teri Hayes & Emma Carroll |
| Chapter 4 | Population and Human Health | AWN – Teri Hayes & Emma Carroll with specialist input from Damian Kelly and Ciara Nolan |
| Chapter 5 | Land, Soils, Geology & Hydrogeology | AWN – Teri Hayes / Paul Conaghan |
| Chapter 6 | Hydrology (including Stage 1 Flood Risk Assessment) | AWN – Teri Hayes / Paul Conaghan |
| Chapter 7 | Biodiversity (including AA) | Moore Group – Ger O'Donohoe |
| Chapter 8 | Air Quality & Climate | AWN – Edward Porter & Ciara Nolan |
| Chapter 9 | Noise & Vibration | AWN – Damian Kelly |
| Chapter 10 | Landscape and Visual | Brady Shipman Martin - John Kelly |
| Chapter 11 | Archaeological, Architectural and Cultural Heritage | CRDS Ltd. – Stephen Mandal |
| Chapter 12 | Traffic & Transportation | CST Group – Philip Bayfield |
| Chapter 13 | Material Assets | AWN – Teri Hayes & Emma Carroll |
| Chapter 14 | Waste Management (including C&D Waste Management Plan) | AWN – Teri Hayes & Emma Carroll |
| Chapter 15 | Interactions- Interrelationship between the Aspects | AWN – Teri Hayes & Emma Carroll |

**Project Director/Selected Chapters, Teri Hayes,** BSc (Geology), MSc (Hydrogeology) 1990. Teri is a member of the International Association of Hydrogeologists (Irish Group) – former president and the Institute of Geologists of Ireland – Professional Member. Teri is a Director with AWN with 25 years of experience in EIA Management, water resource management and contaminated land assessment. She has project managed and contributed to numerous environmental impact assessments and design of appropriate mitigation measures, acted as an expert witness at public hearings, lectured in EIA and providing expert advice on EIA sections for planning authorities.

**Assistant EIA Co-ordinator/Selected Chapters, Emma Carroll** is an Environmental Consultant with AWN. Emma holds a B.A. in Natural Science from Trinity College Dublin and an M.Sc. Environmental Sustainability from University College Dublin. Emma has worked on projects relating to the remediation of agricultural wastes and residues, and also has experience with natural resource management and sustainability models. Emma has prepared specialist inputs for numerous EIA Reports and EIA Screening Reports. Emma assisted in the preparation of selected chapters of the EIA Report.

**Biodiversity/Appropriate Assessment, Ger O'Donohoe,** Ger graduated from GMIT in 1993 with a B.Sc. in Applied Freshwater & Marine Biology and completed an M.Sc. in Environmental Sciences, graduating from TCD in 1999. He is a Environmental Manager and Consultant Ecologist with Moore Group. Ger has over 20 years of experience as an environmental consultant with experience in the planning and management of numerous complex Environmental Impact

Assessments for large scale developments nationwide. He has wide ranging experience as an expert witness at public hearings.

**Land, Soils, Geology, Hydrogeology & Hydrology, Teri Hayes,** (as above)

**Land, Soils, Geology, Hydrogeology & Hydrology, Paul Conaghan.** Paul is an Environmental Consultant at AWN with over 8 years' experience working in the environmental science and environmental engineering fields. Paul holds a degree in Environmental Science from the University of Limerick and a masters in environmental engineering from Queens University Belfast. Paul has worked on a wide range of projects including hydrogeology, contaminated land, project management, site geotechnical evaluations, site assessments specialising in environmental impact assessment. Paul is a member of the International Association of Hydrogeologists.

**Air Quality & Climate, Ciara Nolan** is an Environmental Consultant in the Air Quality section of AWN. She holds a BSc in Energy Systems Engineering from University College Dublin and has also completed an MSc in Applied Environmental Science at University College Dublin. She is an Associate Member of the Institute of Air Quality Management. She specialises in the fields of ambient air monitoring, indoor air monitoring and EIA.

**Noise & Vibration, Damian Kelly,** Director and Principal Acoustic Consultant in AWN. He holds a BSc from DCU and an MSc from Queens University Belfast. He has over 18 years' experience as an acoustic consultant. He is a member of the Institute of Acoustics. He has extensive knowledge in the field of noise modelling and prediction, having prepared the largest and most complex examples of road and industrial noise models currently in existence in Ireland. He was also co-author of the EPA document "*Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities" (2012)* and advised in relation to the noise limits applied to commercial developments by the various local authorities in the Dublin region.

**Landscape and Visual, John Kelly,** BArch (Hons) MRIAI. John is a qualified Architect and Managing Partner of Brady Shipman Martin and has over 25 years' experience of direct involvement in the planning, design and environmental assessment of major infrastructure, industrial, educational, commercial, tourism, leisure and energy projects, as well as large scale mixed-use masterplans. John utilises and develops photographic, surveying and digital methodologies that assist in establishing a thorough understanding of the three-dimensional characteristics of sites and their context.

**Archaeology, Dr. Stephen Mandal,** MIAI, PGeo, EurGeol, is founder and managing director of CRDS Ltd (established in 1997; incorporated in 1999, CRDS (www.crds.ie) is a multi-award winning archaeological and historical consultancy widely acknowledged as a leading provider of a wide range of cultural heritage services). He holds an honours science degree in Geology (1991) and a PhD in Geoarchaeology (1995) from Trinity College Dublin. In 2018, he was appointed to the Cultural Heritage Advisory Panel for the Dublin City Council Culture Company. In 2019 he was appointed to the executive board of the Discovery Programme, the state centre for archaeology and innovation in Ireland. Also in 2019, he was appointed as a Research Associate of the Smithsonian Museum. He served as Vice-Chairperson of the Royal Irish Academy Committee for Archaeology from 2009 to 2014. From 2012 to 2015 he was the External Examiner in Applied Archaeology at Sligo Institute of Technology. He has co-authored two books, The Irish Stone Axe Project: Monograph I (1998, with Prof Gabriel Cooney) and Carrick, County Wexford:

Ireland's first Anglo-Norman Stronghold (2019, with Dr Denis Shine, Dr Michael Potterton and Catherine McLoughlin) and has contributed to a dozen more. He has also authored numerous academic papers in subjects as diverse as geology, archaeology, geoarchaeology, community heritage and the heritage economy. He is a professional member of the Institute of Archaeologists of Ireland, the Institute of Geologists of Ireland, and the European Federation of Professional Geologists.

**Traffic & Transportation, Phillip Bayfield** (BE MSc CEng MIEI MICE) is a Chartered Engineer with over 30 years' experience in the industry. He has overseen civil and structural engineering design of variety of projects including several road and bridge schemes, commercial, educational, public and residential buildings as well as works in the public domain and has been responsible for project team management, resourcing, programming and account management. Projects include the Sutherland School of Law Enabling Works Contract on behalf of UCD, Thornton Hall Access Road and Thornton Hall Offsite Works projects on behalf of the Irish Prison Service, Scotch Hall Development, Kildare Civic Offices infrastructure and Beacon Gateway. Philip is also an experienced PSDP coordinator.

## 1.7 DESCRIPTION OF EFFECTS

The quality, magnitude and duration of potential effects are defined in accordance with the criteria provided in the EPA Draft *EIA Report Guidelines 2017* as outlined in Table 1.2.

***Table 1.2*** Description of Effects as per EPA Draft EIA Report Guidelines 2017

| Effect Characteristic | Term | Description |
|---|---|---|
| **Quality** | Positive | A change which improves the quality of the environment |
| | Neutral | A change which does not affect the quality of the environment |
| | Negative | A change which reduces the quality of the environment |
| **Significance** | Imperceptible | An impact capable of measurement but without noticeable consequences |
| | Not significant | An effect which causes noticeable changes in the character of the environment but without noticeable consequences |
| | Slight | An effect which causes noticeable changes in the character of the environment without affecting its sensitivities |
| | Moderate | An effect that alters the character of the environment in a manner consistent with existing and emerging trends |
| | Significant | An effect, which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment |
| | Very Significant | An effect which, by its character, magnitude, duration or intensity significantly alters the majority of a sensitive aspect of the environment. |
| | Profound | An impact which obliterates sensitive characteristics |
| **Duration of Effects** | Momentary Effects | Effects lasting from seconds to minutes |
| | Brief Effects | Effects lasting less than a day |
| | Temporary Effects | Effects lasting less than a year |
| | Short-term Effects | Effects lasting one to seven years. |
| | Medium-term Effects | Effects lasting seven to fifteen years |
| | Long-term Effects | Effects lasting fifteen to sixty years |
| | Permanent Effects | Effects lasting over sixty years |
| | Reversible Effects | Effects that can be undone, for example through remediation or restoration |

| Effect Characteristic | Term | Description |
|---|---|---|
| **Probability of Effects** | Likely Effects | The effects that can reasonably be expected to occur as a result of the planned project if all mitigation measures are properly implemented. |
| | Unlikely Effects | The effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented. |
| **Type of Effects** | Indirect Effects | Impacts on the environment, which are not a direct result of the project, often produced away from the project site or because of a complex pathway. |
| | Cumulative | The addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects. |
| | 'Do Nothing' | The environment as it would be in the future should no development of any kind be carried out |
| | `Worst case' Effects | The effects arising from a project in the case where mitigation measures substantially fail |
| | Indeterminable | When the full consequences of a change in the environment cannot be described |
| | Irreversible | When the character, distinctiveness, diversity, or reproductive capacity of an environment is permanently lost |
| | Residual | Degree of environmental change that will occur after the proposed mitigation measures have taken effect |
| | Synergistic | Where the resultant impact is of greater significance than the sum of its constituents |

## 1.8 ADDITIONAL ASSESSMENTS REQUIRED

This section addresses the additional approvals and assessments required under other EU Directives and legislation.

- **Appropriate Assessment Screening Report** - A screening report has been completed for the Proposed development, as required under the Habitats and Birds Directive (92/43/EEC and 79/409/EEC) and is included as Appendix 7.1. of this EIA Report.

- **Flood Risk Assessment** - A Stage 1 Flood Risk Assessment has been undertaken for the site and is appended to Chapter 6 Hydrology as Appendix 6.2.

A project-specific Construction Environmental Management Plan (CEMP) has also been prepared by the project engineers, Malachy Walsh and Partners.

## 1.9 FORECASTING METHODS AND DIFFICULTIES IN COMPILING THE SPECIFIED INFORMATION

Forecasting methods and evidence used to identify and assess the significant effects on the environment for each environmental aspect are set out in each chapter.

There were no significant difficulties in compiling the specified information for this EIA Report. Any issues encountered during the assessment of individual factors are noted within the relevant chapters.

# 2.0 DESCRIPTION OF THE PROPOSED DEVELOPMENT

## 2.1 INTRODUCTION

As described in Chapter 1 (Introduction), the Applicant is applying to An Bord Pleanála (ABP) for planning permission for the provision of a 110 kV GIS substation compound along with associated and ancillary works.

The following chapter presents a description of the proposed development as required by the relevant planning legislation, Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment, as amended by the 2014 EIA Directive (2014/52/EU) (herein referred to as the EIA Directive), European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018, the current EPA Draft EIA Report Guidelines 2017 and the EPA Draft "Advice Notes for Preparing Environmental Impact Statements" (2015) (herein referred to as the EPA Draft Advice Notes for EIS 2015). Guidance outlined in the 'Environmental Impact Assessment of Projects - Guidance on the preparation of the Environmental Impact Assessment Report'' published by the European Commission in 2017 was also considered in the preparation of this EIA Report.

## 2.2 CHARACTERISTICS OF THE APPLICATION

### 2.2.1 Description of Site

The subject site is located to the north of the Avoca River, in Avoca River Park, approximately 2.5 km northwest of Arklow town centre, Co. Wicklow. The wider landholding comprises a large primarily brownfield site which is served by existing roads infrastructure implemented as part of the setting out of the Industrial Park. The wider landholding is subject to an extant permission (WCC Planning Application No. 18940) for a data storage facility and ancillary development. A revised layout for the data storage facility and ancillary development has been submitted (Planning Application No. 201285) and this is referred to as the "concurrent development".

The site of the proposed development comprises approximately 1.69 hectares of land. The existing structures on site to be demolished comprise 4 no. industrial commercial buildings, a gas enclosure, and a tank with bund wall. The remains of a previously demolished building, areas of hard standing, and existing surface treatments will also be removed as part of the site clearance works. The total ground floor area of structures to be demolished is approximately 2,200m$^2$.

The development is largely within the existing hard stand area. A narrow strip of land has been extended to provide provision for associated drainage infrastructure. This extends from the main site area to a proposed outfall location at the Avoca River.

The site is bound to the north by a local access road which serves Avoca River Park. To the south and to the west the site is bound by Holfield Plastics Limited. To the east the site is bound by the wider landholding that currently incorporate Harmony Timber and Stunt Drive Ireland which will cease operation and relocate prior to commencement of the construction of the data storage facility.

The existing site currently comprises of brownfield lands. The Avoca River Park is well developed, current operations include timber fabrication plant, a plastic manufacturing

plant, an existing substation and a storage area for scrapped vehicles. The lands in the immediate vicinity surrounding the industrial park comprise a mix of agricultural, forested, residential, commercial and institutional development. Shelton Abbey Prison is located to the north-west, Glenart Castle to the south-west and Sigma Aldrich facility to the south-east.

The site is generally fairly level, with much of the site being circa +2.0m to +2.3m OD. The western portion of the site is slightly higher at approximately +2.4m to +2.8m OD.

### 2.2.2 Proposed Development Description

Figure 2.1(a) and (b) presents an overall site layout plan and compound layout. The proposed substation compound is subdivided into two parts. The northern part of the compound will accommodate a two storey 110kV GIS substation building (with a gross floor area of c. 1,377 sq.m). The southern part of the compound will accommodate four transformers and a single storey client control building (with a gross floor area of c. 416 sq.m) and associated underground services. Both parts of the substation compound will be enclosed within 2.6-metre-high security fencing. The overall compound will be enclosed within a property fence 1.4 metres in height. The 110kV GIS Substation building will comprise a two -storey over partial basement structure. The MV Control Building will comprise a single storey building with a basement of approximately 1.8 metre depth. The site also comprises associated transformers and 18-metre-high lightning protection masts.

The development includes access paths, landscaping, security fencing, provision of access roads car parking within the GIS substation compound, provision of a rural supply electricity connection (connecting to existing electrical services to the east of the proposed substation compound) for the GIS substation building, a unit substation, lightning masts, drainage and attenuation systems, services, all associated construction works, and all ancillary works.

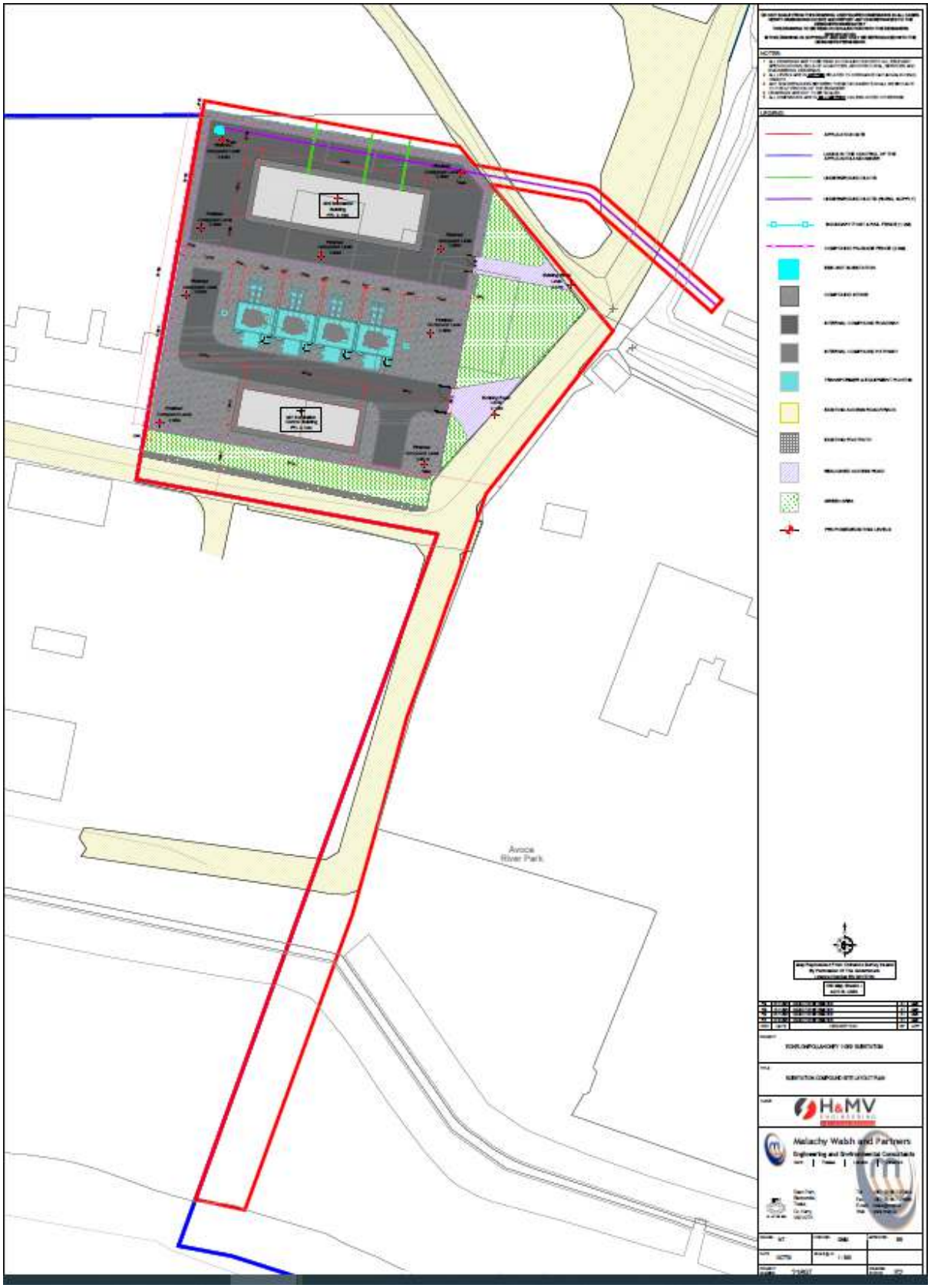



***Figure 2.1a*** Subject site outlined in red (Drawing 21697 MWP-00-00-DR-C-0003_S2P04)

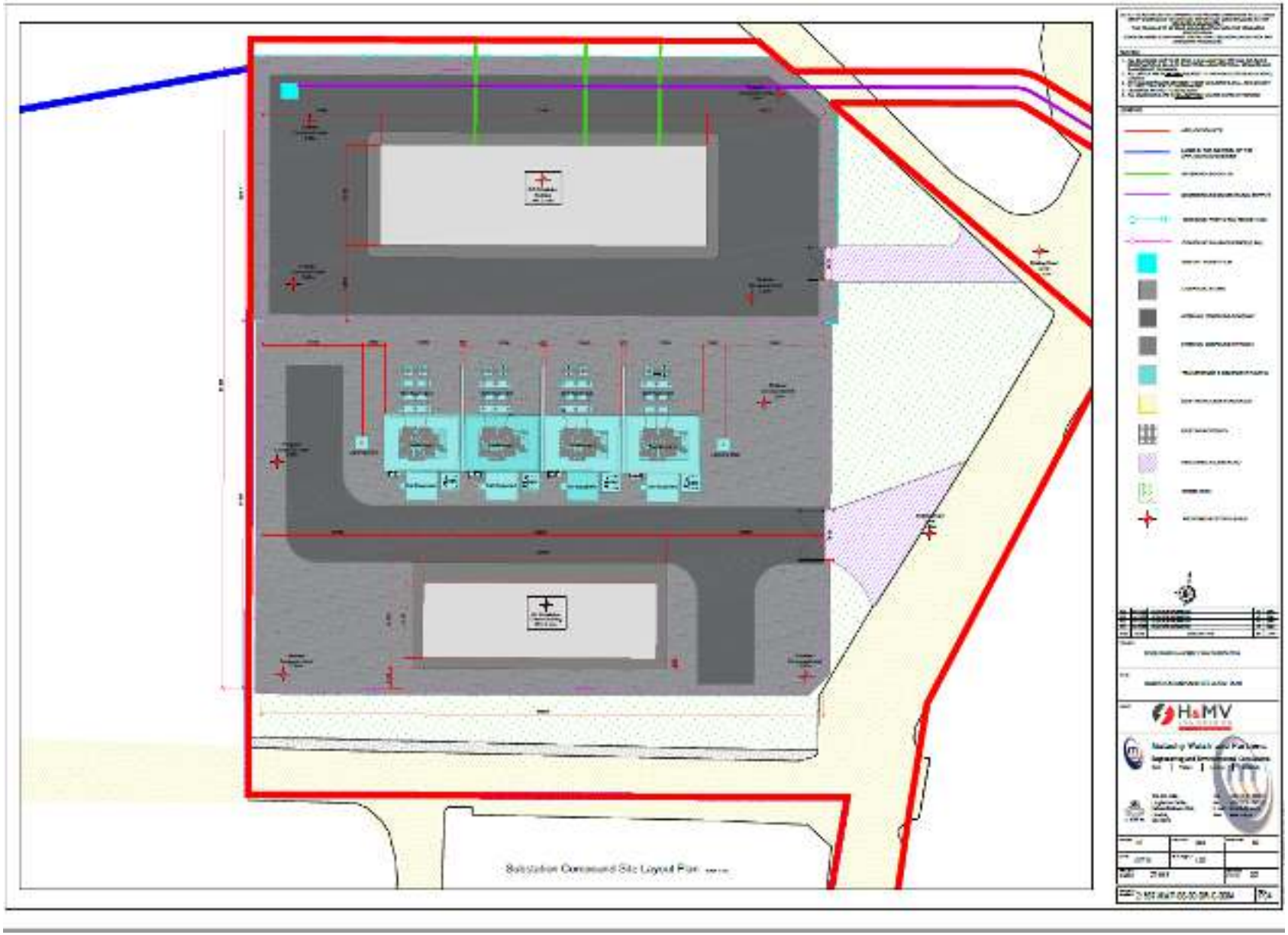



***Figure 2.1b*** Substation layout (Drawing 21697 MWP-00-00-DR-C-0003_S2P03)

The works will also include installation of cable ducts for three 110 kV underground cables (UGC), one to each of the two new OHL towers and one to the existing Shelton Abby 110 kV adjacent to the new Pollahoney 110 kV Substation inside cable ducts. The external works which include connection to overhead lines and underground grid connections will be undertaken by EirGrid. These are described in Section 2.3.5 below.

The cable duct trenches will have an optimum depth of excavation required to facilitate installation of the ducting of c. 1.2m below ground level but may increase to up to c. 1.5m. The typical width of each trench is 1.02m, however this may vary depending on ground conditions and existing services. A typical cross section of the trench is illustrated in Figure 2.2.

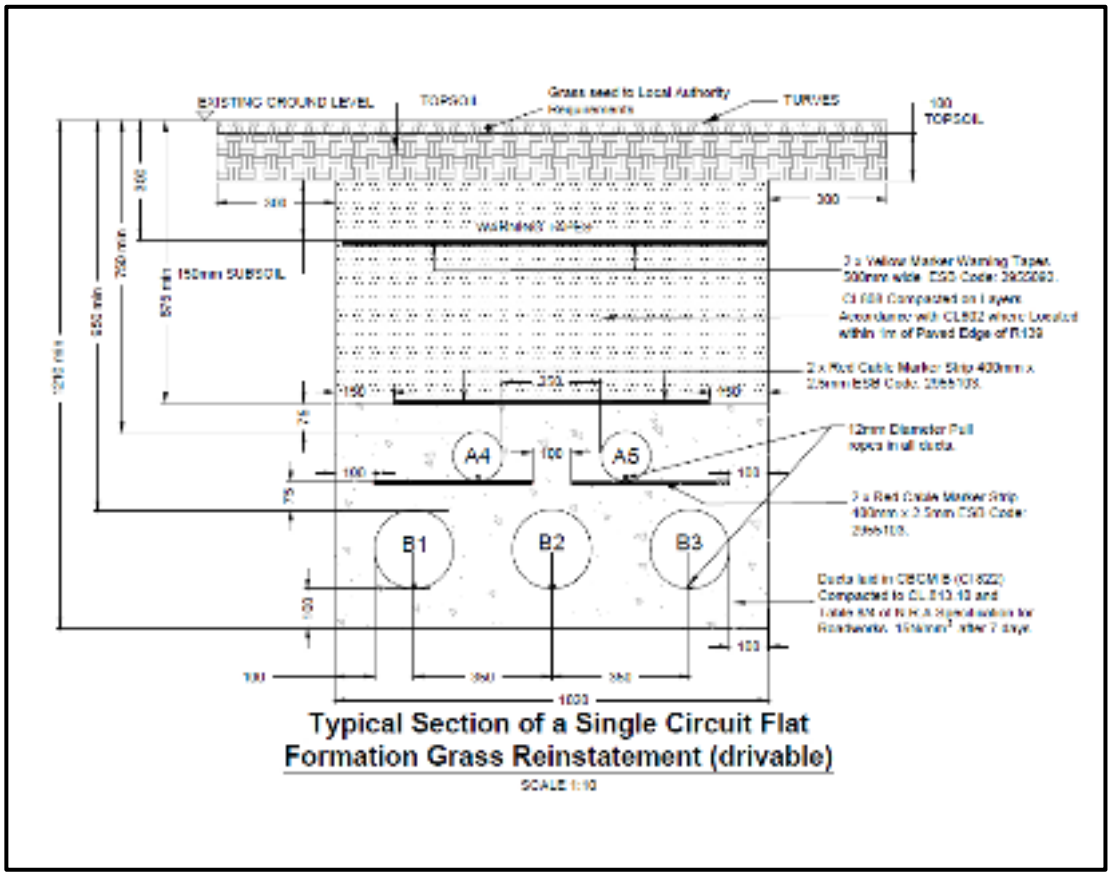



***Figure 2.2*** Typical Cross Section of Trench for Underground Cable

The works will also include a domestic supply to service the substation. This supply will be taken from an existing ESB Networks medium voltage substation within the industrial estate adjacent to the new substation development. The design of the 49 kVA underground cable will comprise a looped 10 kV circuit installed underground in uPVC ducting. The 10 kV cables will be a standard XLPE (cross- linked polyethylene) Aluminium cable. XLPE does not contain oil, therefore there is no risk of migration of oil into the ground in the event of a failure (such as a short circuit, a joint fail, a termination failure etc.).

The installation of the uPVC ducting will require the excavation of one trench along the route; the trench will contain one 10 kV circuit. Between two and four separate ducts will be installed the trench.

The optimum depth of excavation required to facilitate installation of the ducting is 0.95-1m below ground level (bgl) but may increase to up to c. 1.5m at utility crossings. The optimum width of the trench is c. 0.6m, however this may vary

depending on ground conditions and existing services to up to c. 1m. A typical cross section of the trench is illustrated in Figure 2.4.

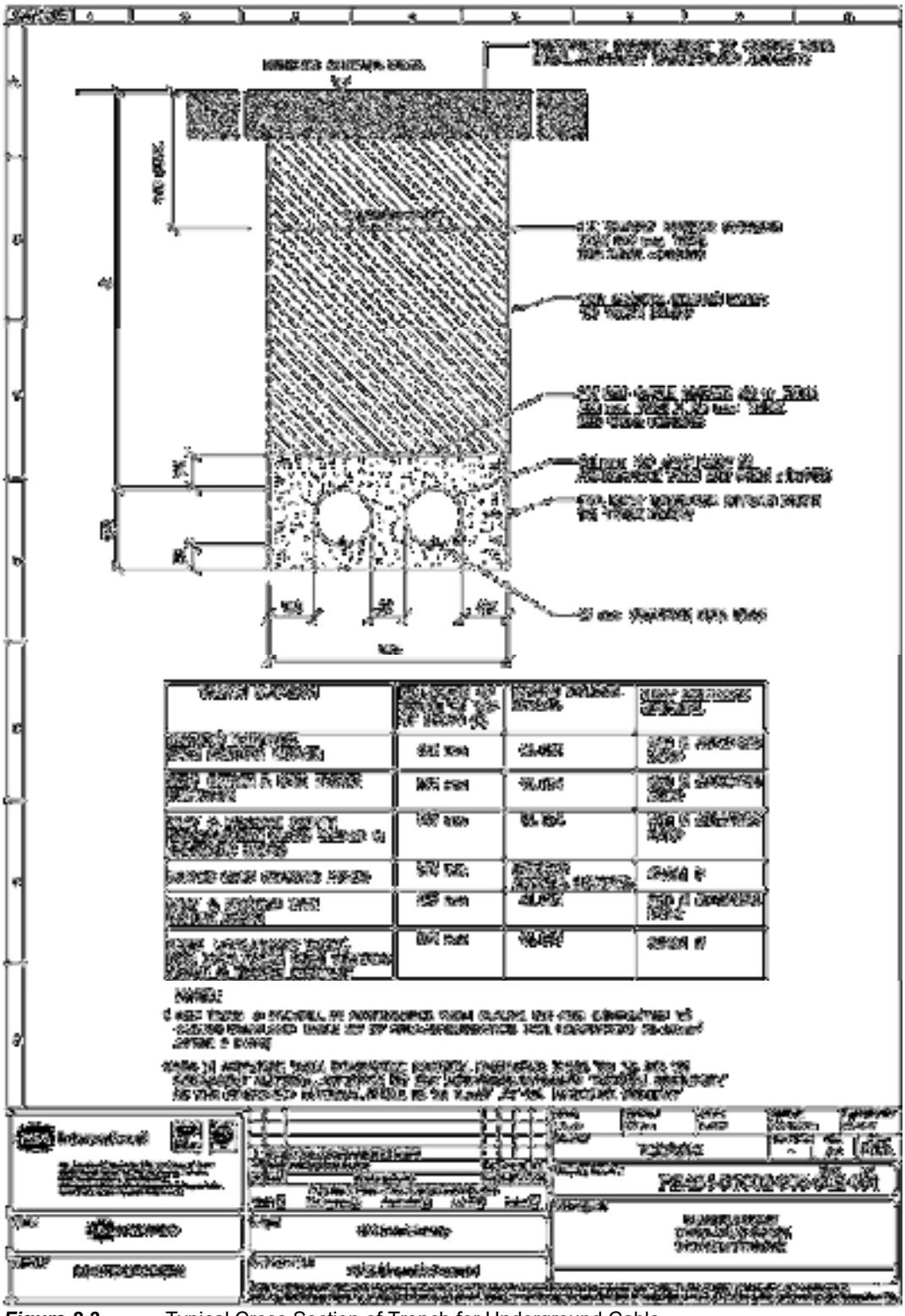


***Figure 2.3*** Typical Cross Section of Trench for Underground Cable

### 2.2.3 Proposed Site Infrastructure and Secondary Facilities

#### *2.2.3.1 Surface Water Drainage*

The existing developments within the Avoca River Park attenuate stormwater on site by means of drainage channels and attenuation ponds before discharging to the local River Avoca. It is proposed to construct a new surface water drainage network to intercept, attenuate and discharge surface water generated by the proposed development on the site. The system will consist of a piped network, underground attenuation system, petrol interceptor and a hydrobrake. The hydrobrake will limit the rate of discharge from the site to a suitable outflow rate. The outflow rate will be calculated using the IH124 method developed by the UK Institute of Hydrology with further guidance adopted from the Greater Dublin Strategic Drainage Study (GDSDS). The GDSDS suggests the following:

- The discharge from all rainfall events up to 1-year return period should be throttled to the mean annual peak flow of 2.5 l/s (Qbar)
- while all rainfall events between 1-year and 30-year return period should be throttled to the factored 30-year peak flow of 5.3 l/s (30-year growth factor of 2.1) Drainage
- and all rainfall events between 30-year and 100-year return period should be throttled
- to the factored 100-year peak flow of 6.6 l/s (100-year growth factor of 2.6)

For small sites it is deemed appropriate to use a single outflow rate rather than separate control rates. It is proposed to limit the discharge rate to the 1 in 100-year Greenfield Runoff rate for this site.

#### *2.2.3.2 Foul Drainage*

The proposed substation will be served by a single 150mm diameter foul sewer which will discharge into a storage tank on site. The storage tank is to be designed for 5 maintenance personnel being present on site 6-8 times per month with the system emptied about approximately twice per annum.

The flow rate assumed for the design is what is advised for an industrial office/factory type setting without a canteen given the nature and usage which is advised as being which is 50l/person/day within Irish Water's Code of Practice. This equates to 250l/day for the substation. As a result, the peak flow will be below 2.5l/s. Therefore, the drains are proposed to be laid at the minimum recommended gradient of 1 in 60 as per Table 6 of TGD Part H.

The volume of effluent that would be generated by the flow rates is estimated to be 2.0$m^3$/month which equates to 12$m^3$ every six months. The proposed volume of the holding tank is 15$m^3$ which has spare capacity of 3$m^3$.

Emptying times of the holding tank may vary depending on usage on the site but should be emptied every 6 months at a minimum. An alarm should be fitted to the tank to advise the maintenance management that the system is close to capacity. This is so that the system can be emptied to prevent the risk of it overflowing and causing an environmental impact on the local environmental impact. A vent pipe is proposed to serve the tanks to reduce the risk of odour nuisance on the site due to the tanks. The foul holding tank and ancillary drainage components may be revised at a later date in the project if further design clarifications are provided.

*2.2.3.3 Water Supply*

It is proposed to install a rainwater harvesting unit to supply non-potable water that is suitable for flushing toilets and washing hands. The rainwater harvesting unit is to be Molloy Environmental Systems H+ Tank or similarly approved. The tank is to supply a minimum volume of 3,500 litres capacity catering for 5 users (reserve supply for 10 days for 5 people). The system is to be installed in accordance with the manufacturer's requirements and is to be fitted with a UV bulb, pressure vessel with and an overflow to the storm network.

*2.2.3.4 Electricity*

The substation will be powered by a 49 kVA domestic supply to service the substation. This supply will be taken from an existing ESB Networks medium voltage substation within the industrial estate.

*2.2.3.5 Oil Storage*

There is a requirement for oil storage for the transformers. The maximum storage is c. 36 $m^3$ and this will be stored within a bunded area which is greater than 110% of the storage capacity. A float switch will operate to ensure that any collected water is pumped to sewer.

## 2.3 EXISTENCE OF THE PROJECT

Under the current Draft EPA Guidelines on the information to be contained in EIA Reports, the description of the existence of the project is required to define all aspects of the proposed lifecycle of the proposed development under the following headings:

- Construction
- Commissioning
- Operation
- Decommissioning; and
- Description of Other Developments.

The following sections present a description of each of these aspects.

### 2.3.1 Description of Construction

The construction of the proposed 110kV GIS substation will comprise four main stages, namely:

- Site preparation works;
- Building Structure Construction;
- Building Envelope Construction; and fit out Including mechanical and electrical fit-outs and commissioning.

The construction of the cable installations will comprise site preparation works and excavations within the site boundary for future cable installation;

All construction works will be undertaken in compliance with the requirements of the Construction Environmental Management plan (CEMP) which has been provided with planning and will be updated with any further requirement of planning prior to commencement of works.

*Working Hours*

It is anticipated that the construction will be completed during normal construction hours i.e. 7am to 6 pm Monday to Friday with a half day working on Saturday (8am - 1pm).

However, it is possible that the appointed contractors may wish to carry out certain operations outside these hours i.e. evening hours during long summer days etc. Such occurrences will be notified to the local authority, where required and generally kept to a minimum. Where they do occur, contractors will ensure they take place over as short a timeframe as possible and as such are unlikely to cause excessive disturbance.

*Staffing*
The following construction data has been used to estimate peak daily construction traffic (assumed to occur during civil works period for substation building):

- Average construction staff: 15 - 20;
- Peak construction staff (peak staff levels during civil works): 30.

*Construction Schedule*
- Application for Planning Permission –January 2021
- Commence Site Construction works (subject to grant of planning permission) – Start of Q2 2021
- Completion of Construction and Commissioning – Q3 2021

*Site Preparation & Demolition Works*
A temporary construction compound will be set up at commencement to facilitate office, portable sanitary facilities, equipment storage, parking etc. for contractors. It will be used for the duration of the works. The site will have site security throughout construction works.

It is proposed to demolish the existing building onsite as part of the enabling works for this project. The total ground floor area of structures to be demolished is approximately 2,200m$^2$.

The site preparation phase for the GIS substation will involve site clearance, excavations and levelling of the site to the necessary base level for construction, surveying and setting out for structures and any rerouting of services/connections to services.

A combination of bulldozer, excavators, trucks and other soil shifting plant will commence the main site clearance and levelling aspects.

The site preparation required for proposed development will be limited with minimal site clearance required.

*Building Construction Works*

*Foundations and Structure*
Following the completion of site clearance and levelling, all structures will require foundations to structural engineer specifications. Building structures will comprise standard structural steel frames.

It is anticipated that foundations will require moderate scale excavations. Based on site conditions no rock breaking or dewatering will be necessary.

*Levelling/Cut and Fill*
It is envisaged that all of the spoil generated during site preparation/levelling will be removed from site. It is anticipated that the top 1000mm to the west of the site and 300mm to the east of the site will be stripped of topsoil/organic material amounting to approximately 6,500 m$^3$. It is also anticipated that excavation for foundations,

basements and ancillary drainage and structural components will amount to approximately 2,000 $m^3$. All material from the demolished buildings is to be exported off site. It is envisaged that approximately 750 tonne of concrete, 350 tonne of steel and 150 tonnes of timber and other material is to be exported off site after demolition. It is envisaged that approximately 10,000$m^3$ of stone fill material will be required on site to build up to the required levels.

Contractors will be required to submit and adhere to a method statement (including the necessary risk assessments) and indicating the extent of the areas likely to be affected and demonstrating that this is the minimum disturbance necessary to achieve the required works.

Any temporary storage of spoil required will be managed to prevent accidental release of dust and uncontrolled surface water run-off which may contain sediment etc. (refer to Chapters 5 & 6 for further details).

*Building Envelopes and Finishes*
The Gas Insulated Switchgear (GIS) Substation and MV Control buildings will be 16.8 metres and 6 metres respectively. There will be a palisade fence separating the two buildings and separate access gates provided to each respected compound. The substation compound will be bounded by a palisade fence 2.6 metres in height and bounded within a property fence 1.4 metres in height.

The 110kV Substation building will comprise a typical industrial form, with a structural steel frame clad with profiled metallic sheet wall and roof cladding, internal walling of masonry will be adopted where applicable. The roof will be shallow pitched and constructed of profiled metal decking on purlins spanning between rafters. The MV Control Building will comprise a typical structure for buildings of this type- cavity wall construction, concrete floor slab and reinforced concrete roof slab.

*Roads, Services and Landscaping*
The main internal road system will be completed as part of the permitted development. An access road of approximately 10 metres in length and 5 metres in width for the GIS substation and an access road of approximately 10 m in length and 8 m wide for the MV Control Building with a new entrance onto the Avoca River Park Industrial Estate road.

Landscaping will be undertaken in accordance with the landscape masterplan for the permitted data storage development (refer to Chapter 11 Landscape and Visual Impact).

*Material Sourcing, Transportation and Storage*

*Materials*
Key materials will include steel, concrete, composite cladding, piping, electrical cabling, process equipment and architectural finishes. A ‘Just in Time’ delivery system will operate to minimise storage of materials on site.

*Sourcing*
Where possible it is proposed to source general construction materials from the Wicklow area to minimise transportation distances.

*Storage*
Aggregate materials such as sands and gravels will be stored in clearly marked receptacles within a secure compound area to prevent contamination. Liquid materials will be stored within temporary bunded areas, doubled skinned tanks or bunded

containers (all bunds will conform to standard bunding specifications – BS EN 1992-3:2006) to prevent spillage.

*Transportation*
Construction materials will be brought to site by road. Construction materials will be transported in clean vehicles. Lorries/trucks will be properly enclosed or covered during transportation of friable construction materials and spoil to prevent the escape of material along the public roadway.

*Waste Management*
Chapter 14 contains a detailed description of waste management relating to construction of the proposed development. A site-specific Construction and Demolition Waste Management Plan is included as Appendix 14.1 of this EIA Report. This C&D Waste Management Plan will be refined and updated in advance of the works to ensure best practice is followed in the management of waste from the proposed development.

*Noise, Vibration and Dust Nuisance Prevention*
With regard to construction activities, reference will be made to BS 5228 (i.e. BS 5228-1:2009+A1:2014 and BS 5228-2:2009+A1:2014) for noise and vibration control on construction and open sites, which offers detailed guidance on the control of noise and vibration from demolition and construction activities. Various mitigation measures will be considered and applied during the construction of the proposed development, such as:

- Limiting the hours during which site activities which are likely to create high levels of noise are permitted, e.g. soil levelling/excavations;
- Establishing channels of communication between the contractor/developer, local authority and residents;
- Appointing a site representative responsible for matters relating to noise and vibration, and;
- Monitoring typical levels of noise during critical periods and at sensitive locations.

Furthermore, it is envisaged that a variety of practicable noise control measures will be employed. These may include:

- Selection of plant with low inherent potential for generation of noise;
- Erection of barriers as necessary around items such as generators or high duty compressors, and;
- Siting of noisy plant as far away from sensitive receptors as permitted by site constraints.

Noise and vibration control measures are discussed in detail in Chapter 9 Noise & Vibration.

The potential for dust to be emitted depends on the type of construction activity being carried out in conjunction with environmental factors including levels of rainfall, wind speeds and wind direction. The potential for impact from dust depends on the distance to potentially sensitive locations and whether the wind can carry the dust to these locations. The majority of dust produced will be deposited close to the generated source.

In order to ensure that no dust nuisance occurs, a series of measures will be implemented including:

- Hard surface roads will be swept to remove mud and aggregate materials from their surface while any unsurfaced roads will be restricted to essential site traffic only;

- If required, any area/road that has the potential to give rise to fugitive dust will be regularly watered, as appropriate, during dry and/or windy conditions;
- Vehicles using site roads will have their speed restricted, and this speed restriction must be enforced rigidly. Indeed, on any un-surfaced site road, this will be 10km/hour, and on hard surfaced roads as site management dictates;
- In dry conditions vehicles delivering material with dust potential (soil, aggregates) will be enclosed or covered with tarpaulin at all times to restrict the escape of dust;
- Wheel washing facilities will be provided for vehicles exiting the site to ensure that mud and other wastes are not tracked onto public roads;
- Public roads outside the site will be regularly inspected for cleanliness and cleaned as necessary; and
- At all times, these procedures will be strictly monitored and assessed. In the event of dust emissions occurring outside the site boundary, movements of materials likely to raise dust would be curtailed and satisfactory procedures implemented to rectify the problem before the resumption of construction operations.

Dust nuisance control measures are discussed in further detail in Chapter 8 Air Quality and Climate.

*Water Discharges*
Portable welfare and sanitary facilities will be provided for the construction workers at the construction compound for the development.

Any surface water run-off will be adequately contained and treated prior to being discharged into the drainage network. See Chapter 6 Hydrology for a full description of mitigation measures proposed.

*Construction Impacts*
Each of the following EIA Report chapters (Chapters 4-14) includes an assessment of the potential impact of construction works on their individual environmental aspect and set out the relevant mitigation measures relating to that aspects.

A Construction Environmental Management Plan (CEMP) has been prepared by Malachy Walsh and Partners for the proposed development, and this will be put in place by contractors to minimise the impact of all aspects of the construction works on the local environment. The CEMP includes emergency response procedures in the event of a spill, leak, fire or other environmental incident related to construction.
A copy of the CEMP is included with planning application documents.

The primary potential effects from construction are all short-term and are anticipated to include;

- Effects in terms of nuisances relating to the air quality of the environs due to dust and other particulate matter generated from excavation works and effects on the noise environment due to plant and equipment involved in construction;
- Effects on the land, soils, geology & hydrogeology of the site during construction i.e. some loss of protection of the underlying aquifer to contaminants during site clearance, levelling and excavations etc.; and
- Effects on the local road network and its environs due to construction workers and other staff attending site during preparation, construction and commissioning phases.

Mitigation measures to address each of these potential short-term effects are presented in each individual EIA Report chapter.

### 2.3.2 Description of Commissioning

Once the construction of the proposed development is completed, ESB Networks will be mobilised to complete the commissioning. Commissioning will be carried out over a period of months. Commissioning works primarily involve a suitably qualified individual connecting the relevant cables to a switchgear within the substations. Following this, energisation can take place.

As there is no requirement for chemicals usage and minimal access to the route by personnel there is no likely environmental effect as a result of commissioning.

Any hard landscaping and final soft landscaping will be completed.

### 2.3.3. Operation of the Project

As stated in Sections 1.1 and 1.3 of Chapter 1, EirGrid will be the transmission system operator (TSO) and ESB Networks will be the transmission asset owner (TAO). EirGrid will operate transmission stations, including the proposed new GIS substation, remotely from their control centres. However, ESB Networks will carry out all local operations on Eirgrid's behalf.

The ESB Networks will undertake local operational activities from the substations with only interim inspections along the transmission line and MV cable installation.

The estimated staff required are outlined in the following paragraphs.

*110 kV GIS substation*
The 110 kV GIS substation does not require any full-time staff to operate it. However, maintenance of the substation will be required by ESB Networks, including a routine weekly inspection, and a more comprehensive inspection once per year. The weekly inspection of the GIS substation will take a maximum of 8 hours on a single day and will be conducted by up to 2 staff.

In addition to the weekly inspections, more comprehensive maintenance works will take place annually on each cubicle. This will require up to 4 staff to conduct testing at the substation over a maximum period of 15 days (120 hours).

It is expected that the proposed 4 new transformers (to be located south of and adjacent to the 110 kV GIS substation) will also be inspected during this time.

*Underground 110kV Cables*
Once constructed, the underground cables will not require any staff to operate it. Instead, two ESB Networks maintenance staff will carry out a routine inspection of the asset one year after completion and once every three years thereafter.

*Underground 49kVA Cable Installation*
Once constructed, the underground cable installation will not require any staff to operate it. Instead, two ESB Networks maintenance staff will carry out a routine inspection of the asset one year after completion and once every three years thereafter. These inspections are likely to be conducted at the same time the underground 110 kV cables are inspected.

Traffic relating to staff movements have been assessed as part of the traffic and transportation chapter of this EIA Report (Chapter 13).

### 2.3.4 Decommissioning of the Project

The lifespan of the proposed development is not defined but it is anticipated that it will be maintained, and periodic upgrading undertaken over a long lifetime to meet future demand and upgrade in technology.

If the GIS substation is no longer required over the long term, then full decommissioning in accordance with prevailing best practice will be undertaken.

### 2.3.5 Description of Other Developments

A list of the other developments in the vicinity of the proposed development, is provided in Chapter 3 Planning and Alternatives of this EIA Report. In terms of construction projects some of these developments are completing alterations or extensions however the majority of these are relatively small scale.

An EIAR for a data storage facility on the subject site was previously published in August 2018 (reference 'Avoca River Park, Environmental Impact Assessment Report', AECOM, reference 60568620, 08 August 2018) and planning approval (Reference 18940). However, due to subsequent design modifications a new planning submission (concurrent application) has been submitted to WCC ( 'Avoca River Park, Environmental Impact Assessment Report', AECOM, (Planning Application No. 201285).

## 2.4 SUSTAINABILITY ENERGY EFFICIENCY & RESOURCE USE

Eirgrid and ESB Networks are committed to running their businesses in the most environmentally friendly way possible. ESB Networks is a subsidiary within ESB Group. The ESB Group has identified energy efficiency as a strategic priority within its Brighter Future strategy. ESB Group is a commercial semi-state-owned company (95% state-owned) and is committed to supporting and being exemplar in the delivery of Ireland's 2020 public sector targets. These targets, outlined in the fourth National Energy Efficiency Action Plan (2017 – 2020) (NEEAP), include an energy efficiency target of 33% for the public sector.

## 2.5 HEALTH & SAFETY

### 2.5.1 Design and Construction Health and Safety

The proposed development has been designed in accordance with the Safety, Health and Welfare at Work Act 2005 (S.I. 10 of 2005) as amended and the Safety, Health and Welfare at Work (General Application) Regulations 2007 to 2016 (S.I. 299 of 2007, S.I. 445 of 2012, S.I. 36 of 2016) as amended and associated regulations.

The proposed development has been designed by skilled personnel in accordance with internationally recognised standards, design codes, legislation, good practice and experience based on a number of similar developments.

### 2.5.2 General Operational Health and Safety

ESB Networks has an Environmental Safety and Health Management System (EMS) which will be implemented at the proposed development.

## 2.6 POTENTIAL IMPACTS OF THE PROPOSED DEVELOPMENT

The proposed development is to be located on suitably zoned lands adjacent to extensive industrial development (details of zoning can be found in Chapter 3). The development, when operational, will generate limited additional traffic, air, noise and water emissions and wastes generation from activities etc.

During construction, there is the potential for temporary nuisance impacts from traffic, dust, noise and construction waste, if not carefully managed. All contractors will be required to implement the CEMP to ensure each of these potential impacts are minimised.

Each chapter of this EIA Report assesses the potential impact of the construction and operation of the proposed development on the receiving environment. Please refer to each specialist chapter respectively.

## 2.7 MAJOR ACCIDENTS/DISASTERS

The 2014 EIA Directive and associated Draft EPA EIA Guidelines requires that the vulnerability of the project to major accidents, and/or natural disasters (such as earthquakes, landslides, flooding, sea level rise etc.) is considered in the EIA Report. The site has been assessed in relation to the following external natural disasters; landslides, seismic activity and volcanic activity and sea level rise/flooding as outlined below. The potential for major accidents to occur at the data storage facility has also been considered with reference to Seveso/COMAH.

*Landslides, Seismic Activity and Volcanic Activity*
There is a negligible risk of landslides occurring at the site and in the immediate vicinity due to the topography and soil profile of the site and surrounding areas. There is no history of seismic activity in the vicinity of the site. There are no active volcanoes in Ireland so there is no risk of volcanic activity. Further detail is provided in Chapter 5 Land, Soils, Geology & Hydrogeology.

*Flooding/Sea Level Rise*
The potential risk of flooding on the site was also assessed. A Stage 1 Flood Risk Assessment was carried out and it was concluded that the development is not at risk of flooding. Furthermore, it is not expected that the proposed development would adversely impact on flood risk for other neighbouring properties. Further detail is provided in Chapter 6 Hydrology and Appendix 6.2 Stage 1 Flood Risk Assessment.

*Seveso/COMAH*
The proposed development will not be a Seveso/COMAH facility. The only substance stored on site controlled under Seveso/COMAH will be diesel for generators and the amounts proposed do not exceed the relevant thresholds of the Seveso directive.

*Minor Accidents/Leaks*
There is a potential impact on the receiving environment as a result of minor accidents/leaks of fuel/oils during the construction and operational phases. However, the implementation of the mitigation measures set out in Chapters 6 and 7 will ensure the risk of minor accidents/leaks of fuel/oils is low and that the residual effect on the environment is imperceptible.

## 2.8 RELATED DEVELOPMENT AND CUMULATIVE IMPACTS

The proposed development is designed to support power demand for the permitted data storage development. The cumulative impact of the proposed development with the permited and concurrent datastorage developments (Green outline on Figure 2.4) within the overall landholding have been considered in each chapter. In addition, consideration of the likely works for the future off site connections (overground and underground cabling) which will be undertaken by EirGrid/ESB have been considered,

With mitigation for each environmental aspect, there are no predicted significant cumulative effects.

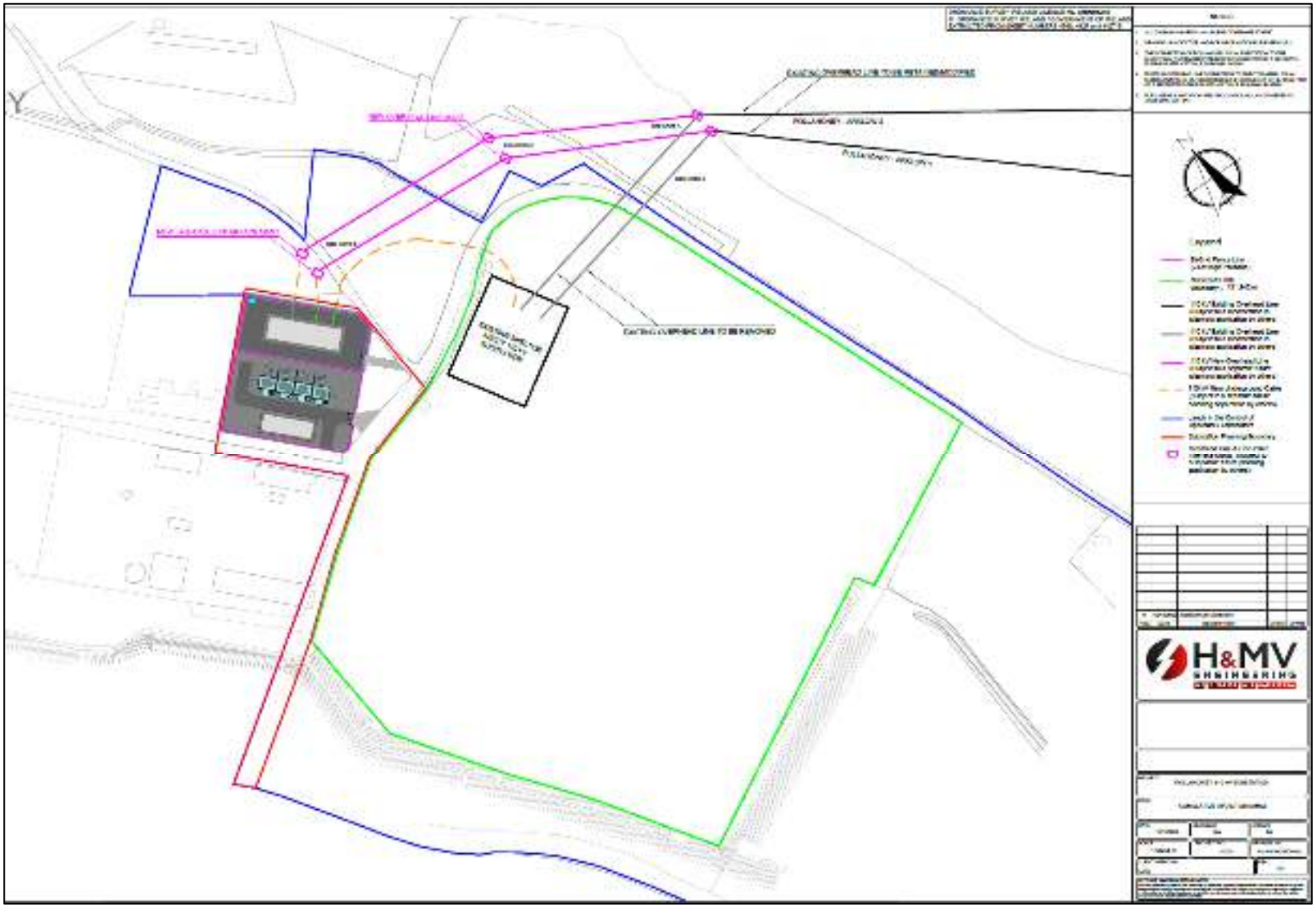



***Figure 2.4*** Permitted, proposed and potential future developments (EirGrid/ESB upgrades)

# 3.0 PLANNING AND ALTERNATIVES

## 3.1 INTRODUCTION

This chapter describes the proposed development within the context of the relevant planning policy as it relates to the environment. The proposed development as described in Chapter 2, is located in the Local Authority area of Wicklow County Council (WCC).

Following consultation with An Bord Pleanála (ABP) it was confirmed that the proposed development meets the relevant criteria and constitutes a Strategic Infrastructure Development (SID) under Section 182A & 182B of the Planning and Development Act 2000 (as amended).

The national and regional policy context provides the clear policy link between national policies and Local Authority planning policies and decisions. The relevant documents are the *National Planning Framework – Ireland 2040* and the *Regional Spatial and Economic Strategy for the Eastern and Midlands Regional Assembly*. This chapter will focus on the Local Planning and Development Context and the interaction with the specialist chapters of this EIA report.

The following sections describe how the proposed development complies with the stated and statutory requirements of Wicklow County Council (WCC) with respect to planning and sustainable development. The relevant local planning policy with which the proposed development complies is defined by the:

- Wicklow County Development Plan 2016 – 2022
- Arklow and Environs Local Area Plan 2018 – 2024

EIA legislation and the prevailing guidelines (as set out in Chapter 2) and best practice require that EIA Reports provide a description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the Operator, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.

This chapter describes the alternatives that were considered for the proposed development, where applicable, under each of the following headings and the reasons for the selection of the chosen option including consideration of environmental effects:

- Do Nothing Alternative;
- Alternative project locations;
- Alternative layouts/designs;
- Alternative processes/technologies; and
- Alternative mitigation.

## 3.2 DEVELOPMENT CONTEXT

The proposed development site is located north of the Avoca River, in Avoca River Park, approximately 2.5 km northwest of Arklow town centre.

The wider landholding comprises a large primarily brownfield site which is served by existing roads infrastructure implemented as part of the setting out of the Industrial Park. The wider landholding is subject to an extant permission (Planning Application No. 18940) for a data storage facility and ancillary development. The land is zoned as '*E1 Employment'* in the Arklow and Environs Local Area Plan (Arklow LAP) 2018 – 2024 (Figure 3.1).

The site is generally fairly level, with much of the site being circa +2.0m to +2.3m OD. The western portion of the site is slightly higher at approximately +2.4m to +2.8m OD.

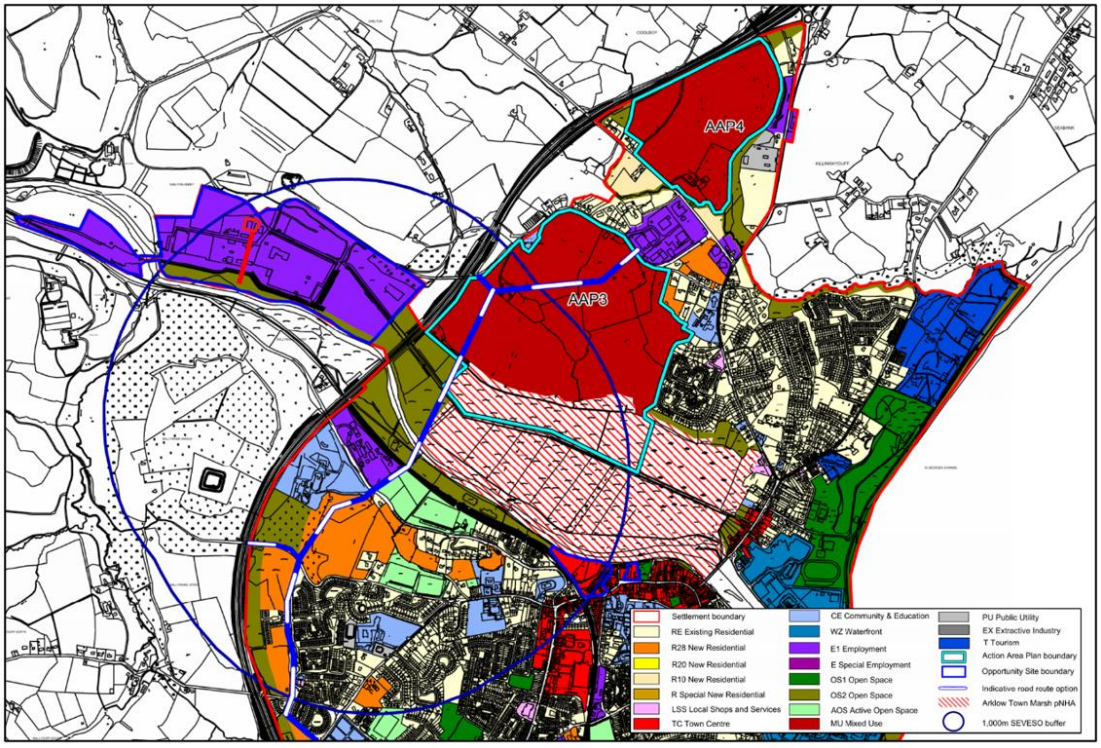



***Figure 3.1*** Proposed development Lands (red boundary) (*Source: Arklow and Environs Local Area Plan 2018-2024 – Land Use Zoning Objectives Map No. 1*)

The site benefits from a strategic location and is accessible from the M11 via the local road network at junction 20 approximately 5.8km metres to the north east.

The proposed development is located in Avoca River Park, the main entry to which is accessed via the R747. This main entrance is also the principal transport connection for freight and deliveries for the existing Avoca River Park.

The proposed site is connected by local road to the northern end of Arklow where residential areas including once-off ribbon developments along the road, as well as larger residential areas such as Mountain Bay lie. The proposed site is also connected to the R747 via local road. The R747 provides a direct route into Arklow town.

The county town of Wicklow is located approximately 25km north, with Dublin city centre 65 km north of the site. The M11 motorway provides an excellent transport link to the surrounding area. Arklow is also serviced by the Dublin Connolly – Rosslare train line.

The northern aspect of the proposed development site is largely defined by agricultural lands, as well as some once-off developments associated with these agricultural holding. The proposed development is located in the Avoca River Park, which is

bounded by the south by the Avoca River, with the Dublin to Gorey/Rosslare Europort railway line running to the south of the Avoca River.

The main defining feature to the east of the site is the M11 motorway, with undeveloped agricultural lands and Arklow town located further east of that.

As discussed in Chapter 1 (Introduction), the proposed development is designed to support the power demand of the permitted data storage facility development on lands adjacent to the proposed development, as permitted under WCC Planning Application No. 18940. Any potential future subsequent phases of development will be subject to a separate Planning Application(s) and environmental assessment as required.

## 3.3 LOCAL PLANNING CONTEXT

### 3.3.1 Wicklow County Council Development Plan 2016 – 2022

The Wicklow County Development Plan 2016-2022 (Wicklow CDP) sets out a coherent spatial planning framework for the County over the plan period within the context of national and regional policies. The plan covers the administrative area of Wicklow. The county occupies a land area of over 2,027 square kilometres in the east of Ireland. The county stretches from the Wicklow mountains and the Dublin county boundary in the north to the Kildare boundary in the west with Wexford and Carlow boundaries to the south. Eastwards the county is bordered by the Irish Sea.

The Wicklow CPD denotes Arklow as an economically active town and the main centre in the south of the county. It identifies the recent M11 upgrade and Arklow wastewater treatment plant (WWTP) as crucial infrastructure to allow for expanded development. Once completed it will be able to provide for the population target and commercial and business needs forecasted within the Arklow and Environs Local Area Plan 2018-2024 (Arklow LAP).

The relevant policies and objectives of the Wicklow CDP and are noted in the sections below.

*Core Strategy*

The Core Strategy describes Arklow as a town being *'smaller in scale but strong active growth towns, economically vibrant with high quality transport links to larger towns/city'*. It also identifies Arklow as located along a strategic development corridor, and a subsidiary attractor for inward investment.

*Settlement Strategy*

Chapter 3 of the Wicklow CDP sets out the settlement strategy for County Wicklow and sets out the role and function of each level within the settlement hierarchy and information on growth targets. Arklow is identified as a 'Level 3 - Large Growth Town II' within the settlement hierarchy.

The settlement strategy notes that the town should aim to attract "*a concentration of major employment generating investment and should target investment from foreign and local sources in a mixture of 'people' and 'product' intensive industries*".

Arklow is strategically located on M/N11 with ease of access to Dublin and Rosslare, with a good supply of zoned employment lands. The applicant seeks to make use of

this zoning for the proposed development, and provide employment generating investment into the area.

*Electricity Transmission and Distribution*

The Wicklow CDP outlines specific objectives in relation to electricity transmission and distribution, as detailed in Table 3.1 below.

***Table 3.1*** Electricity Transmission and Distribution Objectives/Policies

| Objective | Summary |
|---|---|
| CCE17 | To support the development and expansion of the electricity transmission and distribution grid, including the development of new lines, pylons and substations as required. |
| CCE18 | To normally require new employment generating developments to locate on suitably zoned or identified land in settlements. |
| CCE19 | To protect employment zoned land from inappropriate development that would undermine future economic activity or the sustainable development of such areas. |

*Economic Development*

Chapter 5 of the Wicklow CDP provides an overview of the economic vision with policies across a range of business and industry sectors. It defines the overarching strategy of sustainable economic development, competitive advantage, employment growth, and development of a highly skilled workforce supported by good quality infrastructure.

Information and communications technology is specifically identified as a sector for growth and it is stated:

> *The information and communications sector forms the second largest industrial group in Wicklow. With Ireland being a technology hub of choice for many when it comes to attracting the strategic business activities of ICT companies, significant opportunities exist to develop this sector with the County. The presence of Clermont College and its envisaged expansion as a third level centre of excellence alongside Wicklow's highly educated workforce further enhance the attractiveness of the County to prospective new companies within the ICT sector maximising the potential of the County.*

The site is subject to extant planning permission for a data storage facility (WCC Planning Application No. 18940), with the proposed development intended to serve the power needs of the permitted development. As such, the proposed development will directly support the development of the information and communications sector in the Wicklow region, as well as the employment associated, as per the objectives of the Wicklow CDP.

### 3.3.2 Arklow and Environs Local Area Plan 2018 – 2024

The Arklow LAP expresses Wicklow County Council's Policy to: ''*Enhance and facilitate the balancing of economic, social and environmental infrastructure in order to maintain and develop a high quality of life without compromising the protection of the environment and the needs of future generations.*''.

The location of this strategic and state of the art ICT facility in Wicklow County, provides a key component in the support of local employment and provides an anchor for

attracting foreign investment or multinationals interested in large scale IT. This allows for the continued growth experienced in the area, and Arklow's position as a growth town for the surrounding environs of south County Wicklow.

The proposed development site is located within the boundary of the Arklow LAP. Under the LAP the land is zoned as '*E1: Employment'*.

The Arklow LAP provides for site specific policies and zoning as detailed in Table 3.2 below.

***Table 3.2*** Zoning Objectives

| Zoning | Objective | Description |
|---|---|---|
| E1: Employment | To provide for the development of enterprise and employment | To facilitate the further development and improvement of existing employment areas and to facilitate opportunities for the development of new high-quality employment and enterprise developments in a good quality physical environment. |

*Economic Development and Employment*

The Arklow LAP notes that given Arklow's scale, its large growth town designation, its identification as part of the 'Wicklow / Arklow Core Economic Area', its strategic location on the M11/N11 and on the Dublin to Rosslare rail line, and its active port, the town has the capacity to act as an attractor for substantial foreign and local investment.

The subject lands are Identified as a development employment opportunity site and has been identified to provide for large, single, undivided employment development such as 'direct foreign investment' businesses and would be likely to appeal to multinationals or significant IT / green technology / pharmaceutical industries.

The proposed development will support the growth of the permitted development (WCC Planning Application No. 18940), the growth of the established Avoca River Park, and ensure sustainable development at the location in accordance with the aims, objectives and policies of the Arklow LAP.

The Arklow LAP provides economic and development and employment objectives, the relevant of which are detailed in Table 3.3 below.

***Table 3.3*** Economic Development and Employment Objectives

| Objective | Summary |
|---|---|
| ED1 | To facilitate and support all forms of employment creation on appropriately zoned land in Arklow and to promote the intensification of activities on existing employment sites and to take advantage of the existing economic assets in order to stimulate further employment within the area. |
| ED4 | To promote and facilitate the development of large-scale employment generating developments, including industrial, knowledge, high-technology, office and service based and science based developments, at appropriate locations. |

## 3.4 PLANNING PERMISSIONS AND DEVELOPMENT WITHIN THE SURROUNDING AREA

As part of the assessment of the impact of the proposed development, account has been taken of relevant developments that are currently permitted, or under construction and substantial projects for which planning has been submitted within the surrounding areas.

The WCC online planning tool was used to generate a list of relevant planning permissions from the surrounding areas of the proposed development within the previous five years. This search omitted individual residential dwellings and works to residential dwellings. The outcome of this search is presented in Table 3.4 below.

The review of the online planning tool also showed a number of applications for small extensions, retention and other minor alterations to developments in the vicinity of the proposed development. These permissions were for established business within the vicinity of the development and have been considered as a part of the overall project impact.

***Table 3.4*** Relevant planning history for the last 5 years within the vicinity of the proposed development site.

| Planning Reference, Applicant & Location | Development Description | Decision & Decision Date |
|---|---|---|
| 201282<br><br>Harmony Timber Solutions Limited<br><br>Avoca River Park, Glenart, Arklow, Co. Wicklow | (i) first floor extension to existing single storey weighbridge office (ii) above ground fire water storage tank to serve this building and development permitted under PPR 19/54 (iii) omission of office building permitted under PPR 19/54 and all associated site works | NEW APPLICATION RECEIVED BY WCC 15/12/2020 |
| 201285<br><br>Crag Digital Avoca Limited<br><br>Avoca River Park, Shelton Abbey & Kilbride, Arklow, Co. Wicklow | 1. Demolition of existing ind building units totalling (C.2784.4m2) comprising of a c.7.1m high Overall Main Building (c.2460m2), a c.4.2m high Sub-station (c. 107.3m2), a c.3.6m high Guardhouse (c.106.2m2), a c.3.6m high East-Building (c.39.1m2), c.5m high Water Tank (c.56.8m2) &c.2.6m high Pump House Building (c.15.1m2), assoc works. 2. Dev of 3 no. Data Centre Buildings, ancillary offices & plant comprising of: Data Centre Building A, - a single storey Data Centre Building, with mezzanine 1st floor level offices (GFA c.10,564m2, building height c.13,658m & structures c.15,137m), made up of 2 no. Data Halls & loading areas with assoc 2 no. Dock Levellers & including 10 no. c.14m high flues, & adjacent 1 no. Standby Power Generation Compounds, consisting of 10 no. HV Diesel Generators &belly tanks (GFA c.530 m2), 1 no. storage fuel tank (GFA c.15m2). Data Centre Building B – a single storey data centre building with mezzanine 1st floor level offices (GFA c.18,508m2, building height c.13,658m &structures c.15,137m), made up of 4 no. Data Halls &loading areas with associated 2 no. Dock Levellers &including 20 no. c.14m high flues, &adjacent 2 no. Standby Power Generation Compounds, consisting of 20 no. HV diesel Generators &belly tanks (GFA c.1,060 m2), 2 no. storage fuel tanks (GFA c.30m2). Data Centre Building C – a single storey data centre building with mezzanine 1st floor level offices (GFA c.18,508m2, building height c.13,658m & structures c.15,137m), made up of 4 no. Data Halls & loading areas with associated 2 no. Dock Levellers &including 20 no. c.14m high flues, &adjacent 2 no. Standby Power Generation Compounds, consisting of 20 no. HV Diesel Generators & belly tanks (GFA c.1,060 m2), 2 no. storage fuel tanks (GFA c.30m2). 3. Upgrading of existing 110 kV Substation to comprise of Compound (c. 8539m2) consisting of 11 kV GIS Switch Room (GFA c.708m2), &4 no. External Transformers (GFA c.550m2), a grid connection, security fence & all assoc works & services. 4. Dev of 1 no. Fire Hydrant Pump Hse (GFA c.129m2) with Sprinkler Tank (c.49m2), 1 no. single storey Security Guard Hse (GFA c.48m2) &2 no. vehicular accesses, internal access rds & 224 no. surface car parking spaces. 5. An upgraded attenuation basin, a proposed ww treatment plant &polishing filter. 6. All assoc site services, with c.2.7m high palisade fence, landscaping, boundary & all assoc site development works above & below ground. An EIAR has been prepared in respect of the proposed development | NEW APPLICATION VALIDATED BY WCC 15/12/2020<br><br>SUBMISSIONS DUE BY 27/01/2020 |
| 20662<br><br>Sigma Aldrich Ireland Ltd | 1) A portal fame structure 20 m long by 14 m wide by 7.5 m high (floor area 280 m2). The building will be used as a store to house spare parts<br>and maintenance equipment. | PERMISSION GRANTED (with conditions) |

| Planning Reference, Applicant & Location | Development Description | Decision & Decision Date |
|---|---|---|
| Vale Road, Arklow, Co. Wicklow | 2) A single-storey office 5.0 m by 3.5 m within the proposed store to keep records and specification details of the spare parts and equipment stored.<br>3) Associated site works. | 02/09/2020 |
| 20235<br><br>Cordiva Ltd<br><br>Heatherside,<br>Vale Road,<br>Yardland Td,<br>Arklow, Co.<br>Wicklow | Revisions to development permitted under Registry Reference 8/610066 (as extended by Reg Refs 13/610035 and 19/373 and revised by Reg Refs 16/1418, 18/1033 and 19/266 and concurrent revisions applications Reg Ref 20/187 and shall provide for the replacement of 55 no. previously permitted units located in 'Phase 3' (comprising 6 no type B, 16 no type C, 17 no type D and 16 no type X 3 bedroom semi-detached / terraced two storey house units), with 84 no. residential units (comprising 68 no 2 storey houses and 16 no. apartment / duplex units arranged across 3 storeys). Permission is also being sought for the omission of 22 no. previously permitted units comprising 6 no. houses (consisting of 2 no 3 bedroom semi-detached two storey type C house units and 4 no 3 bedroom terraced 2 storey type D house units) and 16 no. apartments (consisting of 8 no 2 bedroom single-storey / ground floor apartment unit and 8 no. 3 bedroom 2 storey / duplex apartment units) located to the north of the site and in their place the provision of an enlarged area of public open space | FURTHER INFORMATION REQUESTED<br><br>24/06/2020 |
| 19/1322<br><br>Robert Marshall<br><br>Kish Business Park, Clogga Road, Arklow, Co. Wicklow | Single storey 710 sqm industrial unit, comprising of a 236 sqm metal fabrication workshop, and 474 sqm trade sales and display area, plus 272 sqm concrete surfaced yard with security fence to the side of the proposed building, connect into the existing mains sewer and storm water systems, to provide car parking, a 3.5m high sign at the site entrance and all additional site works | PERMISSION GRANTED (with conditions)<br><br>06/02/2020 |
| 19545<br><br>Alan Connolly<br><br>Boglands, Arklow, Co. Wicklow | Demolish the existing 90 sqm substandard dwelling and all outbuilding totalling 84 sqm and erect a new 215 sqm dwelling and 84 sqm garage, upgrade the existing effluent disposal system to current EPA standards, improve the existing vehicular entrance along with all associated site development works | PERMISSION GRANTED (with conditions)<br><br>04/07/2019 |
| 19373<br><br>Ardale Property Ltd<br><br>Yardland,<br>Vale Road,<br>Arklow, Co.<br>Wicklow | Extend the appropriate period of a permission - 08/66 – residential development comprising a creche; 185 houses with 4 house types; 8 subject to duplex units over 8 apartments; new access/relief road and conditions infrastructure linking Vale Road to Lamberton Avenue; all services and on ancillary site development works; relocation of part of existing overhead ESB lines; with temporary effluent treatment plant and sewerage pumping station at Yardland, Vale Road. | PERMISSION GRANTED<br><br>23/05/2019 |
| 19332<br><br>Rappel Enterprises Ltd | Extend the appropriate period of a permission - 13/8823 - single-storey industrial unit with ancillary office accommodation at ground and subject to mezzanine floor level (floor area 1,611 sqm), wastewater treatment conditions plant and associated site works and drainage | PERMISSION GRANTED<br><br>16/05/2019 |

| Planning Reference, Applicant & Location | Development Description | Decision & Decision Date |
|---|---|---|
| Avoca River Business Park (former IFI Facility),<br>Shelton Abbey,<br>Arklow, Co.<br>Wicklow | | |
| 1954<br><br>Harmony Timber Solutions Ltd<br><br>Avoca River<br>Park, Glenart,<br>Arklow, Co.<br>Wicklow | Detached two storey office building (249 sqm) detached timber factory building with canteen, wcs and 1st floor office (1432 sqm) and detached timber factory building with mezzanine office / wcs / canteen (1476 sqm), site layout to include 3 no yard areas, 30 no car parking spaces, 20 no cycle spaces, 2 no bin storage area, 3 no vehicular entrance gates, boundary fence, wastewater treatment system and associated site works | PERMISSION GRANTED (with conditions)<br><br>12/03/2019 |
| 18/711<br><br>Kish Business Park Ltd<br><br>Kish Business Park, Clogga Road, Arklow, Co. Wicklow | Single storey industrial unit (Gross Area 1513sqm) comprising 6 individual units for light industrial and warehousing use, 35no carparking spaces, truck unloading bay, connection to existing services and all associated site works | PERMISSION GRANTED (with conditions)<br><br>06/03/2019 |
| 18940<br><br>Crag Digital Avoca Ltd<br><br>Avoca River Business Park, Shelton Abbey, Arklow, Co.Wicklow | Demolition of buildings & structures on site & construction of Data Storage Facility comprising 3 data storage buildings & all associated site infrastructure: data storage facility 1 (6 Pod Data Centre) located to north of site served by 1 gas generator compound to south of Data Storage building including 5 flues & 2 bunded fuel tanks located to south east & south west of Data Storage building & powered by (-part grid / - part gas) with emergency diesel fuel backup. Data storage facility 2 (8 pod data centre) located to south of Data Storage Facility 1 served by 1 gas generator compound to the south of building including 6 flues & 2 bunded fuel tanks located to south east & south west of Data Storage building & powered by (-part grid / -part gas) with emergency diesel fuel backup. Data storage 3 (8 pod data centre) located to south of site served by 1 diesel generator compound to north of building including 8 flues & 2 bunded fuel tanks, located to north east & north west of Data Storage building & powered by grid. The development will consist of upgrade of existing 100 kV substation to provide a Substation Compound comprising Gas Insulated Switchgear equipment with 4 50 mega Volt Amp bays within a singlestorey MV building 10 lighting protection masts, 4 oil filled transformers, with circa 2.4 m high palisade fence, provision of 1 single-storey security guard house at primary access to data storage facilities, provision of 4 vehicular access points off Shelton Abbey (access road) on western side (2 to serve Data Storage Facilities, 1 to serve GIS substation & 1 to serve MV building), internal access roads, surface level car parking, site services (foul & surface water drainage & water supply) including 1 pump house with 3 water tanks to south west, 1 attenuation basin to | PERMISSION GRANTED (with conditions)<br><br>15/02/2019 |

| Planning Reference, Applicant & Location | Development Description | Decision & Decision Date |
|---|---|---|
| | south east, waste water treatment plant to the west of Shelton Abbey (access road), landscaping, boundary & site dev works above & below ground. Accompany by EIAR. | |
| 181404<br><br>Sigma Aldrich Ireland Ltd<br><br>Vale Road,<br>Arklow, Co.<br>Wicklow | Portal frame structure 69m long by 15.4 m wide by 6.5m high (floor area 1063 sqm) to enclose existing drum storage bund in pharmaceutical complex | PERMISSION GRANTED (with conditions)<br><br>14/02/2019 |
| 18/1283<br><br>Armstrong Timber Engineering Ltd<br><br>Unit 1 Kish Business Park, Clogga Road, Arklow, Co. Wicklow | 56 sqm of existing first floor office and external window and full permission for office (gross area 120 sqm) and windows at second floor, new fire escape at ground floor, additional parking and all associated site works | RETENTION GRANTED (with conditions)<br><br>15/01/2019 |
| 18772<br><br>Robert & Alan Kennedy<br><br>Kilbride,<br>Arklow, Co.<br>Wicklow | Change of use of part of an existing commercial mushroom farm to a steel container self storage facility along with all associated site development works to include security fencing to all boundaries and upgrading of the existing site entrance | PERMISSION GRANTED (with conditions)<br><br>24/08/2018 |
| 18/663<br><br>William Jameson<br><br>Boglands, Arlow, Co. Wicklow | Extensions to dining room and play room, revision to window on West Elevation. Upgrade and replacement of existing roof, retention permission is also sought for garage/garden store all with associated site works | PERMISSION GRANTED (with conditions)<br><br>27/07/2018 |
| 1831<br><br>Sigma Aldrich Ireland Ltd<br><br>Vale Road,<br>Arklow, Co.<br>Wicklow | Erection of 3 illuminated signs at pharmaceutical complex to reflect a rebranding of the company as a subsidiary of Merck KGaA. Two signs are to be located at the entrance to the site and will replace two existing signs at the site entrance. The third sign will be located on the south west gable of the existing distribution warehouse building | PERMISSION GRANTED (with conditions)<br><br>22/03//2018 |
| 17/941<br><br>Armstrong Timber Engineering Ltd<br><br>Unit 1 Kish Business Park, Clogga Road, Arklow, Co. Wicklow | Single storey industrial unit (gross area 1523 sqm) for timber storage, revised parking layout and all associated site works and RETENTION of revised layout to eastern gable doors to existing building and boundary fence treatment | PERMISSION GRANTED (with conditions)<br><br>19/10/2017 |

| Planning Reference, Applicant & Location | Development Description | Decision & Decision Date |
|---|---|---|
| 161418<br><br>Cordiva Ltd<br><br>Vale Road,<br>Yardland Td.,<br>Vale Road,<br>Arklow | Laying of 570m(approx.) of 100mm diameter uPVC watermain through greenfield lands and laying of 340m (approx.) of 100mmdiameter uPVC watermain along Glenart Drive including all associated valves, chambers and meters and associated site works | PERMISSION GRANTED (with conditions)<br><br>09/02/2017 |
| 161384<br><br>Sigma Aldrich Ireland Ltd<br><br>Vale Road, Arklow, Co. Wicklow | Steel framed weatherproof structure to enclose existing air handling units, a cold water storage tank and ancillary equipment including utilities pipework, electrical cabling and ducting located on the roof of the existing laboratory building in pharmaceutical complex | PERMISSION GRANTED (with conditions)<br><br>01/02/2017 |
| 16345<br><br>Restwing Trading Ltd<br><br>Avoca River<br>Park, Shelton<br>Abbey, Arklow, Co.Wicklow | Proposed change of use from industrial use to plastics recycling facility<br>unit | PERMISSION GRANTED (with conditions)<br><br>23/05/2016 |
| 15/1030<br><br>Servier (Ireland) Industries Ltd<br><br>Moneylands, Gorey Road, Arklow,<br>Co. Wicklow | A single storey recyclable plastics sorting, compaction and water proof wrapping facility | PERMISSION GRANTED (with conditions)<br><br>25/11/2015 |
| 15465<br><br>Restwing Trading Ltd<br><br>Avoca River Business Park, Shelton<br>Abbey, Arklow, Co. Wicklow | Change of use of existing industrial unit to plastic waste recycling facility | PERMISSION GRANTED (with conditions)<br><br>26/05/2015 |

### 3.4.1 Future Planning Applications

A Pre-Application consultation was undertaken with ABP for an onshore transmission connection infrastructure related to the Arklow Bank Wind Park offshore wind energy project (ABP Case Reference: PL27.306662). ABP concluded that "having regard to the provisions of the Planning and Development Act 2000, as amended, and the nature of the proposed development which consists of an underground 220kV AC cable from a proposed landing point to a new onshore substation, the construction of a new onshore 220kV substation and connection of this substation to the existing Lodgewood-Arklow-Carrickmines 220 kV power line, as set out in the plans and particulars received by An Bord Pleanála on the 17th day of February 2020, as amended and added to by the plans and particulars received by the Board on the 2nd day of September 2020, falls within the scope of section 182A of the Planning and Development Act 2000, as amended, and is therefore strategic infrastructure within the meaning of the Act. Accordingly, a planning application should be made directly to the Board".

## 3.5 CONSULTATION

The current application has been subject to pre-application consultation with An Bord Pleanála which has primarily been undertaken remotely via phone and email due partly to the ongoing Covid-19 public health crisis.

The application reflects and responds to the points of discussion during the course of the pre-application consultations. The development thereby ensures that the delivery of this infrastructure will not be prejudiced and will be supported by the current application proposals.

## 3.6 SEVESO AND COMAH SITES

The Chemical Act (Control of Major Accident Hazards Involving Dangerous Substances) Regulations 2015 (S.I. 209 of 2015) or 'COMAH' regulations define the "consultation distance" as a distance or area relating to an establishment, within which there are potentially significant consequences for human health or the environment from a major accident at the establishment, including potentially significant consequences for developments such as residential areas, buildings and areas of public use, recreational areas and major transport routes.

Establishments are either lower tier establishments or upper-tier COMAH sites with above threshold quantities of dangerous substances present, and to which the provisions of the COMAH regulations apply. The proposed development does not meet the thresholds for either lower or upper tier.

The Health and Safety Authority (HSA) list of Notified Seveso Establishments has been reviewed to identify any facilities within the lands surrounding the development site. According to the Wicklow CDP and the HSA database, there is one Notified Seveso Establishments listed within the general vicinity of the proposed development site. Sigma Aldrich Ireland Ltd (Vale Road, Arklow, Wicklow, Y14 EK18) is a designated lower-tier facility, whose HSA-listed activity is described as "production of pharmaceuticals". The

proposed development is located within the 1,000 m Seveso consultation zone for the Sigma Aldrich Ireland Ltd Arklow facility.

The Wicklow CDP contains policies for managing Seveso sites and developments within their consultation zone, as outlined in Table 3.5 below.

***Table 3.4*** Seveso site policies

| Objective | Summary |
|---|---|
| EMP13 | The Seveso Directive 96/82/EC as amended by Directive 2003/105/EC and more recently by Directive 2012/18/EU is concerned with the prevention of major accidents that involve dangerous substances and the limitation of their consequences for humans and the environment. It applies to establishments where dangerous substances are produced, used, handled or stored. This EU directive seeks to ensure the safety of people and the environment in relation to major industrial accidents involving dangerous substances.<br>The European Communities (Control of Major Accident Hazards Involving Dangerous Substances) (the "COMAH Regulations", (S.I. No. 209 of 2015) implement the Seveso III Directive (2012/18/EU) and are the main regulations that give effect to this Directive in Irish law. The National Authority for Occupational Safety Health (i.e. the Health and Safety Authority – HSA) has been designated as the central competent authority for enforcement of these regulations.<br>There are two Seveso sites in County Wicklow (as of Sept 2015), located at Schering-Plough, Rathdrum and Sigma Aldrich Fine Chemicals, Arklow. In relation to the Prevention of Major Accidents (Control of Major Accident Hazards Involving Dangerous Substances) legislation, it is the objective of the Council to:<br>• comply with the Seveso III Directive in reducing the risk and limiting the potential consequences of major industrial accidents;<br>• where proposals are being considered for the following: (i) new establishments at risk of causing major accidents, (ii) the expansion of existing establishments designated under the Directive, and (iii) other developments proposed near to existing establishments; the Council will require that applicants must demonstrate that the following considerations are taken into account: (i) prevention of major accidents involving dangerous substances, (ii) public health and safeguarding of public health, and (iii) protection of the environment;<br>• ensure that land use objectives must take account of the need to maintain appropriate distances between future major accident hazard establishments and residential areas, areas of substantial public use and areas of particular natural sensitivity or interest; and<br>• have regard to the advice of the Health and Safety Authority when dealing with proposals relating to Seveso sites and land use plans in the vicinity of such sites |

## 3.7 INDUSTRIAL EMISSIONS LICENCED FACILITIES

According to the EPA (2019) there are two licensed IE/IPPC facilities in the immediate vicinity of the site. There are no licensed waste facilities in the vicinity of the proposed development. Details of licensed sites in the vicinity of the proposed development are presented in Table 3.6 and Figure 3.2.

***Table 3.6*** EPA Licenced facilities near to the proposed development site

| Registration number | Name | Category | License type | Distance (km) |
|---|---|---|---|---|
| P0031 | Avoca Park River Limited | Industry | IPPC | 0.1 |
| P0089 | Sigma-Aldrich Ireland Limited | Industry | IE | 1 |




***Figure 3.2*** EPA Licenced facilities in the vicinity of the proposed development site

## 3.8 ALTERNATIVES

### 3.8.1 Do Nothing Alternative

The wider landholding is subject to an extant permission (WCC Planning Application No. 18940) for a data storage facility and ancillary development. It is intended that the proposed development will provide power supply for the permitted development. In the event that the proposed development does not proceed, development of additional data storage facilities on this site would be left without adequate permanent power supply.

There are no environmental effects associated with the do-nothing scenario.

The Do-Nothing scenario has been considered in each chapter of the EIA Report.

### 3.8.2 Alternative Project Locations, Scale and Size

<u>GIS Substation</u>

The proposed development is based on a functional specification provided by EirGrid and as required by their connection agreement. As such the scale and size is determined by their specification.

The location of the proposed GIS substation was chosen with respect to the permitted development on site. The location of the proposed GIS substation is deemed to be the most logical location on the site for such a development.

Installation of Cable Ducts

The works will also include installation of cable ducts for three 110 kV underground cable (UGC), one to each of the two new OHL towers and one to Pollahoney Substation inside cable ducts. The external works which include connection to overhead lines and underground grid connections will be undertaken by EirGrid.

Various alternative routes for the cable ducts were assessed, but given the length of the ducting required, and taking into the environmental context of the location of the cable ducting, each alternative was found to have a negligible effect on the environment. The routes chosen for the cable ducts are the shortest and most logical routes for the cable ducts.

The works will also include a domestic supply to service the substation . The design of the 49kVA underground cable will comprise a looped 10kV circuit installed underground in uPVC ducting.

### 3.8.3 Alternative Designs/Layouts

The proposed GIS substation is designed based on requirements stipulated by the Transmission Asset Owner (TAO) i.e. ESB Networks. The design of the substation unit is centred on the equipment requirements of ESB Networks that are required to provide an efficient and safe service. From a “design and layout” point of view, therefore, the flexibility to select alternative designs and layouts was not available to the Applicant.

### 3.8.4 Alternative Processes

This section typically examines the project processes in relation to likely emissions to air and water, likely generation of waste and likely effect on traffic to determine the process that is least likely to impact on these parameters.

The proposed development will become an integral part of the national high voltage electricity grid which is currently operated by ESB Networks. As such the underground cable installations and substation must meet ESB Network’s and Eirgrid’s strict specifications respectively to ensure they will be seamlessly absorbed into the national grid infrastructure and can provide a reliable power supply. From a “process design” point of view, therefore, the flexibility to select alternative processes for integrating into the current national grid is not available to the Applicant. As such there are no reasonable alternatives.

The Eirgrid’s specifications for auxiliary power supplies (i.e. the 49kVA cable installation) are set out in Document Reference: XDS GFS 08 001 R2 *Functional Specification Station Auxiliary Power Supplies*. The proposed GIS substation and new cable bays will employ the same electricity generation and transmission process that are used by ESB Networks at their other facilities in Ireland and represents the most up-to-date and state of the art processes currently available. As appropriate, alternative processes are considered on an ongoing basis by ESB Networks as a part of each of their operations based on many factors including technical feasibility, environmental impact, efficiency, security, reliability and cost. Therefore, from a “process design” point of view, the flexibility to select alternative processes for integrating into the current national grid is not available to the Applicant. There are no reasonable alternatives available.

### 3.8.5 Alternative Mitigation

For each aspect of the environment, each specialist has considered the existing environment, likely impacts of the proposed development and reviewed feasible mitigation measures to identify the most suitable measures appropriate to the environmental setting of the proposed development. In making a decision on the most suitable mitigation measure the specialist has considered relevant guidance and legislation. In each case, a comparison of environmental effects was made, and the specialist has reviewed the possible mitigation measures available and considered the use of the mitigation in terms of the likely residual impact on the environment. The four established strategies for mitigation of effects have been considered: avoidance, prevention, reduction and offsetting (not required in this Proposed development). Mitigation measures have also been considered based on the effect on quality, duration of impact, probability and significance of effects.

The selected mitigation measures are set out in each of the EIA Report Chapters.

## 3.9 CONCLUSIONS

The proposed development is in accordance with the policies and objectives of the National Spatial Strategy, Draft Regional Spatial and Economic Strategy for the Eastern and Midlands Regional Assembly, and the Wicklow County Development Plan 2016-2022, and Arklow Town and Environs Local Area Plan 2018 - 2024.

The site context does not include any Industrial Emissions licenced sites. The proposed development site lies within the consultation zone of 1 no. Seveso/COMAH site. The proposed development will adhere to the policies of WCC with regards to Seveso/COMAH sites. There are no significant permissions for new development in the surrounding area. The permissions that do exist are for minor modifications or alterations to existing and established businesses.

The development is located on lands zoned for ‘Employment’ within the Arklow Town & Environs Local Area Plan, which provide for IT infrastructure, infrastructure which the proposed development will facilitate by means of a permanent source of power.

The development is an appropriate land use for the area and meets the requirements of the WCC zoning objectives. The development will minimise the potential environmental impacts as described in various chapters of this EIA Report.

The design of the proposed GIS substation and new cable bays have been selected with due regard to minimising the environmental and visual impact once in situ. The selection of the design has been constrained to the standard specifications required by ESB Networks for connection to the national grid.

In conclusion, it is considered that the proposed development and design is the most suitable choice to provide the support required to meet the power requirements of the data storage facility.

# 4.0 HUMAN HEALTH AND POPULATIONS

## 4.1 INTRODUCTION

This chapter has been prepared to assess the likely impacts associated with Human Health for the proposed development. In accordance with the *Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports* (EPA, 2017), and *Draft Advice Notes for Preparing Environmental Impact Statements* (EPA, 2015), this chapter has considered the *"existence, activities and health of people"* with respect to *"topics which are manifested in the environment such as employment and housing areas, amenities, extended infrastructure or resource utilisation and associated emissions"*.

- Population and Demographics;
- Socioeconomics;
- Population Health;
- Natural Resources;
- Tourism;
- Social Infrastructure;
- Health and Safety.

Impacts on humans from other issues such as natural hazards, soils, geology and hydrogeology, water, air quality, noise and vibration, traffic and landscape are discussed in their respective EIAR chapters:

- Chapter 5 - Soils, Geology and Hydrogeology;
- Chapter 6 - Hydrology;
- Chapter 8 - Air Quality and Climate;
- Chapter 10 - Noise and Vibration;
- Chapter 11 - Landscape and Visual Impact; and
- Chapter 13 - Traffic and Transportation.

Where these topics are dealt with in further detail elsewhere in this EIA Report, the relevant chapters have been cross referenced in this Chapter.

## 4.2 METHODOLOGY

In accordance with the *Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports* (EPA, 2017), this chapter has considered that:

> *"in an EIAR the assessment of impacts on population and human health should refer to the assessment of those factors under which human health effects might occur, as addressed elsewhere in the EIAR e.g. under environmental factors of air, water soil etc".*

As per Article 3 of Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment, as amended by Directive 2014/52/EU:

1) *The environmental impact assessment shall identify, describe, and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of a project on the following factors:*

*a) population and human health;*
*b) biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC;*
*c) land, soil, water, air and climate;*
*d) material assets, cultural heritage and the landscape;*
*e) the interaction between the factors referred to in points (a) to (d).*

*2) The effects referred to in paragraph 1 on the factors set out therein shall include the expected effects deriving from the vulnerability of the project to risks of major accidents and/or disasters that are relevant to the project concerned."*

The 2017 publication by the European Commission (EC), *Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report*, considered that:

> *"Human health is a very broad factor that would be highly Project dependent. The notion of human health should be considered in the context of the other factors in Article 3(1) of the EIA Directive and thus environmentally related health issues (such as health effects caused by the release of toxic substances to the environment, health risks arising from major hazards associated with the Project, effects caused by changes in disease vectors caused by the Project, changes in living conditions, effects on vulnerable groups, exposure to traffic noise or air pollutants) are obvious aspects to study. In addition, these would concern the commissioning, operation, and decommissioning of a Project in relation to workers on the Project and surrounding population."*

This chapter will follow these EC guidelines, and will examine the health effects relevant to the proposed development as they relate to a relevant, defined study area. The effects of the proposed development on the population and human health are analysed in compliance with the requirements of the EPA Guidelines.

### 4.2.1 Assessment of Significance & Sensitivity

The assessment of significance is a professional appraisal based on the sensitivity of the receptor and the magnitude of effect.

Within any area, the sensitivity of individuals in a population will vary. As such, it would be neither representative of the population, nor a fair representation of the range of sensitivities in a population, were an overall sensitivity classification assigned to the population in question. As such, the precautionary principle has been adopted for this assessment, which assumes that the population within the study area is of a uniformly high sensitivity.

### 4.2.2 Magnitude of Impact

The magnitude of predicted impacts has been quantified in this assessment using the terms outlined in Table 4.1 below.

***Table 4.1*** Description of magnitude of predicted impacts

| Magnitude | Description of Magnitude |
|---|---|
| High | Change in an environmental and/or socio-economic factor(s) as a result of the proposed development which would result in a major change to existing baseline conditions (adverse or beneficial) |
| Medium | Change in an environmental and/or socio-economic factor(s) as a result of the proposed development which would result in a moderate change to existing baseline conditions (adverse or beneficial) |
| Low | Change in an environmental and/or socio-economic factor(s) as a result of the proposed development which would result in a minor change to existing baseline conditions (adverse or beneficial) |
| Negligible | Change in an environmental and/or socio-economic factor(s) as a result of the proposed development which would not result in change to existing baseline conditions at a population level, but may still result in an individual impact (adverse or beneficial) |
| No change | No change would occur as a result of the proposed development which would alter the exiting baseline conditions (adverse or beneficial) |

### 4.2.3 Significance of Effects

The assessment of significant effects in this assessment is a professional appraisal and has been based on the relationship between the magnitude of effects (Section 4.2.2) and the sensitivity of the receptor. Table 4.2 below provides a matrix on the measure of the significance of effects as determined by the relationship between the magnitude of impact and the sensitivity of receptors

***Table 4.2*** Significance of effects and the sensitivity of the receptor

| | | *Magnitude of Impact* | | | |
|---|---|---|---|---|---|
| | | Negligible | Low | Medium | High |
| Sensitivity of Receptor | Negligible | Negligible | Negligible or minor | Negligible or minor | Minor |
| | Low | Negligible or minor | Negligible or minor | Minor | Minor or moderate |
| | Medium | Negligible or minor | Minor | Moderate | Moderate or major |
| | High | Minor | Minor or moderate | Moderate or major | Major |

### 4.2.4 Study Area

The proposed development site is located in County Wicklow, and in the electoral district of Kilbride (ED 15055). The area selected for the assessment of the impact on human health has been defined as the Electoral Divisions (ED) of Kilbride (ED15055), Arklow Rural (ED 15038), Arklow No. 2 Urban (ED15002) and Arklow No. 1 Urban (15001). The study area is shown in Figure 4.1 below.

The site is located within the Mid-East region, as defined by the Nomenclature of Territorial Units for Statistics developed by Eurostat. The Mid-East region comprises counties Meath, Louth, Kildare and Wicklow.

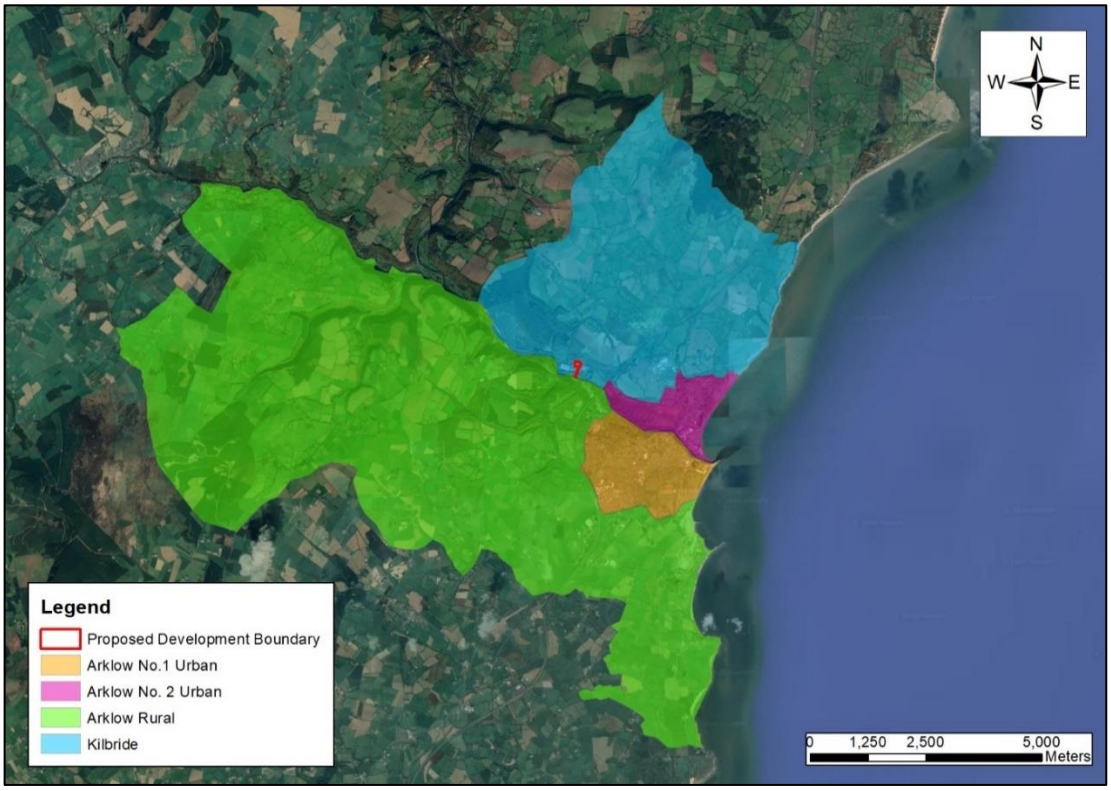



***Figure 4.1.*** The Study Area considered for the proposed development

## 4.3 EXISTING BASELINE CONDITIONS

### 4.3.1 Development Site Context

The subject site is located to the north of the *Avoca River*, in Avoca River Park, approximately 2.5 km northwest of Arklow town centre. The wider landholding comprises a large primarily brownfield site which is served by existing roads infrastructure implemented as part of the setting out of the Industrial Park. The wider landholding is subject to an extant permission (Planning Application No. 18940) for a data storage facility and ancillary development.

The site of the proposed development comprises approximately 1.65 hectares of land. It is proposed to demolish the existing building onsite as part of the enabling works for this project. The total ground floor area of structures to be demolished is approximately 2,200m$^2$.

A development is largely within the existing hard stand area. A narrow strip of land has been extended to provide provision for associated drainage infrastructure. This extends from the main site area to a proposed outfall location at the Avoca River.

The site is bound to the north by a local access road which serves Avoca River Park. To the south and to the west the site is bound by Holfeld Plastics Limited. To the east the site is bound by the wider landholding that currently incorporate Harmony Timber and Stunt Drive Ireland which will cease operation and relocate prior to commencement of the construction of the data storage facility.

The existing site currently comprises of brownfield lands. The Avoca River Park is well

developed, current operations include timber fabrication plant, a plastic manufacturing plant, an existing substation and a storage area for scrapped vehicles. The lands in the immediate vicinity surrounding the industrial park comprises of a mix of agricultural, forested, residential, commercial and institutional development. Shelton Abbey Prison is located to the north-west, Glenart Castle to the south-west and Sigma Aldrich facility to the south-east.

The proposed development site zoned as is *'E1 – Employment'.*

A detailed description of the development site context is presented in Chapter 3 (Planning and Alternatives).

### 4.3.2 Population and Demographics

#### *4.3.2.1* Population

The most recent census of population was carried out by the CSO on the 24th April 2016, and the previous census on the 10th of April 2011. The census compiles data for the whole state as well as smaller individual areas including counties, cities, towns, and electoral divisions. Taking into consideration the location of the proposed development, the census information on population, age profile, employment, and social class, has been analysed in relation to the development site.

Table 4.3 denotes the population change at for the state, and electoral districts for the census years 2011 and 2016. The latest census data shows that the average population in the study area grew by 1.7% between the years 2011 and 2016, a rate lower than that nationally (3.8%). The general increase in population in the study area, suggests the increasing economic role of the areas surrounding the proposed development site.

***Table 4.3*** Population change 2011 – 2016 (Source: www.cso.ie)

| Area | 2011 | 2016 | % Change 2011-2016 |
|---|---|---|---|
| State | 4,588,252 | 4,761,865 | + 3.8% |
| Wicklow | 136,640 | 142,425 | + 4.2% |
| Kilbride | 909 | 889 | - 2.2% |
| Arklow Rural | 1,310 | 1,367 | + 4.4% |
| Arklow No. 1 Urban | 9,817 | 9,976 | + 1.6% |
| Arklow No. 2 Urban | 2,953 | 3,013 | + 2.0% |
| Study Area (Mean) | 3,747 | 3,811 | + 1.7% |

#### *4.3.2.2* Age Profile

The age profile of the population in the area is an important parameter as it provides a good insight into the potential labour force, the demand for schools, amenities, other facilities, and the future housing demand. Table 4.4 shows the age profiles at state, and electoral districts for the census year 2016

***Table 4.4*** Age profile 2016 (Source: www.cso.ie)

| Age | 0-12 | 13-18 | 19-24 | 25-44 | 45-64 | 65+ | Total Persons |
|---|---|---|---|---|---|---|---|
| State | 18.5% | 7.8% | 7.0% | 29.5% | 23.8% | 13.4% | 4,761,865 |
| Wicklow | 19.7% | 8.1% | 6.1% | 28.0% | 25.0% | 13.1% | 142,425 |
| Kilbride | 15.6% | 4.7% | 4.1% | 25.9% | 25.6% | 24.1% | 889 |
| Arklow Rural | 20.9% | 8.4% | 6.1% | 27.3% | 24.4% | 12.9% | 1,367 |
| Arklow No. 1 Urban | 21.2% | 8.2% | 6.0% | 29.7% | 23.2% | 11.8% | 9,976 |
| Arklow No. 2 Urban | 20.4% | 7.7% | 6.9% | 30.2% | 24.2% | 10.8% | 3,013 |
| Study Area (Mean) | 19.5% | 7.3% | 5.8% | 28.3% | 24.4% | 14.9% | 3,811 |

This table shows that both nationally and in the study area, the dominant age grouping is 25-44 at 29.5%, 28.0% and 28.3% of the total population, respectively. This also reflects that the overall labour force population (12-64 age group) in the study area is reflective of the national level. This is in keeping with census data from 2011 and 2006.

### 4.3.3 Socioeconomics

#### *4.3.3.1 Employment*

Table 4.5 presents the employment statistics at a national, county, and study area level in 2016 compared with 2011. The data shows that unemployment decreased significantly in the county, as well as nationally, reflecting the economic recovery in recent years.

***Table 4.5*** Employment statistics 2011 and 2016 (Source: www.cso.ie)

| | At Work | Looking for first regular job | Unemployed having lost or given up previous job | Total in labour force | % Unemployment |
|---|---|---|---|---|---|
| 2011 Labour Force | | | | | |
| State | 1,807,360 | 34,166 | 390,677 | 2,232,203 | 19.0% |
| Wicklow | 52,907 | 789 | 11,885 | 105,468 | 11.3% |
| Kilbride | 311 | 6 | 110 | 766 | 14.4% |
| Arklow Rural | 499 | 5 | 117 | 621 | 19.7% |
| Arklow No. 1 Urban | 3,347 | 74 | 1,339 | 4,760 | 29.7% |
| Arklow No. 2 Urban | 1,124 | 13 | 344 | 2,280 | 15.1% |
| Study Area (Mean) | 1,320 | 25 | 478 | 2,107 | 19.7% |
| 2016 Labour Force | | | | | |
| State | 2,006,641 | 31,434 | 265,962 | 2,304,037 | 12.9% |
| Wicklow | 59.134 | 791 | 7,812 | 110,158 | 10.1% |
| Kilbride | 312 | 5 | 55 | 740 | 7.4% |
| Arklow Rural | 532 | 4 | 87 | 623 | 14.6% |
| Arklow No. 1 Urban | 3,602 | 73 | 886 | 4,561 | 21.0% |
| Arklow No. 2 Urban | 1,184 | 17 | 274 | 2,313 | 11.9% |
| Study Area (Mean) | 1,408 | 25 | 326 | 2,059 | 13.7% |

The 2016 census data shows that the percentage of unemployed has decreased for the state and the area surrounding the development site since the 2011 census.

#### *4.3.3.2 Education*

Census data presenting the highest level of education completed for key educational levels by people living in the county and the area surrounding the development site is presented in Table 4.6. The table presents key milestone education and ignores people undertaking studies or where information was not stated.

***Table 4.6*** Highest level of education in 2016 (Source: www.cso.ie)

| Area | No formal education | Primary education | Secondary[1] | Higher Education[2] | Undergraduate Degree[3] | Postgraduate Degree[4] | Total Persons |
|---|---|---|---|---|---|---|---|
| Wicklow | 1,435 | 8,816 | 30,167 | 20,004 | 17,946 | 9,190 | 87,558 |
| Kilbride | 33 | 81 | 202 | 138 | 121 | 42 | 651 |
| Arklow Rural | 39 | 113 | 309 | 208 | 133 | 60 | 862 |
| Arklow No. 1 Urban | 134 | 758 | 2,572 | 1,483 | 785 | 237 | 5,969 |
| Arklow No. 2 Urban | 26 | 170 | 677 | 423 | 392 | 144 | 1,932 |
| Study Area (Mean) | 58 | 281 | 940 | 563 | 358 | 121 | 2,354 |

#### *4.3.3.3 Labour Force Survey*

The Labour Force Survey (LFS) is a large-scale, nationwide survey of households in Ireland carried out every three months. It generates labour force estimates which include the official measure of employment and unemployment for the state.

The LFS results nationally for Q2 2020 showed that there were 2,222,500 people employed in the state with 118,700 registered as unemployed. In Q2 2020, the majority of people were employed in the broad occupations of 'professionals' or as 'skilled trade'.

These figures are reflective of the effects of Covid-19 on the Irish economy. Q2 2020 saw the closure of many business across Ireland, along with the implementation of restrictions on employment.

#### *4.3.3.4 Income*

The below data in Table 4.7 is obtained from CSO Statbank (CIA02), this demonstrates the levels of total income and disposable income per person in the Wicklow area are 2-5% higher over the study years than the State in 2017. A similar pattern of income distribution is observed in data on disposable income per person.

***Table 4.7*** Income per Person (Source: CSO Statbank CIA02)

| Area | Income | 2015 | 2016 | 2017 |
|---|---|---|---|---|
| State | Total Income per Person (€) | 26,857 | 27,753 | 29,239 |
| | Disposable Income per Person (€) | 18,854 | 19,660 | 20,714 |
| Wicklow | Total Income per Person (€) | 27,265 | 28,339 | 30,607 |
| | Disposable Income per Person (€) | 18,856 | 19,709 | 21,375 |

[1] Lower secondary and Upper secondary
[2] Higher Certificate, Advanced certificate/completed apprenticeship or Technical/vocational training
[3] Ordinary bachelor degree, Honours bachelor degree/professional qualification
[4] Postgraduate degree or Ph.D

#### *4.3.3.5 Deprivation*

Deprivation in small areas is mapped using the Pobal HP Deprivation Index. This Index draws on data from censuses and combines three dimensions of relative affluence and deprivation: Demographic Profile, Social Class Composition and Labour Market Situation. Figure 4.2 below shows graphical representation of how the concepts of Demographic Growth, Social Class Composition and Labour Market Situation are measured by ten key socio-economic indicators from the Census of Population. In this EIA Report, the Relative Index Score is considered as the measure for deprivation, as these Relative Index Scores are rescaled such that the mean is 0 and standard deviation is 10 at each census wave. This allows for the provision of descriptive labels with the scores, which are grouped by standard deviation as seen in Table 4.8 below.

Graphical representation of how the concepts of Demographic Growth, Social Class Composition and Labour Market Situation are measured by ten key socio-economic indicators from the Census of Population.

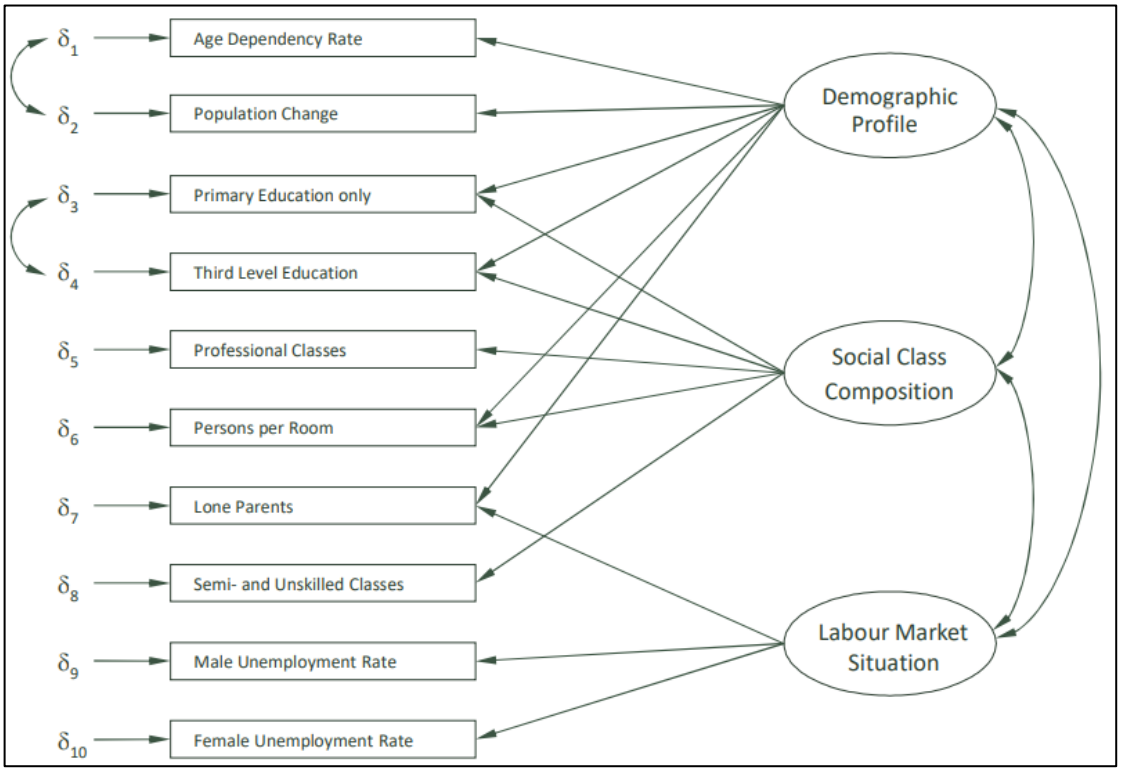



***Figure 4.2*** Basic Model of the Pobal HP Deprivation Index

***Table 4.8*** Pobal HP Index Relevant Index Score labels (Source: Pobal HP Deprivation Index)

| Relative Index Score | Standard Deviation | Label |
|---|---|---|
| > 30 | > 3 | Extremely affluent |
| 20 – 30 | 2 – 3 | Very affluent |
| 10 – 20 | 1 – 2 | Affluent |
| 0 – 10 | 0 – 1 | Marginally above average |
| 0 – -10 | 0 – -1 | Marginally below average |
| -10 – -20 | -1 – -2 | Disadvantaged |
| -20 – -30 | -2 – -3 | Very disadvantaged |
| < -30 | < -3 | Extremely disadvantaged |

The data in Table 4.9 show the Pobal HP Index Relevant Index Score Figures at a local and County level for the year 2016 (*Source: Pobal HP Deprivation Index).* These figures show that the population living within the Study Area are generally classified as 'Marginally below average'. The county of Wicklow is classified as classified as 'Marginally above average'. Figure 4.3 below presents the Pobal HP Index map illustrating the Study Area.

***Table 4.9*** Pobal HP Index Relevant Index (Source: Pobal HP Deprivation Index)

| Area | Relative Index Score | Pobal HP Description 2011 |
|---|---|---|
| Wicklow | 1.43 | Marginally above average |
| Kilbride | -4.73 | Marginally below average |
| Arklow Rural | -2.34 | Marginally below average |
| Arklow No. 1 Urban | -7.75 | Marginally below average |
| Arklow No. 2 Urban | -2.90 | Marginally below average |
| Study Area (Mean) | -4.43 | Marginally below average |

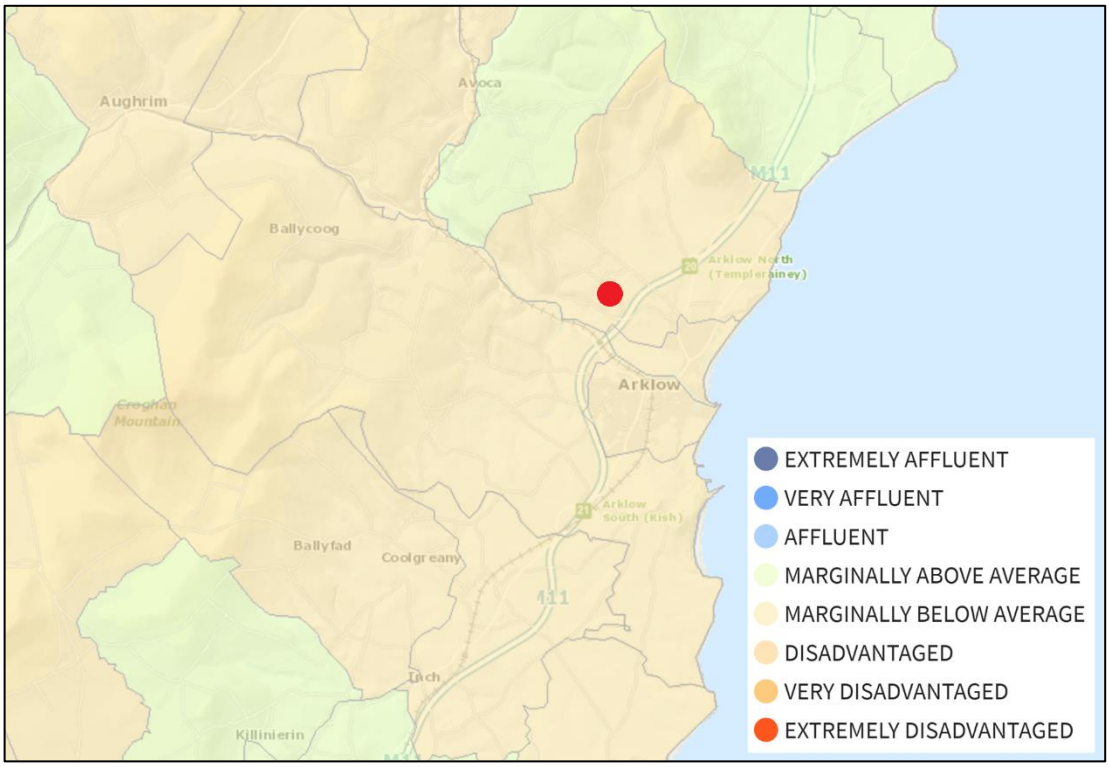



***Figure 4.3*** Pobal HP Index 2016. The proposed development site is indicated with a red dot (Source: Pobal HP Deprivation Index)

## 4.3.4 Health

### *4.3.4.1 Physical Health*

Life expectancy in Ireland by sex is a key metric for assessing population health; data for the study area is shown in Table 4.10. Mid-East data shows that life expectancy for both males and females has increased consistently, with female life expectancy consistently higher than male.

***Table 4.10*** Period Life Expectancy (Source: CSO Statbank VSA30 & VSA31)

| Period Life Expectancy in Ireland by sex | | | | |
|---|---|---|---|---|
| Area | Sex | 2002 | 2006 | 2011 |
| Mid-East | Male | 75.9 | 77.2 | 79 |
| | Female | 80.5 | 81.4 | 83 |

Table 4.11 shows Circulatory Diseases Admission Rate per 100,000 Population at a National and County level *(Source: Public Health Well Community Profiles)*. The rate of hospital admissions in county Wicklow tend to exceed those of the State for all study years.

***Table 4.11*** Circulatory Diseases (Source: Public Health Well Community Profiles)

| Circulatory Diseases Admission Rate per 100,000 Population | | | | | |
|---|---|---|---|---|---|
| Area | 2010 | 2011 | 2013 | 2014 | 2015 |
| State | 4,308.6 | 4,026.8 | 4,495.6 | 4,644.6 | 3,794.9 |
| Wicklow | 4,334.6 | 4,147.3 | 4,643.7 | 5,760.7 | 4,473.3 |

Respiratory Diseases Admission Rate per 100,000 Population at a National and County level are shown in Table 4.12. The rate of hospital admissions in county Wicklow tends to fall broadly in line of that of the State.

***Table 4.12*** Respiratory Diseases (Source: Public Health Well Community Profiles)

| Respiratory Diseases Admission Rate per 100,000 Population | | | | | |
|---|---|---|---|---|---|
| Area | 2010 | 2011 | 2013 | 2014 | 2015 |
| State | 2,402.6 | 2,361.0 | 2,633.6 | 2,691.0 | 2,712.5 |
| Wicklow | 2,068.7 | 2,153.6 | 2,303.8 | 2,493.2 | 2,546.3 |

#### *4.3.4.2 Mental Health*

The rates of death by suicide and intentional self-harm rate per 100,000 population is shown in Table 4.13 below. The rates in Wicklow are lower than those in the State in 2013. Rates of death by suicide and intentional self-harm are generally decreasing year-on-year, this is generally in line with the pattern seen in the State.

***Table 4.13*** Death by Suicide and Intentional Self Harm (Source: CSO Statbank DHA12)

| Death by Suicide and Intentional Self Harm Rate per 100,000 Population | | | | |
|---|---|---|---|---|
| Area | 2010 | 2011 | 2012 | 2013 |
| State | 10.87 | 12.11 | 11.8 | 10.34 |
| Wicklow | 10.69 | 12.46 | 7.22 | 3.61 |

The number of admissions to hospital for anxiety or depression per 1,000 people (Table 4.14) in Wicklow have followed the same pattern of the State, which shows a decline and stabilising over the 2013 – 2015 period (Table 4.14).

***Table 4.14*** Number of admissions to hospital for anxiety or depression (Source: Public Health Well Community Profiles)

| Number of admissions to hospital for anxiety or depression per 1,000 people | | | |
|---|---|---|---|
| Area | 2013 | 2014 | 2015 |
| State | 2 | 1.8 | 1.8 |
| Wicklow | 2 | 1.5 | 1.7 |

#### *4.3.4.3 Lifestyle*

In terms of lifestyle, populations in the Mid-East are broadly similar to those in the State, with rates of smoking, consumption of alcohol and prevalence of eating 5 portions or more fruit or vegetables daily for persons aged 15 and over being similar or identical across both comparative areas (Table 4.15).

***Table 4.15*** Prevalence of smoking, drinking alcohol and consumption of fruit and vegetables of persons aged 15 and over (Source: CSO Statbank IH079)

| Area | Smoking daily | Smoking occasionally | Prevalence of drinking alcohol | Prevalence of eating 5 portions or more fruit or vegetables daily |
|---|---|---|---|---|
| State | 15% | 7% | 81% | 42% |
| Mid-East | 18% | 8% | 81% | 43% |

Activity levels in the Mid-East are similar to those in the State, with the prevalence of individuals walking and cycling as a form of transport, as well as levels of participation in sports, fitness or recreational physical activities being on par in the Mid-East and the State (Table 4.16).

***Table 4.16*** All persons aged 15 and over by Region, Year and Physical Activity Undertaken (Source: CSO Statbank IH072)

| Area | Walk to get to and from places | Cycle to get to and from places | Sports, fitness or recreational physical activities | Muscle strengthening activities |
|---|---|---|---|---|
| State | 86 | 14 | 49 | 34 |
| Mid-East | 85 | 13 | 55 | 35 |

### 4.3.5 Natural Resources

Natural resources and land use in the hinterland of the proposed development have also been considered as they may have implications for the development of the lands.

The proposed development is located on a brownfield site in Avoca River Park Industrial Estate, and as such, there will be no loss of soil available for agricultural economic use due to the development.

In terms of extractive industries, there is one active quarry c. 5 km south-south-east of the proposed development site. The Arklow (Parnell) Quarry is located in Rock Big. The processing which happens at the quarry includes excavation, blasting, crushing, and grading, which involves the use of both fixed and mobile plant.

### 4.3.6 Tourism

Tourism is returning to strong growth and continues to play a hugely influential role in Ireland's economic success.

The development site is located within Wicklow County which has scenic hikes and a number of attractive towns as well as several centres of residential, retail and service industries surrounding a traditional market gardening region. The Tourism Statement of the Strategy and Work Programme 2017 – 2022 describes Wicklow as:

> *"…easy to get to and provides a warm welcome for visitors seeking an escape to Irelands premier outdoor destination. Wicklow offers an unspoilt environment of stunning scenery and a wide range of outdoor, cultural and heritage experiences that will leave lasting memories."*

The development site is located next to an existing business park and is not located near any areas of significance or local tourism. Shelton Abbey, a historical landmark which also provides accommodation, is the closest site of local tourism in the surrounding area, c. 500m west-north-west of the proposed development. Tourism is not a major industry in the immediate environs of the site.

### 4.3.7 Social Infrastructure

Social infrastructure covers a range of services and facilities that meet local and strategic needs and contribute towards a good quality of life. In this context it includes local business, residential areas, education, health facilities, emergency services, places of worship, and green infrastructure.

#### *4.3.7.1 Businesses*

The proposed development site is currently a brownfield site located in Avoca River Park. The proposed development site is bounded to the south by Avoca River Park, and to the north by an industrial site and greenfield lands. The Avoca River defines the southern aspect of Avoca River Park. The urban centre to the proposed development, Arklow, is located south east of the Proposed development site, beyond the M11 motorway.

#### *4.3.7.2 Residential Dwellings*

The nearest residential sensitive locations are located in a small residential development c. 750m south-south-east from the proposed development site, on Vale Road. There exist concentrations of residential development in the environs of Arklow town, south west of the site beyond the M11.

#### *4.3.7.3 Education*

There are a number of primary and secondary schools within a 2 km vicinity of the proposed development including:

- Gaelcholáiste na Mara – c. 1.6 km southeast;
- St. John's Senior National School – c. 1.9 km southeast;
- Glenart College – c. 1.9 km south-southeast, and;
- Arklow CBS – c. 2 km southeast.

These schools, as well as other educational facilities located further than 2km from the proposed development, are concentrated in the environs of Arklow town, beyond the M11 motorway.

#### *4.3.7.4 Health*

The nearest medical centre to the proposed development site is Arklow Health Centre, c. 2.5km southeast of the site in Castle Park, Arklow. The closest hospital to the Proposed development site is Gorey District Hospital c. 17.4km southwest.

#### *4.3.7.5 Emergency Services*

The Arklow Garda Station and Arklow Fire Station located c. 2.6 km southeast and south-southeast of the proposed development site respectively.

#### *4.3.7.6 Places of Worship*

The closest place of worship to the proposed development site is Saint Brigid's Church in Kilbride, which is c. 1.4km north east of the site. There exist multiple places of worship within the environs of Arklow town, beyond the M11 motorway.

#### *4.3.7.7 Green Infrastructure*

In terms of landscape amenity, there are no listed or scenic views, no landscape or amenity designations or protected trees pertaining to the site, and no protected structures or National Monuments on the site.

There are no areas designated as amenity space by the Wicklow County Council in the immediate vicinity of the site.

The site is zoned as E1 Employment, and the potential land use at this site was a consideration during the plan development process. The site is not considered to be significant or sensitive from a landscape and visual aspect.

### 4.3.8 Summary of Baseline Conditions

The sensitivity of the surrounding area has been considered based on the details of the published data. The local area has seen a population growth between the 2011 and 2016 census, there is a large proportion of the population within working age (24 – 44 years old) reflective of the national level. The area sees low unemployment, and a high proportion of residents with a university education. The disposable income is higher than average, and relative to the national level disposable income. The Pobal HP Deprivation Index shows the area be marginally below average. The general health of the population is on trend with the state averages.

The initial analysis indicates the site has good access to social infrastructure and emergency services within 5 km of the site and in general a lack of vulnerable persons within the immediate vicinity (schools or public amenity). There are few residential receptors within close proximity to the site as the land is located north of Kish Business Park.

It is important to note that the analysis and data used to inform this study has not fully reflected the impacts of COVID-19 this is primarily due to the time which this data was collected. It is difficult to determine the long-term impacts of the COVID-19 pandemic will have on population, socioeconomics and health. This study has assumed that when the business closures and associated restrictions once ended will see a return to the pre-restriction state.

## 4.4 IMPACTS OF THE PROPOSED DEVELOPMENT

The impact of construction, commissioning, operation and decommissioning of the proposed development are considered below.

### 4.4.1 Impacts on Businesses and Residences

The main potential impacts on local businesses and residences associated with the proposed development will be in relation to air quality, noise, visual impact and traffic. The potential impacts and mitigation measures to address them are dealt with within the corresponding chapters of this EIA Report as follows:

- Chapter 8 – Air Quality and Climate
- Chapter 10 – Noise and Vibration
- Chapter 11 – Landscape and Visual Impact
- Chapter 13 – Traffic and Transportation

It is predicted that there will be a very slight positive impact on local business activity during the construction phase with the increased presence of up to 30 no. construction workers using local facilities. The positive impact during the operational phase will be less with c. 5 staff on site at any given time for maintenance works.

There may be a short term slight negative impact on the local residential population during the construction phase and the operational phase (as described in section 4.7.3.1 below and Chapter 10 – Noise and Vibration). It is also anticipated that the proposed development will have indirect positive effects on employment in terms of construction material manufacture, maintenance contracts, equipment supply, landscaping etc. It is likely that the proposed development, during both the construction and operational phases, will have a negligible significance of effects on businesses and residences with respect to human health.

### 4.4.2 Impacts on Amenity and Tourism

The location of the proposed development within an industrial park area and adjacent to a national motorway will have a minimal impact on the local landscape amenity. There will be no impact on the local parks.

It is not anticipated that the proposed development will not have any impact on local tourism or shopping amenities.

The proposed development will not create any wastewater discharge which could have a potential impact on local amenities or the local population.

The scale and massing of the proposed development is modest relative to the permitted development, such that the proposed development will only give rise to a modest intensification, if any, of the landscape and visual effects, both during construction and in operation. It is noted that construction of the proposed development will take place within the overall construction programme for the wider permitted development and will not therefore extend the overall construction period. Cumulative effects, in combination with the permitted development, will be ***not significant***. Further discussion is presented in Chapter 11 Landscape and Visual.

The proposed development will have a ***negligible*** significance of effect, and a ***long-term, neutral*** and ***imperceptible*** impact on local amenities and tourism with respect to human health.

### 4.4.3 Impacts on Natural Resources and Material Assets

The proposed development will require additional electrical power supply from the national grid, and water supply through mains connection the requirements for this supply have been detailed in Chapter 12 (Material Assets).

The proposed development will require power supplied from the grid, water, and diesel fuel during operations. The power supply for the proposed development will be drawn directly from the national grid and there is no anticipated impact to local residential or business users. A connection to mains water can be facilitated with Irish Water. Diesel

usage is minimal with less than 1,200 $m^3$ of diesel use for the entire development annually.

Chapter 5 (Land, Soils, Geology and Hydrogeology) identified quarries in the vicinity of the site. There will be no impact to mineral resources in the area as a result of the proposed development.

The proposed development will include an onsite wastewater treatment system and percolation to ground; this system will not create a wastewater discharge which could have a potential impact on local amenities or the local population. This is further discussed in Chapter 5 (Land, Soils, Geology & Hydrogeology) and Chapter 6 (Hydrology).

There is a groundwater source within the gravel aquifer upgradient of the site. The GSI Well Card Index does not show any wells drilled or springs within the zone of potential impact for the site. The redevelopment of the site will require removal of contaminated soil (generated a s a result of the historical use of the site) resulting in improved conditions as a result of the development. In order to minimise impacts on the soils geology and water environment a number of mitigation measures will be adopted to prevent the contamination of groundwater and surface water runoff during the construction and operational phase; as described in Chapter 5 (Land, Soils, Geology & Hydrogeology and Chapter 6 (water) and outlined in the CEMP. During operation there is negligible potential for impact on soil, geology and water as low trafficking with the site and minimal storage of hydrocarbons. The cumulative impacts of the proposed development, Eirgrid connecting works, and the data storage facility have been assessed in Chapter 5 and 6. The resultant impact is ***negligible***, ***imperceptible*** and ***long-term***.

No significant impact to Natural Resources or Material Assets is predicted.

### 4.4.4 Impacts on Human Health from Air Quality and Climate

As outlined in Chapter 8 (Air Quality and Climate), National and European statutory bodies have set limit values in ambient air for a range of air pollutants. These limit values or “Air Quality Standards” are based on the protection of the environment as well as the protection of human health. Additional factors such as natural background levels, environmental conditions and socio-economic factors are also considered in the limit values which are set (see Chapter 8, Table 8.1).

#### *4.4.4.1 Construction Phase*

As detailed in Chapter 8 (Air Quality & Climate), Best practice mitigation measures are proposed for the construction phase of the proposed development which will focus on the pro-active control of dust and other air pollutants to minimise generation of emissions at source. The mitigation measures that will be put in place during construction of the proposed development will ensure that the impact of the development complies with all EU ambient air quality legislative limit values which are based on the protection of human health. Therefore, the impact of construction of the proposed development is likely to be ***short-term*** and ***imperceptible*** with respect to human health.

#### *4.4.4.2 Operational Phase*

As detailed in Chapter 8 Air Quality & Climate, there are no predicted impacts to air quality or climate during the operational phase of the proposed development.

Therefore, the operational phase is considered ***long term, neutral*** and ***imperceptible***.

It is concluded that the proposed development, during both the construction and operational phases, will have a negligible significance of effects on air quality with respect to human health.

### 4.4.5 Impacts on Human Health from Noise and Vibration

Noise and vibration impacts associated with the proposed development have been fully considered within Chapter 10 of the EIA Report. Commentary on the impact assessment and related noise levels are summarised below with respect to potential environmental health impacts.

#### *4.4.5.1 Construction Phase*

As detailed in Chapter 10 Noise and Vibration, noise emissions associated with the construction phase of the development are expected to be less than the prevailing ambient noise level at the nearest sensitive locations. As a result, the existing noise environment is not expected to change significantly because of the short-term construction phase. In addition, due to the distance between the site and the nearest sensitive locations, vibration impacts generated during construction are expected to be negligible. Therefore, the noise and vibration impact of the construction phase of the proposed development is likely to be ***short-term*** and ***not significant*** with respect to human health because of the short-term construction phase.

#### *4.4.5.2 Operational Phase*

The proposed development will not generate any perceptible levels of vibration or noise during operation and therefore there will be no impact from noise emissions or vibrations on human health.

The cumulative noise impacts of the proposed development, Eirgrid connecting works, and the data storage facility have been assessed in Chapter 10. The resultant noise impact is ***negative***, ***not significant*** and ***long-term***.

The proposed development will not generate any perceptible levels of vibration during operation and will have a negligible significance of effect with respect to human health. Therefore, there will be no impact from vibrations on human health.

### 4.4.6 Impacts on Human Health from Traffic and Transportation

An assessment of the additional traffic movements associated with the proposed development during the construction phase is presented in Chapter 13 Traffic and Transportation. The available data indicates that there are no location-specific road safety concerns of relevance to the proposed development.

The predicted impact of the development on human beings and in particular road users will be ***short-term, negative*** and ***not significant*** for the construction phase and ***long-term, neutral*** and ***imperceptible*** for the operational phase.

### 4.4.7 Impacts on Health and Safety

The proposed development has been designed in accordance with the Safety, Health and Welfare at Work Act 2005 (S.I. 10 of 2005) as amended and the Safety, Health and Welfare at Work (General Application) Regulations 2007 (S.I. 299 of 2007) as

amended and associated regulations. The plant has been designed by skilled personnel in accordance with internationally recognised standards, design codes, legislation, good practice and experience based on a number of similar existing facilities operated by ESB Networks.

The potential health and safety risks have been addressed for certain aspects including the vulnerability of the project to natural disasters, flooding and other hazards, air quality, noise and vibration, and traffic in Chapters 6, 8, 10 and 13 respectively.

The potential for major accidents has been considered with reference to Seveso/Control of Major Accident Hazards (COMAH) Regulations. The proposed development will not be a Seveso/COMAH facility. The only substance stored on site controlled under Seveso/COMAH will be diesel for generators and the amounts proposed do not exceed the relevant thresholds of the Seveso Directive. The proposed development is classified as Level 1 type development which is permittable in terms of the land use planning guidelines.

The proposed development has the potential for an impact on the health and safety of workers employed on the site, particularly during the construction phase. The activities of contractors during the construction phase will be carried out in accordance with the Safety, Health and Welfare at Work (Construction) Regulations 2013 (S.I. No. 291 of 2013) as amended to minimise the likelihood of any impacts on worker's health and safety. The health and safety planning for the construction phase of the proposed development will consider any appropriate measures to safeguard workers' health and safety with regards to Covid-19.

Potential impacts associated with electromagnetic fields (EMF) for 110kV electronic and magnetic fields are assessed by EirGrid in their policy documents. Substations produce small fields with the maximum values generally occurring where the line(s) and/or cable(s) enter and exit the substation. There are no significant impacts due to EMP anticipated.

There is a potential impact on the receiving environment as a result of minor accidents/leaks of fuel/oils during the construction and operational phases. However, the implementation of the mitigation measures set out in Chapter 5 (Land, Soils, Geology and Hydrogeology) and Chapter 6 (Hydrology) of the EIA Report will ensure the risk of a minor/accident is low and that the residual effect on the environment is imperceptible.

## 4.5 REMEDIAL AND MITIGATION MEASURES

The impacts on the local population are considered to be short-term, positive and imperceptible due to the expected short-term employment of a small number of construction workers directly employed to work on the construction of the proposed development and in turn creating a small amount of indirect additional business from using local businesses during the construction phase. The proposed development will provide a permanent power supply to the permitted data storage facility development and support future growth which will support employment in the area.

The remedial and mitigation measures to address the potential impacts on population and human health from the proposed development have been assessed within the corresponding specialist chapters; Chapter 5 (Soils, Geology and Hydrogeology); Chapter 6 (Hydrology); Chapter 8 (Air Quality and Climate), Chapter 10 (Noise and Vibration); Chapter 11 (Landscape and Visual); and Chapter 13 (Traffic and Transportation).

## 4.6 POTENTIAL CUMULATIVE IMPACTS

The cumulative impact of the proposed development with any/all relevant other planned or permitted developments are discussed below. Related and permitted, concurrent, and future developments are listed in Chapter 2. Planned development in the surrounding area have been defined in Chapter 3 (Planning and Alternatives).

### 4.6.1 Construction Phase

The construction phases of any relevant developments would be restricted by the same binding limits for noise, dust, and emissions to water. It is considered that there would be no cumulative impact on human health.

The proposed construction works for any relevant developments will be subject to their own appropriate environmental assessment and subject to a construction environmental management plan, if applicable, that will mitigate any impacts on human health. Regardless, works are anticipated to be temporary and the limited time frame for construction works in the vicinity of a specific properties reduce the cumulative impacts significantly.

The overall cumulative impact of construction is therefore concluded as ***negative, short-term*** and ***not significant*** with respect to human health.

### 4.6.2 Operational Stage

The individual assessments have concluded that there will be no significant noise emissions, emissions to air soil or water from the operation of the substation. As such all adjacent developments will be required to operate in compliance with legislative and guideline requirements, there are not anticipated to be any cumulative impacts with adjacent development during operation.

The traffic assessment indicates that the proposed development is not likely to result in significant adverse impacts either alone or in combination with any likely future projects.

All developments in the area will be subject to impact assessment as required by the planning authority and be required to manage any impacts on human health.

As the proposed development together with the Eirgrid connection works and the data storage facility will have a positive impact on the immediate hinterland and the Wicklow region through continued expanding employment and the associated economic and social benefits, it is concluded that once appropriate mitigation measures are put in place any cumulative effects on population and human health will be ***positive*** and ***long-term*** and ranging from ***imperceptible*** to ***slight***.

## 4.7 RESIDUAL IMPACTS

When the mitigation measures outlined in this EIAR are implemented, there will be no residual impacts of significance on human health and populations from the construction or operational phases of the proposed development.

# 5.0 LAND, SOILS, GEOLOGY AND HYDROGEOLOGY

## 5.1 INTRODUCTION

This chapter of the EIAR which assesses and evaluates the potential impacts on the land, soil, geological and hydrogeological aspects of the site and surrounding area.

In assessing likely potential and predicted impacts, account is taken of both the importance of the attributes and the predicted scale and duration of the likely impacts.

## 5.2 STUDY METHODOLOGY

### 5.2.1 Appraisals Methodology

The appraisal methodology for the EIAR is completed in accordance with the EPA 'Guidelines on the Information to be contained in Environmental Impact Statements' (EPA, 2002). The EPA document entitled '*Advice Notes on Current Practice in the Preparation of EIS'*, 2003 and in accordance with *'Draft Guidelines on the Information to be contained in Environmental Impact Statements'* (EPA, 2017); are also followed in this geological assessment and classification of environmental impacts. Due consideration is also given to the guidelines provided by the Institute of Geologists of Ireland (IGI) in the document entitled 'Geology in Environmental Impact Statements, a Guide', (IGI, 2002) and 'Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements' (IGI 2013).

In addition, the document entitled 'Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes' by the National Roads Authority (NRA, 2009) is referenced where the methodology for assessment of impact is appropriate.

In this assessment, consideration is given to both the importance of an attribute and the magnitude of the potential environmental impacts of the proposed activities on that cited attribute.

The rating of potential environmental impacts on the soils and geology environment is based on the matrix presented in Chapter 1 (Introduction) Table 1.2 which takes account of the quality, significance, duration and type of impact characteristic identified.

The IGI and NRA criteria for rating the magnitude and significance of impacts at EIA stage on the geological related attributes are also relevant in determining impact assessment and are presented in Table 5.1 and 5.2 (see Appendix 5.1).

The principal attributes (and impacts) to be assessed include the following:

- The extent of topsoil and subsoil cover and the potential use of this material on site or requirement to remove it off-site as waste for disposal or recovery;
- High yielding water supply springs/ wells in the vicinity of the site to within a 2km radius and the potential for increased risk presented by the proposed development;
- Classification (regionally important, locally important) and extent of aquifers underlying the site perimeter area and increased risks presented to them by

the proposed development associated with aspects such as for example removal of subsoil cover, removal of aquifer (in whole or part), drawdown in water levels, alteration in established flow regimes and/or change in groundwater quality;
- Natural hydrogeological/ karst features in the area and potential for increased risk presented by the activities at the site;
- Groundwater-fed ecosystems and the increased risk presented by operations both spatially and temporally; and,
- Presence of area of geological heritage and potential to impact on same.

### 5.2.2 Sources of Information

Ground conditions at the Avoca Park adjacent site have been proved by a site investigation carried out by Ground Investigations Ireland (GII) between December 2019 and February 2020. These investigations consist of 17 no. exploratory boreholes and 30 no. trial pits. Soil and groundwater samples have been taken and the results assessed to determine the soil and water quality as part of an Environmental Assessment Avoca River Park. (GII, June 2020).

Desk-based geological information on the substrata (both Quaternary deposits and bedrock geology) underlying the area in which the site is located was obtained through accessing databases and other archives where available. Data was sourced from the following:

- The Geological Survey of Ireland (GSI) well card, groundwater body descriptions, aquifer type, vulnerability, groundwater boreholes, geological heritage database and source protection zones for the area were inspected,
- Teagasc soil and subsoil database;
- Ordnance Survey Ireland - aerial photographs and historical mapping;
- Environmental Protection Agency (EPA) – website mapping and database information.

Information on the proposed design including civil engineering works are outlined in the planning drawings and the Water and Sewage Design Report prepared by Malachy Walsh and Partners (MWP) which is included with the planning submission.

A project-specific Construction and Environmental Management Plan (CEMP) has been prepared by MWP which is included with the planning submission.

## 5.3 RECEIVING ENVIRONMENT

### 5.3.1 Site Area Description

The subject site is located to the north of the Avoca River, in Avoca River Park, approximately 2.5 km northwest of Arklow town centre. The wider landholding comprises a large primarily brownfield site which is served by existing roads infrastructure implemented as part of the setting out of the Industrial Park. The wider landholding is subject to an extant permission for a data storage facility and ancillary development.

It is proposed to demolish the existing building onsite as part of the enabling works for this project. The total ground floor area of structures to be demolished is 2187m$^2$.

The site is bound to the north by a local access road which serves Avoca River Park. To the south and to the west the site is bound by Holfeld Plastics Limited. To the east the site is bound by the wider landholding that currently incorporate Harmony Timber and Stunt Drive Ireland which will cease operation and relocate prior to commencement of the data storage facility.

The Avoca River is the principal surface water body in the area, at its closest point it is approximately 230 m south of the site. The Avoca River Valley and the Arklow Town Marsh pNHA are located c. 580m and 1 Km to the northwest and southeast of the subject site, respectively. Refer to figure 5.1 below for further details.




***Figure 5.1*** Subject site outlined in red

The Avoca River Park is well developed, current operations include timber fabrication plant, a plastic manufacturing plant, an existing substation and a storage area for scrapped vehicles. The lands in the immediate vicinity surrounding the industrial park comprises a mix of agricultural, forested, residential, commercial and institutional development. Shelton Abbey Prison is located to the north-west, Glenart Castle to the south-west and Sigma Aldrich facility to the south-east.

The site is generally fairly level, with much of the site being circa +2.0m to +2.3m OD. The western portion of the site is slightly higher at approximately +2.4m to +2.8m OD.

The receiving environment in terms of land, soils, geology and hydrogeology is described in the following sections.

### 5.3.2 Soils

The EPA soil map of Ireland shows that at the location and surrounding area, the soil types found are predominantly Made (Made Ground) which is to be expected considering the urban location of the site. There are also AminPD (Mineral poorly

drained, mainly acidic) and AlluvMIN (Alluvial – Mineral) soils types to be found to the north and to the south of the subject site, respectively. The alluvial soils can be associated with the historic Avoca River riverbed. See Figure 5.2 below.

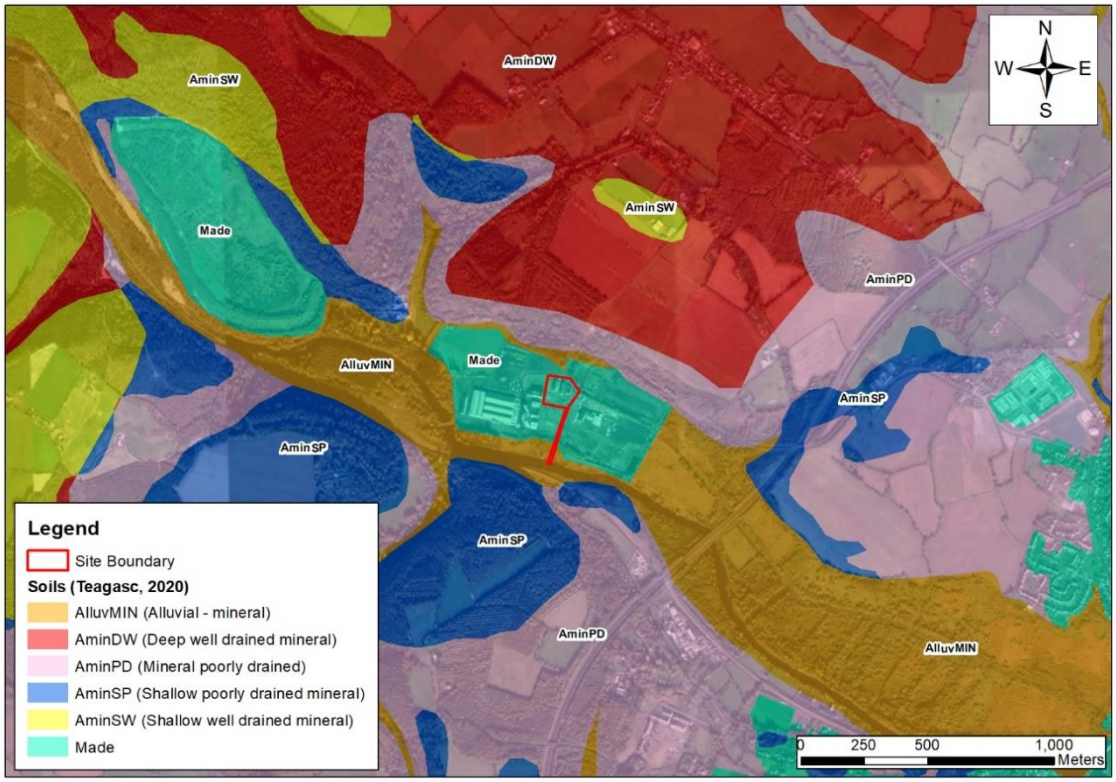



***Figure 5.2*** Soils (Source: Teagasc, 2020)

### 5.3.3 Quaternary Deposits

The Quaternary Period is the final stage of the geological time scale. This period includes the start of the Ice Age (approximately 1.6 million years ago), known as the Pleistocene Epoch right through to the postglacial period, known as the Holocene Epoch, which began 10,000 years ago and extends from the Pleistocene to the present day.

The Pleistocene Epoch in Ireland began when there was a significant cooling of the Earth's climate and was characterised by alternating extended periods of very cold conditions, during which time much of the country was covered by an ice sheet. These colder periods were interspaced with warmer periods, known as interglacial, which lasted for approximately 10,000 years at a time.

A subsoil map, produced by the GSI, indicates that the majority of the site and surrounding area is underlain Alluvium sediments located along the Avoca River. Figure 5.3 below shows the subsoils underlying the site.

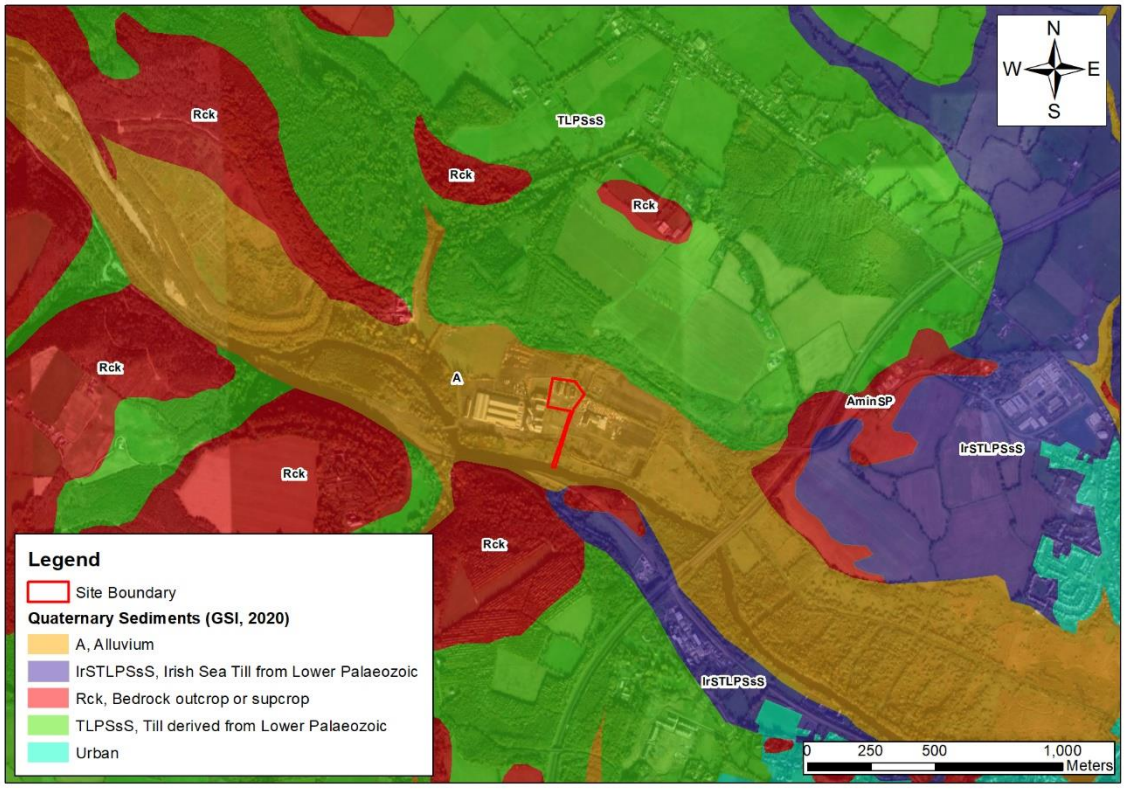



***Figure 5.3*** Subsoils (Source: GSI, 2020)

### 5.3.4 Site Investigation

During December 2019 and February 2020 site investigations at the Avoca Park site were carried out by Ground Investigations Ireland (GII). These investigations were part of the Avoca River Park Proposed Data Centre Development EIAR and consist of 17 no. exploratory boreholes and 30 no. trial pits.

Specifically, 2 no. boreholes (BH01 [cable percussion] and BH12 [rotary core]) and 4 no. trial pits (TP01, TP13, TP15 & TP17) were drilled in the immediate vicinity of the subject site. Refer to Figure 5.4 below for the location of these site investigations points.




***Figure 5.4*** Avoca Park EIAR Site Investigation locations (Source : GII, 2020)

### 5.3.5 Ground Conditions

According to the site investigations abovementioned, made ground deposits were encountered across the site at most locations beneath the Topsoil/Surfacing and were present to a depth of between 0.7m and 2.3 mbgl in the vicinity of the subject site. These deposits were described generally as grey, slightly silty, sandy Gravel and contained occasional fragments of concrete, red brick, glass and plastic

The made ground is underlain by soft cohesive deposits which can broadly be divided into an upper clay/silt layer and a lower layer containing peat. The deposits were described typically as a grey, brown Clay/Silt overlying a lower layer containing Clayey Peat. There was occasional sand and gravel lenses present with in the upper cohesive deposits. In the zone surrounding the subject site these deposits were encountered at depths up to 6.2 mbgl.

The cohesive deposits are underlain by granular deposits which were typically described as dense sandy Gravel with occasional cobbles. These deposits overlie bedrock which, in the zone surrounding the subject site, was encountered at a depth of 23.6 mbgl (borehole BH12).

A cross section of the site geology can be seen in Figure 5.5 below.

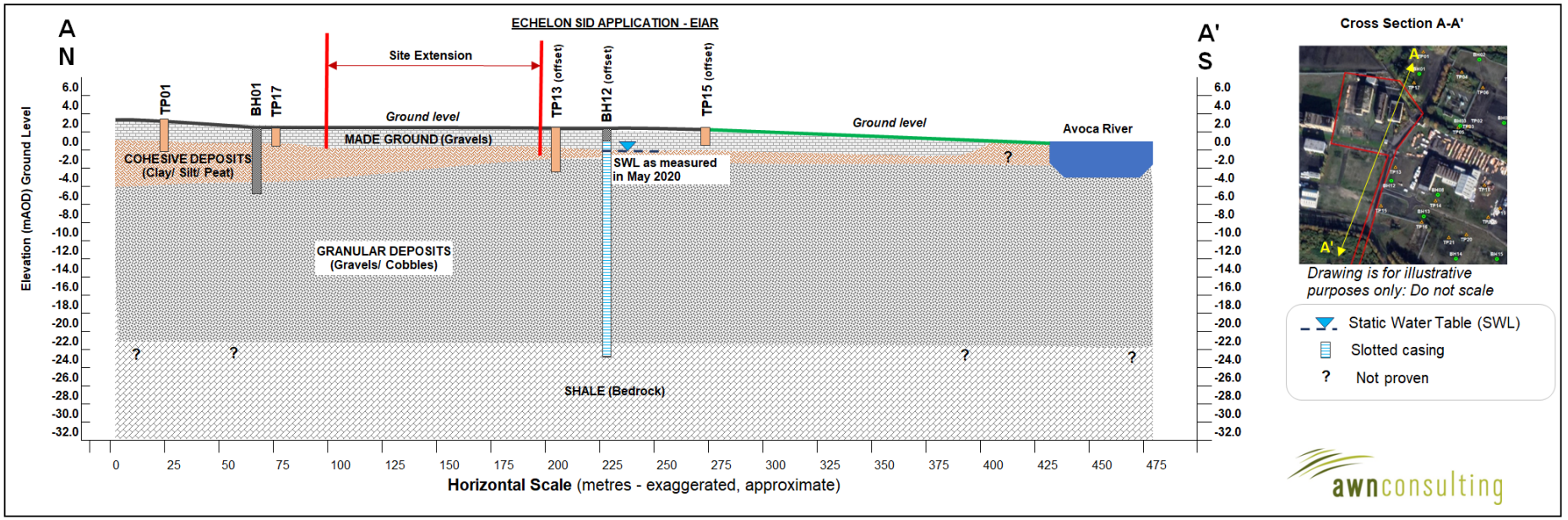



***Figure 5.5*** Schematic cross section of the proposed development site.

### 5.3.6 Groundwater Wells

The GSI Well Card Index is a record of wells drilled in Ireland. This Index shows a number of wells in the vicinity of the site. While much useful information can be obtained from this Index, it is important to note that it is by no means exhaustive, as it requires individual drillers to submit details of wells in each area.

The well card data presented in Table 5.1 shows the occurrence of recorded wells within a 2km radius of the site area, information regarding the depth to bedrock, and hence the depth of overburden is noted for each well where available. See Figure 5.6 below for locations. From the GSI well card data presented in Table 5.1, it can be seen that abstractions of up to 160 $m^3$/day are obtained from the bedrock and gravel aquifer at well 3217SWW52, which is located approx. 2km to the southeast from the site, in Arklow town. In the surrounding area of the site, yield class ranges 'Poor' to 'Moderate' as it can be seen in the boreholes 3217SWW29, 3217SWW30, 3217SWW31, 3217SWW32 and 3217SWW38, which are located in Shelton Abbey townland c. 700 m to the northwest of the site.

***Table 5.1*** GSI Well Card Data for the Site location and Surrounding Areas (Source: GSI, 2020)

| GSI Name | Type | Depth (mbgl) | Depth to Bedrock (mbgl) | Drilling Year | Easting (Irish Grid) | Northing (Irish Grid) | Location Accuracy | Townland | Usage | Yield Class | Yield (m3/d) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3217SWW037 | Dug Well | 3.7 | 3.7 | 1972 | 322,550 | 176,250 | Within 20 m | Raheen | Domestic | | |
| 3217SWW042 | Borehole | 61 | Unknown | 1983 | 323,130 | 173,960 | Within 20 m | Ballyraine Lower | Domestic | Poor | 35 |
| 3217SWW061 | Borehole | 23.8 | 15.2 | 1993 | 324,880 | 174,980 | Within 20 m | Ticknock | | Poor | 22 |
| 3217SWW081 | Borehole | 3.5 | 3.5 | 1997 | 323,120 | 176,320 | Within 20 m | Shelton | | | |
| 3217SWW098 | Borehole | 36.6 | 27.4 | 1999 | 324,610 | 175,240 | Within 20 m | Coolboy | Agricultural and domestic | Moderate | 43.6 |
| 3217SWW101 | Borehole | 31.4 | 20.7 | 1999 | 323,570 | 175,950 | Within 20 m | Shelton | Agricultural and domestic | Moderate | 87.3 |
| 3217SWW043 | Borehole | 61 | Unknown | 1996 | 324,080 | 174,790 | Within 100 m | Kilbride | Domestic | Poor | 22 |
| 3217SWW044 | Borehole | 30.5 | Not met | 1996 | 323,130 | 175,840 | Within 100 m | Shelton | Domestic | Poor | 33 |
| 3217SWW057 | Borehole | 48.8 | Unknown | 1995 | 322,410 | 176,140 | Within 100 m | Raheen | Domestic | Moderate | 55 |
| 3217SWW039 | Borehole | 91 | 0 | 1996 | 321,630 | 174,820 | Within 200 m | Glenart | Domestic | Poor | 30 |
| 3217SWW040 | Borehole | 120 | 4.5 | 1996 | 323,170 | 174,080 | Within 200 m | Ballyraine Lower | Other | Poor | 3 |
| 3217SWW041 | Borehole | 61 | 12 | - | 323,180 | 174,180 | Within 200 m | Ballyraine Lower | Industrial | Good | 120 |
| 3217SWW029 | Borehole | 21.6 | 6.7 | 1956 | 322,130 | 175,630 | Within 500 m | Shelton Abbey | | Moderate | 55 |
| 3217SWW030 | Borehole | 30.5 | 13.7 | 1956 | 322,130 | 175,580 | Within 500 m | Shelton Abbey | | Moderate | 65 |
| 3217SWW031 | Borehole | 27.7 | 4.5 | 1956 | 322,130 | 175,540 | Within 500 m | Shelton Abbey | | Moderate | 65 |
| 3217SWW032 | Borehole | 23.4 | 7 | 1956 | 322,130 | 175,520 | Within 500 m | Shelton Abbey | | Moderate | 65 |
| 3217SWW003 | Borehole | 29.6 | 3.1 | 1962 | 325,050 | 176,480 | Within 1 km | Templerainy | Domestic | Poor | 27 |
| 3217SWW005 | Borehole | 27.4 | 2.7 | 1975 | 320,610 | 175,430 | Within 1 km | Kilcarra | Domestic | Poor | 28 |
| 3217SWW006 | Borehole | 31.7 | 9.1 | 1961 | 325,260 | 175,310 | Within 1 km | Killiniskyduff | Domestic | Poor | 21.8 |
| 3217SWW010 | Borehole | 30.5 | 6.1 | 1974 | 324,390 | 175,570 | Within 1 km | Coolboy | Domestic | Moderate | 44 |
| 3217SWW012 | Borehole | 27.4 | 3.1 | 1962 | 323,360 | 176,370 | Within 1 km | Ballinaheese | Domestic | Poor | 27 |
| 3217SWW033 | Dug Well | 1.2 | 1.2 | - | 320,220 | 175,920 | Within 1 km | Kilcarra | | | |
| 3217SWW038 | Borehole | 47.2 | 3.1 | 1956 | 322,040 | 175,460 | Within 1 km | Shelton Abbey | Domestic | Poor | 33 |
| 3217SWW048 | Borehole | 48.7 | 21.3 | 1983 | 324,600 | 173,400 | Within 1 km | Arklow | Industrial | Moderate | 55 |
| 3217SWW052 | Borehole | 53.3 | 12 | 1996 | 324,580 | 173,320 | Within 1 km | Arklow | Domestic | Good | 160 |
| 3217SWW053 | Borehole | 45.7 | 3.6 | 1996 | 324,560 | 173,250 | Within 1 km | Arklow | Domestic | Moderate | 55 |

The well card data shows that the wells recorded close to the site location indications the depth of overburden to range from 3.1 to 13.7 mbgl, with an average depth of 7.0 mbgl.

In addition, there is a wellfield which is not recorded on the GSI Well Card and is located 2 km to the northwest of the site (i.e., upgradient) known as the Woodenbridge Wellfield, which is the public water supply source for the Arklow area. The source consists of five bored wells which together provide approximately 10,000 $m^3$ of water per day. The wells are between 12.5m and 20.6m deep and are bored into a sequence of alluvial clays, gravels and clays. The alluvial gravels are approx. 10m deep, with the gravels underlain by clay, and the depth to bedrock at the site is greater than 20m. Collectively these boreholes are potentially some of the best yielding wells in Ireland (refer to Figure 5.6 below). These are c. 1 km upgradient of the proposed development.

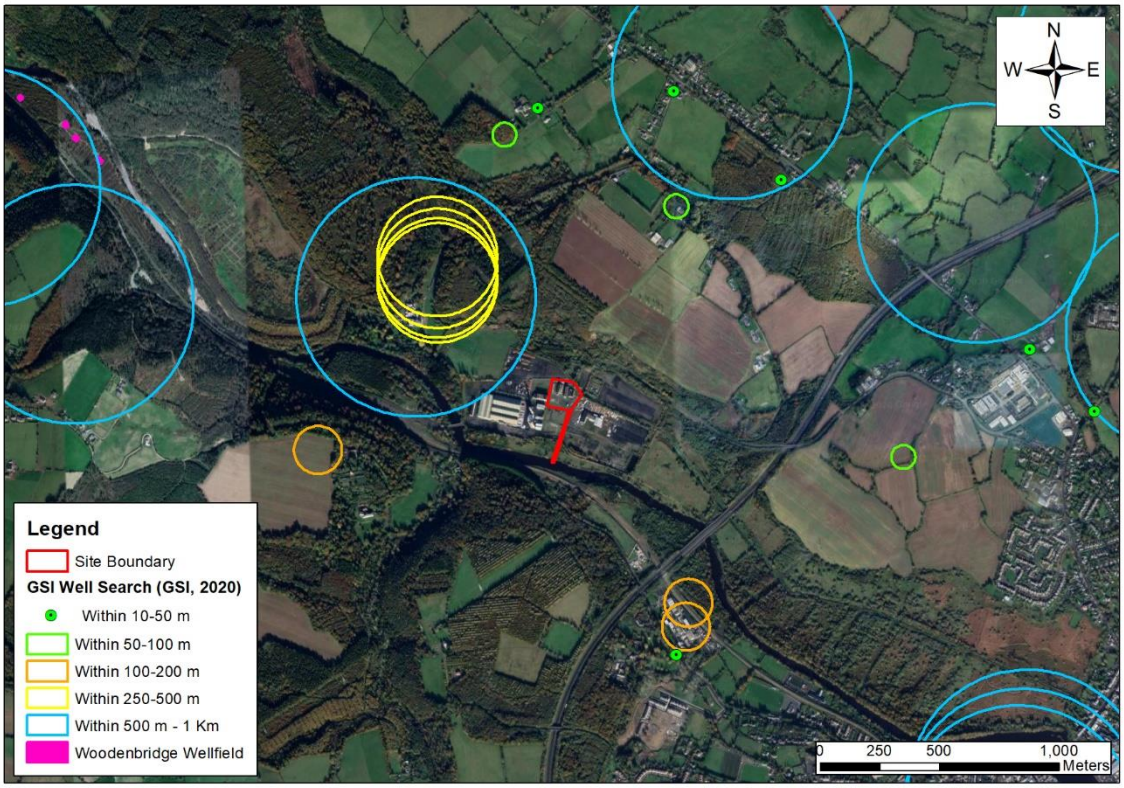



***Figure 5.6*** GSI Well Locations (Source: GSI, 2020) Note the circles show general location of wells only.

There are no sites of geological heritage within the immediate vicinity of the site. However, as mentioned above, the closest site of geological heritage is located approximately 2km to the northwest of the site (i.e., upgradient of the site) and is the Woodenbridge wellfield (IGH 16 Hydrogeology), which consist of very productive bored wells which are high yielding wells and are a public water supply source for the Arklow area. To note these wells are c. 1 km upgradient of the proposed development.

### 5.3.7 Geology (Bedrock)

The bedrock geology of the site is classified as Kilmacrea Formation, which is described as dark grey slate, minor pale sandstone of Ordovician period. See figure 5.7 below.

The site investigation found that the depth to bedrock varies from 9.8 to 25.5mbgl with a depth of 23.6 mbgl in the immediate vicinity to the subject site. The GSI well card data (Table 5.1 above) indicated the depth to bedrock in the wider area ranges from 3.1 to 13.7 mbgl.

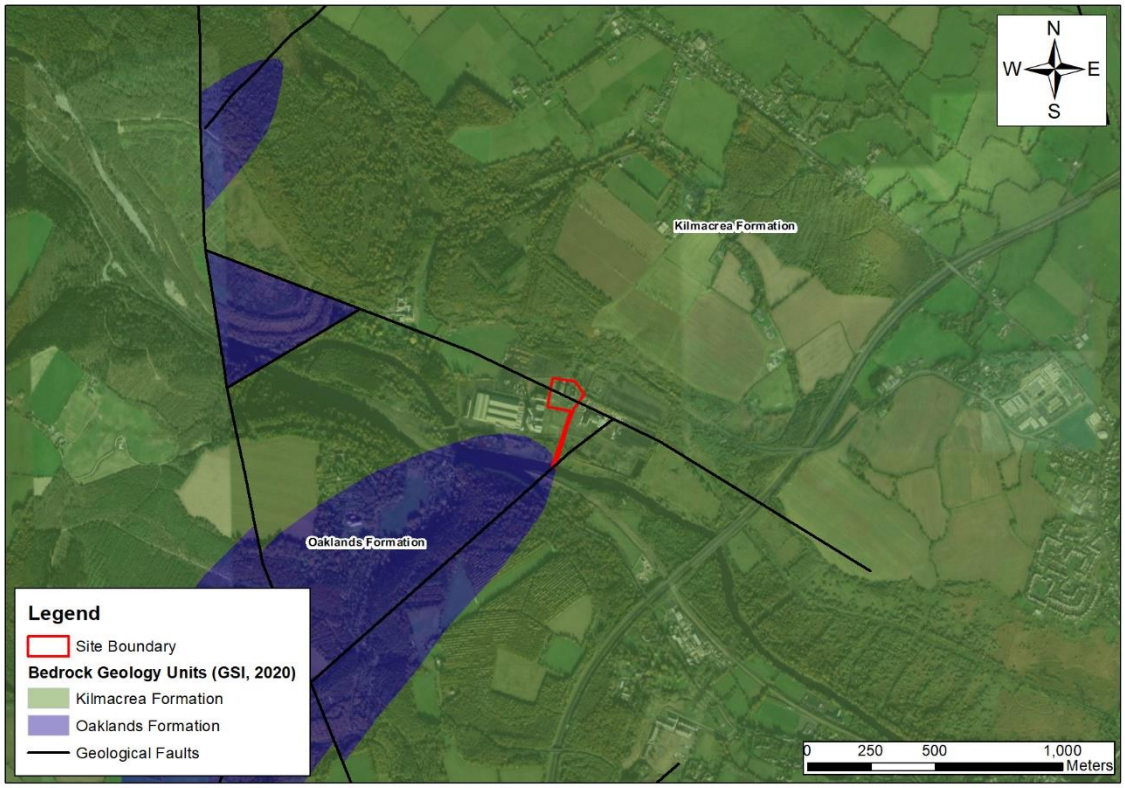



***Figure 5.7*** Bedrock Geology (Source: GSI, 2020)

As it can be seen above, GSI maps show a geological fault crossing the site in the NW-SE direction. Site investigations carried out in the Avoca Park adjacent site (refer to Appendix 5.2) show a few signs of fracture but not related to a major structural and regional fault.

### 5.3.8 Aquifer Classification and Water Body Status

Groundwater can be defined as water that is stored in, or moves through, pores and cracks in sub-soils. Aquifers are rocks or granular deposits that contain sufficient void spaces, and which are permeable enough, to allow water to flow through them in significant quantities. The potential of rock or deposits to store and transport water is governed by permeability of which there are two types, intergranular and fissure permeability.

Intergranular permeability is found in sediments, sands, gravels and clays and fissure permeability is found in bedrock, where water moves through (and is stored in) cracks, fissures, planes and solution openings. The aquifer underlying the study area is a gravel aquifer and therefore the primary characteristic of this aquifer is defined by intergranular permeability which apply in the case of a quaternary aquifer.

The major gravel aquifer underlying the site are part of the broader Arklow gravels and has been classified by the GSI as a Locally Important (Lg) Gravel Aquifer.

The Woodenbridge wellfield abovementioned, which represents potentially some of the best yielding wells in Ireland, belongs to these Arklow gravels. With regard to this wellfield, it is considered that the Arklow River, which is only a few tens of metres from the boreholes laterally, is perched within the alluvial clay deposits. The gravel deposit (which are underlain by clay deposits) is therefore acting like a saturated ‘funnel’ of

groundwater set in the valley, constrained by high bedrock ridges on either side, and with water levels just below ground level.

The major bedrock aquifer surrounding the site has been classified by the GSI as a Locally Important (LI) Aquifer which is moderately productive in local zones only (refer to Figure 5.8).

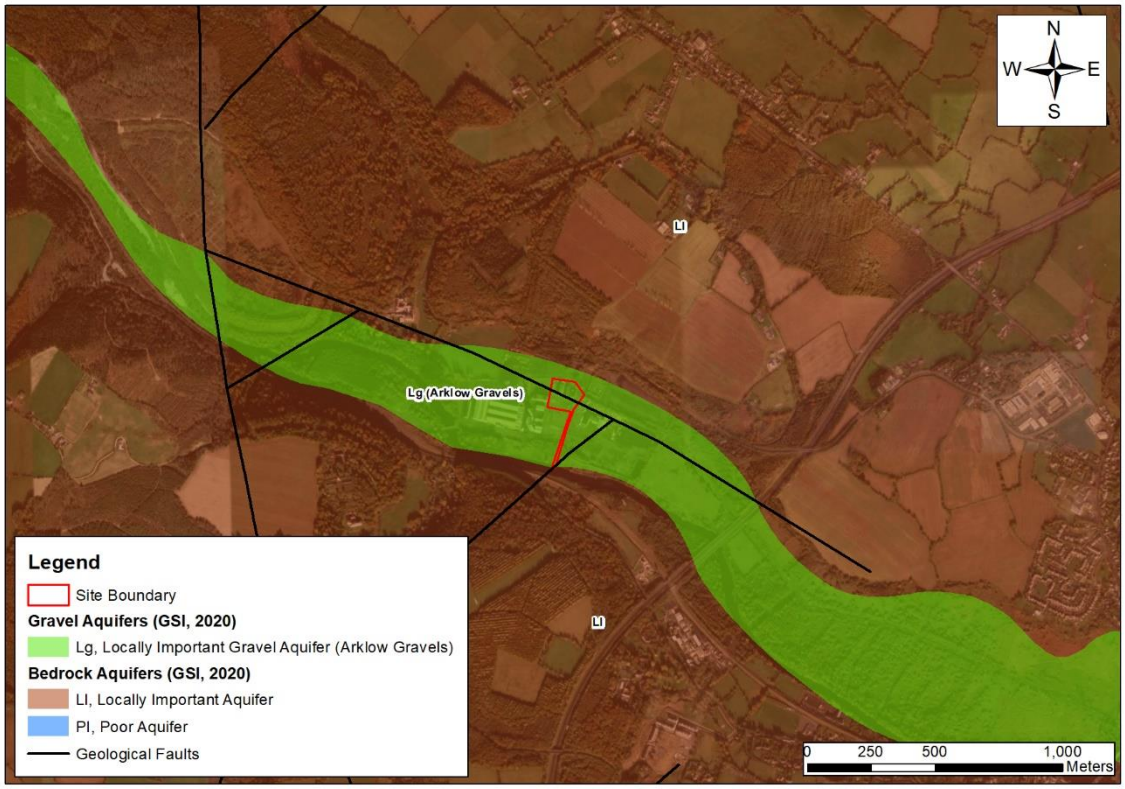



***Figure 5.8*** Bedrock and Gravel Aquifers (Source: GSI, 2020).

The Water Framework Directive (WFD) Directive 2000/60/EC was adopted in 2000 as a single piece of legislation covering rivers, lakes, groundwater and transitional (estuarine) and coastal waters. In addition to protecting said waters, its objectives include the attainment of 'Good Status' in water bodies that are of lesser status at present and retaining 'Good Status' or better where such status exists at present.

The WFD requires 'Good Water Status' for all European waters to be achieved through a system of river basin management planning and extensive monitoring. 'Good status' means both 'good ecological status' and 'good chemical status'.

The proposed development is within the 'Wicklow' groundwater body which most recent WFD groundwater status (2013-2018) is 'Good' with a current WFD risk score under 'Review'.

The Environmental Assessment for the Avoca River Park development carried out by GII (June 2020) includes the analysis of groundwater samples which were collected from the wells BH02, BH03, BH06, BH10 and BH12 on the 26 May 2020 (refer to Figure 5.4 above for locations of these boreholes). Overall, the water quality results indicate that the underlying gravel aquifer has been impacted by the historical use as a fertiliser factory which previously operated on the adjacent site with elevated levels of ammonia, potassium, sulphate and sulphur in the samples collected. Borehole BH12, which is

located in the immediate vicinity of the subject site recorded the highest exceedances. Further details are presented in Section 5.3.11 below.

There are no karst features identified in the area.

### 5.3.9 Aquifer Vulnerability

The GSI, EPA, and the Department of Environment, Heritage and Local Government (DoEHLG) have developed a programme of Groundwater Protection Schemes, with the aim of maintaining the quantity and quality of groundwater in Ireland, and in some cases improving groundwater quality, by applying a risk assessment approach to groundwater protection and sustainable development.

As part of this scheme, the GSI have mapped the vulnerability of the country's aquifers. Reference to the GSI Vulnerability data indicates that the proposed development site is classified as having a 'Moderate' aquifer vulnerability which indicates that the soil cover is >10m of moderate permeability soil at the site, given by the cohesive and granular deposits which overlay the gravel aquifer (Refer to Figure 5.9 and Table 5.2 below). Comparison with the site investigation results and GSI Well Card Data (Table 5.1) shows that the surrounding area can be classified as 'Moderate' to 'High'. The GII site investigations encountered the bedrock at a depth of 23.6 mbgl in the boreholes nearest the site (BH12).

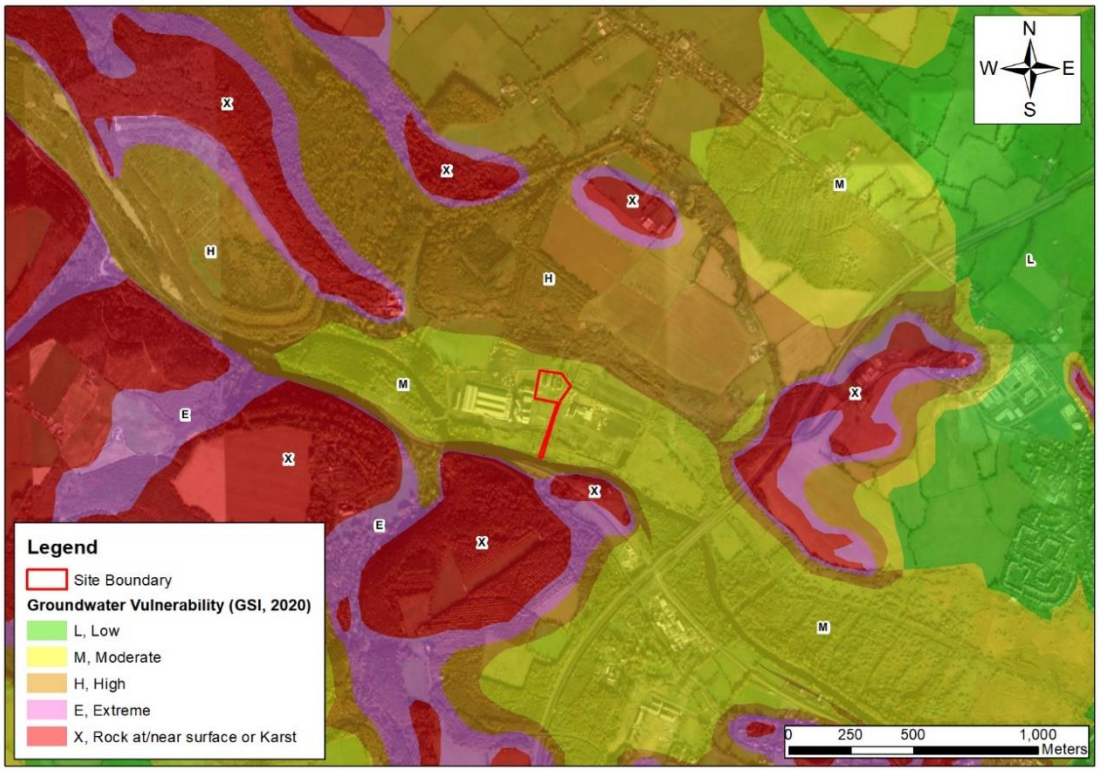



***Figure 5.9*** Groundwater Vulnerability (Source: GSI, 2020)

***Table 5.2*** Vulnerability Mapping Guidelines (Source: GSI, 2020)

| Vulnerability Rating | Hydrogeological Conditions | | | | |
|---|---|---|---|---|---|
| | Subsoil Permeability (Type) and Thickness | | | Unsaturated Zone | Karst Features |
| | High permeability (sand/gravel) | Moderate permeability (e.g. Sandy subsoil) | Low permeability (e.g. Clayey subsoil, clay, peat) | (Sand/gravel aquifers only) | (<30 m radius) |
| Extreme (E) | 0 - 3.0m | 0 - 3.0m | 0 - 3.0m | 0 - 3.0m | - |
| High (H) | >3.0m | 3.0 - 10.0m | 3.0 - 5.0m | >3.0m | N/A |
| Moderate (M) | N/A | >10.0m | 5.0 - 10.0m | N/A | N/A |
| Low (L) | N/A | N/A | >10.0m | N/A | N/A |

Notes: (1) N/A = not applicable.
(2) Precise permeability values cannot be given at present.
(3) Release point of contaminants is assumed to be 1-2 m below ground surface.

### 5.3.10 Geo-Hazards

In general, Ireland suffers few landslides. Landslides are more common in unconsolidated material than in bedrock, and where the sea constantly erodes the material at the base of a cliff landslides and falls lead to recession of the cliffs. Landslides have also occurred in Ireland in recent years in upland peat areas due to disturbance of peat associated with construction activities.

Based on the GSI spatial map viewer, the proposed development site is not in an area susceptible to landslides. This is consistent with the topography and the geology across the site. There are no active volcanoes in Ireland.

### 5.3.11 Groundwater Quality Monitoring

The Environmental Assessment for the Avoca River Park development carried out by GII (June 2020) includes the groundwater sampling from boreholes BH02, BH03, BH06, BH10 and BH12 (refer to Figure 5.4 above for locations of these boreholes) and groundwater level measurement. This monitoring was undertaken on the 26 May 2020. There was no evidence of visual or olfactory contamination from any of the water samples.

The recorded groundwater levels in the mentioned boreholes ranged from 1.48 to 2.17 mbgl. The deepest record (2.17 mbgl) was recorded at BH12, which is the nearest borehole to the subject site. These results indicate that the groundwater flow is towards the southeast.

The laboratory analysis undertaken on the samples collected from the mentioned boreholes included dissolved metals, aliphatic and aromatic petroleum hydrocarbons, polycyclic aromatic hydrocarbons (PAH), MTBE, BTEX, total phenols, psycho-chemicals parameters, pesticides, VOCs. The laboratory testing was competed by Element Materials Technology in the UK; EMT is a UKAS accredited laboratory.

The results were compared with the Interim Guideline Values (IGV) published by the EPA (2003) and the Groundwater Threshold Values (GTV) set out in the European Communities Environmental Objectives (Groundwater) Regulations (S.I. 9 of 2010 and S.I. 266 of 2016).

A summary of the observed exceedances is presented as follows:

- The levels of arsenic detected in BH06 and BH12 exceeded the GTV.
- The level of manganese detected in all boreholes were significantly higher than the IGV.
- The level of nickel in BH03 exceeded the GTV.
- The level of potassium in BH03 and BH12 exceeded the IGV.
- The level of sulphate detected in BH03 and BH12 exceeded the GTV.
- There is no IGV or GTV established for sulphur however it was detected in all wells with the levels in BH12 significantly higher than the remaining wells.
- The level of ammonia in all wells exceeded the GTV. The level of ammonia detected in BH12 was significantly higher than the other wells.
- The electrical conductivity measured both in the field and by the laboratory at BH12 exceeded the IGV and was significantly higher when compared with the other wells.
- Low levels of Tetrachloroethene (PCE) were detected in the borehole BH12. The dechlorination or degradation process for tetrachloroethene produces the daughter products trichloroethylene (TCE), 1,1- Dichloroethene, cis-1,2-dichloroethylene (cis-DCE), trans-1,2-dichloroethylene (trans-DCE), and vinyl chloride (VC) several of which were also detected at low levels in BH12. The source of the PCE is not known. The level of vinyl chloride detected exceeded the GTV.

Overall, the water quality results indicate that the underlying gravel aquifer has been impacted by the historical use as a fertiliser factory located in the adjacent site with elevated levels of ammonia, potassium, sulphate and sulphur in the samples collected. Borehole BH12, which is located in the immediate vicinity of the subject site recorded the highest number exceedances. However, it has to be noted that these boreholes are located to the southeast of the subject site (i.e., downgradient).

### 5.3.12 Soil Quality Monitoring

During the abovementioned site investigation works soil samples from 30 no. trial pits were analysed. Samples were tested for the RILTA suite including asbestos. TP01, TP13 and TP15 are located in the immediate vicinity of the subject site (refer to Figure 5.4 above for the trial pits locations).

There are no legislated threshold values for soils in Ireland. As such soil samples were compared to a Generic Assessment Criteria (GAC) derived to be protective of human health, water bodies (including groundwater) and also ecology for a resident and commercial/industrial end use.

Generic Assessment Criteria in the UK has been derived using the Contaminated Land Exposure Assessment (CLEA) model to be protective of human health for a number of different land uses. LQM (Land Quality Management) and the CIEH (Chartered Institute of Environmental Health) developed a document in July 2009 detailing their own research and derivation of their own ‘LQM GACs’. A total of 82 substances

including many organic substances had LQM GACs derived, for the standard land uses of residential, commercial/industrial and allotments. This was updated in 2015 following further research and the derived results are now called LQM/CIEH Suitable 4 Use Level (S4UL). The LQM/CIEH S4ULs are intended for use in assessing the potential risks posed to human health by contaminants in soil and as transparently derived and cautious "trigger values" above which further assessment of the risks or remedial action may be needed. For each contaminant S4ULs have been derived for six land use scenarios based on assessing exposure pathways in each planning scenario. In this instance the commercial scenario has been considered. Soil type and soil organic matter (SOM) has an influence on the behaviour of contaminants. S4ULs have been derived for three SOM contents (1%, 2.5% and 6%) to cover the likely range in soils. A prudent approach has been taken by considering the lower 1% SOM content.

The level of arsenic detected in the samples from TP08 at 1.5mbgl and TP13 at 1.5mbgl exceeded the commercial S4UL threshold value. TP13 was the nearest trial pit to the subject site.

The soil analysis results were compared to the landfill acceptance criteria as specified in the European Communities (EC) Council Decision 2003/33/EC which identifies the maximum concentration of selected key contaminants permitted for acceptance at authorised waste facilities. The soil samples were classified as Hazardous or Non-Hazardous by using the *HazWasteOnline* tool.

Trial pit TP13 presented hazardous materials at 1.5 mbgl, the sample was classified as 17 05 13 (Soil and stones containing hazardous substances) due to the high concentrations of Arsenic, Copper, Lead and Zinc. It is believed that these results are product of the previous fertiliser production process existing at the adjacent site.

Refer to Appendix 5.2 for further details with regard to these results and the respective laboratory reports.

### 5.3.13 Landfills

The lands immediately to the southeast of the Avoca Park site are closed landfills. Historical landfill operations comprise: disposal of phosphogypsum wastes from the production of phosphoric acid; disposal of carbon from the ammonia plant and disposal of general plant wastes.

### 5.3.14 Rating of site importance of the geological and hydrogeological features

Based on the NRA/IGI methodology, the criteria for rating the importance of geological features, the importance of the geological features at this site is rated as ***Medium Importance***. This is based on the presence of contaminated soil in the surrounding area (made ground deposits) due to the historical fertiliser production process in the Avoca Park.

Based on the NRA/IGI methodology, the criteria for rating the importance of hydrogeological features, the importance of the hydrogeological features at this site is rated as ***High Importance***. This is based on the assessment that the attribute has a medium quality significance or value on a local scale. The aquifer is a *locally important* (Lg) gravel aquifer over site and is used for public water supply in Arklow (Woodenbridge wellfield which, however, is located upgradient of the site). In addition, it does host the Arklow Town Marsh pNHA, located 1 km downgradient of the subject site (refer to Figure 5.1 above).

## 5.4 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

The proposed development includes a new 110kV GIS substation MV Control Building and associated transformer infrastructure. The key elements of the proposed development are outlined in Chapter 2.

The activities of the proposed development with regard to the land, soil, geological and hydrogeological environment are outlined below.

### 5.4.1 Construction Activities

- Additional removal of shallow made ground and superficial deposits for foundations and civil engineering works. The maximum cut depth will be c. 2 m bgl and the average cut depth will be c. 0.655.
- Infilling with engineering fill.
- Temporary storage of fuel will be required on site for construction traffic.
- No significant dewatering is anticipated to be required for construction as groundwater is at a sufficient depth in comparison to required excavation levels and water ingress will be unlikely to occur.

### 5.4.2 Operational Activities

- There will be no direct discharges to ground required for operation of the facility. Non potable water supply will be supplied from a proposed rainwater harvesting unit and foul water will be discharge into a storage tank on site which will be emptied as required with final discharge disposed by a licenced contractor.
- Slightly increased hard stand area will reduce local recharge to ground.
- There is a requirement for oil storage for the transformers. The maximum storage is c. 36 $m^3$ and this will be stored within a bunded area which is greater than 110% of the storage capacity.
- The land is currently unused and zoned for industrial development so there is no loss of agricultural or amenity value.

## 5.5 POTENTIAL IMPACT OF THE PROPOSED DEVELOPMENT

An analysis of the potential impacts of the proposed development on the land, soils, geology and hydrogeological environment during the construction and operation is outlined below. Due to the inter-relationship between land, soils, geology and hydrogeology and surface water (water & hydrology chapter) the following impacts discussed will be considered applicable to Chapter 6 of the EIAR. Waste Management is also considered an interaction.

### 5.5.1 Construction Phase

Potential impacts considered during construction are as follows:

<u>Excavation and Infilling</u>

Following the completion of site clearance and levelling, all structures will require foundations to structural engineer specifications. Building structures will comprise standard structural steel frames. It is anticipated that foundations will require moderate scale excavations. Based on site conditions, no rock breaking or dewatering will be necessary.

It is not envisaged that any of the material on site will be reused. It is anticipated that the top 1000mm to the west of the site and 300mm to the east of the site will be stripped of topsoil/organic material amounting to approximately 6,500m$^3$. It is also anticipated that excavation for foundations, basements and ancillary drainage and structural components will amount to approximately 2,000m$^3$. All material from the demolished buildings is to be exported off site. It is envisaged that approximately 750 tonne of concrete, 350 tonne of steel and 150 tonnes of timber and other material is to be exported off site after demolition. It is envisaged that approximately 10,000m$^3$ of stone fill material will be required on site to build up to the required levels. The importation of fill will be required to facilitate construction.

Further soil sampling will be undertaken during pre-development works however, it is anticipated that all excavated material being removed off this site will be removed as a waste and not as a by-product under article 27.

*Accidental Spills and Leaks*

During construction of the development, there is a risk of accidental pollution incidences from the following sources if not adequately mitigated:

- Spillage or leakage of oils and fuels stored on site.
- Spillage or leakage of oils and fuels from construction machinery or site vehicles.
- The use of concrete and cement during pad foundation construction.

### 5.5.2 Operation Phase

Potential for impacts during operation are low. The storage volume of any liquid hazards is low and there will be no direct discharges to the water or soil environment during the operational phase.

There is a low potential for leaks and spillages during operation and maintenance of the development as no bulk fuel or chemicals required for operation. However, there is a requirement for a small volume of oil storage for the transformers; the maximum storage is c. 36 m$^3$ and this will be stored within a bunded area which is greater than 110% of the storage capacity. Any accidental emissions during storage, transfer, or delivery or leakage in the car parks could cause localised contamination if the emissions enter the soil and groundwater environment without adequate mitigation. However, it is noted that any accidental discharge will more likely impact stormwater drainage due to the hardstand and drainage infrastructure proposed.

Incorporation of hard stand area on previous greenfield area and the use of SUDs techniques will have a minor effect on local recharge to ground; however, the impact on the overall groundwater regime will be insignificant as the site was already partly covered in hardstand.

A small portion of the land is a greenfield site, and this will become industrial during operational phase. However, there will no loss of amenity/agricultural land as a result of the proposed development.

## 5.6 DO NOTHING SCENARIO

Should neither the approved development nor the proposed development take place, the land, soils, geology and hydrogeology will remain in their current state and there will be no change.

## 5.7 REMEDIAL & MITIGATION MEASURES

The design has taken account of the potential impacts of the development on the land, soils, geology and hydrogeology environment local to the area where construction is taking place. Measures have been incorporated in the design and CEMP during construction to mitigate the potential effects on the surrounding land, soils, geology and hydrogeology. These measures seek to avoid or minimise potential effects in the main through the implementation of best practice construction methods and adherence to all relevant legislation.

Due to the inter-relationship between land, soils, geology and hydrogeology and water (hydrology) the following mitigation measures discussed will be considered applicable to both.

### 5.7.1 Construction Phase

*Construction Environmental Management Plan*

A project-specific Construction and Environmental Management Plan (CEMP) has been prepared by Malachy Walsh and Partners Consultants (December 2020). This CEMP will be maintained by the contractors during the construction and operational phases and covers all potentially polluting activities and include an emergency response procedure. All personnel working on the site will be trained in the implementation of the procedures.

*Soil handling, Removal and Compaction*

Soil sampling has indicated that the soil may not be suitable for reuse on site. Further testing will be required should any soils be required to be removed from site. All soils removed from site will be disposed of by a licenced contractor to a licenced facility.

Temporary storage of soil will be carefully managed in such a way as to prevent any potential negative impact on the receiving environment and the material will be stored away from any surface water drains. Movement of material will be minimised in order to reduce degradation of soil structure and generation of dust. Stockpiles of soil/subsoil will be restricted to less than 3m in height.

*Fuel and Chemical Handling*

To minimise any impact on the underlying subsurface strata from material spillages, all oils, solvents and paints used during construction will be stored within temporary bunded areas.

Leakages of oil from oil stores will be prevented by storing these oils in bunded tanks which have a capacity of 110% of the total volume of the stored oil. Ancillary equipment such as hoses and pipes will be contained within the bunded storage container. Drainage from the bunded area(s) shall be diverted for collection and safe disposal.

Refuelling of construction machinery and vehicles and the addition of hydraulic oils or lubricants to vehicles will take place in designated refuelling areas using a prescribed re-fuelling procedure. Plant nappies or absorbent mats to be place under refuelling point during all refuelling to absorb drips. All relevant personnel will be fully trained in the use of this equipment. Guidelines such as “Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors” (CIRIA 532, 2001) will be complied with.

Should there be an oil leak or spill, the leak or spill will be contained immediately using oil spill kits; the nearby dirty water drain outlet will be blocked with an oil absorbent boom until the fuel/oil spill has been cleaned up and all oil and any contaminated material removed from the area. This contaminated material will be properly disposed of in a licensed facility

All ready-mixed concrete will be brought to site by truck. A suitable risk assessment for wet concreting will be completed prior to works being carried out which will include measures to prevent discharge of alkaline wastewaters or contaminated storm water to the underlying subsoil. The pouring of concrete will take place within a designated area using a geosynthetic material to prevent concrete runoff into the soil/groundwater media. Pours will not take place during forecasted heavy rainfall. Washout of concrete transporting vehicles will not take place on site. Concrete trucks will be washed out off site at the source quarry.

To reduce the volume of cementitious water, only concrete truck chutes will be washed down on site. The concrete trucks will wash down their chutes at a designated chute wash down area in the site compound. The wash down area will consist of a polythene lined bunded area with a capacity of about 20$m^3$. The location of the chute washdown area will be appropriately located. The system is sealed with no overflow discharge to the drainage system.

In the event of a spillage on site, the dirty water drains in the immediate area will temporarily be blocked and the pH levels of the water in the associated settlement ponds will be monitored and if necessary, will adjust the pH levels using $CO_2$ entrainment. Any spillage will be cleared immediately and deposited in the Chute wash down area

In the case of drummed fuel or other chemical which may be used during construction containers will be stored in a dedicated internally bunded chemical storage cabinet and labelled clearly to allow appropriate remedial action in the event of a spillage.

### 5.7.2 Operational Phase

During operation measures there is no requirement for bulk fuels or chemical storage, no requirement for discharge to ground and no requirement for abstraction of groundwater. However, there is a requirement for oil storage for the transformers. The maximum storage is c. 36 $m^3$ and this will be stored within a bunded area which is greater than 110% of the storage capacity.

An environmental management plan will apply to the overall development during the operational phase incorporating mitigation measures and emergency response measures.

Hydrocarbon interceptors will be installed to capture any potential hydrocarbon contamination prior to discharge into the attenuation system on site. This together with hardstand cover will minimise the potential for any impact to the underlying aquifer.

## 5.8 PREDICTED IMPACT OF THE PROPOSED DEVELOPMENT

Based on the natural conditions present and with appropriate mitigation measures (refer to Section 5.7 above) to reduce the potential for any impact of accidental discharges to ground during this phase, the potential impact on land soils, geology and hydrogeology during construction (following EPA, 2017) is considered to have a **short term, imperceptible significance**, with a **neutral** impact on quality.

In the case of the proposed development the predicted impact during operation is considered to be **long term**, **neutral** in terms of quality and of an **imperceptible significance** as a result of this proposed development on the surrounding land, soils, geology and hydrogeological environment.

## 5.9 MONITORING

### Construction Phase

Regular inspection of surface water run-off and sediments controls e.g., silt traps will be carried during the construction phase.

Soil sampling to confirm disposal options for excavated soils.

Regular inspection of construction/mitigation measures will be undertaken e.g., concrete pouring, refuelling etc.

### Operational Phase

There will be no requirement for groundwater monitoring as there is no likely discharge to ground.

## 5.10 RESIDUAL IMPACTS

There are no likely significant impacts on the land, geological or hydrogeological environment associated with the proposed operational development of the site with mitigation in place. As such the impact is considered to have a **long term, imperceptible significance** with a **neutral impact on quality** i.e., an impact capable of measurement but without noticeable consequences.

## 5.11 POTENTIAL CUMULATIVE IMPACTS

The cumulative impact of the proposed development with any/all relevant other planned or permitted developments are discussed below. Related permitted, concurrent, developments are listed in Chapter 2 (Project Description) and Chapter 3 (Planning and Development Context).

### 5.11.1 Construction Phase

In relation to the potential cumulative impact on the land, geological or hydrogeological environment during the construction phases, those key engineering works which would have additional impacts above are:

Run-off containing large amounts of silt could cause damage to surface water systems and receiving watercourses. Run-off for the development and the Future Avoca Park development will therefore need to be managed using similar methods described for the proposed development.

Contamination of soils and groundwater underlying the site from accidental spillage and leakage from construction traffic and construction materials may occur unless project-specific Construction Environmental Management Plans (CEMPs) are put in place and complied with. It is proposed that project-specific CEMP's will be put in place for the Future Avoca Park development.

The proposed development does not require dewatering and with standard mitigation in place (as outlined in Section 6.6) for management of accidental discharges, the effect due to construction in this area is considered to be a ***neutral*** on quality and an ***imperceptible*** significance.

Contractors for the proposed development will be contractually required to operate in compliance with the CEMP which includes the mitigation measures outlined in this EIA report. Other developments will also have to incorporate measures to protect soil and water quality in compliance with legislative standards for receiving water quality (European Communities Environmental Objectives (Groundwater) Regulations (S.I. 9 of 2010 and S.I. 266 of 2016). As a result, there will be minimal cumulative potential for change in soil quality or the natural groundwater regime. The cumulative impact is considered to be ***neutral*** *and* ***imperceptible***.

### 5.11.2 Operational Phase

In relation to the potential cumulative impacts from the operational stages, the following would apply:

Overall, there will be a local change in recharge pattern due to the increase in hardstand from the proposed development and surrounding planned or permitted developments (e.g., Avoca Park development). However, based on the overall size of the underlying aquifer and measures required by all developments to protect soil and water quality there will be no overall change on the groundwater body status. There is no requirement for bulk chemical storage at the proposed development.

Accidental releases from fuel storage/unloading could contaminate groundwater or soil environments unless mitigated adequately i.e. bunded tanks and delivery areas. Localised accidental discharge of hydrocarbons could occur in car parking areas and along roads unless diverted to surface water drainage system with petrol interceptors. However, all developments are required to ensure they do not have an impact on the receiving water environment in accordance with relevant legislation (European Communities Environmental Objectives (Groundwater) Regulations (S.I. 9 of 2010 and S.I. 266 of 2016). such that they would be required to manage runoff and fuel leakages.

As such there will be no cumulative impact to groundwater quality. The cumulative impact is concluded to have a ***long-term, imperceptible*** significance *with a* ***neutral*** impact on soil and water quality.

As the local area is currently developed and zoned for development, the cumulative impact on the land is considered to be ***long-term, imperceptible*** significance *with a* ***neutral*** impact.

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# APPENDIX 5.1

# METHODOLOGY FOR ASSESSMENT OF THE IMPACTS

**Impact Ratings and Assessment Criteria (Soils, Geology and Hydrogeology)**
The NRA criteria for rating the magnitude and significance of impacts at EIA stage on the geological related attributes are also relevant in determining impact assessment and area presented in Table 2 below.

**Table 6.1 Criteria for rating site importance of Geological Features (NRA)**

| Importance | Criteria | Typical Example |
|---|---|---|
| Very High | Attribute has a high quality, significance or value on a regional or national scale<br>Degree or extent of soil contamination is significant on a national or regional scale<br>Volume of peat and/or soft organic soil underlying route is significant on a national or regional scale. | Geological feature rare on a regional or national scale (NHA)<br>Large existing quarry or pit<br>Proven economically extractable mineral resource |
| High | Attribute has a high quality, significance or value on a local scale. Degree or extent of soil contamination is significant on a local scale. Volume of peat and/or soft organic soil underlying route is significant on a local scale. | Contaminated soil on site with previous heavy industrial usage<br>Large recent landfill site for mixed wastes<br>Geological feature of high value on a local scale (County Geological Site)<br>Well drained and/or high fertility soils<br>Moderately sized existing quarry or pit<br>Marginally economic extractable mineral resource |
| Medium | Attribute has a medium quality, significance or value on a local scale<br>Degree or extent of soil contamination is moderate on a local scale<br>Volume of peat and/or soft organic soil underlying route is moderate on a local scale | Contaminated soil on site with previous light industrial usage<br>Small recent landfill site for mixed wastes<br>Moderately drained and/or moderate fertility soils<br>Small existing quarry or pit<br>Sub-economic extractable mineral resource |
| Low | Attribute has a low quality, significance or value on a local scale<br>Degree or extent of soil contamination is minor on a local scale.<br>Volume of peat and/or soft organic soil underlying route is small on a local scale | Large historical and/or recent site for construction and demolition wastes.<br>Small historical and/or recent landfill site for construction and demolition wastes.<br>Poorly drained and/or low fertility soils.<br>Uneconomically extractable mineral resource. |

**Table 6.2 Criteria for rating impact magnitude at EIS stage – Estimation of magnitude of impact on soil / geology attribute (NRA)**

| Magnitude of Impact | Criteria | Typical Examples |
|---|---|---|
| **Large Adverse** | Results in loss of attribute | Loss of high proportion of future quarry or pit reserves |
| **Moderate Adverse** | Results in impact on integrity of attribute or loss of part of attribute | Loss of moderate proportion of future quarry or pit reserves |
| **Small Adverse** | Results in minor impact on integrity of attribute or loss of small part of attribute | Loss of small proportion of future quarry or pit reserves |
| **Negligible** | Results in an impact on attribute but of insufficient magnitude to affect either use or integrity | No measurable changes in attributes |
| **Minor Beneficial** | Results in minor improvement of attribute quality | Minor enhancement of geological heritage feature |
| **Moderate Beneficial** | Results in moderate improvement of attribute quality | Moderate enhancement of geological heritage feature |
| **Major Beneficial** | Results in major improvement of attribute quality | Major enhancement of geological heritage feature |

The NRA criteria for estimation of the importance of hydrogeological attributes at the site during the EIA stage are summarised below.

**Table 6.3 Criteria for rating Site Attributes - Estimation of Importance of Hydrogeology Attributes (NRA)**

| Magnitude of Impact | Criteria | Typical Examples |
|---|---|---|
| **Extremely High** | Attribute has a high quality or value on an international scale | Groundwater supports river, wetland or surface water body ecosystem protected by EU legislation e.g. SAC or SPA status |
| **Very High** | Attribute has a high quality or value on a regional or national scale | Regionally Important Aquifer with multiple well fields<br>Groundwater supports river, wetland or surface water body ecosystem protected by national legislation – NHA status<br>Regionally important potable water source supplying >2500 homes<br>Inner source protection area for |
| **High** | Attribute has a high quality or value on a local scale | Regionally Important Aquifer<br>Groundwater provides large proportion of baseflow to local rivers<br>Locally important potable water source supplying >1000 homes<br>Outer source protection area for regionally important water source<br>Inner source protection area for locally important water source |
| **Medium** | Attribute has a medium quality or value on a local scale | Locally Important Aquifer<br>Potable water source supplying >50 homes<br>Outer source protection area for locally important water source |
| **Low** | Attribute has a low quality or value on a local scale | Poor Bedrock Aquifer<br>Potable water source supplying <50 homes |

**Table 6.4 Criteria for Rating Impact Significance at EIS Stage – Estimation of Magnitude of Impact on Hydrogeology Attribute (NRA)**

| Magnitude of Impact | Criteria | Typical Examples |
|---|---|---|
| **Large Adverse** | Results in loss of attribute and /or quality and integrity of attribute | Removal of large proportion of aquifer.<br>Changes to aquifer or unsaturated zone resulting in extensive change to existing water supply springs and wells, river baseflow or ecosystems.<br>Potential high risk of pollution to groundwater from routine run-off.<br>Calculated risk of serious pollution incident >2% annually. |
| **Moderate Adverse** | Results in impact on integrity of attribute or loss of part of attribute | Removal of moderate proportion of aquifer.<br>Changes to aquifer or unsaturated zone resulting in moderate change to existing water supply springs and wells, river baseflow or ecosystems.<br>Potential medium risk of pollution to groundwater from routine run-off.<br>Calculated risk of serious pollution incident >1% annually. |
| **Small Adverse** | Results in minor impact on integrity of attribute or loss of small part of attribute | Removal of small proportion of aquifer.<br>Changes to aquifer or unsaturated zone resulting in minor change to<br>water supply springs and wells, river baseflow or ecosystems.<br>Potential low risk of pollution to groundwater from routine run-off.<br>Calculated risk of serious pollution incident >0.5% annually. |
| **Negligible** | Results in an impact on attribute but of insufficient magnitude to affect either use or integrity | Calculated risk of serious pollution incident <0.5% annually. |

**Table 6.5: Rating of Significant Environmental Impacts at EIS Stage (NRA)**

| Importance of Attribute | Magnitude of Importance | | | |
|---|---|---|---|---|
| | **Neglible** | **Small Adverse** | **Moderate Adverse** | **Large Adverse** |
| **Extremely High** | Imperceptible | Significant | Profound | Profound |
| **Very High** | Imperceptible | Significant/moderate | Profound/Significant | Profound |
| **High** | Imperceptible | Moderate/Slight | Significant/moderate | Profound/Significant |
| **Medium** | Imperceptible | Slight | Moderate | Significant |
| **Low** | Imperceptible | Imperceptible | Slight | Slight/Moderate |

**Table 6.6: Criteria for rating impact magnitude at EIS stage – Estimation of magnitude of impact on hydrology attributes (NRA, 2009)**

| Magnitude of Impact | Criteria | Typical Examples |
|---|---|---|
| Large Adverse | Results in loss of attribute and/ or quality and integrity of attribute | Loss or extensive change to a water body or water dependent habitat |
| Moderate Adverse | Results in impact on integrity of attribute or loss of part of attribute | Calculated risk of serious pollution incident >1% annually2 |
| Small Adverse | Results in minor impact on integrity of attribute or loss of small part of attribute | Increase in predicted peak flood level >10mm1 |
| Negligible | Results in an impact on attribute but of insufficient magnitude to affect either use or integrity | Negligible change in predicted peak flood level1 |
| Minor Beneficial | Results in minor improvement of attribute quality | Calculated reduction in pollution risk of 50% or more where existing risk is <1% annually2 |
| Moderate Beneficial | Results in moderate improvement of attribute quality | Calculated reduction in pollution risk of 50% or more where existing risk is >1% annually2 |
| Major Beneficial | Results in major improvement of attribute quality | Reduction in predicted peak flood level >100mm1 |

*Additional examples are provided in the NRA Guidance Document*

*1 Refer to Annex 1, Methods E and F, Annex 1 of HA216/06*

*1 Refer to Appendix B3 / Annex 1, Method D, Annex 1 of HA216/06*

**Source: 'Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes' by the National Roads Authority (NRA, 2009)**

**Table 6.7 Criteria for Rating Impact Significance of Hydrological Attributes (NRA, 2009)**

| Importance | Criteria | Typical Examples |
|---|---|---|
| Extremely High | Attribute has a high quality or value on an international scale | River, wetland or surface water body ecosystem protected by EU legislation e.g. 'European sites' designated under the Habitats Regulations or 'Salmonid waters' designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988. |
| Very High | Attribute has a high quality or value on a regional or national scale | River, wetland or surface water body ecosystem protected by national legislation – NHA status<br>Regionally important potable water source supplying >2500 homes<br>Quality Class A (Biotic Index Q4, Q5)<br>Flood plain protecting more than 50 residential or commercial properties from flooding<br>Nationally important amenity site for wide range of leisure activities |
| High | Attribute has a high quality or value on a local scale | Salmon fishery<br>Locally important potable water source supplying >1000 homes<br>Quality Class B (Biotic Index Q3-4)<br>Flood plain protecting between 5 and 50 residential or commercial properties from flooding<br>Locally important amenity site for wide range of leisure activities |
| Medium | Attribute has a medium quality or value on a local scale | Coarse fishery<br>Local potable water source supplying >50 homes Quality Class C (Biotic Index Q3, Q2- 3)<br>Flood plain protecting between 1 and 5 residential or commercial properties from flooding |
| Low | Attribute has a low quality or value on a local scale | Locally important amenity site for small range of leisure activities<br>Local potable water source supplying <50 homes Quality Class D (Biotic Index Q2, Q1)<br>Flood plain protecting 1 residential or commercial property from flooding<br>Amenity site used by small numbers of local people |

**Source: 'Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes' by the National Roads Authority (NRA, 2009)**

# APPENDIX 5.2

# AVOCA RIVER PARK ENVIRONMENTAL ASSESSMENT REPORT (GII, 2020)

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# Ground Investigations Ireland

# Avoca River Park

# Phase 2 Environmental Assessment Avoca River Park

# June 2020

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## *DOCUMENT CONTROL SHEET*

| | |
|---|---|
| Project Title | Avoca River Park |
| Client | FT Squared |
| Project No | 9230-11-199230 |
| Document Title | Phase 2 Environmental Assessment Report |

| Rev. | Status | Author(s) | Reviewed By | Approved By | Office of Origin | Issue Date |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| A | Final | N Morgan | B Sexton | B Sexton | Dublin | 30 June 2020 |

*Ground Investigations Ireland Ltd. present the results of the fieldworks and laboratory testing in accordance with the specification and related documents provided by or on behalf of the client. The possibility of variation in the ground and/or groundwater conditions between or below exploratory locations or due to the investigation techniques employed must be taken into account when this report and the appendices inform designs or decisions where such variation may be considered relevant. Ground and/or groundwater conditions may vary due to seasonal, man-made or other activities not apparent during the fieldworks and no responsibility can be taken for such variation. The data presented and the recommendations included in this report and associated appendices are intended for the use of the client and the client's geotechnical representative only and any duty of care to others is excluded unless approved in writing.*

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## 1.0 Preamble

On the instructions of FT Squared, Ground Investigations Ireland Limited (GII) completed a Phase I Environmental Site Assessment (ESA) and general compliance review of a site at Avoca River Park Industrial Estate, Arklow, County Wicklow. The findings of the Phase 1 report recommended that further assessment of the site was required to assess the potential for environmental liabilities associated with the site including subsoil, ground water and surface water quality.
GII undertook an intrusive site investigation to further assess potential liabilities identified in the Phase 1 report between December 2019 and June 2020.

## 2.0 Purpose & Scope

It is understood that as part of the proposed development there may be an excavation to accommodate foundations, services, roadways and pavements. An assessment was required to assess the potential environmental and human health exposure risk associated with any on site contamination as well as the potential disposal outlets for material excavated as part of any excavations. The environmental assessment was carried in parallel with a wider geotechnical site investigation. GII understand that the proposed end use of the site will be commercial.

The purpose of the environmental assessment was as follows.

- Assess the quality of the groundwater, subsoils and surface water at the site;
- Classification, in terms of waste management and final disposal outlets, of material that may require disposal following excavation during the construction phase; and
- Assessment of the suitability for any material left on site for the proposed use following development through comparison of data against generic assessment criteria.

The scope of the work undertaken to facilitate the environmental assessment exercise included the following:

- Excavation of thirty (30 No.) trial pits;
- Boring of sixteen (16 No.) cable percussion boreholes;
- Boring of seven (7 No.) rotary core boreholes;
- Installation of six (6 No.) groundwater wells;
- Collection of subsoil samples for chemical analysis;
- Collection of groundwater samples;
- Collection of surface water samples;
- Environmental laboratory testing;
- Waste classification; and
- Generic Environmental Risk Assessment.

## 3.0 Limitations

GII has prepared this report for the sole use of FT Squared. No other warranty, express or implied, is made as to the professional advice included in this report or other services provided by GII.

The conclusions and recommendations contained in this report are based upon information provided by others and the assumption that all relevant information has been provided by those bodies from whom it has been requested. Information obtained from third parties has not been independently verified by GII, unless otherwise stated in this report.

This report has been prepared in line with best industry standards and within the project's budgetary and time constraints. The methodology adopted and the sources of information used by GII in providing its services are outlined in this report.

The work described was undertaken between December 2019 and June 2020, this report is based on the conditions encountered and the information available during that period. The scope of this Report and the services are accordingly factually limited by these circumstances.

Site investigations locations were selected by the consultant engineer.

GII disclaim any undertaking or obligation to advise any person of any change in any matter affecting the Report, which may come or be brought to GII's attention after the date of the Report.

The conclusions presented in this report represent GII's best professional judgement based on review of site conditions observed during any site visit and the relevant information available at the time of writing. The opinions and conclusions presented are valid only to the extent that the information provided was accurate and complete.

The investigation was focused on a broad assessment of the subsoil and groundwater quality across the site. There was no access to the electrical compound in the northern section of the site and also there was no access to the Harmony Timber Buildings.

The assessment is reflective of and applicable to the site's ground conditions at the time of the site investigation and sampling. Alterations to the ground conditions or any further excavations carried out on site following the investigation are not reflected in this report.

## 4.0 Site Description

### 4.1. Site Location & Layout

The site, which is the subject of the Phase I ESA, is located at the Avoca River Park Industrial Estate, approximately 2.5km to the north west of Aughrim, County Wicklow (Figure 1 – Appendix 1). The area of the site is approximately 13.7 hectares. The site is divided by the "Shelton Abbey Canal" which runs from north west to south east across the site.

The northern section of the site is comprised of a large open asphalt paved area. There is a fenced off ESB compound located in the western section of this area. The compound houses various electrical supply infrastructure.

The southern section of the site is comprised of an open asphalt paved area with several industrial buildings located in its western section. The industrial units are in use by Harmony Timber Solutions. Harmony Timber Solutions manufacture various timber products for the construction industry including joists and roof trusses. The yard surrounding the industrial units, at the time of the inspection, was being used for the storage of various timber products.

The lands to the east of the site are made up of grassed fields which are closed landfills. The site is bounded to the south by an earth embankment/berm with the Avoca River immediately to the south of the embankment.

There was no visual evidence of waste deposited on site or the storage of any hazardous substances. There was no evidence of discoloration of any of the surface material at the time of inspection.

### 4.2. Site History

GII carried out a review of the on-line database of historical maps held by the (OSI). These included the 6-inch maps that were produced between 1829 and 1842, the 25-inch maps that were produced between 1888 and 1913 and the 6-inch Cassini Maps that were produced between the 1830's and 1930's (Figures 2 to 4). The site is farmland on all historical maps. The Shelton Abbey Canal is present on all historical maps viewed.

GII reviewed the aerial photograph record between 1995 and present day (OSI and Google Imagery). The aerial photographs show the site in industrial use on all available aerial images. The site appears to have been paved in asphalt or concrete since at least 1995. The Harmony Timber buildings are present all aerial images. There are a number of tanks located in the eastern and southern section of the site which appear to have been demolished and removed between 1995 and the present day.

GII also reviewed a 2011 Risk Assessment Report (Appendix 2) for the below summary of the site's history.[1] The site had previously been in the ownership of Irish Fertilizer Industries (IFI). IFI was a joint venture company formed by the state company Nitrigin Eireann Teoranta (NET) and ICI plc, which operated three manufacturing facilities in Cork, Belfast and Arklow. The main products manufactured at Arklow were Calcium Ammonium Nitrate (CAN) and blends. Other nutrients, which complemented the range of fertiliser products were imported and blended as required. Nitric acid was produced mainly as an intermediate, although there was a minor acid sales business. Facility operations required a typical range of services, including water treatment system generation, laboratory activities and storage of raw materials, intermediates, products and ancillary materials.

IFI was granted an IPC license in January 1997. A revised license was issued in March 2000 which approved significant process changes. In 2002 fertiliser manufacturing stopped and in 2005 following the purchase of the site the license was transferred to Holfeld Plastics. Following acquisition by Holfeld the final

[1] OCM, Environmental Risk Assessment, Holfeld Plastics, Former Irish Fertilizer Industries Site, Arklow, County Wicklow, June 2011.

decommissioning of the fertiliser manufacturing area and general cleanup was completed. The former bulk storage sheds were refurbished. Environmental liabilities identified by IFI resulted in the following remedial actions being undertaken.

- Decommissioning and removal of production plant;
- Hazardous waste disposal;
- Refurbishment of bulk storage sheds;
- Removal of asbestos roofing;
- Excavation and removal of diesel oil contaminated soils;
- Excavation and removal of PCB contaminated soils; and
- General clean up, reinstatement and landscaping of the site.

In October 2011 an application was made to the EPA to amend the extent of the licence boundary area. At that stage the boundary was amended to remove the study site from the licenced area. The application was approved by the EPA in 2012 (Appendix 3).

As part of the application process an assessment was completed on the natural attenuation of the groundwater contamination which had been associated with the former production processes on site. The risk assessment concluded that "the environmental risk associate with the Production Area is insignificant".[2]

Based on a review of the 2011 AER for the Holfeld Plastics site (Appendix 4) the lands immediately to the south east of the site are comprised of closed landfills. Historical landfill operations at the site can be separated into three main categories as follows:

1. Disposal of phosphogypsum wastes from the production of phosphoric acid;
2. Disposal of carbon from the ammonia plant; and
3. Disposal of general plant wastes.

A summary of the waste despotised at these landfills is summarised as follows:[3]

**Phosphogypsum Wastes**

Phosphogypsum wastes were produced during the manufacture of phosphoric acid. The phosphogypsum pond was constructed by the use of soil bunds around the perimeter of the pond and the natural alluvial clay and peat deposits formed the base of the pond. The phosphogypsum slurry was pumped to the pond where the phosphogypsum was allowed to settle with the water being drained from the pond by a series of drainage pipes through the bund and discharging into the drainage canal running through the landfill area.

[2] OCM, Environmental Risk Assessment, Holfeld Plastics, Former Irish Fertilizer Industries Site, Arklow, County Wicklow, June 2011 - page 34.
[3] 2011 Annual Environmental Report, Holfeld Plastics Limited, P0031-02.

The gypsum pond was used for approximately 6 years (1967 - 1973) until the capacity was exhausted. At this time phosphogypsum wastes were diverted to the carbon pond which had been constructed by similar means immediately to the south of the phosphogypsum pond. The pond was covered with up to 0.6 metres of shale and topsoil and grassed.

**Carbon Wastes**

Carbon wastes, produced during the manufacture of ammonia, were diverted in slurry form to the carbon pond that had been constructed in the south-western corner of the landfill area. The carbon pond was constructed in a similar fashion to the phosphogypsum pond with soil embankments and the surface water was disposed of by drainage to the canal and by seepage into the ground. When exhausted the carbon pond was covered with up to 0.6 metres of shale and topsoil and grassed. Additional material made available during construction of the Arklow by-pass has been added bringing the total depth of cover material to 1 to 2 metres.

**General Site Wastes**

General solid wastes from the Site have been disposed of in two landfill areas immediately to the east of the phosphogypsum and carbon ponds, the Eastern Landfill, North and South. Wastes disposed of in these areas have historically included excavated clay, plastic bags, insulating materials, concrete blocks, bricks, canteen wastes, dredgings from the drainage canals and effluent lagoon. The Northern Section also includes quantities of iron oxide cinder arising from the manufacture of sulphuric acid from local iron pyrite from the Avoca mines during the period 1972 to 1980. The Eastern Landfill areas were constructed with either clay or shale embankments around the perimeters and the base being provided by the natural alluvial clay and peat deposits. The Northern Section was closed and capped with shale and topsoil in 1984, after which time waste disposal activities started in the Southern Section. The western half of the Southern Section was completed in 1994/95 to allow construction of the Arklow by-pass with the Eastern Section in use until May 2001 for disposal of inert Site wastes. Capping work on the Eastern Section was completed in September 2002.

A summary of the volumes of waste deposited at each of the landfill sections are: [4]

1. Phosphogypsum Pond - 55,847 $m^3$ of gypsum
2. Carbon/Phosphogypsum Pond - 137,801 $m^3$ of gypsum and approximately 19,080 m3 of carbon black
3. Northern Landfill - approximately 130,000 $m^3$ of waste
4. Southern Landfill – approximately 59,588 $m^3$
5. Western Landfill (Phase1) – approximately 2501 $m^3$

[4] 2011 Annual Environmental Report, Holfeld Plastics Limited, P0031-02.

### 4.3. Geology & Hydrogeology

GII obtained information relating to the local and regional geology and hydrogeology as part of the desk study phase. GII reviewed the Geological Survey of Ireland (GSI) geology databases and the Eastern River Basin District (SRBD) Management Plan.

The local subsoil distribution is shown on Figure 5. The site is described in the GSI Quaternary mapping as being Alluvium (A). Based on previous site investigations and subsequent reports the alluvium is underlain by Gravels to a depth of up to 24m.[5] The bedrock underlying the site is the Kilmacrea Formation (Figure 6). The Kilmacrea Formation is comprised of dark grey slate with minor pale sandstone.

The GSI has developed a classification system for aquifers based on the value of the resource and their hydrogeological characteristics. The site is underlain by the Arklow Gravel Aquifer which is classified as a locally important gravel aquifer (Lg). The bedrock aquifer beneath the site (the Kilmacrea Formation) is classified as a Locally Important Bedrock Aquifer (Figure 7) which is moderately productive only in local zones (Ll).

The GSI have developed a system that ranks an aquifer is terms of the intrinsic geological and hydrogeological characteristics that determine the ease with which that aquifer may be contaminated by human activities. The GSI have through this system assigned a “vulnerability” category to each aquifer nationwide. The vulnerability of groundwater depends on:

- The time of travel of infiltrating water (and contaminants);
- The relative quantity of contaminants that can reach the groundwater; and
- The contaminant attenuation capacity of the geological materials through which the water and contaminants infiltrate.

The depth of subsoil and the subsoil type overlying the aquifer are directly linked to the vulnerability. The GSI vulnerability map indicates that aquifer vulnerability at the site is moderate (Figure 8).

The Eastern River Basin District (ERBD) Management Plan identifies that the groundwater body (GWB) beneath the site is part of the Dublin Urban Groundwater Body (IE_EA_10_1611). The GWB Report, which is in Appendix 5, indicates the status of the water body is ‘Good’.
A review of the GSI groundwater well database found no record of any public water supply or drinking water protection zones within 1km of the site. There are no recorded wells located downgradient of the site.

[5] OCM, Environmental Risk Assessment, Holfeld Plastics, Former Irish Fertilizer Industries Site, Arklow, County Wicklow, June 2011 – page 10.

### 4.4. Hydrology

The closest surface water feature to the site is the Avoca River which is located adjacent to the southern site boundary. The Shelton Abbey Canal runs though the central section of the site towards the south east and the Avoca River. Surface water runoff from the site enters the canal.

The site lies within the Avoca Lower surface water body (SWB) catchment area (IE_EA_10_1611). The WFD SWB Report is in Appendix 5. The overall status of this waterbody is 'Good". The River Body section directly upstream of the site is the Upper Avoca River (IE_EA_10_1477). The GWB report for this section indicates that the status of the water body is Bad. This s related to the closed Avoca Mines acid mines discharge to the River.

### 4.5. Ecologically Sensitive/Designated Areas

GII completed a review of the National Parks and Wildlife Services (NPWS) databases. A summary of the surrounding protected areas is presented in Table 1 and Figures 9 & 10. There are no protected areas within 5km of the site. The Arklow Town marsh which is a proposed natural heritage area is located 600m to the east and downstream of the site.

**Table 1 Protected Area Summary**

| Site ID | Type | Site Code | Distance (m) |
|---|---|---|---|
| Arklow Town Marsh | Proposed Natural Heritage Area | 001931 | 600m to the east |
| Wicklow Head | Special Protection Area | 004016 | 20km north east |
| Cahore Marshes | Special Protection Area | 004006 | 28km south east |
| Buckroney-Brittas Dunes and Fen | Special Area of Conservation | 000729 | 5.2km north east |
| Kilpatrick Sandhills | Special Area of Conservation | 001742 | 8.2km south east |

### 4.6. Radon

A review of the EPA national radon map was carried out. The radon map is broken into 10km$^2$ grids. Each grid is ranked based on the percentage of dwellings within that grid where radon is present at levels greater than 200 Becquerel per metre cubed (Bq/m$^3$). The radon map has five categories: less than 1 %, 1 to 5 %, 5 to 10 %, 10 to 20 % and greater than 20 %. The subject site is located within a grid where 1 to 5% of the residences will have radon levels greater than 200Bq/m$^3$, making it relatively low risk for radon (Figure 11).

### 4.7. Planning Data

GII carried out a review of the Wicklow County Council online planning system. There have been several planning applications and permissions recorded between 1989 and 2019. The most recent application was for the demolition of the existing buildings and construction of three data centre buildings. The planning applications recorded on the Council database are summarised in Table 2. GII reviewed a 2018 EIAR which was prepared by AECOM as part of the 2019 application for a data centre.

**Table 2 Planning Applications**

| Applicant Name | Proposed Works or Change of Use | Decision Date | Decision |
|---|---|---|---|
| Irish Fertilizer Ind Ltd | Welfare facilities building and septic tank | 21/07/1989 | Decision not listed on records |
| Irish Fertilizer Ind Ltd | extension to switch and control room | 17/12/1991 | Decision not listed on records |
| Power & Energy Holdings (ROI) Ltd | The development of a Simple Cycle Gas Turbine peaking power station on a site of approx 4.25 hectares at the former Irish Fertilisers Industries Ltd site at the Avoca River Park, in the townland of Shelton, Arklow, Co. Wicklow. | 09/11/2008 | Granted with conditions |
| Crosbie Transcar Ltd | palisade fencing to site boundaries and the retention of 3 no buildings (port cabins) together with all associated site works | 25/03/2009 | Granted with conditions |
| Restwing Trading Ltd | change of use of existing industrial unit to plastic waste recycling facility | 30/06/2015 | Granted with conditions |
| Edmund Holfeld | extend the appropriate period of a permission - 08/468 - Simple Cycle Gas Turbine peaking power station on a site of approx 4.25 hectares at the former Irish Fertilisers Industries Ltd site at the Avoca River Park, in the townland of Shelton, Arklow, Co. | 18/07/2018 | Extension Granted |
| Crag Digital Avoca Ltd | demolition of buildings & structures on site & construction of Data Storage Facility comprising 3 data storage buildings & all associated site infrastructure: data storage facility 1 (6 Pod Data Centre) located to north of site served by 1 gas generator compo | 20/02/2019 | Granted with conditions |

### 4.8. Flood Risk

The Office of Public Works (OPW) has produced flood risk maps that identify areas that may be susceptible to flooding during extreme events. The draft flood maps are predictive flood maps, as they provide predicted flood extent and other information for a design flood event that has an estimated probability of occurrence rather than information of floods that have occurred in the past. The maps identify the risk from fluvial and coastal flooding. The OPW rates risk in terms of %. These percentages are linked to return events or chance of occurrence in any given year:

- 10% - 1 in 10 chance in any given year;
- 1% - 1 in 100 chance in any given year; and
- 0.1% - 1 in 1,000 chance in any given year.

They are also commonly referred to in terms of a return period (e.g., the 100-year flood event), although it should be understood that this does not mean the length of time that will elapse between two such events occurring, as, although unlikely, two or more very severe events may occur within a very short space of time. GII reviewed these maps and it appears from the maps that the site is not at risk from flooding, this is likely due to the presence of a berm between the site and the Avoca River. The lands to the south east of the site which are comprised of the landfill sections appear to lie within an area at risk from both fluvial and coastal flooding (appendix 6).

The 2018 Aecom EIAR included a site-specific flood risk assessment. The report concluded that “the site is protected from flooding by the existing flood defense embankment up to an including the 0.1AEP event (1,000 year)”.[6]

The report as part of flood mitigation recommends a that the embankment is regularly inspected and maintained. The report does not include an assessment of the current condition or structural integrity of the embankment. GII did not encounter documentation in relation to the construction of the berm which is acting as a flood barrier for the site. GII did not encounter any report in relation to the stability of the berm.

### 4.9. Phosphogypsum Wastes

Landfilling of phosphogypsum waste occurred on the wider fertilizer site between 1967 and 1973 in the gypsum ponds until the pond’s capacity was exhausted. Further landfilling of the phosphogypsum waste was continued at the carbon pond. The cessation date for landfilling of phosphogypsum waste is not known. In this case the phosphogypsum was a by-product of the manufacture of phosphoric acid. Phosphogypsum contains naturally occurring radioactive material (NORM) in the form of uranium and thorium and their associated daughter products. GII have not found any record of any radioactivity survey completed at the site or any assessment of the potentially radioactivity of the material landfilled on site. The areas of landfilling are not located within the study site but is located within the lands immediately adjacent and to

[6] Avoca River Park, Environmental Impact Assessment Report, Volume 1: Non-technical Summary, August 2018.

the east of the site. The areas where the phosphogypsum material has been landfilled are presented in Figure 13.[7]

## 5.0 Subsurface Exploration

### 5.1. General

During the ground investigation a programme of intrusive investigation specified by the Consulting Engineer was undertaken to determine the sub surface conditions at the proposed site. Regular sampling and in-situ testing was undertaken in the exploratory holes to facilitate the geotechnical descriptions and to enable laboratory testing to be carried out on the soil samples recovered during excavation and drilling.
The procedures used in this site investigation are in accordance with Eurocode 7 Part 2: Ground Investigation and testing (ISEN 1997 – 2:2007) and B.S. 5930:2015.

### 5.2. Trial Pits

The trial pits were excavated using either a 6T or 13T tracked excavator at the locations shown in Figure 14. The locations were checked using a CAT scan to minimise the potential for encountering services during the excavation. The trial pits were sampled, logged and photographed by a Geotechnical Engineer/Engineering Geologist prior to backfilling with arisings. Notes were made of any services, inclusions, pit stability, groundwater encountered and the characteristics of the strata encountered and are presented on the trial pit logs which are provided in Appendix 7 of this Report.

### 5.3. Cable Percussion Boreholes

The Cable Percussion Boreholes were drilled at the locations shown in Figure 15 using a Dando 2000 drilling rig with regular in-situ testing and sampling undertaken to facilitate the production of geotechnical logs and laboratory testing.
The standard method of boring in soil for site investigation is known as the Cable Percussion method. It consists of using a Shell in non-cohesive soils and a clay cutter in cohesive soils, both operated on a wire cable. Very hard soils, boulders and other hard obstructions are broken up by chiselling and the fragments removed with the Shell. Where ground conditions made it necessary, the borehole was lined with 200mm diameter steel casing. While the use of the Cable Percussion method of boring gives the maximum data on soil conditions, some mixing of laminated soil is inevitable. For this reason, thin lenses of granular material may not be noticed. Disturbed samples were taken from the boring tools at suitable depths, so that there is a representative sample at the top of each change in stratum and thereafter at regular intervals down the borehole until the next stratum was encountered. The disturbed samples were then sealed and sent to the laboratory where they were visually examined to confirm the description of the relevant strata.
Standard Penetration Tests were carried out in the boreholes. The results of these tests, together with the depths at which the tests were taken are shown on the accompanying borehole records. The test consists

[7] As adopted from the Byrne Looby Report PH McCarthy Report - Irish Water & Wicklow County Council Arklow Wastewater Treatment Plant Site Assessment Report – Phase 2, May 2015

of a thick wall sampler tube, 50mm external diameter, being driven into the soil by a monkey weighing 63.5kg and with a free drop of 760mm. For gravels and glacial till the driving shoe was replaced by a solid 60º cone. The Standard Penetration Test number referred to as the 'N' value is the number of blows required to drive the tube 300mm, after an initial penetration of 150mm. The number gives a guide to the consistency of the soil and can also be used to estimate the relative strength/density at the depth of the test and also to estimate the bearing capacity and compressibility of the soil. The cable percussion borehole logs are provided in Appendix 8 of this Report.

### 5.4. Rotary Boreholes

The rotary coring was carried out by a track mounted T44 Beretta rig at the locations shown in Figure 15. The rotary boreholes were completed from the ground surface or alternatively, where noted on the individual borehole log, from the base of the cable percussion borehole where a temporary liner was installed to facilitate follow-on rotary coring.

The T44 Beretta is equipped with rubber tracks which allow for short travel on pavement surfaces avoiding any damage to the surface. The T44 Beretta utilises a triple tube core barrel system operated using a wireline drilling process. The outer barrel is rotated by the drill rods and at its lower end, carries the coring bit. The inner barrel is mounted on a swivel so that it does not rotate during the process. The third barrel or liner is placed within the second one to retain the core intact and to preserve as much as possible the fabric of the drilling stratum. The core is cut by the coring bit and passes to the inner liner. The core is brought up to the surface within the inner barrel on a small diameter wire rope or line attached to the "overshoot" recovery tool which is then placed into a core box in order of recovery. A drilling fluid, typically air mist or water flush is passed from the surface through hollow drill rods to the drill bit, and is used to cool the drill bit. Temporary casing is used in some situations to support unstable ground or to seal off fissures or voids. It should be noted that the rotary coring can only achieve limited recovery in overburden, particularly granular or weakly cemented strata due to the flushing medium washing away the cohesive fraction during coring. The recovery achieved, where required is noted on the borehole logs and core photographs are provided to allow assessment of the core recovered. The rotary borehole logs are provided in Appendix 8 of this Report.

### 5.5. Surveying

The exploratory hole locations have been recorded using a Trimble R10 GNSS System which records the coordinates and elevation of the locations to ITM or Irish National Grid as required by the project specification. The coordinates and elevations are provided on the exploratory hole logs in the appendices of this Report.

### 5.6. Groundwater/Gas Monitoring Installations

Groundwater Monitoring Installation were installed upon the completion of the boreholes RC-02, 03, 06, 10, 12 and 14 to enable sampling and the determination of the equilibrium groundwater level. The groundwater wells were screened in the gravels to allow measurement of the groundwater head and assessment of the

groundwater quality in the gravels. The material overlying the gravels in most cases was not significantly water bearing. The groundwater monitoring installation consists of a 50mm HDPE slotted pipe with a pea gravel response zone and bentonite seal installed to the Engineers specification. Where required the standpipe is sealed with a gas tap and finished with a durable steel cover fixed in place with a concrete surround. The installation details are provided on the exploratory hole logs in the appendices of this Report. Groundwater level monitoring has not been completed for the finished wells. Groundwater samples have not been collected from the groundwater wells.

## 6.0 Ground Conditions

### 6.1. General

The ground conditions encountered during the investigation are summarised below with reference to insitu and laboratory test results. The full details of the strata encountered during the ground investigation are provided in the exploratory hole logs included in the appendices of this report.

The sequence of strata encountered were consistent across the site and are generally comprised;

- Surfacing/Tarmacadam
- Cohesive Deposits
- Granular Deposits
- Weathered Bedrock
- Bedrock

**SURFACING/TARMACADAM:** Surfacing was generally comprised concrete or tarmacadam and was present to a maximum depth of 0.1m. This was encountered in the majority of exploratory holes. Tarmacadam was present typically to a depth of 0.07m to 0.09m BGL. In TP01, TP21, TP22, TP24 and TP25 a layer of tarmacadam was encountered within the made ground deposits.

**MADE GROUND:** Made Ground deposits were encountered beneath the Surfacing and were present to a depth of between 0.6m and 2.4m BGL. These deposits were described generally as *grey, slightly silty, sandy, GRAVEL with occasional fragments of concrete, red brick, glass and plastic.*

**COHESIVE DEPOSITS:** Cohesive deposits were encountered beneath the Made Ground and they can broadly be divided into an upper clay/silt layer and a lower layer containing peat. The deposits were described typically as a grey *brown CLAY/SILT* overlying a *lower layer containing PEAT/ CLAYEY PEAT*. The peat encountered can generally be described as a brown to dark brown soft fibrous peat. The strength of the cohesive deposits was very soft to soft in the majority of the exploratory holes. There was occasional sand and gravel lenses present with in the upper cohesive deposits.

**GRANULAR DEPOSITS:** The granular deposits were encountered within and below the base of the cohesive deposits and were typically described as *Grey brown medium dense to dense sandy sub rounded to sub angular fine to very coarse GRAVEL with occasional cobbles and rare boulders.* The secondary sand/gravel and silt/clay constituents varied across the site and with depth while occasional or frequent cobble and boulder content also present where noted on the exploratory hole logs.

**BEDROCK**: The GSI Mapping Database indicates that the bedrock underlying the site is the Kilmacrea Formation. The Kilmacrea Formation is described as Ordovician Metasediments comprised dark grey slate and minor pale sandstone. The rotary core boreholes recovered consists of a weak to medium strong thinly laminated grey SLATE.

## 7.0 Subsoil Laboratory Testing

In order to assess materials, which may be excavated and removed from site, in terms of waste classification, a selection of samples collected were analysed for a suite of parameters which allows for the assessment of the soils in terms of total pollutant content for classification of materials as *hazardous* or *non-hazardous* (RILTA Suite). The suite also allows for the assessment of the soils in terms of suitability for placement at various categories of landfill. The parameter list for the RILTA suite includes analysis of the solid samples for arsenic, barium, cadmium, chromium, copper, cyanide, lead, nickel, mercury, zinc, speciated aliphatic and aromatic petroleum hydrocarbons, pH, sulphate, sulphide, moisture content, soil organic matter and an asbestos screen.

The total pollutant content analysis also provides analytical data which can be used to assess the quality of the subsoils underlying the site and allow an assessment of their suitability for a range of proposed uses against generic assessment criteria.

The RILTA suite also includes those parameters specified in the EU Council Decision establishing criteria for the acceptance of waste at Landfills (Council Decision 2003/33/EC), which for the solid samples are pH, total organic carbon (TOC), speciated aliphatic and aromatic petroleum hydrocarbons, BTEX, phenol, polychlorinated biphenyls (PCB) and PAH.

In line with the requirement of Council Decision 2003/33/EC a leachate was generated from the solid samples which was in turn analysed for antimony, arsenic, barium, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium, zinc, chloride, fluoride, soluble sulphate, sulphide, phenols, dissolved organic carbon (DOC) and total dissolved solids (TDS). The laboratory testing was competed by Element Materials Technology (EMT) in the UK; EMT is a UKAS accredited laboratory. The full laboratory reports are included in Appendix 9.

### 7.1. Hydrocarbons

Petroleum hydrocarbons were encountered in various locations across the site. Significantly elevated levels of hydrocarbons were detected in the samples TP-19 and 29.

### 7.2. PCBS

PCBs were detected in the made ground samples at TP-13, 16, 19, 20 and 29. The highest level detected was 3.715 mg/kg at TP-20.

### 7.3. Metals

Significantly elevated levels of the metals Arsenic, Copper, Lead and Zinc were detected in the "red Fertiliser by-product" material encountered at several trial pit including TP-08, 09 and 13. The highest level of arsenic detected was 1,658 mg/kg at TP-08. The highest level of lead detected was 1,633 mg/kg at TP-13, the highest level of copper detected was 6,327 mg/kg at TP-13. The highest level of zinc detected was 4,572 mg/kg at TP-08.

### 7.4. Asbestos

Asbestos fibres were detected in the samples TP-20 at 0.5m and 1.5m, TP-24 at 0.5m and TP-29 at 1.5m. The asbestos type in all cases was chrysotile and the levels detected were below the laboratory detection limit of <0.001%. The laboratory did **not** identify asbestos containing materials (ACMs) in the samples. The level detected in all cases was below the hazardous level of 0.1%[8].

## 8.0 Waste Classification

GII understands that any materials which may be excavated from site would meet the definition of waste under the Waste Framework Directive. This may not be the case at the time of excavation when all or some of the materials may have been declared a by-product in line with Article 27 of the European Communities (Waste Directive) Regulations 2011[9].

Excess soil and stone resulting from excavation works (the primary purpose of which is not the production of soil and stone) may be declared a by-product if all four by-product conditions are met.[10]

a) further use of the soil and stone is certain;

b) the soil and stone can be used directly without any further processing other than normal industrial practice;

c) the soil and stone is produced as an integral part of a production process; and

d) further use is lawful in that the soil and stone fulfils all relevant requirements for the specific use and will not lead to overall adverse environmental or human health impacts.

[8] Environment Agency (2018). Technical Guidance WM3 - Guidance on the classification and assessment of waste (1st Edition V1.1 May 2018) Technical Guidance WM3 – page 19.
[9] S.I. No. 126/2011 - European Communities (Waste Directive) Regulations 2011 (Article 27).
[10] Irish EPA (June 2019), Guidance on Soil and Stone By-Products.

Due to the varying levels of anthropogenic materials encountered in the made ground there are potentially two sets of List of Waste (LoW)[11] codes with “mirror” entries which may be applied to excavated materials to be removed from site.

1. 17-05-03* (soil and stone containing dangerous substances, classified as hazardous) or 17-05-04 (soil and stone other than those mentioned in 17-05-03, not hazardous); or
2. 17-09-03* (other construction and demolition wastes (including mixed wastes) containing hazardous substances) or 17-09-04 (mixed construction and demolition wastes other than those mentioned in 17 09 01, 17 09 02 and 17 09 03).

Where waste is a mirror entry in the LoW, it can be classified via a process of analysis against standard criteria set out in the Waste Framework Directive. The assessment process is described in detail in guidance published by the Irish (EPA Waste Classification, List of Waste & Determining if Waste is Hazardous or Non-Hazardous, June 2015) and UK regulatory authorities (Guidance on the Classification and Assessment of Waste: Technical Guidance WM3, 2015). The assessment involves comparison of the concentration of various parameters against defined threshold values.

The specific LoW code which should be applied to the material at each sample location is summarised in Table 3 below. These codes are only applicable where the material is being removed for site as a waste.

GII use HazWasteOnline™, a web-based commercial waste classification software tool which assists in the classification of potentially hazardous materials. This tool was used to determine whether the materials sampled are classified as hazardous or non-hazardous. The use of the online tool is accepted by the EPA (EPA 2014).

The conclusions presented in the report are based on GII’s professional opinion. **It should be noted that the environmental regulator (in this case the EPA) and the waste acceptor (in this case a landfill operator) shall decide whether a waste is hazardous or non-hazardous and suitable for disposal at their facility.**

## 9.0 HazWasteOnLine™ Results

In total, thirty (30 No.) samples were assessed using the HazWasteOnLine™ Tool, five (5 No.) of which were classified as hazardous. The samples TP-08 at 1.5m and TP-13 at 1.5m were classified as hazardous due to elevated levels of several metals and the associated hazardous properties HP7[12] Carcinogenic and HP14[13] Ecotoxic. The sample TP-09 at 1.5m was classified as hazardous due to elevated levels of zinc and the associated hazardous property HP14 Ecotoxic. The samples TP-19 at 1.5m and TP-29 at 1.5m were classified as hazardous due to elevated levels of TPH and the associated hazardous properties HP7

[11] Formerly European Waste Catalogue Codes (EWC Codes)
[12] HP 7: Carcinogenic "waste which induces cancer or increases its incidence".
[13] HP14: Ecotoxic “waste which presents or may present immediate or delayed risks for one or more sectors of the environment”.

Carcinogenic and HP11[14] Mutagenic. The remaining samples were classified as being not hazardous. The complete HazWasteOnLine™ report for all samples is included in Appendix 10.

**The samples of the "red Fertiliser by-product" sampled in TP-08 and TP-13 was classified as hazardous due to significantly elevated levels of arsenic, copper, lead and zinc.**

The specific LoW code which should be applied to the material at each SI location is summarised in Table 3 below. The assigning of the LoW code is based on observations recorded in the trial pits an estimation of the % of anthropogenic material present and the results of the HazWasteOnline™ output. The final LoW codes applied at the time of disposal may vary due to variations in % of anthropogenic material observed in the excavation phase. Where there is in excess of 2%[15] anthropogenic material observed the LoW code 17 09 04 may be applied.

**Table 3 LoW Codes**

| SI Location | Depth (m) | Hazardous/Non-Hazardous | Asbestos Type if Present | LoW Code |
|---|---|---|---|---|
| TP02 | 0.50 | Non-Hazardous | NAD[16] | 17 05 04 |
| TP03 | 0.50 | Non-Hazardous | NAD | 17 05 04 |
| TP05 | 1.20 | Non-Hazardous | NAD | 17 05 04 |
| TP06 | 1.50 | Non-Hazardous | NAD | 17 05 04 |
| TP08 | 1.50 | Hazardous | NAD | 17 05 03 |
| TP08 | 2.50 | Non-Hazardous | NAD | 17 05 04 |
| TP09 | 0.50 | Non-Hazardous | NAD | 17 05 04 |
| TP09 | 1.50 | Hazardous | NAD | 17 05 03 |
| TP11 | 0.50 | Non-Hazardous | NAD | 17 05 04 |
| TP11 | 1.50 | Non-Hazardous | NAD | 17 05 04 |
| TP13 | 0.50 | Non-Hazardous | NAD | 17 05 04 |
| TP13 | 1.50 | Hazardous | NAD | 17 05 03 |
| TP16 | 0.50 | Non-Hazardous | NAD | 17 05 04 |
| TP17 | 1.50 | Non-Hazardous | NAD | 17 05 04 |
| TP19 | 0.50 | Non-Hazardous | NAD | 17 05 04 |
| TP19 | 1.50 | Hazardous | NAD | 17 05 03 |
| TP20 | 0.50 | Non-Hazardous | Chrysotile <0.001% | 17 05 04 |
| TP20 | 1.50 | Non-Hazardous | Chrysotile <0.001% | 17 05 04 |
| TP21 | 0.50 | Non-Hazardous | NAD | 17 05 04 |
| TP21 | 1.50 | Non-Hazardous | NAD | 17 05 04 |
| TP22 | 0.50 | Non-Hazardous | NAD | 17 05 04 |
| TP24 | 0.50 | Non-Hazardous | Chrysotile <0.001% | 17 05 04 |
| TP24 | 1.50 | Non-Hazardous | NAD | 17 05 04 |
| TP25 | 0.50 | Non-Hazardous | NAD | 17 05 04 |
| TP26 | 0.50 | Non-Hazardous | NAD | 17 05 04 |

[14] HP11: Mutagenic "waste which may cause a mutation, that is a permanent change in the amount or structure of the genetic material in a cell".
[15] EPA (2017) - Draft Guidance Note on Soil Recovery Waste Acceptance Criteria.
[16] NAD – no asbestos detected.

| SI Location | Depth (m) | Hazardous/Non-Hazardous | Asbestos Type if Present | LoW Code |
|---|---|---|---|---|
| TP27 | 0.50 | Non-Hazardous | NAD | 17 05 04 |
| TP28 | 0.50 | Non-Hazardous | NAD | 17 05 04 |
| TP28 | 1.50 | Non-Hazardous | NAD | 17 05 04 |
| TP29 | 0.50 | Non-Hazardous | NAD | 17 05 04 |
| TP29 | 1.50 | Hazardous | Chrysotile <0.001% | 17 05 03 |

## 10.0 Landfill Waste Acceptance Criteria

Waste Acceptance Criteria (WAC) have been agreed by the EU (Council Decision 2003/33/EC) and are only applicable to material if it is to be disposed of as a waste at a landfill facility. Each individual member state and licensed operators of landfills may apply more stringent WAC. WAC limits and the associated laboratory analysis are not suitable for use in the determination of whether a waste is hazardous or non-hazardous. The data have been compared to the WAC limits set out in Council Decision 2003/33/EC as well as the specific WAC which the EPA have applied to the Integrated Materials Solutions (IMS) Landfill in north County Dublin. The IMS landfill has higher limits for a range of parameters while still operating under an inert landfill licence. The WAC data considered in combination with the waste classification outlined in Section 12.0 allows the most suitable waste category to be applied to the material tested. The applicable waste categories are summarised in Table 4. A summary of the WAC data is presented in Appendix 11. The waste category assigned to each sample is summarised in Table 5.

**Table 4 Waste Category for Disposal/Recovery**

| Waste Category | Classification Criteria |
|---|---|
| Category A<br>Unlined Soil Recovery Facilities | Soil and Stone only which are free from[17] anthropogenic materials such as concrete, brock timber. Soil must be free from "contamination" e.g. PAHs, Hydrocarbons. |
| Category B1<br>Inert Landfill | Reported concentrations within inert waste limits, which are set out by the adopted EU Council Decision 2003/33/EC establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 and Annex II of Directive 1999/31/EC (2002).<br>Results also found to be non-hazardous using the HWOL[18] application. |
| Category B2<br>Inert Landfill | Reported concentrations greater than Category B1 criteria but less than IMS Hollywood Landfill acceptance criteria, as set out in their Waste Licence W0129-02.<br>Results also found to be non-hazardous using the HWOL application. |
| Category C<br>Non-Haz Landfill | Reported concentrations greater than Category B2 criteria but within non-haz landfill waste acceptance limits set out by the adopted EU Council Decision 2003/33/EC establishing criteria and procedures for |

[17] Free from equates to less than 2%.
[18] HazWasteOnLine™ Tool.

| | |
|---|---|
| | the acceptance of waste at landfills pursuant to Article 16 and Annex II of Directive 1999/31/EC (2002).<br>Results also found to be non-hazardous using the HWOL application. |
| Category C 1<br>Non-Haz Landfill | As Category C but containing < 0.001% w/w asbestos fibres. |
| Category C 2<br>Non-Haz Landfill | As Category C but containing >0.001% and <0.01% w/w asbestos fibres |
| Category C 3<br>Non-Haz Landfill | As Category C but containing >0.01% and <0.1% w/w asbestos fibres. |
| Category D<br>Hazardous Treatment | Results found to be hazardous using HWOL Application. |
| Category D 1<br>Hazardous Disposal | Results found to be hazardous due to the presence of asbestos (>0.1%). |

## 11.0 Final Waste Categorisation

All samples were assessed in terms of waste classification using the HazWasteOnLine™ tool and also the WAC set out in Council Decision 2003/33/EC and the IMS specific WAC to give a final waste categorisation to determine the most appropriate disposal route for any waste generated. The final and most applicable waste category for each sample is summarised in Table 5.

**Table 5 Individual Sample Waste Category**

| Sample ID | Sample Depth (m) | Material Type | Waste Category | LoW Code |
|---|---|---|---|---|
| TP02 | 0.50 | Made Ground | Category C | 17 05 04 |
| TP03 | 0.50 | Made Ground | Category B1 | 17 05 04 |
| TP05 | 1.20 | Clay | Category A | 17 05 04 |
| TP06 | 1.50 | Silt | Category A | 17 05 04 |
| TP08 | 1.50 | Made Ground | Category D | 17 05 03 |
| TP08 | 2.50 | Silt | Category C | 17 05 04 |
| TP09 | 0.50 | Made Ground | Category B2 | 17 05 04 |
| TP09 | 1.50 | Clay | Category D | 17 05 03 |
| TP11 | 0.50 | Made Ground | Category B1 | 17 05 04 |
| TP11 | 1.50 | Made Ground | Category B1 | 17 05 04 |
| TP13 | 0.50 | Made Ground | Category B1 | 17 05 04 |
| TP13 | 1.50 | Made Ground | Category D | 17 05 03 |
| TP16 | 0.50 | Made Ground | Category B1 | 17 05 04 |
| TP17 | 1.50 | Clay | Category C | 17 05 04 |
| TP19 | 0.50 | Made Ground | Category B1 | 17 05 04 |
| TP19 | 1.50 | Made Ground | Category D | 17 05 03 |
| TP20 | 0.50 | Made Ground | Category C1 | 17 05 04 |
| TP20 | 1.50 | Silt | Category C1 | 17 05 04 |
| TP21 | 0.50 | Made Ground | Category B1 | 17 05 04 |
| TP21 | 1.50 | Clay | Category A | 17 05 04 |
| TP22 | 0.50 | Made Ground | Category B2 | 17 05 04 |

| Sample ID | Sample Depth (m) | Material Type | Waste Category | LoW Code |
|---|---|---|---|---|
| TP24 | 0.50 | Made Ground | Category C1 | 17 05 04 |
| TP24 | 1.50 | Peat | Category C | 17 05 04 |
| TP25 | 0.50 | Made Ground | Category B1 | 17 05 04 |
| TP26 | 0.50 | Made Ground | Category B1 | 17 05 04 |
| TP27 | 0.50 | Made Ground | Category B1 | 17 05 04 |
| TP28 | 0.50 | Made Ground | Category B1 | 17 05 04 |
| TP28 | 1.50 | Silt | Category B2 | 17 05 04 |
| TP29 | 0.50 | Made Ground | Category B1 | 17 05 04 |
| TP29 | 1.50 | Clay | Category D | 17 05 03 |

## 12.0 Suitable for Use Assessment

GII assessed the soil data collected from the trial pits against the LQM/CIEH S4ULs for Human Health Risk Assessment (S4ULs)[19]. The S4ULs present soil assessment criteria for an extended range of 89 substances. For each substance, S4ULs have been derived for a range of generic land uses and Soil Organic Matter (%SOM) contents. All toxicological and physical-chemical inputs used in the derivation of the S4ULs are clearly identified and discussed. For each substance, S4ULs have been derived for six generic land uses (including the two Public Open Space land uses defined in C4SL guidance) and a range of Soil Organic Matter contents (organic contaminants only). All toxicological and physical-chemical data inputs used in the derivation of the S4ULs are presented and discussed in the publication. The proposed future use of the site is commercial.

The level of arsenic detected in the samples from TP-08 at 1.m ad TP-13 at 1.5m exceeded the commercial S4UL. The material sampled in these cases was the “red fertiliser by-product” material.

All remaining samples were all within the residential without homegrown produce S4ULs. A full summary of the S4UL data is presented in Appendix 12.

## 13.0 Groundwater Quality

Groundwater samples were collected from the wells installed in BH02, BH03, BH06, BH10 and BH12 on the 26th May 2020 by a GII Geo-Environmental Engineer.

The groundwater level in each well was recorded using a Geotechnical Instruments water level probe after which, the well was purged to remove the stagnant water in the well and surrounding gravel pack. Purging is necessary to ensure that the groundwater parameters measured are representative of the formation and not the stagnant water in the monitoring well or surrounding gravel filter.

[19] LQM/CIEH 'Suitable 4 Use Levels' (S4ULs). Copyright Land Quality Management Limited reproduced with permission; Publication Number S4UL3746. All rights reserved.

### 13.1. Field Observations

No evidence of contamination was noted during the sampling of the groundwater wells. Groundwater field parameters were measured in situ using calibrated hand probes. Measurement included pH, electrical conductivity, temperature and redox potential (ORP). The recorded field data are summarised in Table 6.

The field measurement show and elevated level of electrical conductivity at BH-12. The water temperature recorded ranged from 12.6 degrees in BH-02 to 16.0 degrees in BH-10.

**Table 6 Groundwater Field Measurements**

| Sample ID | Sample Date | Water Level (mBGL) | pH (pH Units) | Electrical Conductivity (mS/cm) | Temperature (Celsius) | Redox Potential (mV) | Odour | Colour |
|---|---|---|---|---|---|---|---|---|
| BH-02 | 26-05-2020 | 1.7 | 6.50 | 0.39 | 12.6 | -17 | None | Clear |
| BH-03 | 26-05-2020 | 1.52 | 5.64 | 0.66 | 13.8 | 51 | None | Clear |
| BH-06 | 26-05-2020 | 1.48 | 6.01 | 0.49 | 14.3 | -48 | None | Clear |
| BH-10 | 26-05-2020 | 1.54 | 6.30 | 0.47 | 16.0 | -10 | None | Clear |
| BH-12 | 26-05-2020 | 2.17 | 5.88 | 1.30 | 15.3 | 28 | None | Clear |

### 13.2. Laboratory Analysis

The laboratory analysis undertaken on the samples collected from the boreholes included dissolved arsenic, boron, cadmium, copper, chromium (III & VI), cyanide, lead, mercury, nickel, manganese and zinc, aliphatic and aromatic petroleum hydrocarbons, polycyclic aromatic hydrocarbons (PAH), methyl tert butyl ether (MTBE), benzene toluene ethylbenzene and toluene (BTEX), total phenols, pH, electrical conductivity, pesticides, volatile organic compounds (VOCs, nitrate, nitrite, chloride, sulphate, ammonia, calcium, sulphur, phosphorus and potassium. The parameter range was based on the site history and the need to establish a comprehensive environmental baseline for the groundwater quality for the site.

The laboratory testing was competed by Element Materials Technology in the UK; EMT is a UKAS accredited laboratory. The full laboratory reports are included in Appendix 9. The analytical methodologies are all ISO/CEN approved or equivalent.

### 13.3. Laboratory Results

The full laboratory test report is presented in Appendix 9 and the results are summarised in Tables 7 to 10 The tables include Interim Guideline Values (IGV) published by the EPA and the Groundwater Threshold Values (GTV) set out in the European Communities Environmental Objectives (Groundwater) Regulations (S.I. 9 of 2010).

The IGVs are not statutory but were developed to assist in the assessment of impacts on groundwater quality. The IGVs are based on, but are more conservative than, the Drinking Water quality standards. GTVs have only been established for core indicator parameters. To ensure a comprehensive assessment of the groundwater quality, the IGVs are presented for parameters for which there are no GTV.

The levels of arsenic detected in BH-06 and BH-12 exceeded the GTV.

The level of manganese detected in all boreholes were significantly higher than the IGV.

The level of nickel in BH-03 exceeded the GTV.

The level of potassium in BH-03 and BH-12 exceeded the IGV.

The level of sulphate detected in BH-03 and BH-12 exceeded the GTV.

There is no IGV or GTV established for sulphur however it was detected in all wells with the levels in BH-12 significantly higher than the remaining wells.

The level of ammonia in all wells exceeded the GTV. The level of ammonia detected in BH-12 was significantly higher than the other wells.

The electrical conductivity measured both in the field and by the laboratory at BH-12 exceeded the IGV and was significantly higher when compared with the other wells.

Low levels of Tetrachloroethene (PCE) were detected in the borehole BH-12. The dechlorination or degradation process for tetrachloroethene produces the daughter products trichloroethylene (TCE), 1,1-Dichloroethene, cis-1,2-dichloroethylene (cis-DCE), trans-1,2-dichloroethylene (trans-DCE), and vinyl chloride (VC) several of which were also detected at low levels in BH-12. The source of the PCE is not known. The level of vinyl chloride detected exceeded the GTV.

**Table 7 Groundwater Metals and Inorganics**

| Parameter | BH-02 | BH-03 | BH-06 | BH-10 | BH-12 | LOD | Unit | EPA IGV[20] | GTV[21] |
|---|---|---|---|---|---|---|---|---|---|
| Dissolved Arsenic | 4.5 | 3.1 | 29.4 | <2.5 | 16.2 | <2.5 | ug/l | - | 7.5 |
| Dissolved Boron | 16 | 25 | 13 | 59 | 25 | <12 | ug/l | - | 750 |
| Dissolved Cadmium | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | ug/l | - | 3.75 |
| Total Dissolved Chromium | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | ug/l | - | 37.5 |
| Hexavalent Chromium | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | mg/l | 0.03 | - |
| Dissolved Copper | <7 | <7 | 8 | <7 | <7 | <7 | ug/l | - | 1,500 |
| Dissolved Lead | <5 | <5 | <5 | <5 | <5 | <5 | ug/l | - | 18.75 |
| Dissolved Manganese | 7,372 | 7,291 | 13,850 | 5,962 | 14,480 | <2 | ug/l | 50 | ne[22] |
| Dissolved Mercury | <1 | <1 | <1 | <1 | <1 | <1 | ug/l | - | 0.75 |
| Dissolved Nickel | <2 | 15 | 5 | 9 | 9 | <2 | ug/l | - | 15 |
| Dissolved Potassium | 1.5 | 7.6 | 2.2 | 4.4 | 13.0 | <0.1 | mg/l | 5 | ne |
| Dissolved Zinc | <3 | 48 | 21 | 5 | 18 | <3 | ug/l | 100 | ne |
| Sulphate | 18.8 | 234.2 | 89.5 | 89.5 | 455.7 | <0.5 | mg/l | - | 187.5 |
| Chloride | 25.0 | 22.2 | 25.9 | 26.4 | 30.5 | <0.3 | mg/l | - | 187.5 |
| Sulphur | **5,479** | **90,403** | **27,023** | **27,762** | **168,355** | <10 | ug/l | - | - |
| Nitrate as $NO_3$ | 8.9 | <0.2 | <0.2 | 10.6 | <0.2 | <0.2 | mg/l | - | 37.5 |
| Nitrite as $NO_2$ | 0.13 | <0.02 | <0.02 | 0.04 | <0.02 | <0.02 | mg/l | 0.1 | 375,000 |
| Total Cyanide | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | mg/l | - | 0.0375 |
| Ammoniacal Nitrogen as $NH_3$ | 1.20 | 8.53 | 6.28 | 5.26 | 98.36 | <0.03 | mg/l | - | 0.175 |
| Electrical Conductivity @25C # | 386 | 646 | 390 | 427 | 1,353 | <2 | µS/cm | 1,000 | 1,875 |
| pH | 7.38 | 6.47 | 6.64 | 6.98 | 6.67 | <0.01 | pH units | ≥ 6.5 - ≤ 9.5 | ne |

**Table 8 Groundwater PAHs**

| Parameter | BH-02 | BH-03 | BH-06 | BH-10 | BH-12 | LOD | Unit | EPA IGV | GTV |
|---|---|---|---|---|---|---|---|---|---|
| Naphthalene | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.013 | µg/l | 1 | ne |
| Acenaphthylene | <0.013 | <0.013 | <0.013 | <0.013 | <0.013 | <0.013 | µg/l | ne | ne |
| Acenaphthene | <0.013 | <0.013 | <0.013 | <0.013 | <0.013 | <0.014 | µg/l | ne | ne |
| Fluorene | <0.014 | <0.014 | <0.014 | <0.014 | <0.014 | <0.011 | µg/l | ne | ne |
| Phenanthrene | <0.011 | <0.011 | <0.011 | <0.011 | <0.011 | <0.013 | µg/l | ne | ne |
| Anthracene | <0.013 | <0.013 | <0.013 | <0.013 | <0.013 | <0.012 | µg/l | 10,000 | ne |
| Fluoranthene | <0.012 | <0.012 | <0.012 | <0.012 | <0.012 | <0.013 | µg/l | 1 | ne |
| Pyrene | <0.013 | <0.013 | <0.013 | <0.013 | <0.013 | <0.015 | µg/l | ne | ne |
| Benzo(a)anthracene | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.011 | µg/l | ne | ne |

[20] EPA Report – Towards Setting Guideline Values for the Protection of Groundwater in Ireland, Interim Report, 2003.
[21] Groundwater Threshold Values as set out in S.I. 9 of 2010.
[22] ne – not established.

| Parameter | BH-02 | BH-03 | BH-06 | BH-10 | BH-12 | LOD | Unit | EPA IGV | GTV |
|---|---|---|---|---|---|---|---|---|---|
| Chrysene | <0.011 | <0.011 | <0.011 | <0.011 | <0.011 | <0.018 | µg/l | ne | ne |
| Benzo(bk)fluoranthene | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 | <0.016 | µg/l | ne | ne |
| Benzo(a)pyrene | <0.016 | <0.016 | <0.016 | <0.016 | <0.016 | <0.011 | µg/l | 0.01 | 0.0075 |
| Indeno(123cd)pyrene | <0.011 | <0.011 | <0.011 | <0.011 | <0.011 | <0.01 | µg/l | 0.05 | ne |
| Dibenzo(ah)anthracene | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.011 | µg/l | ne | ne |
| Benzo(ghi)perylene | <0.011 | <0.011 | <0.011 | <0.011 | <0.011 | <0.195 | µg/l | 0.05 | ne |
| PAH 16 Total | <0.195 | <0.195 | <0.195 | <0.195 | <0.195 | <0.01 | µg/l | ne | 0.075 |
| Benzo(b)fluoranthene | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | µg/l | 0.5 | ne |
| Benzo(k)fluoranthene | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.1 | µg/l | 0.05 | ne |

**Table 9 Groundwater Hydrocarbons**

| Parameter | BH-02 | BH-03 | BH-06 | BH-10 | BH-12 | LOD | Unit | EPA IGV | GTV |
|---|---|---|---|---|---|---|---|---|---|
| TPH CWG | | | | | | | | | |
| Aliphatics | | | | | | | | | |
| >C5-C6 | <10 | <10 | <10 | <10 | <10 | <10 | µg/l | ne | ne |
| >C6-C8 | <10 | <10 | <10 | <10 | <10 | <10 | µg/l | ne | ne |
| >C8-C10 | <10 | <10 | <10 | <10 | <10 | <10 | µg/l | ne | ne |
| >C10-C12 | <5 | <5 | <5 | <5 | <5 | <5 | µg/l | ne | ne |
| >C12-C16 | <10 | <10 | <10 | <10 | <10 | <10 | µg/l | ne | ne |
| >C16-C21 | <10 | <10 | <10 | <10 | <10 | <10 | µg/l | ne | ne |
| >C21-C35 | <10 | <10 | <10 | <10 | <10 | <10 | µg/l | ne | ne |
| Total aliphatics C5-35 | <10 | <10 | <10 | <10 | <10 | <10 | µg/l | 0.01 | ne |
| Aromatics | | | | | | | | | |
| >C5-EC7 | <10 | <10 | <10 | <10 | <10 | <10 | µg/l | ne | ne |
| >EC7-EC8 | <10 | <10 | <10 | <10 | <10 | <10 | µg/l | ne | ne |
| >EC8-EC10 | <10 | <10 | <10 | <10 | <10 | <10 | µg/l | ne | ne |
| >EC10-EC12 | <5 | <5 | <5 | <5 | <5 | <10 | µg/l | ne | ne |
| >EC12-EC16 | <10 | <10 | <10 | <10 | <10 | <10 | µg/l | ne | ne |
| >EC16-EC21 | <10 | <10 | <10 | <10 | <10 | <10 | µg/l | ne | ne |
| >EC21-EC35 | <10 | <10 | <10 | <10 | <10 | <10 | µg/l | ne | ne |
| Total aromatics C5-35 | <10 | <10 | <10 | <10 | <10 | <10 | µg/l | 0.01 | ne |
| Total aliphatics and aromatics(C5-35) | <10 | <10 | <10 | <10 | <10 | <10 | µg/l | 0.01 | ne |
| Total Phenols HPLC | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | mg/l | 0.5 | ne |
| MTBE | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | ug/l | 30 | ne |
| Benzene | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | ug/l | ne | 0.75 |
| Toluene | <5 | <5 | <5 | <5 | <5 | <5 | ug/l | 10 | ne |
| Ethylbenzene | <1 | <1 | <1 | <1 | <1 | <1 | ug/l | 10 | ne |
| m/p-Xylene | <2 | <2 | <2 | <2 | <2 | <2 | ug/l | 10 | ne |
| o-Xylene | <1 | <1 | <1 | <1 | <1 | <1 | ug/l | 10 | ne |

**Table 10 Groundwater VOCs**

| Parameter | BH-02 | BH-03 | BH-06 | BH-10 | BH-12 | LOD | Unit | EPA IGV | GTV |
|---|---|---|---|---|---|---|---|---|---|
| Tetrachloroethene (PCE) | <3 | <3 | <3 | <3 | 5 | <3 | ug/l | 40 | 7.5 |
| Trichloroethene (TCE) | <3 | <3 | <3 | <3 | 4 | <3 | ug/l | 70 | - |
| 1,1-Dichloroethene (1,1 DCE) | <3 | <3 | <3 | <3 | 4 | <3 | ug/l | 30 | - |
| 1,1-Dichloroethane | <3 | <3 | <3 | <3 | 28 | <3 | ug/l | 30 | - |
| cis-1-2-Dichloroethene | <3 | <3 | <3 | <3 | 7 | <3 | ug/l | 30 | - |
| Vinyl Chloride | <0.1 | <0.1 | <0.1 | <0.1 | 0.8 | <0.1 | ug/l | - | 0.375 |
| 1,1,1-Trichloroethane | <2 | <2 | <2 | <2 | 9 | <2 | ug/l | 500 | - |

## 14.0 Surface water Quality

A surface water sample was collected from the Avoca River on the 26th May 2020 by a GII Geo-Environmental Engineer. An upstream sample (SW-01) was collected, it was not possible to collect a downstream sample due to access issues.

### 14.1. Field Observations

No evidence of contamination was noted during the sampling of the Avoca River. Surface water field parameters were measured in situ using calibrated hand probes. Measurement included pH, electrical conductivity, temperature and redox potential (ORP). The recorded field data are summarised in Table 11.

**Table 11 Surface Water Field Measurements**

| Sample ID | Sample Date | pH (pH Units) | Electrical Conductivity (mS/cm) | Temperature (Celsius) | Redox Potential (mV) | Odour | Colour |
|---|---|---|---|---|---|---|---|
| SW-01 | 26-05-2020 | 7.67 | 0.14 | 19.8 | 54 | None | Clear |

### 14.2. Laboratory Analysis

The laboratory analysis undertaken on the samples collected from the river included dissolved arsenic, boron, cadmium, copper, chromium (III & VI), cyanide, lead, mercury, nickel, manganese and zinc, aliphatic and aromatic petroleum hydrocarbons, polycyclic aromatic hydrocarbons (PAH), methyl tert butyl ether (MTBE), benzene toluene ethylbenzene and toluene (BTEX), total phenols, pH, electrical conductivity, pesticides, volatile organic compounds (VOCs, nitrate, nitrite, chloride, sulphate, ammonia, calcium, sulphur, phosphorus and potassium. The parameter range was based on the site history and the need to establish a comprehensive environmental baseline for the groundwater quality for the site.

The laboratory testing was competed by Element Materials Technology in the UK; EMT is a UKAS accredited laboratory. The full laboratory reports are included in Appendix 9. The analytical methodologies are all ISO/CEN approved or equivalent.

### 14.3. Laboratory Results

The full laboratory test report is presented in Appendix 9 and the results are summarised in Tables 12 to 14. The tables include the EPA Environmental Quality Objectives and Environmental Quality Standards for the Aquatic Environment (1997).

Elevated levels of ammonia and zinc were detected in the upstream sample. Low levels of several PAHS were also detected.

It is not possible to comment on any impact the site may have on the Avoca River without a downstream sample.

**Table 12 Surface Water Metals and Inorganics**

| Parameter | Upstream | LOD | Unit | EQS |
|---|---|---|---|---|
| Dissolved Arsenic | <2.5 | <2.5 | ug/l | 25 |
| Dissolved Boron | <12 | <12 | ug/l | 2,000 |
| Dissolved Cadmium | <0.5 | <0.5 | ug/l | 5 |
| Total Dissolved Chromium | <1.5 | <1.5 | ug/l | 30 |
| Hexavalent Chromium | <0.006 | <0.006 | mg/l | - |
| Dissolved Copper | 16 | <7 | ug/l | 30 |
| Dissolved Lead | <5 | <5 | ug/l | 10 |
| Dissolved Manganese | 118 | <2 | ug/l | 300 |
| Dissolved Mercury | <1 | <1 | ug/l | 1 |
| Dissolved Nickel | <2 | <2 | ug/l | 50 |
| Dissolved Potassium | 1.1 | <0.1 | mg/l | - |
| Dissolved Zinc | 160 | <3 | ug/l | 100 |
| Sulphate | 21.1 | <0.5 | mg/l | 200 |
| Chloride | 12.5 | <0.3 | mg/l | 250 |
| Sulphur | 6,407 | <10 | ug/l | - |
| Nitrate as $NO_3$ | 6.6 | <0.2 | mg/l | 50 |
| Nitrite as $NO_2$ | 0.02 | <0.02 | mg/l | 0.2 |
| Total Cyanide | <0.01 | <0.01 | mg/l | 0.01 |
| Ammoniacal Nitrogen as $NH_3$ | 0.09 | <0.03 | mg/l | 0.02 |
| Electrical Conductivity @25C # | 125 | <2 | µS/cm | 1,000 |
| pH | 7.59 | <0.01 | pH units | - |

**Table 13 Surface Water PAHs**

| Parameter | Upstream | LOD | Unit | EQS |
|---|---|---|---|---|
| Naphthalene | <0.1 | <0.013 | µg/l | - |
| Acenaphthylene | <0.013 | <0.013 | µg/l | - |
| Acenaphthene | <0.013 | <0.014 | µg/l | - |
| Fluorene | <0.014 | <0.011 | µg/l | - |
| Phenanthrene | **0.023** | <0.013 | µg/l | - |
| Anthracene | <0.013 | <0.012 | µg/l | - |
| Fluoranthene | **0.025** | <0.013 | µg/l | - |
| Pyrene | **0.017** | <0.015 | µg/l | - |
| Benzo(a)anthracene | <0.015 | <0.011 | µg/l | - |
| Chrysene | <0.011 | <0.018 | µg/l | - |
| Benzo(bk)fluoranthene | <0.018 | <0.016 | µg/l | - |
| Benzo(a)pyrene | <0.016 | <0.011 | µg/l | - |
| Indeno(123cd)pyrene | <0.011 | <0.01 | µg/l | - |
| Dibenzo(ah)anthracene | <0.01 | <0.011 | µg/l | - |
| Benzo(ghi)perylene | <0.011 | <0.195 | µg/l | - |
| PAH 16 Total | <0.195 | <0.01 | µg/l | 0.0002 |
| Benzo(b)fluoranthene | <0.01 | <0.01 | µg/l | - |
| Benzo(k)fluoranthene | <0.01 | <0.1 | µg/l | - |

**Table 14 Surface Water Hydrocarbons**

| Parameter | Upstream | LOD | Unit | EQS |
|---|---|---|---|---|
| TPH CWG | | | | |
| Aliphatics | | | | |
| >C5-C6 | <10 | <10 | µg/l | - |
| >C6-C8 | <10 | <10 | µg/l | - |
| >C8-C10 | <10 | <10 | µg/l | - |
| >C10-C12 | <5 | <5 | µg/l | - |
| >C12-C16 | <10 | <10 | µg/l | - |
| >C16-C21 | <10 | <10 | µg/l | - |
| >C21-C35 | <10 | <10 | µg/l | - |
| Total aliphatics C5-35 | <10 | <10 | µg/l | - |
| Aromatics | | | | - |
| >C5-EC7 | <10 | <10 | µg/l | - |
| >EC7-EC8 | <10 | <10 | µg/l | - |
| >EC8-EC10 | <10 | <10 | µg/l | - |
| >EC10-EC12 | <5 | <10 | µg/l | - |
| >EC12-EC16 | <10 | <10 | µg/l | - |
| >EC16-EC21 | <10 | <10 | µg/l | - |
| >EC21-EC35 | <10 | <10 | µg/l | - |

| Parameter | Upstream | LOD | Unit | EQS |
|---|---|---|---|---|
| Total aromatics C5-35 | <10 | <10 | µg/l | - |
| Total aliphatics and aromatics(C5-35) | <10 | <10 | µg/l | 10 |
| Total Phenols HPLC | <0.01 | <0.01 | mg/l | 0.005 |
| MTBE | <0.1 | <0.1 | ug/l | - |
| Benzene | <0.5 | <0.5 | ug/l | 10 |
| Toluene | <5 | <5 | ug/l | 10 |
| Ethylbenzene | <1 | <1 | ug/l | 10 |
| m/p-Xylene | <2 | <2 | ug/l | 10 |
| o-Xylene | <1 | <1 | ug/l | 10 |

## 15.0 Conceptual Site Model

A conceptual site model (CSM) has been completed based on the site investigation and environmental sampling works competed. The CSM includes a risk assessment which was completed by considering the sources, pathways and receptors (pollutant linkages), an assessment of the human health and environmental risks with reference to the significance and degree of the risk.

The rationale relating to the calculation of the risk based on severity of each hazard and the risk probability is outlined in Tables 15 to 17.

**Table 15 Hazard Severity Matrix**

| Category | Definition |
|---|---|
| Severe | Acute risks to human health, catastrophic damage to buildings/property, major pollution of controlled waters. |
| Medium | Chronic risk to human health, pollution of sensitive controlled waters, significant effects on sensitive ecosystems or species, significant damage to buildings or structures. |
| Mild | Pollution of non-sensitive waters, minor damage to buildings or structures. |
| Minor | Requirement for protective equipment during site works to mitigate health effects, damage to non-sensitive ecosystems or species. |

**Table 16 Risk Probability Matrix**

| Category | Definition |
|---|---|
| High likelihood | Pollutant linkage may be present, and risk is almost certain to occur in long term, or there is evidence of harm to the receptor. |
| Likely | Pollutant linkage may be present, and it is probable that the risk will occur over the long term. |

| | |
|---|---|
| Low likelihood | Pollutant linkage may be present, and there is a possibility of the risk occurring, although there is no certainty that it will do so. |
| Unlikely | Pollutant linkage may be present, but the circumstances under which harm would occur are improbable. |

**Table 17 Risk Matrix**

| | **Potential Severity** | | | |
|---|---|---|---|---|
| **Probability** | Severe | Medium | Mild | Minor |
| **High likelihood** | Very High | High | Moderate | Low/Moderate |
| **Likely** | High | Moderate | Low/Moderate | Low |
| **Low Likelihood** | Moderate | Low/Moderate | Low | Very Low |
| **Unlikely** | Low/Moderate | Low | Very Low | Very Low |

**Table 18 Conceptual Site Model**

| Source | Pathway | Receptor | Severity | Likelihood | Potential Risk | Discussion |
|---|---|---|---|---|---|---|
| Elevated Levels of TPH, PCBs and Metals detected in the made ground deposits | • Ingestion of soil and dust<br>• Dermal contact<br>• Inhalation of fugitive dust | • Construction workers sin any future development scenario<br>• Future site users in residential scenario<br>• Future site users in a commercial scenario | Medium | Highly Likely | High | Elevated level of metals in mad ground deposits pose significant human health exposure risk during future development/construction works |
| Elevated Levels of TPH, PCBs and Metals detected in the made ground deposits | • Leaching from soil into underlying shallow groundwater<br>• Leaching from soil into underlying bedrock aquifer<br>• Leaching from soil and lateral discharge to surface water | • Shallow groundwater<br>• Bedrock aquifer<br>• Avoca River<br>• Shelton Abbey Canal | Medium | Highly Likely | High | Elevated level of the metals present in the gravel aquifer. Arsenic detected at elevated concentrations at two locations adjacent to where “red material” had been detected in trial pitting. |
| Elevated Levels of Metals, Ammonia, Sulphates, Sulphur detected in groundwater. | • Groundwater discharging to surface water.<br>• Lateral migration of shallow groundwater<br>• Downward migration of impacted groundwater | • Avoca River.<br>• Shelton Abbey Canal<br>• Downgradient shallow groundwater<br>• Bedrock aquifer<br>• Arklow Town Marsh | Medium | Likely | Moderate | Collection of a downgradient surface water sample was no possible. Further attempts to collect surface water samples is recommended. |

## 16.0 Conclusions & Recommendations

The conclusions and recommendations given and opinions expressed in this report are based on the findings of the site investigation works and laboratory testing undertaken. Where any opinion is expressed on the classification of material between site investigations locations, this is for guidance only and no liability can be accepted for its accuracy. No responsibility can be accepted for conditions which have not been revealed by the findings at the site investigation locations.

### 16.1. Conclusions

#### 16.1.1. Waste Classification

Based on the results of the HazWasteOnLine™ there are several locations across the site where the material has been impacted by hydrocarbons to a degree to classy the material if excavated for removal form site as hazardous waste.

The red material which is believed to be a by-product of the fertiliser production process has been shown to be classified ad a hazardous waste due to significantly elevated levels of the metals arsenic, copper, lead and zinc. This classification is only assigned if the material is to be removed from site a s a waste.

#### 16.1.2. Waste Categories

The most applicable waste category for each of the samples has been presented in Table 5.

#### 16.1.3. Asbestos

Asbestos was detected in several samples across the site. The asbestos type detected in all cases was chrysotile and was present at a level lower than the detection limit of <0.001%.

#### 16.1.4. PCBs

PCBs were detected at several locations across the site. Based on the site history there had been a subsoil excavation programme at the site to remediate PCB contamination. These detections may be residual contamination associated with the original remediation programme as opposed to evidence of large-scale PCB contamination.

### 16.2. S4UL Assessment

The levels of arsenic detected at TP-08 and TP-13 exceeded the commercial S4UL.

### 16.2.1. Water Quality

Groundwater sampling indicates that the underlying gravel aquifer has been impacted by the site's historical use as a fertiliser factory with elevated levels of ammonia, potassium, sulphate and sulphur in the samples collected.
The groundwater sampling also indicates that the gravel aquifer has been impacted by heavy metals possibly associated with the red material encountered in the trial pitting.
Downstream sampling of the Avoca River should be completed to assess the impact if any from the site on the river.

### 16.2.2. Overall Risk

Based on the subsoil and groundwater sampling the underlying bedrock aquifer is at risk from historical contamination associated with the fertiliser production process. The historical landfilling of the "red material" across the site appears to have impacted the underlying gravel aquifer in terms of elevated levels of arsenic.

Groundwater downgradient of the site may also be impacted or at risk.

Based on the groundwater quality recorded there is a risk to the adjacent Avoca River as well as the underlying bedrock aquifer. The risk to the Avoca should be further assesses through additional surface water sampling.

There is a risk to future site users and construction workers during any redevelopment in terms of exposure to hazardous fugitive material releases related to the 'red material' buried on site.

## 16.3. Recommendations

## 16.4. Groundwater and Surface Water Sampling

It is recommended that groundwater and surface water sampling is carried out to assess any potential impacts from the site.

### 16.4.1. Waste Transfer

In the event that material is excavated for removal from site, any firm engaged to transport waste material from site and the operator of any waste facility that will accept subsoils excavated from this site should be furnished with, at a minimum, copies of the **full unabridged** laboratory reports and HazWasteOnLine™ report for all samples presented in this report.

The material on site if excavated should be removed to the most appropriate facility under the waste categories and LoW codes identified in Table 3. Potential outlets for the various waste categories are presented in Appendix 13, this list is not exhaustive and applicable at the time of the writing this report.

The non-hazardous material across the site if excavated should be removed from site to an appropriate facility under either the LoW codes 17 05 04 or 17 09 04. Where during excavation there is noted to be in excess of 2% anthropogenic material the appropriate LoW code which should be applied is 17 09 04.

The hazardous material across the site if excavated should be removed from site to an appropriate facility under either the LoW codes 17 05 03 or 17 09 03. Where during excavation there is noted to be in excess of 2% anthropogenic material the appropriate LoW code which should be applied is 17 09 04.

### 16.4.2. Excavations

The excavation and management of soils on site should take cognisance of the waste categories outlined in Table 5.

If the hazardous material on site is to be removed and disposed of it is recommended that the excavation is supervised and validated by a suitably qualified environmental engineer or scientist.

The hazardous material is recommended to be excavated in advance of the main excavation works to minimise the potential risk of cross contamination of other excavated soils.

### 16.4.3. Water Quality

Further groundwater and surface water sampling is recommended. The groundwater monitoring network should be expanded to include the EPA licence compliance monitoring points on site and off site where access can be arranged.

Surface water sampling where possible at several points along the site boundary and downstream of the site should be undertaken to assess the impact of the site on the Avoca River.

## 17.0 References

Environment Agency (2013). *Waste Sampling and Testing for Disposal to Landfill.* Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/321207/Sampling_and_testing_of_waste_for_landfill.pdf

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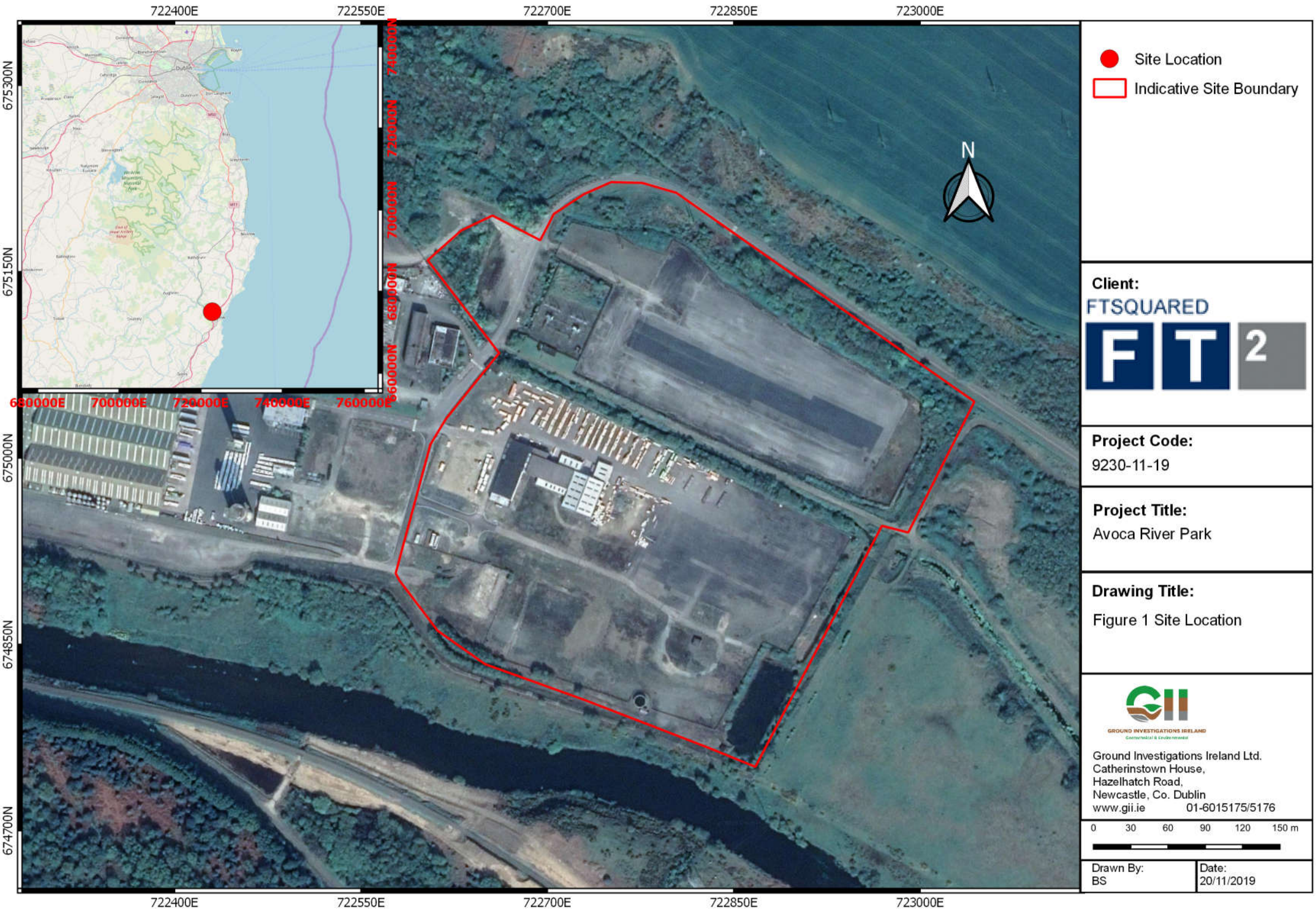
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# **APPENDIX 1** - Figures


722400E
722550E
722700E
722850E
723000E
675300N
675150N
675000N
674850N
674700N
740000N
720000N
700000N
680000N
660000N
680000E
700000E
720000E
740000E
760000E
N
Site Location
Indicative Site Boundary
Client:
FTSQUARED
Project Code:
9230-11-19
Project Title:
Avoca River Park
Drawing Title:
Figure 1 Site Location
GROUND INVESTIGATIONS IRELAND
Ground Investigations Ireland Ltd.
Catherinstown House,
Hazelhatch Road,
Newcastle, Co. Dublin
www.gii.ie 01-6015175/5176
0 30 60 90 120 150 m
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Date:
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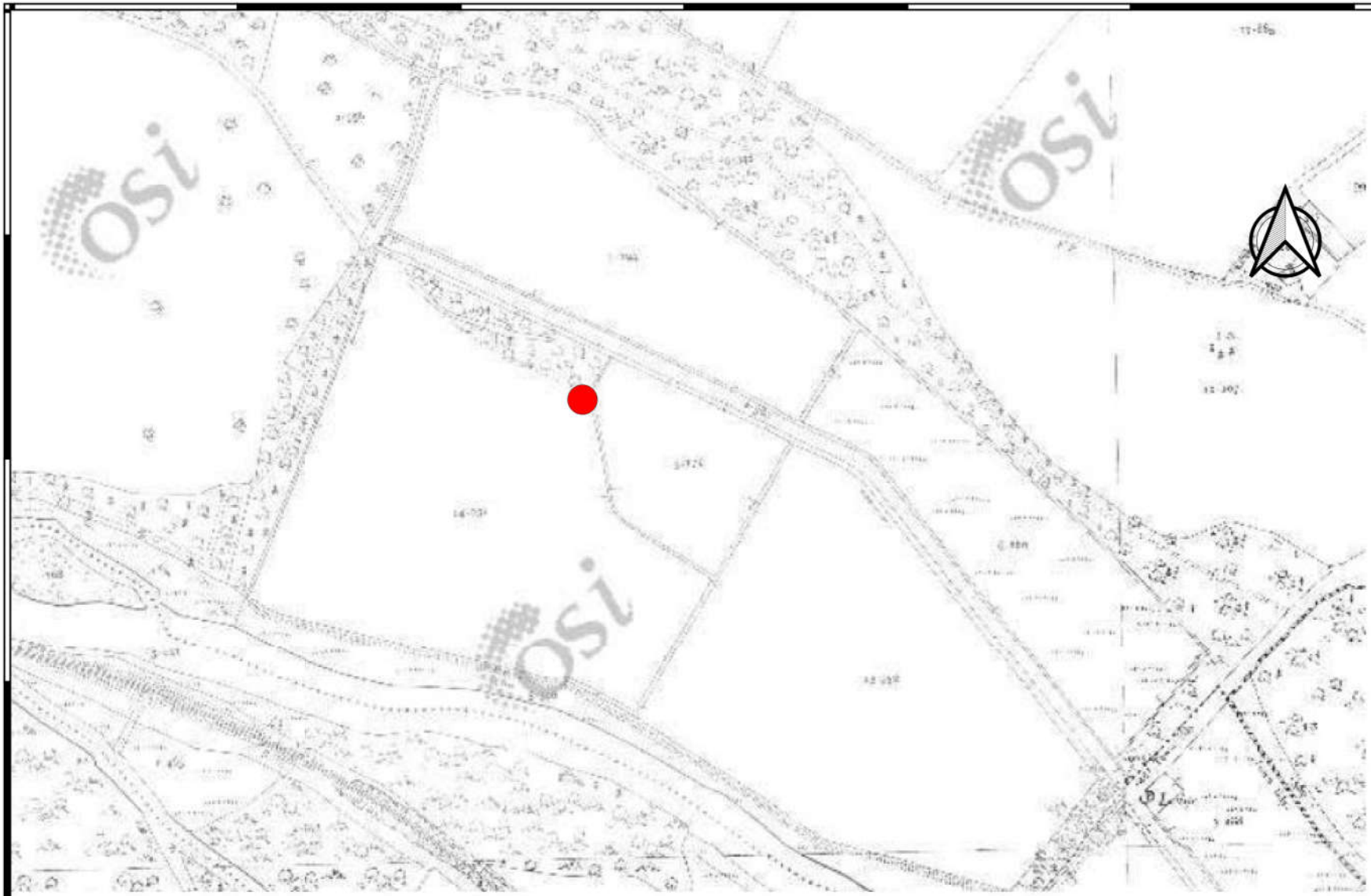
**Project Code:**
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**Project Title:**
Avoca River Park

**Drawing Title:**
Figure 2 OSI 6-Inch Map

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|---|---|
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Site Location

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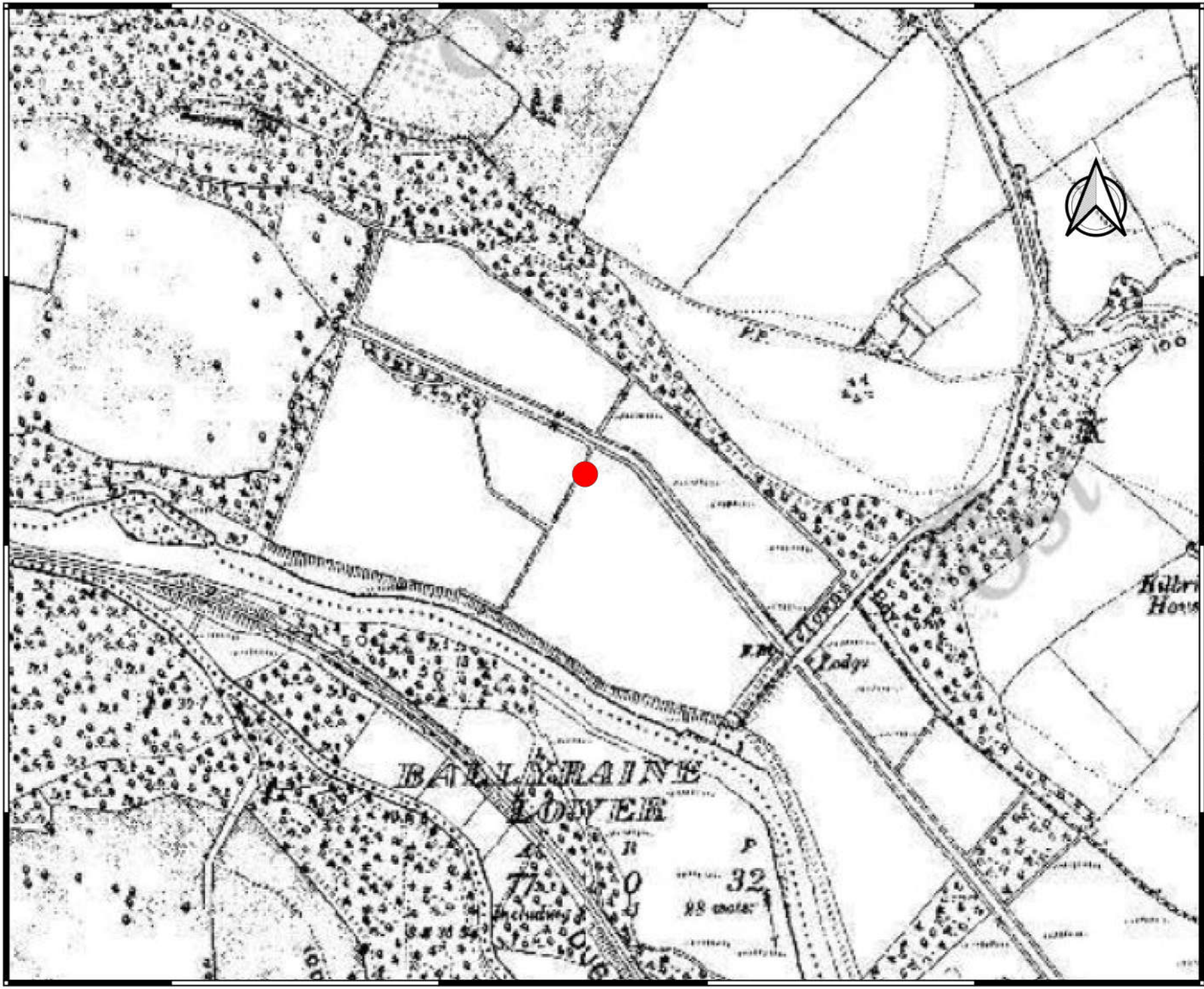
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Figure 3 OSI 25-Inch Map

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**Project Title:**

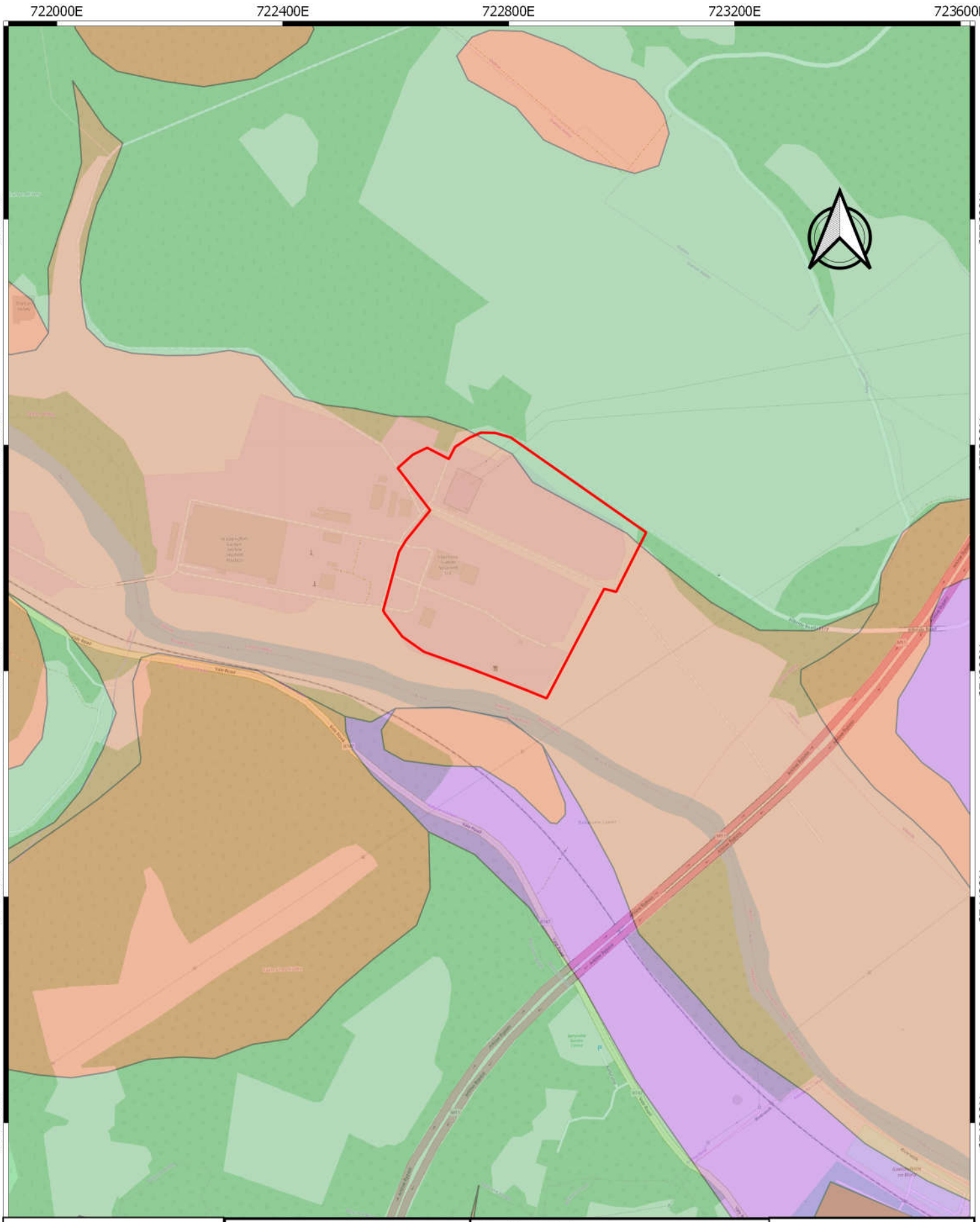
Avoca River Park

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Figure 4 OSI Cassini Map

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**Drawing Title:**
Figure 5 Quaternary Geology

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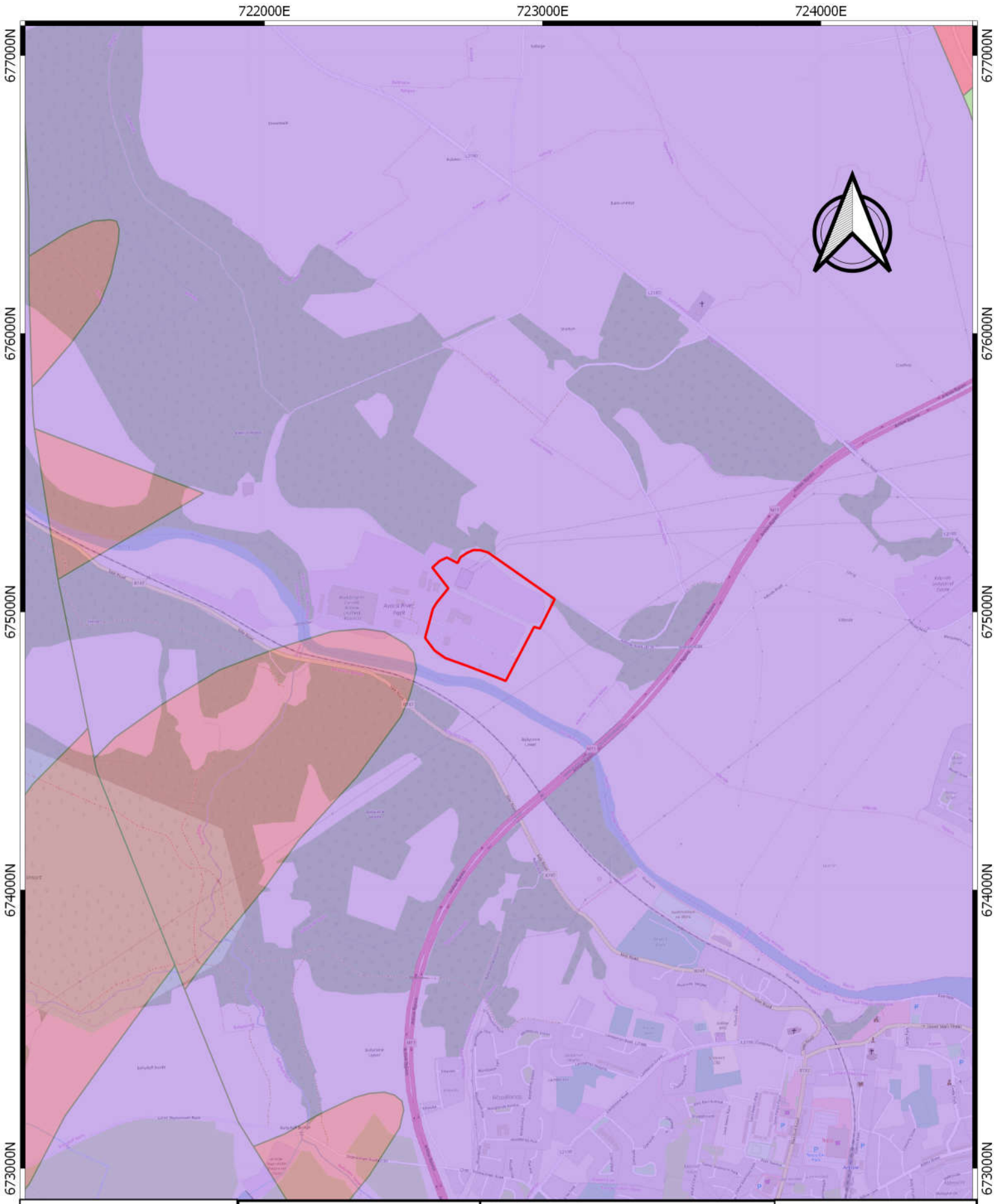
0 100 200 300 m

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Site Boundary

Subsoil Type
- A
- IrSTLPSsS
- Rck
- TLPSsS
- Urban




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Figure 6 Bedrock Geology

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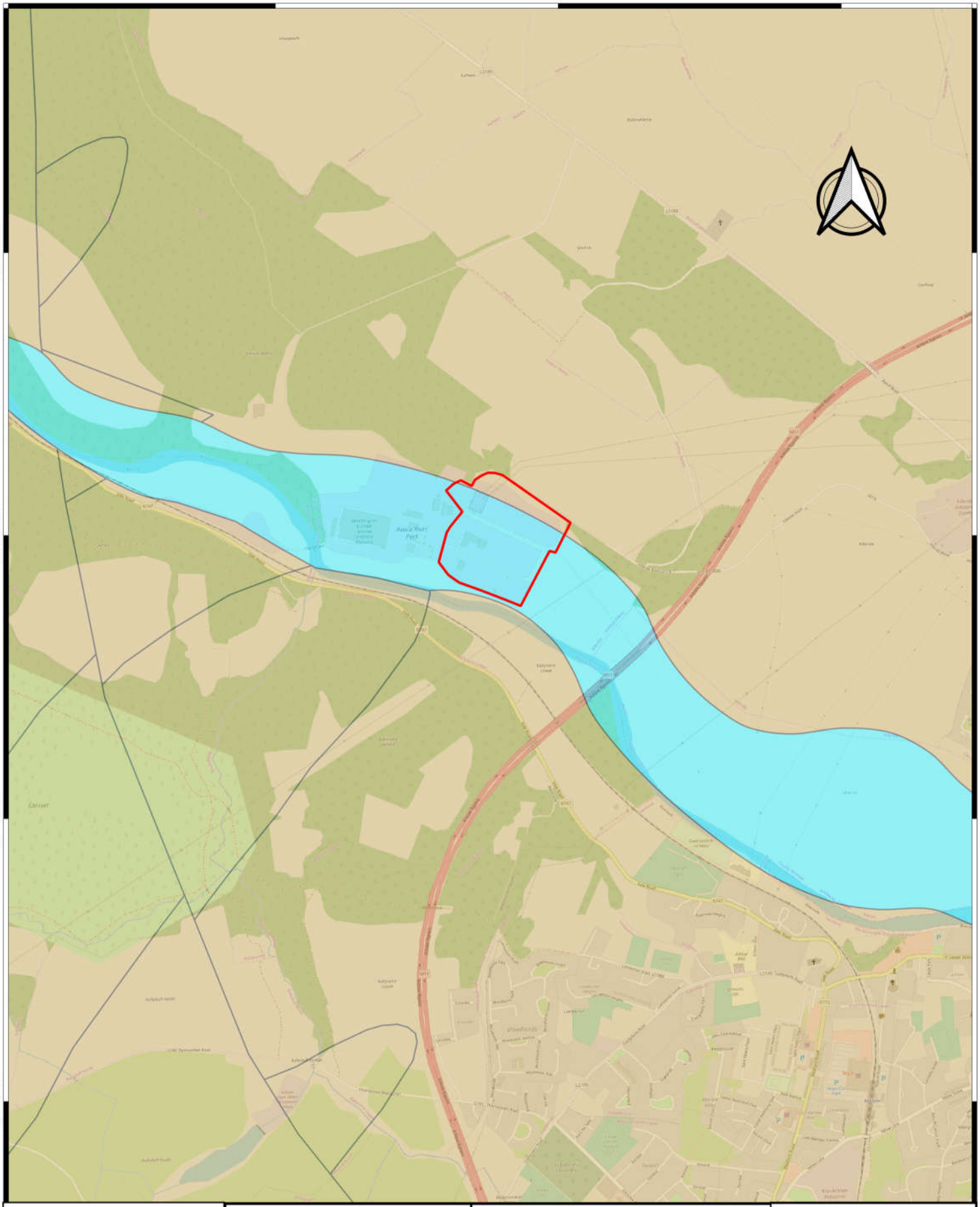
0 200 400 600 m

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Date:
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Site Boundary

Bedrock Geology
- Ballymoyle Fm
- in Ballymoyle Fm
- Kilmacrea Fm
- Oaklands Fm




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**Drawing Title:**
Figure 7 Aquifer Category

**GII Project Reference:**
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0 200 400 600 m

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Date:
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Site Boundary

Bedrock Aquifer
Ll

Sand/Gravel Aquifer
Lg




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**Project Title:**
Avoca River Park

**Drawing Title:**
Figure 8 Aquifer Vulnerability

**GII Project Reference:**
9230-11-19

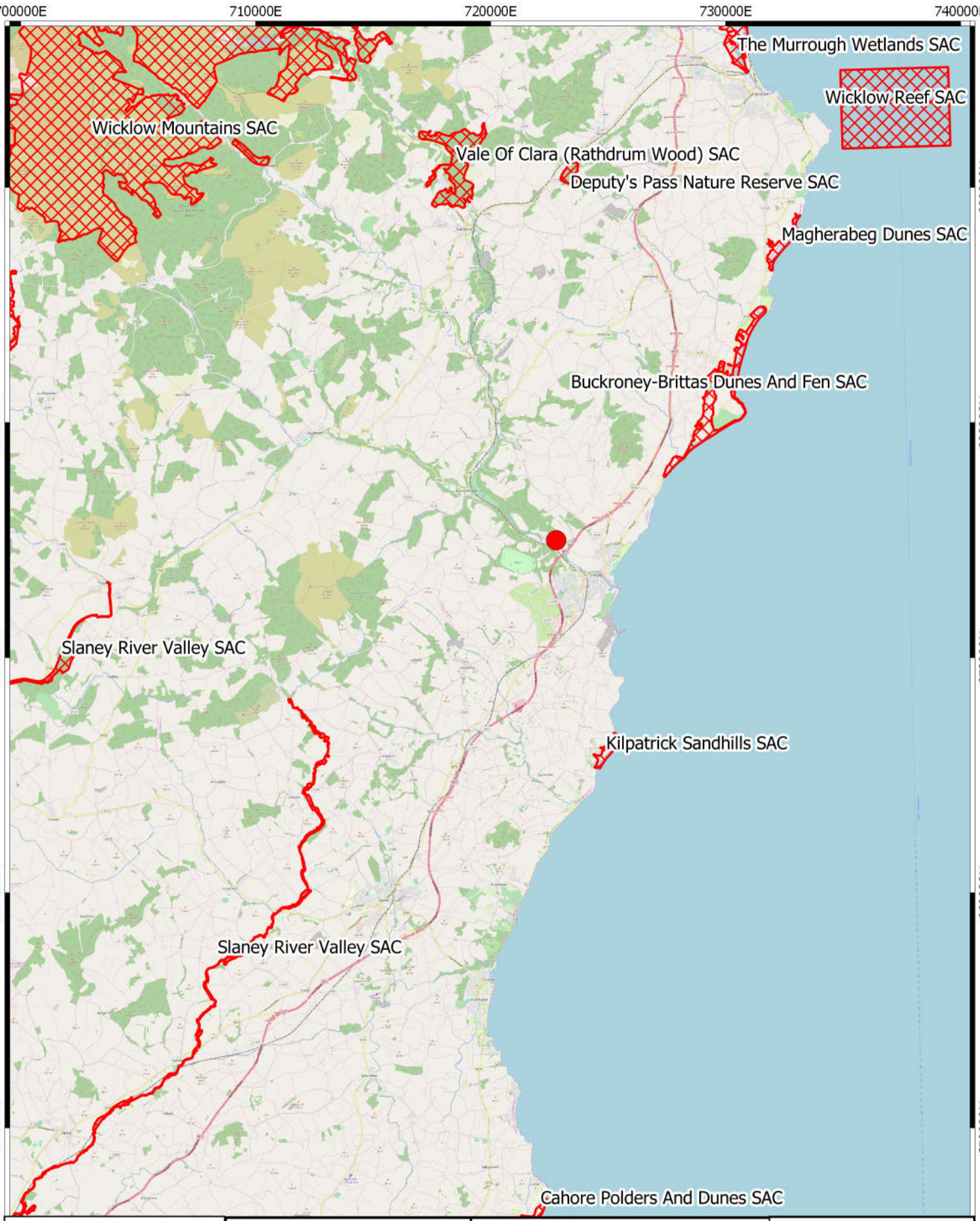
0 200 400 600 m

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BS

Date:
21/11/2019

Indicative Site Boundary

Vulnerability
- E
- H
- L
- M
- X




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**Project Title:**
Avoca River Park

**Drawing Title:**
Figure 9 Special Area of Conservation

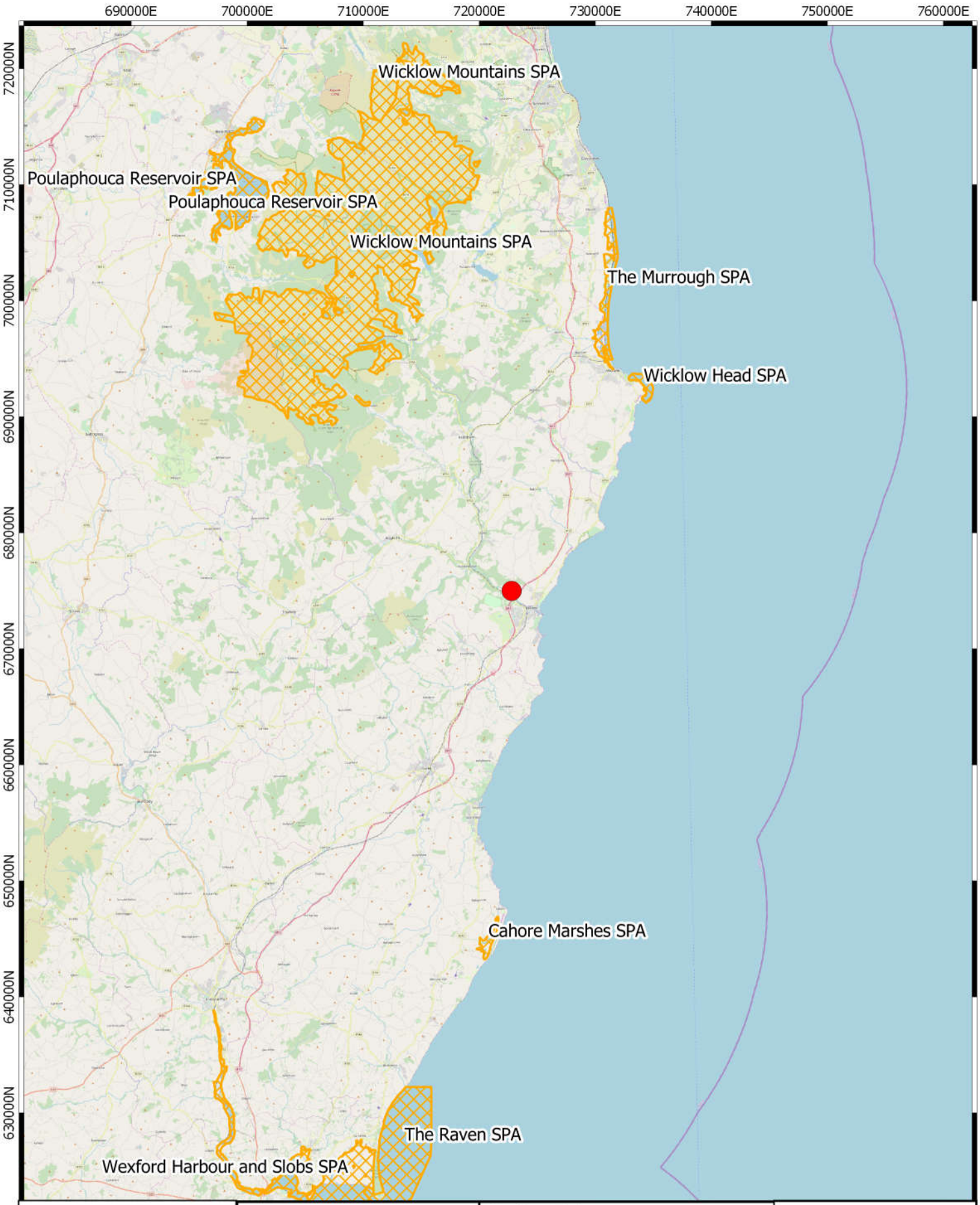
**GII Project Reference:**
9230-11-19

0 2.5 5 7.5 km

Drawn By:
BS

Date:
21/11/2019

Site Location
SAC




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**Project Title:**
Avoca River Park

**Drawing Title:**
Figure 10 Special Protected

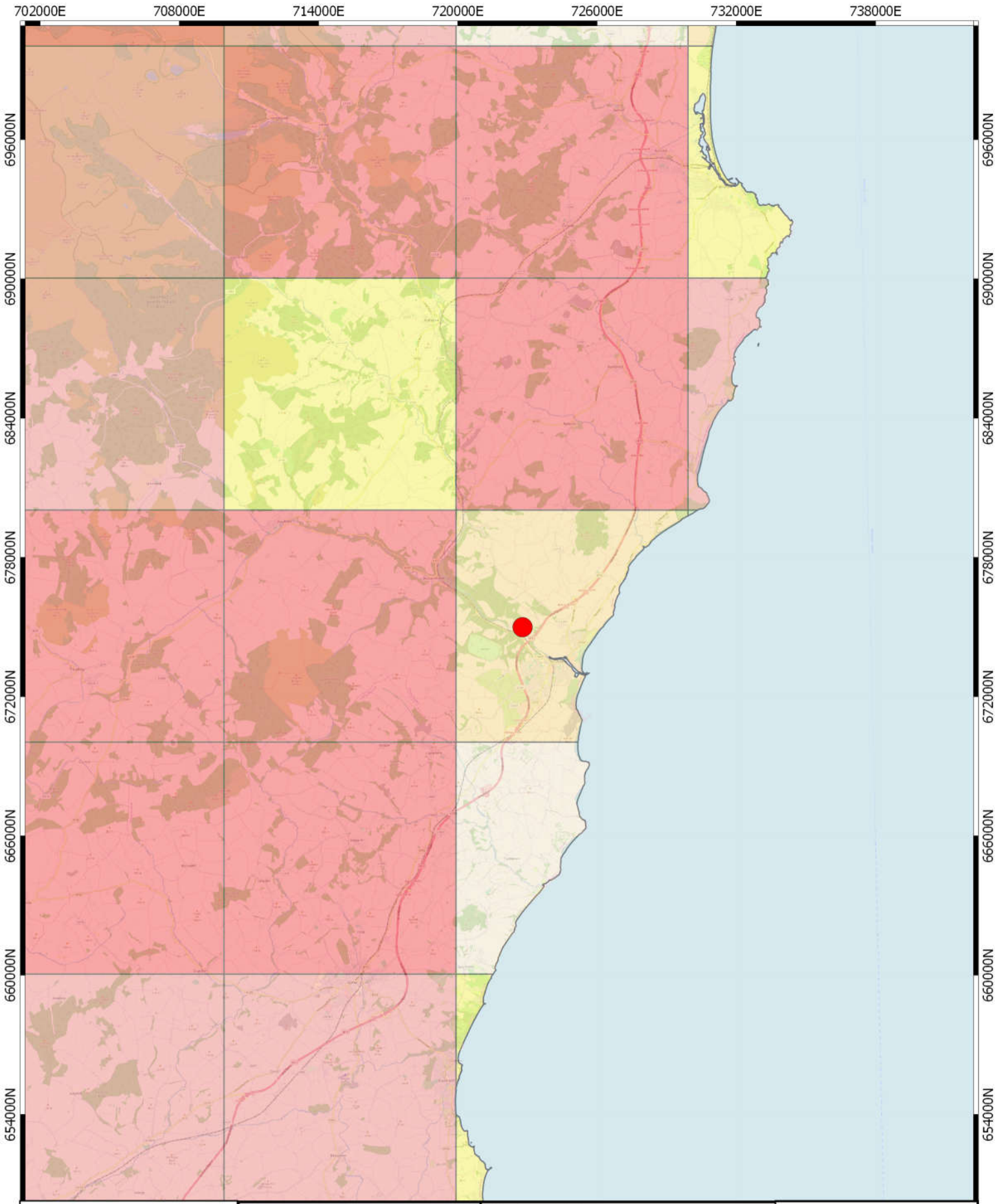
**GII Project Reference:**
9230-11-19

0 1000 2000 3000 4000 m

Drawn By:
BS

Date:
21/11/2019

Site Location
SPA




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0 2.5 5 7.5 km

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Avoca River Park

**Drawing Title:**
Figure 11 Radon

**GII Project Reference:**
9230-11-19

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BS

Date:
21/11/2019

Site Location

Radon
- <1%
- 1% - 5%
- 5% - 10%
- 10% - 20%
- >20%




Indicative Site Boundary

EPA Licence Boundary

**Client:**

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**Project Code:**

9230-11-19

**Project Title:**

Avoca River Park

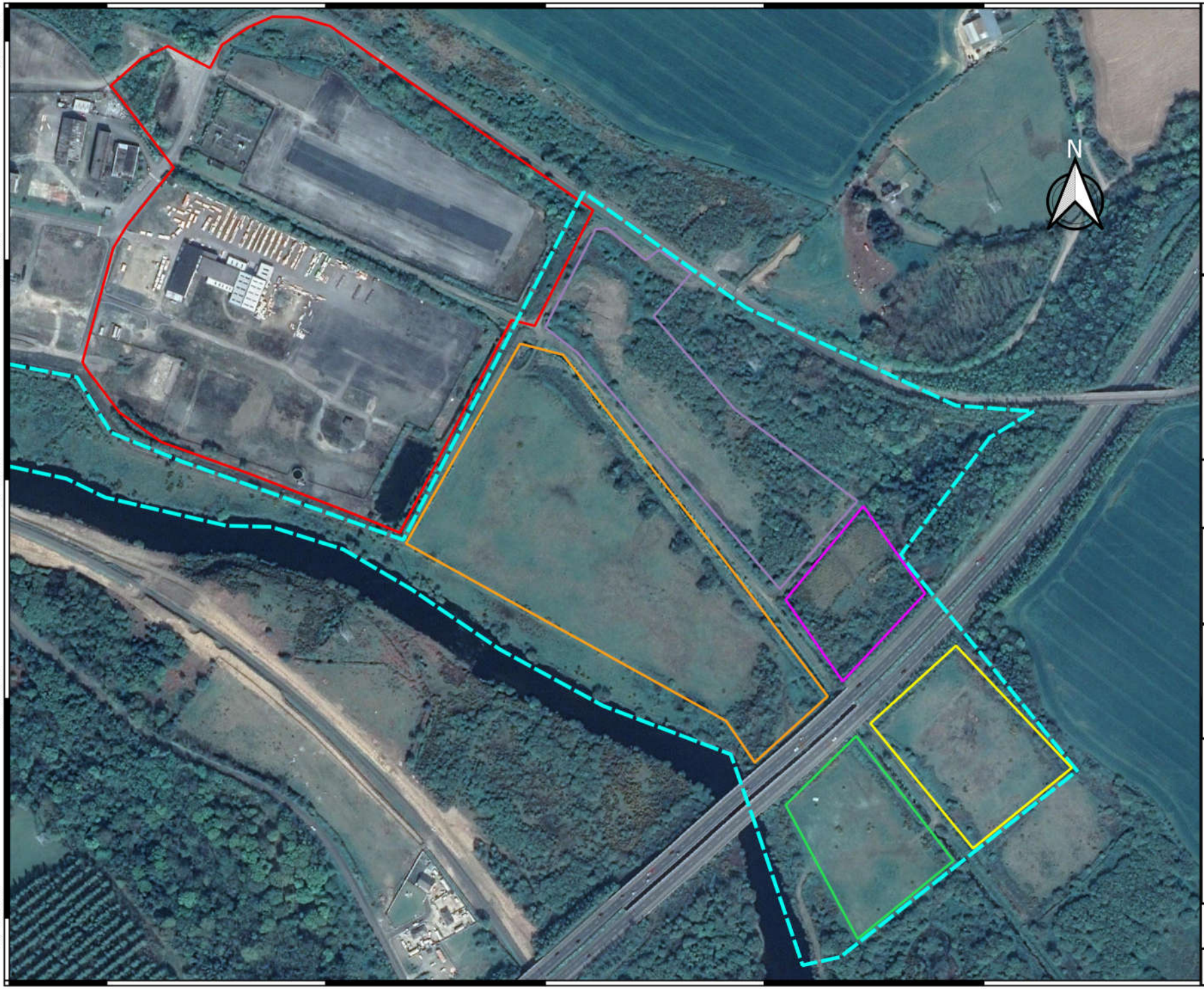
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Figure 12 EPA Licence Boundary


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0 30 60 90 120 150 m

| Drawn By: | Date: |
|---|---|
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Ground Investigation

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Figure13 Historical Landfill Cells

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0 50 100 150 m

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|---|---|
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Indicative Site Boundary

Canal

Trial Pit

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**Project Title:**

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**Drawing Title:**

Figure 14 Trial Pit Locations


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0 20 40 60 80 100 m

| Drawn By: | Date: |
|---|---|
| BS | 26/05/2020 |




Indicative Site Boundary

Borehole

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9230-11-19

**Project Title:**

Avoca River Park

**Drawing Title:**

Figure 15 Borehole Locations

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0 30 60 90 120 150 m

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|---|---|
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# **APPENDIX 2** – Previous Environmental Risk Assessment

# ATTACHMENT 2

## OMC ENVIRONMENTAL RISK ASSESSMENT

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Cork

Tel. (021)4321521
Fax. (021)4321522

# ENVIRONMENTAL RISK ASSESSMENT

## HOLFELD PLASTICS LIMITED

FORMER IRISH FERTILIZER INDUSTRIES SITE

ARKLOW

COUNTY WICKLOW

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**Prepared For: -**

***PM*** Group
Killakee House,
Belgard Square,
Tallaght,
Dublin 24

**Prepared By: -**

O' Callaghan Moran & Associates,
Granary House,
Rutland Street,
Cork

**June 2011**



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**APPENDIX 2** PM AER 2010 and Risk Assessment Reports (CD)

**APPENDIX 3** OCM Surface Water Sampling Protocol

**APPENDIX 4** Laboratory Results


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# 1. INTRODUCTION

Irish Fertilisers Industries (IFI) operated its fertiliser manufacturing facility in Arklow County Wicklow under an Integrated Pollution and Control (IPC) License (Register No. 31) by the Environmental Protection Agency (Agency). In 2002, fertiliser manufacture stopped and in October 2005 the Licence was transferred to Holfeld Plastics Ltd (Holfeld).

Although fertiliser production ended in 2002, the environmental monitoring programme at the former fertiliser Production Area and adjacent Landfill Areas continued due to the presence of groundwater contamination beneath both areas. This was initially identified during site investigations undertaken in 1994 and subsequent investigations in 1997.

In 2004, Project Management Group (PM) completed an Environmental Risk Assessment that included groundwater modelling to predict long term levels of contaminants in groundwater beneath the former production area. An updated assessment was prepared in 2007, which tracked the progress of the monitored natural attenuation that had occurred.

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Based on the reduction in the contaminant levels in the groundwater beneath the production area in line with the predictions of the groundwater modelling completed in 2004 and 2007, Holfeld intends to apply to the Agency to amend the IPPC Licence area to exclude the Production Area. The revised Licence area is shown on Figure 1.1

The Agency has indicated that an application for the revision of the License should include an assessment by an experienced hydrogeologist of the monitored natural attenuation programme from 2007 to date, which should be based on the updated groundwater model (2007) and the Water Framework Directive. The objective is to demonstrate that the groundwater beneath the former production area does not present an environmental or health risk.

PM requested O'Callaghan Moran & Associates (OCM) to undertake the environmental assessment and this report presents the findings. It is based on information on the site history and operations provide by Holfeld Plastics, a review of the reports on the previous site investigations and risk assessments and a site inspection carried out on the 23rd of May 2011.



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## 1.1. Report Contents

Section 2 describes the site layout, site history and the geology and hydrogeology. Section 3 presents a Conceptual Site Model. Section 4 presents an updated risk assessment based on a the groundwater data collected between 2007 and 2011 and surface water monitoring data from the Avoca River collected by OCM in 2011. Section 5 sets out the conclusions and recommendations.

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NOTES

LEGEND

REVISED BOUNDARY OF HOLFELD PLASTICS LTD

FOR INFORMATION

HOLFELD PLASTICS LTD

AM GROUP

EPA SUBMISSION

REVISED IPPC SITE BOUNDARY FOR HOLFELD PLASTICS LTD.

11-13141

Figure 1.1

0 20m 100m

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# 2. SITE DESCRIPTION

## 2.1. Site Location & Layout

The site is located on the northern bank of the Avoca River approximately 2.5km to the northwest of Arklow (Figure 2.1). The site layout is shown on Figure 2.2. It covers an area of approximately 50 hectares (c.123 acres), of which the Production Area covers approximately 36.5 hectares. Holfeld Plastics occupies the southwest corner of the Production Area.

## 2.2. Site Activities

Holfeld manufactures rigid plastics packaging, supplying bespoke formings as well as an extensive range of standard trays and containers to customers throughout Europe in both food and non food sectors. The manufacturing activities do not belong to any of the prescribed processes that are subject to IPPC licensing.

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## 2.3. Site History

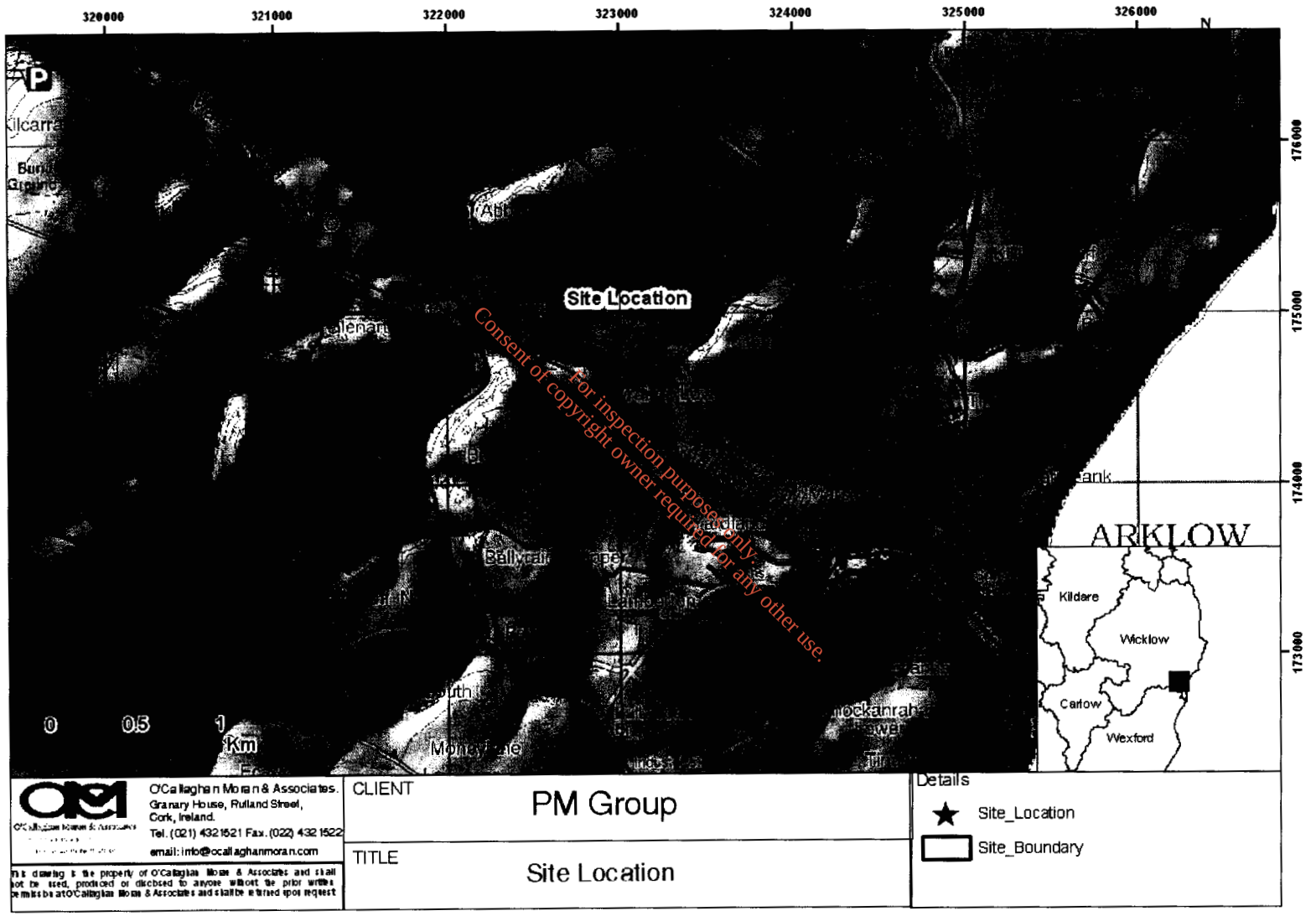
IFI was a joint venture company formed by state company Nitrigin Eireann Teoranta (NET) and ICI plc, which operated three manufacturing facilities in Cork, Belfast and Arklow. The main products manufactured at Arklow were Calcium Ammonium Nitrate (CAN) and blends. Other nutrients, which complemented the range of fertiliser products were imported and blended as required. Nitric acid was produced mainly as an intermediate, although there was a minor acid sales business.

Facility operations required a typical range of services, including water treatment, steam generation, laboratory activities and storage of raw materials, intermediates, products and ancillary materials. .

IFI was granted the IPC Licence in January 1997. A revised Licence (Register No. 495) was issued in March 2000, which approved significant process changes. In 2002, fertiliser manufacturing stopped and in 2005, following the purchase of the site, the Licence was transferred to Holfeld.



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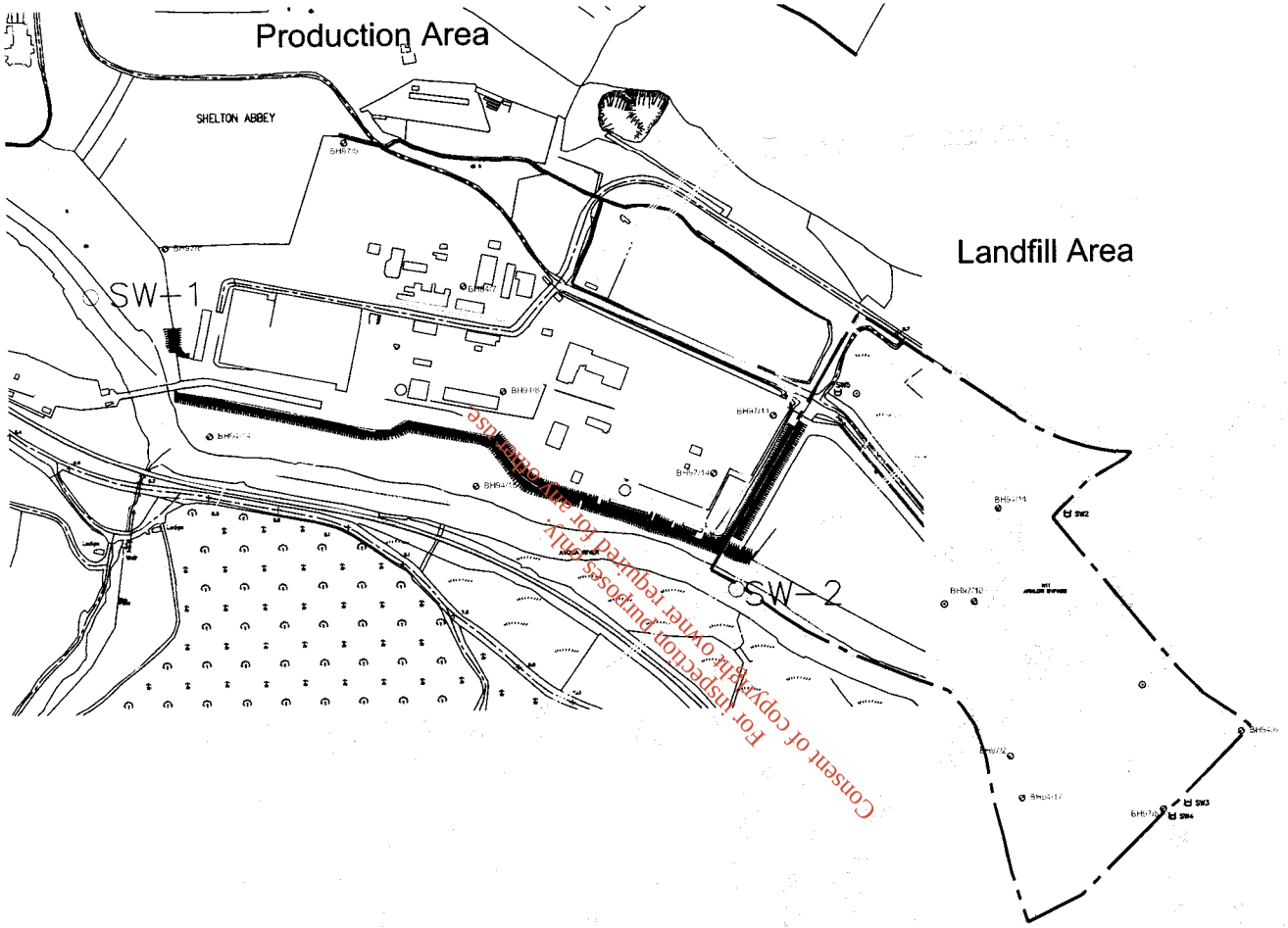



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**Figure 2.1 Site Location**



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CLIENT: PM Group

TITLE: Site Layout

DRAWING No.: 2.2

SCALE: 1:6500 A3

REV.: A

NOTES
- Revised Boundary of Holfield Plastics
- SW-1 Surface Water Monitoring Locations

DOS Filename : *********

Since Holfeld acquired the facility, the final decommissioning of the fertiliser manufacturing area and general site clean-up has been completed. The former bulk storage sheds have been fully refurbished and are now used for plastic product manufacturing.

Earlier studies by IFI had identified known liabilities that have resulted in multiple clean-up projects, these included;

- Decommissioning and removal of production plant
- Hazardous waste disposal
- Refurbishments of bulk storage sheds
- Removal and disposal of asbestos roofing
- Excavation and removal of diesel oil contaminated soils
- Excavation and removal of PCB oil contaminated soils
- General clean-up, reinstatement and landscaping of the site

All remediation projects have been completed and serve to remove all known liabilities from the former production and storage areas.

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***Table 2.1: Materials Used for Activities at the IFI Site***

| Material | Activities | Location | By-Products/Wastes |
|---|---|---|---|
| Amine and coating oils | Coating of calcium ammonium nitrate | Main production area | |
| Ammonia | Manufacture of ammonia | Main production area | Hydrogen sulphide, carbon, carbon dioxide |
| | Ammonia recovery | Fertilizer production area | |
| | Manufacture of ammonium sulphate | Fertilizer production area | Ammonium sulphate wastes |
| | Manufacture of fertilizers | Fertilizer production area | Process condensate containing ammonium nitrate and ammonia |
| Carbon black | Manufacture of carbon black | Carbon black plant | |
| Carbon dioxide | Manufacture of carbon dioxide | Ammonia production plant | |
| | Manufacture of dry ice | Ammonia production plant | |
| China clay | Coating of fertilizers | Fertilizer production area | China clay |
| Heavy fuel oil | Manufacture of ammonia, heating | Main production area, Boilers | |
| Iron pyrites | Manufacture of sulphuric acid | Acid production plant | Iron oxide cinder |



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| Material | Activities | Location | By-Products/Wastes |
|---|---|---|---|
| Limestone /Dolomite | Manufacture of calcium ammonium nitrate | CAN1 granulating and CAN2 prilling plant | Limestone, dolomite |
| Oils (diesel, engine and hydraulic, transformer, compressor) | Various uses | Stored at western end of process area, garage and engineering workshops | PCB wastes, waste oils |
| Phosphate rock (crushed) | Manufacture of phosphoric acid | Phosphoric acid plant | Phosphogypsum |
| Phosphoric acid | Manufacture of phosphoric acid | Phosphoric acid plant | Phosphogypsum |
| | Manufacture of compound fertilizers | Fertilizer production area | |
| Potash | Manufacture of compound fertilizers | Fertilizer production area | |
| Nitric acid | Manufacture of fertilizers | Acid production area | Spent catalysts, filter elements |
| Solvents and cleaning chemicals | Maintenance and cleaning | All areas | Liquid wastes |
| Sulphur | Manufacture of sulphuric acid | Acid production area | |
| Sulphuric acid | Manufacture of ammonium sulphate | | |
| | Manufacture of phosphoric acid | Phosphoric acid plant | Phosphogypsum |
| | Manufacture of calcium ammonium nitrate | Fertilizer production area | |

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## 2.4. Site Investigations

The first site investigations were undertaken in 1994 by ESB International as part of the application for the IPC license. The investigations identified the presence of elevated levels of ammonia, nitrate and sulphate in the subsoil and groundwater.

In 1995 Bord-na-Mona completed a review of the findings of the ESBI investigations, following which more detailed investigations were undertaken by Conestoga-Rovers and Associates (CRA) in 1997. This identified the presence of groundwater contamination (ammonia, sulphate and nitrate) plume and included an assessment of the impacts on the Avoca River.



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In addition to the elevated inorganic parameters, localised hydrocarbon contamination was identified around oil storage areas and polychlorinated biphenyls (PCB) were detected in the subsoils at transformer stations. The hydrocarbons and PCB contaminated soils were removed in the 2006. The report on the 1994, 1995 and 1997 investigations are in the CD in Appendix 1

In 2004, PM completed an Environmental Risk Assessment incorporating a quantitative risk assessment using the Modflow groundwater modelling programme. The modelling predicted rates of attenuation of the nitrate and ammonia plume over a 10 year period. In 2007, the assessment was reviewed and revised to include an assessment of the nitrogen loadings to the Avoca River. Copies of the PM reports are included in Appendix 2

Since 2004, PM has conducted annual groundwater monitoring at the facility, with the results reported to the Agency in the Annual Environmental Report (AER). A copy of the 2010 AER is included in Appendix 2. This AER includes groundwater monitoring data from July 1997 to February 2011.

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## 2.5. Hydrology

The site is on the floodplain of the Avoca River. Surface run-off from the high ground to the north drains to the floodplain and into the river. The poorly draining lands at the margins of the flood plain have been drained to improve the lands locally up and downstream of the site. The Shelton Abbey Canal runs through the site, parallel to the river and enters the Avoca River down stream in Arklow.

## 2.6. Geology and Hydrogeology

OCM established the site geology and hydrogeology from a review of databases maintained by Geological Survey of Ireland (GSI), Teagasc and the reports on the previous site investigations

### *2.6.1. Subsoils*

According to the Teagasc soil maps (Figure 2.3), the majority of the site is covered by made ground. Closer to the river, the subsoils comprise alluvium as would be expected given the location of the site in the floodplain of the river.

The site investigation confirmed the presence of between 1 to 3m of fill comprising topsoil, coarse gravels and cobbles. . Beneath this is a clay layer containing sandy silt with intermittent peat ranging in thickness from 3-7m. The peat is thicker toward the southeastern end of the Production Area and increases in thickness moving further southeast under the Landfill Area.



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The clay and peat is underlain by fine to coarse gravels with occasional large cobbles and bolder, probably indicating the presence of ancient river channels. The gravels range in thickness from 15- 18m and extend in depth to 24m below ground level and comprise an upper, middle and lower zone, separated by thin lenses of poorly permeable clays and silts. The total subsoil thickness ranges from at least 22m beneath the Production Area, to greater than 24m beneath the Landfill Area.

### *2.6.2. Bedrock*

The bedrock beneath the majority of the site comprises Ordovician metasediments primarily dark, grey slate, with minor pale sandstone from the Kilmacrea Formation (Figure 2.4). A small portion of the Production Area is underlain by green, red-purple, buff slate, siltstone from the Oaklands Formation. The bedrock outcrops in the high ground to the north of the site and the bedrock surface slopes from the north to south beneath the river valley.

The bedrock is classified as a Locally Important Aquifer that is productive only in Local Zones (**Ll**) (Figure 2.5). These types of aquifers are generally described as poor aquifer that are only capable of supplying water to individual dwellings or farm holdings and typically are poorly yielding in drier periods of the year.

The GSI Vulnerability Map for Wicklow (Figure 2.6) indicates that the vulnerability of the bedrock aquifer is Low (**L**). However, it is considers that the gravel deposits overlying the bedrock are water bearing and provide bank storage for the Avoca River.

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### *2.6.3. Groundwater Flow Direction*

The groundwater flow direction beneath the Production Area was calculated using water levels data from the on-site monitoring wells (BH-97/10, 94/15, 94/14, 97/2, 94/11, 97/9, 97/6, 94/6, 97/14, 94/7 and 94/8) recorded on June 11th 2010 and the ordnance levels provided in the CRA 1997 Report.

In three of the wells (94/7, 94/14 and 94/15), the groundwater level is much higher (c. 0.4-1.2m) than in the other wells. Two of these wells (94/14 and 94/15) are located along the southern site boundary close to the river with the third well toward the centre of the site further north. The construction logs for these wells indicate the presence of much thicker sequences of silt and clay compared to the other wells. It is considered that high water levels in these wells is a result of increased pressure head levels backing up the groundwater due to more poorly permeable subsoils inhibiting discharge to the river.

The direction of flow, which is shown on Figure 2.7, is generally from north to south, with a possible localised slightly southeast component toward the Avoca River.



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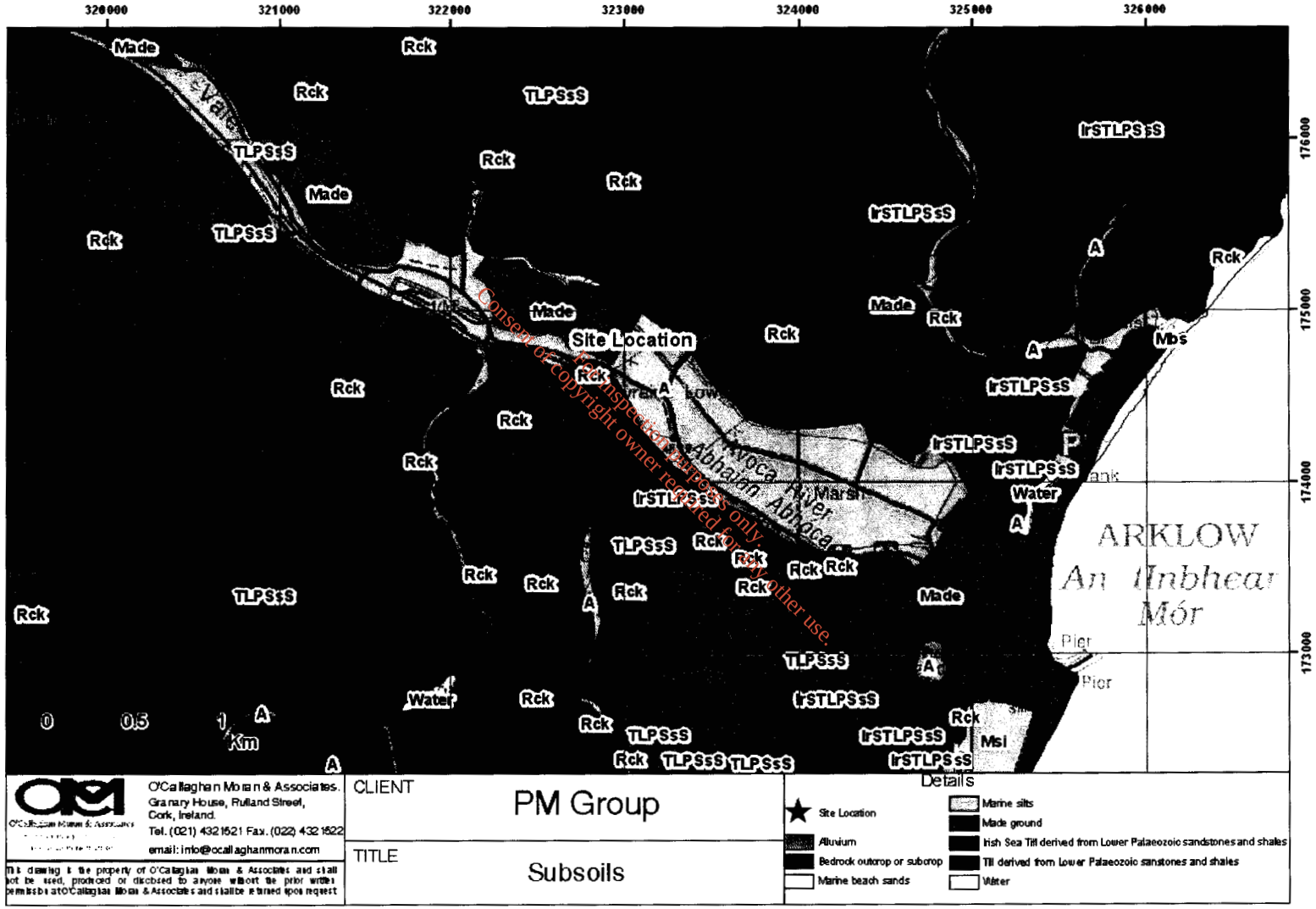
*2.6.4. Nearby Wells*

A search of GSI records did not identify any wells within 500m of the site. The closest known wells are at Shelton Abbey and are 750 northwest and up hydraulic gradient of the site.

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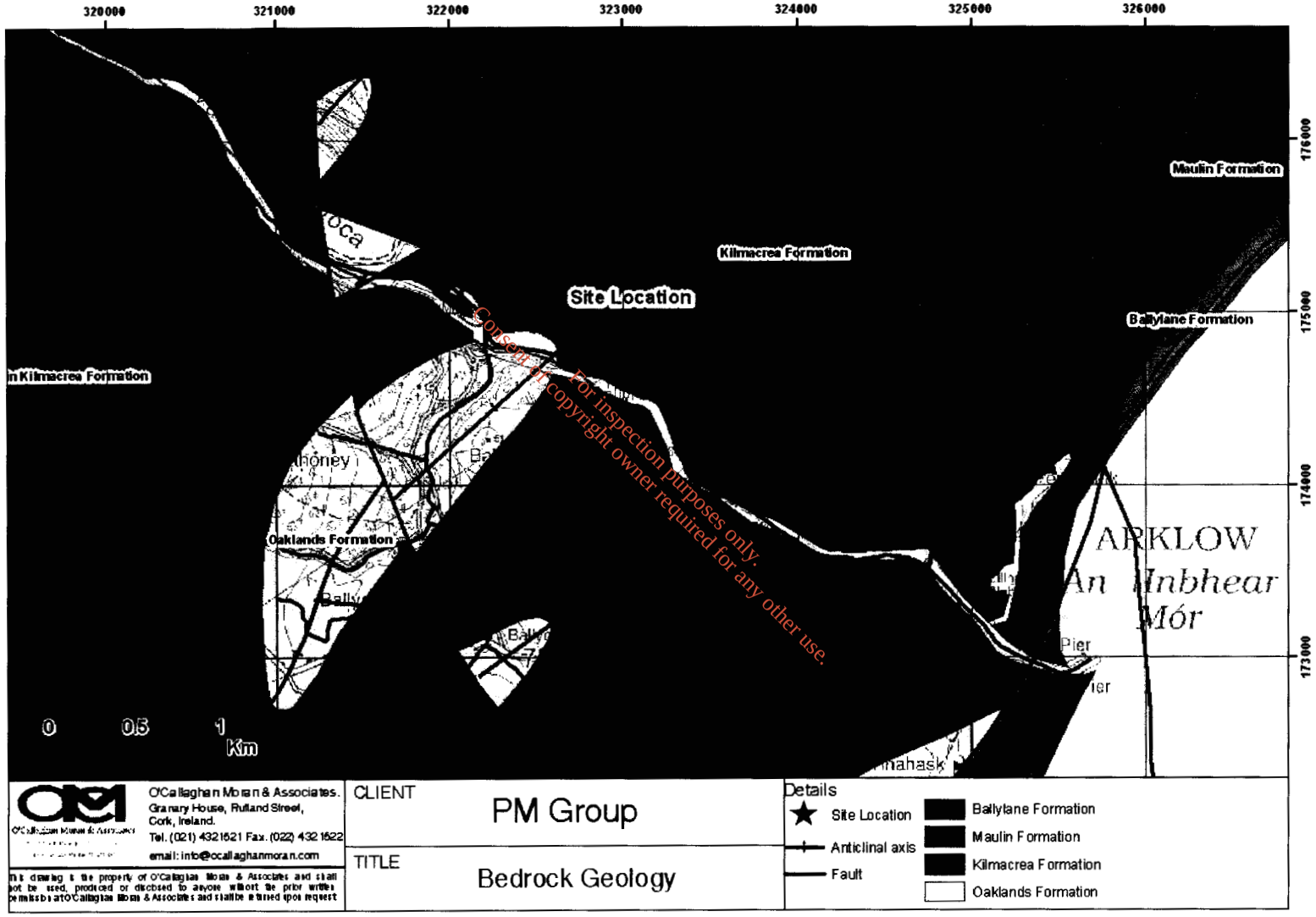



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**Figure 2.3 Subsoils**



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**Figure 2.4 Bedrock Geology**



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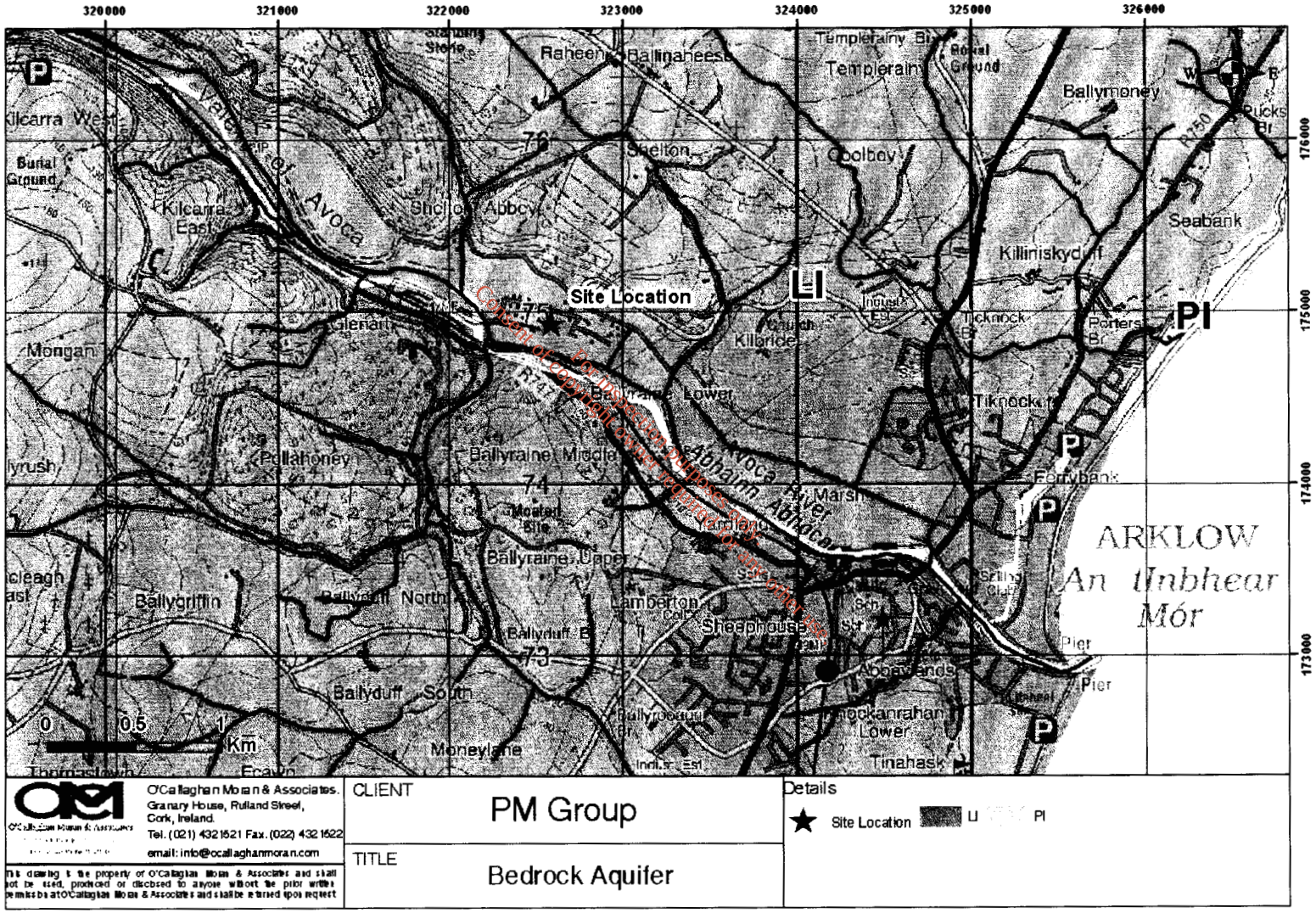
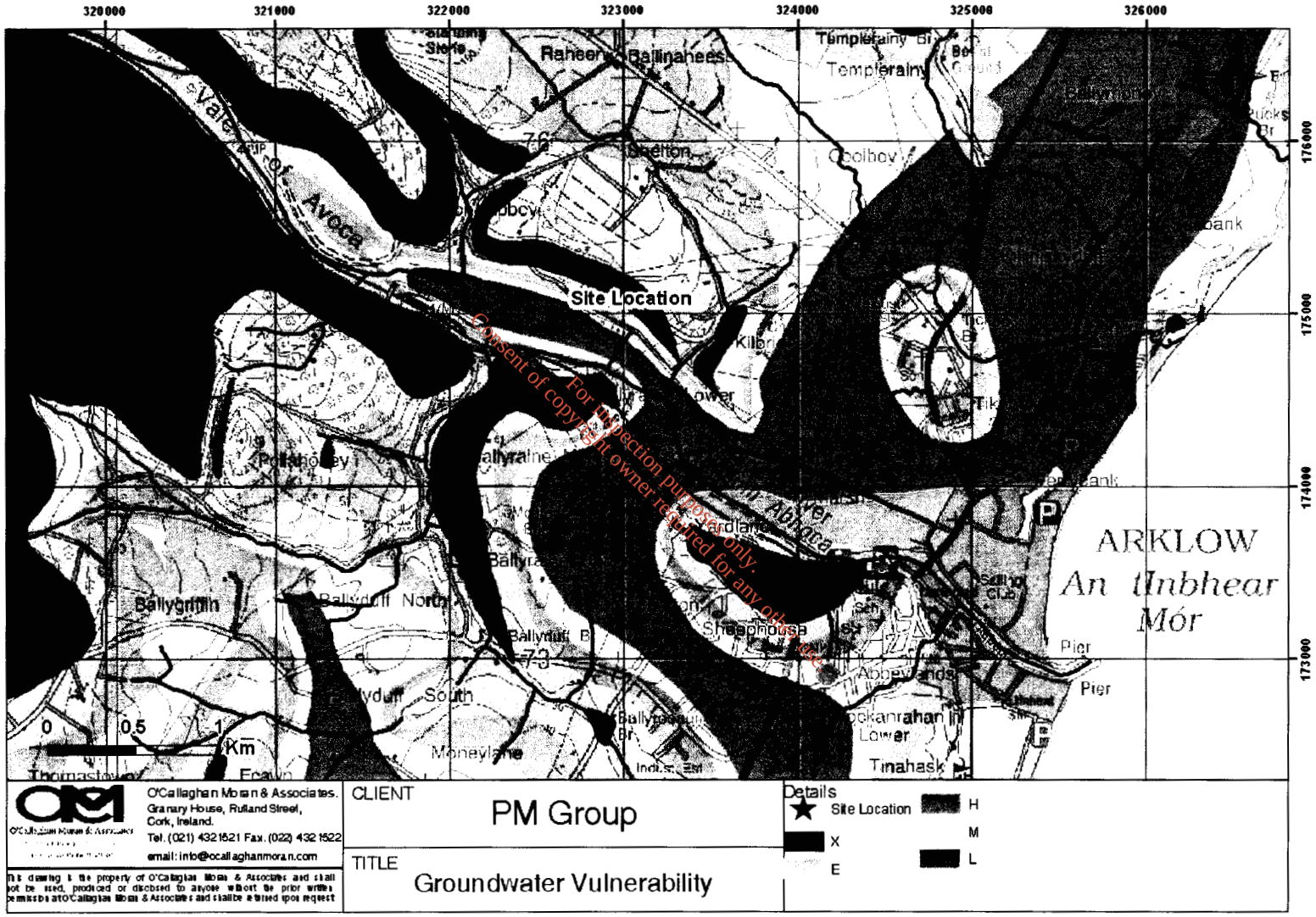



**Figure 2.5 Bedrock Aquifer**



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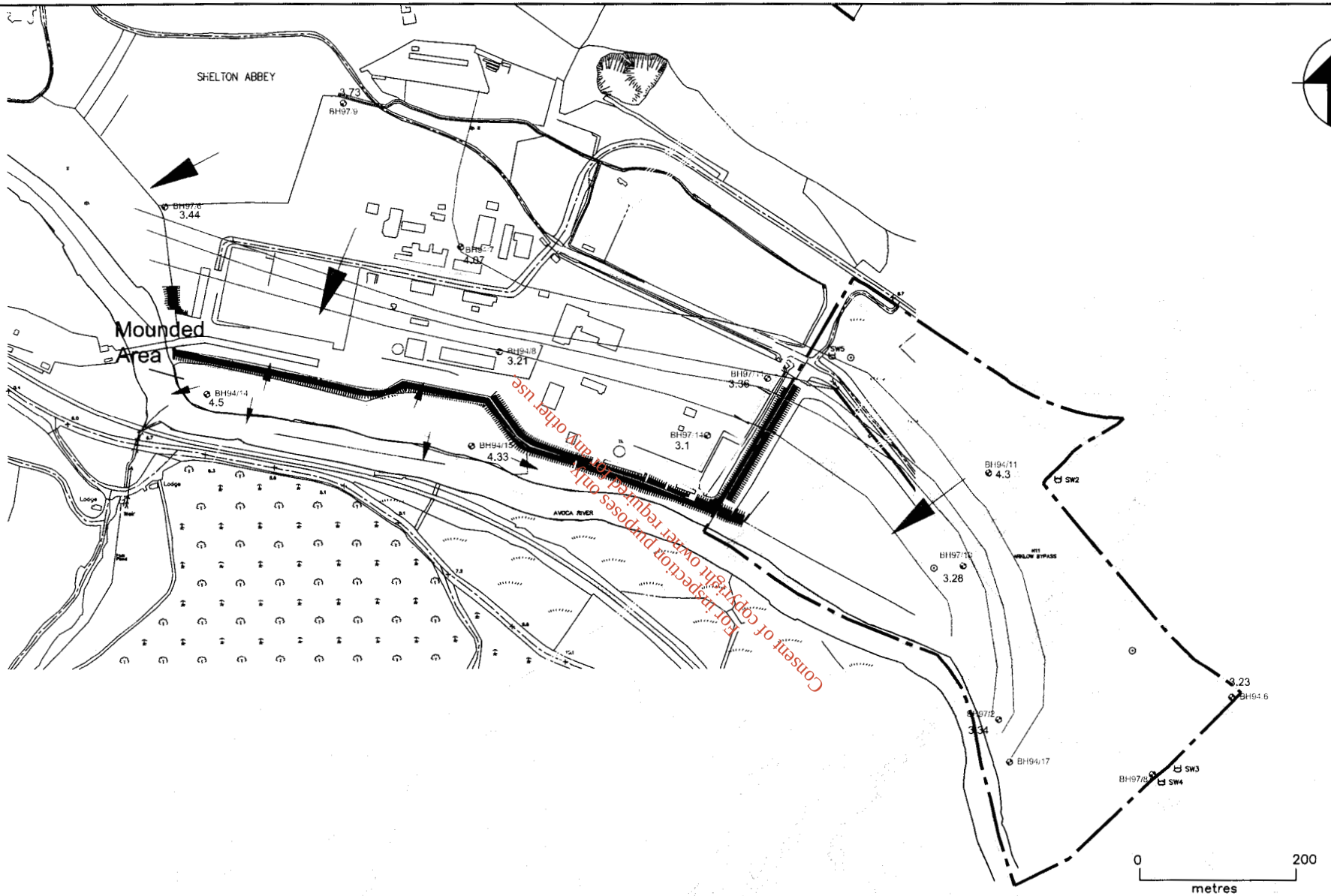

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**Figure 2.6 Aquifer Vulnerability**



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CLIENT: PM Group

DRAWING No.: 2.7

TITLE: Groundwater Flow Direction

SCALE: 1:5,000 A3

REV.: A

NOTES
- Groundwater Flow Direction
- Groundwater Contour
- River Channel
- Revised Boundary of Holfield Plastics

DOS Filename : *********

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# 3. CONCEPTUAL SITE MODEL

A Conceptual Site Model (CSM) was developed based on the findings of the various site investigations undertaken at the site between 1994 and 1997 and the site inspection undertaken by OCM in May 2011. This is shown on Figure 3.1.

This is based primarily on a long section, running west to east across the Production Area and was updated to reflect OCMs interpretation of the site hydrogeological information.

Most of the Production Area is covered by either, buildings, roads, tarmacadam, gravel hard core or asphalt paved former fertiliser storage areas. A small portion of the site along the river is landscaped with coniferous forestry and grassland.

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The upper 1-3m of subsoils comprises topsoil, coarse gravels and cobbles. Beneath the fill, is a layer of silt/clay with peat along the southeast section, which increases in lateral and vertical thickness beneath the landfill area. The silt/clay layer ranges in thickness from 4 to 7 m moving from northwest to south east, but the layer is interspersed with gravel lenses toward the middle of the site. The silt/clay layer is underlain by a sequence of gravels with interspersed clay lenses which are up to 15m thick.

CSA delineated an upper, middle and lower gravel zone separated by thin extensive but discontinuous lenses of clay. Because these clay lenses are not continuous, there is some hydraulic connectivity between the gravel layers. Within the gravel layers, grain sizes range from fine to coarse, with occasionally very large cobbles and boulders. The underlying bedrock is classified as a Poor Aquifer with limited vertical groundwater movement.

Direct infiltration to the subsoils is limited to the small hard core covered or landscaped areas. It is possible the original construction of the fertiliser plant involved either piling through the silt/clay layers or excavation of the clay down to the gravels to foundation formation levels. This could have opened pathways from the ground surface through the silt/clay and into the gravels

The monitoring wells are exclusively screened in the gravel zones. The water levels recorded in June 2010 are all above the top of the gravel on average between 1.5 and 3m below ground level and c. 3-4.5m above the top of the upper gravel zone. The water levels indicate that the silt/clay layer is acting a confining layer above the gravel zone



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The ground water in the gravels is semi-confined, with some leakage between the upper, middle and lower gravel zones. This is based on CRA report of higher concentrations of contamination in the upper gravel zone with decreasing amounts in the lower gravel zones.

Much of the groundwater throughput originates in the high ground to the north of the site. In 1997, CSA considered that groundwater movement beneath the Production Area was to the west, south and southeast from a high point beneath the Production Area. They indicated a hydraulic gradient ranging form 0.05 -0.5% beneath the Production area, with a much shallower gradient beneath the Landfill Area.

The average hydraulic conductivity for the gravels was estimated at 35m/day, with an aquifer flow velocity of between 0.09 and 0.9m assuming a porosity of 20%. They also concluded that the fastest flow velocities occurred in the northwest of the Production Area, while the slowest flow velocities occur in the east.

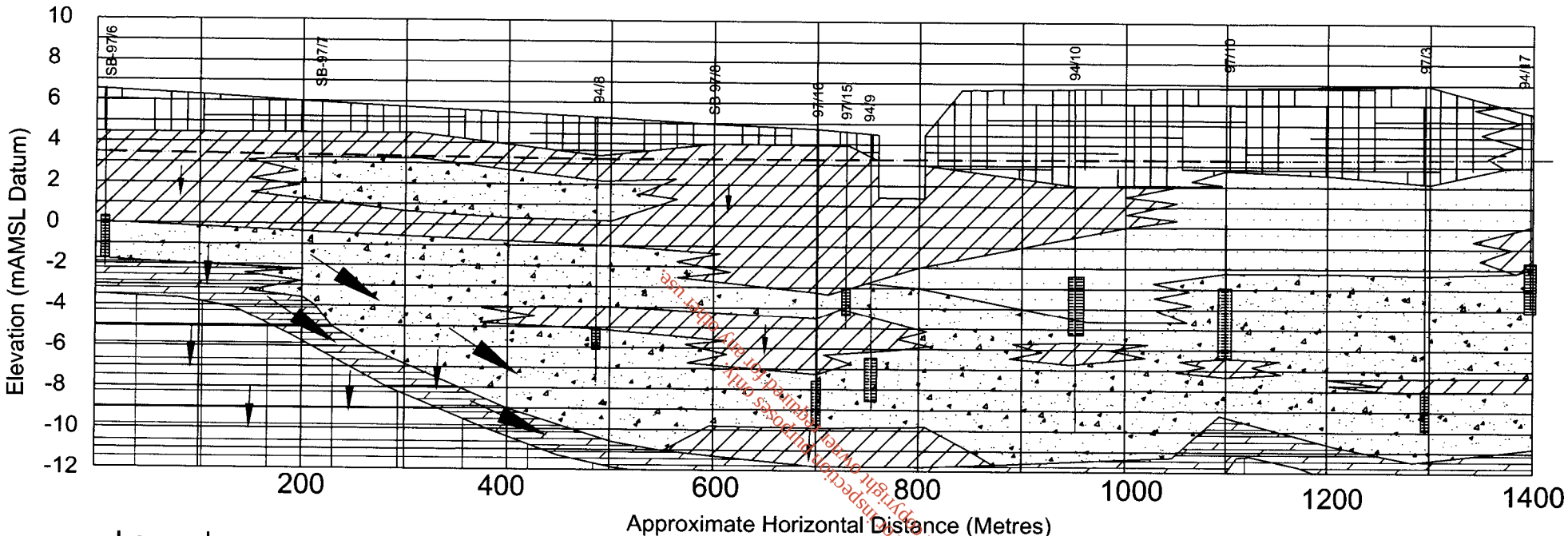
The 2010 groundwater level data also indicates mounding or increased hydraulic head in the central and southern part of the Production Area with a gradient indicating flow to the east and west from the this mound area. Over the remainder of the site, the flow is from the northwest to the southeast toward the river.

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# Conceptual Site Model




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## Legend

- Fill Material
- Clays and Silt
- Peat and Organic-Rich Sediments
- Gravel and Sand
- Weathered Bedrock
- Bedrock
- Groundwater Piezometric Surface on 11 June 2011
- Assumed Direction of Groundwater Flow
- 97/16 — Well Designation
- SB-97/7 — Boring Designation
- Boring or Monitoring Well Screened Interval

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| CLIENT | DRAWING No. | NOTES |
|---|---|---|
| PM Group | 3.1 | |
| TITLE: Conceptual Site Model | SCALE: 1: A3 / REV.: A | |

DOS Filename : *********

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# 4. ENVIRONMENTAL RISK ASSESSMENT

This assessment focuses on the groundwater quality beneath the Production Area and the surface water quality in the Avoca River, which is the closest sensitive off-site receptor for groundwater movement from the site.

## 4.1. Contaminant Sources

The primary contaminant sources included the handling and storage of the compounds used in the fertiliser manufacture (anhydrite, ammonia, dolomite and gypsum); oil storage, and PCB containing electrical equipment. The oil and PCB contaminated subsoils were removed from the site in 2006, which eliminated this source. All fertiliser manufacturing compounds and finished product were removed from the site during the decommissioning process, thereby eliminating this primary source.

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## 4.2. PM 2004/2007 Risk assessment

The assessment modelled the decline in the concentrations of ammonia and nitrate in the groundwater due to natural attenuation over a 10 year period. PM also completed an assessment of the nitrogen and ammonia loading to the Avoca River and the potential risk posed to the aquatic resources downstream.

### *4.2.1. Groundwater Model Inputs*

The predictive model used to calculate the predicted concentrations of ammonia and nitrate over time was the United States Geological Survey modelling Engine MODFLOW. This model requires a range of hydrological, hydrogeological and meteorological input criteria. Some of the criteria applied were site specific, based on data obtained from the site investigations, while others where based on desk study information. These are summarised in Table 4.1



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***Table 4.1:** Initial Model Inputs*

| Parameter | Value* | Range (from texts) |
|---|---|---|
| SS (specific storage) | $1 \times 10^{-5}$ $m^{-1}$ | N/A |
| Sy (specific yield) | 0.2 | 0.12 to 0.35 |
| Total Porosity | 0.3 | 0.25 to 0.4 |
| Effective Porosity | 0.15 | 0.13 to 0.2 |
| Recharge | 1000 mm/yr | N/A |
| Evapotranspiration | No data available | N/A |
| K (layer 1) | K=0.0001 m/s (from ESB/CRA reports) | N/A |
| K (layer 2) | K=0.00042 m/s (from ESB/CRA reports) | 0.01 to 0.0001 |

* Values used were based on model defaults, unless otherwise stated.

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No value was entered for evapotranspiration, presumably as most of the Production Area is covered by paving and evapotranspiration is not significant.

The hydraulic conductivity (K) was assigned for the upper fill zone and the lower gravel zone. While the gravels comprise three units separated by partially confining silt and clay layers, the layers are not continuous and the assumption of treating them as a single unit is conservative. This may however affect the model predictions in those parts of the site underlain by greater thicknesses of peat or clay, for example the southern/south eastern section of the Production Area.

A Recharge Value of 1000mm/yr was applied. The main parameters involved in recharge rate estimation are annual rainfall, annual evapotranspiration and annual run-off. Since it was decided that evapotranspiration was negligible, the total potential recharge is assumed to infiltrate to the groundwater system.

This is an over estimate of the amount of recharge. Best practice guidance was developed by the Irish Groundwater Working Group (2005), as part of the implementation of the Water Framework Directive 2000 to assess the level of recharge through a range of different soil types in Ireland, indicates that for gravels the maximum amount of recharge that would occur is 90% of the Potential Recharge.

The inputs are considered to be within acceptable ranges and are generally conservative.



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*4.2.2. Predicted Ammonia Levels*

Table 4.2 is from the 2007 PM Report and shows the maximum predicted concentration of ammonia in the groundwater beneath the site over a 10 year period, starting in 2007.

**Table 4.2 Maximum Ammonia Concentrations 2007 - 2017**

| Time Period | Maximum Predicted Concentration (mg/l)* | Cumulative Reduction (%) |
|---|---|---|
| Today (Day 1) | 467 | |
| 6 Months | 286 | 38.8 |
| 1 Year | 239 | 48.8 |
| 2 Years | 133 | 71.5 |
| 3 Years | 92 | 80.3 |
| 5 Years | 19 | 95.9 |
| 7 Years | 6 | 98.7 |
| 10 Years | 1 | 99.8 |

*These values have been extrapolated from contour plots

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The model predicts that by 2010, the concentration of ammonia in any of the on-site groundwater wells should not exceed 92mg/l.

*4.2.3. Predicted Nitrate Levels*

Table 4.3 shows the maximum predicted concentration of ammonia in the groundwater beneath the site over a 10 year period, starting in 2007.



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**Table 4.3 Maximum Nitrate Concentrations 2007 – 2017**

| Time Period | Maximum Predicted Concentration (mg/l) | Cumulative Reduction (%) |
|---|---|---|
| Today (Day 1) | 1181 | |
| 6 Months | 718 | 39.2 |
| 1 Year | 571 | 51.7 |
| 2 Years | 369 | 68.8 |
| 3 Years | 231 | 80.4 |
| 5 Years | 105 | 91.1 |
| 7 Years | 50 | 95.8 |
| 10 Years | 14 | 98.8 |

The model predicted that the concentration of nitrate in any of the groundwater wells on site by 2010 should not exceed 231mg/l.

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*4.2.4. Real Time Data*

The ammonia and nitrate levels recorded in the annual groundwater monitoring conducted in the 12 on-site monitoring wells are presented in Tables 4.4 and 4.5, which includes data from July 1997 to February 2011. It was not possible to collect a sample from well 94/14 in 2010 as it was blocked during the monitoring event. OCM unblocked and sampled this well in June 2011.

With the exception of monitoring wells 94/14 (272mg/l) and 94/15 (220mg/l) located in the southwest and south east sections of the Production Area respectively, just before the Avoca River, all ammonia levels were below the predicted model outputs.

In the case of nitrate, with the exception of monitoring well 94/15, the levels in all wells in the Production Area show nitrate levels below the predicted model values.



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Table 4.4
Groundwater Analytical results for **Ammoniacal Nitrogen** (mg/l) Results
July 97 to February 2011

| Borehole Number | Jul-97 | Jan-98 | Aug-98 | Mar-99 | Sep-99 | Apr-00 | Sep-00 | Mar-01 | Sep-01 | Feb-02 | Sep-02 | Mar-03 | Sep-03 | Feb-04 | Sep-04 | Jun-06 | Mar-07 | Nov-07 | EPA Mar 08 | Nov-08 | EPA Jun - 09 | Oct-09 | Jun-10 | Aug-10 | Feb-11 | Jun-11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 97/2 | 6.0 | 0.8 | 4.4 | 4.4 | 2.8 | 4.7 | 4.8 | 13.2 | 11 | 10 | 8.9 | 18 | 27 | 26 | 7 | <0.1 | 20 | 90 | 2.4 | 21 | 28 | 50 | 39 | 26 | 24 | |
| 97/6 | 0.7 | 1.4 | 1.0 | 2.6 | 1.2 | 0.4 | 0.1 | 4 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 | 0.09 | 0.1 | | 0 | | <0.1 | <0.1 | | 0.12 | |
| 97/9 | 0.2 | | | | | | <0.1 | <0.1 | | | | | <0.1 | | <0.09 | <0.1 | 0.6 | 0.1 | | 0 | | <0.1 | <0.1 | | <0.1 | |
| 97/10 | 116.0 | 44.8 | 34.0 | 41.7 | 33.5 | 30.7 | 29.8 | 38.5 | 37 | 39 | 26 | 37 | 25 | 17 | 18 | 8 | 16 | 9.5 | | 10 | | 11 | 9.3 | | 8.7 | |
| 97/11 | 0.4 | | | | | | 0.9 | | | | | | 0.1 | | | | | 0.16 | | 0.3 | | 0.57 | 0.39 | | 0.37 | |
| 97/14 | 507.0 | | | | | | 328 | | | | | | 487 | | | 55 | 237 | 7.2 | | 4.3 | | 5.6 | 5.6 | | 4.7 | |
| 94/6 | 1.9 | 1.7 | 1.7 | 0.9 | 1.7 | 1.6 | <0.1 | 1.6 | 1.3 | 1.8 | 0.8 | 1 | 3.5 | 1 | 9 | 1 | 1.4 | 1.2 | | 1.4 | | 1.2 | 1.5 | | 1.4 | |
| 94/7 | 321.0 | | | | | | 140 | | | | | | 73 | | | 22 | 58 | 49 | | 42 | | 50 | 33 | | 44 | |
| 94/8 | 437.0 | | | | | | 156 | | | | | | 262 | | | 3.7 | | | | 79 | | 102 | 91 | | 89 | |
| 94/11 | 1.9 | | | | | | <0.1 | | | | | | 0.2 | | | | | | | / | | | | | | |
| 94/14 | 824.0 | 620.0 | 154.0 | 2.1 | 589 | 561 | 580 | 497 | 632 | 438 | 574 | 335 | 0.1 | 59 | 249 | 283 | 365 | 0.1 | 324 | 278 | 339 | 186 | | | | 272 |
| 94/15 | 4230.0 | 3210.0 | 4600.0 | 4209.0 | 3420 | 3274 | 2544 | 2690 | 3140 | 639 | 516 | 42 | 2280 | 96 | 418 | 218 | 391 | 320 | 310 | 285 | 295 | 304 | 242 | 234 | 220 | |

Figures in Red represent EPA monitoring carried out

NR = No Result

mg/l = Milligrams per litre

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Table 4.5
Groundwater Analytical Results for **Nitrate** (mg/l)
July 97 to February 2011

| Borehole Number | Jul-97 | Jan-98 | Aug-98 | Mar-99 | Sep-99 | Apr-00 | Sep-00 | Mar-01 | Sep-01 | Feb-02 | Sep-02 | Mar-03 | Sep-03 | Feb-04 | Sep-04 | Jun-06 | Mar-07 | Nov-07 | EPA Mar 08 | Nov-08 | EPA Jun 09 | Oct-09 | Jun-10 | Aug-10 | Feb-11 | Jun-11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 97/2 | 43 | 44 | 48 | 183 | 69 | 87 | 84 | 74 | 82 | 61 | 85 | 75 | 61 | 55 | 29 | 3 | 17 | 0.8 | 25 | 17 | 25 | 1 | 0.6 | 28 | 19 | |
| 97/6 | 6 | 25 | 23 | 17 | <1 | 7 | 2 | 12 | 9 | 6.5 | 12 | 6 | 12 | 9 | 22 | 28 | 2 | 11 | | 11 | | 2 | 9 | | 4 | |
| 97/9 | 99 | | | | | | 59 | 81 | | | | | 60 | | 48 | 35 | 39 | 35 | | 31 | | 33 | 33 | | 32 | |
| 97/10 | 1 | <5 | <1 | <1 | 36 | 2.4 | 1 | <0.5 | <0.5 | <0.5 | <0.5 | 0.6 | <0.5 | <0.5 | 0.68 | <0.5 | 0.5 | 0.5 | | 0.5 | | 1 | <0.5 | | <0.5 | |
| 97/11 | 14 | | | | | | <0.5 | | | | | | 0.6 | | | | | 0.5 | | 0.5 | | 1 | <0.5 | | <0.5 | |
| 97/14 | 86 | | | | | | 96 | | | | | | 101 | | | 108 | 41 | 88 | | 73 | | 77 | 50 | | 62 | |
| 94/6 | <1 | <5 | <1 | 7 | <1 | 2.9 | 6 | 1 | <0.5 | <0.5 | <0.5 | 0.8 | 0.6 | <0.5 | 0.69 | <0.5 | 0.5 | 0.5 | | 0.5 | | 1 | 0.6 | | <0.5 | |
| 94/7 | 929 | | | | | | 312 | | | | | | 242 | | | 101 | 186 | 196 | | 133 | | 66 | 46 | | 22 | |
| 94/8 | 1281 | | | | | | 403 | | | | | | 298 | | | 47 | | | | 140 | | 88 | 85 | | 54 | |
| 94/11 | 2 | | | | | | 4 | | | | | | 5 | | | | | | | | | | | | | |
| 94/14 | 1803 | 1004 | 1700 | 1270 | 1470 | 625 | 1815 | 1137 | 836 | 1244 | 1016 | 1033 | 0.6 | 236 | 660 | 258 | 597 | 319 | 416 | 270 | 338 | 104 | | | | 85.6 |
| 94/15 | / | 7830 | 13120 | 9675 | 4685 | 7035 | 6348 | 5733 | 6049 | 1428 | 1739 | 123 | 3606 | 3033 | 1529 | 556 | 816 | 612 | 576 | 506 | 530 | 524 | 455 | 386 | 349 | |

Figures in Red represent EPA monitoring carried out

NR = No Result

mg/l = Milligrams per litre

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*4.2.5. OCM Assessment*

The PM model predicts that within 10 years i.e. by 2017 there will have been a 99.8% reduction in ammonia and a 98.8% reduction in nitrate in the groundwater beneath the site as a result of natural attenuation.

The monitoring has confirmed that, in general, the decline predicted by the model has occurred. The actual concentrations of ammonia recorded in February 2011 are lower than predicted values for this year in all but two wells (94/14 and 94/15) and for nitrate the predicted level is only exceeded in one well (94/15).

There are up to 6m of clays and silts above the gravels at monitoring wells 94/14 and 94/15. Figure 4.1 shows a north south cross section compiled by CRA in 1997 across the production area indicating the presence of very thick clays in the vicinity of 94/15 just north of the river.

The 2010 groundwater level data shows that the water level in 94/14 and 94/15 is c.1-1.2m higher than the wells immediately to the north (97/6, 94/6, 97/11). This indicates that the water table in the vicinity of these wells is at least partially confined and that there is limited hydraulic connection with the Avoca River in this area.

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The reduction of ammonia levels in groundwater is a primarily linked to the oxygen concentration, which controls the rate of transformation to nitrate. It is likely that the oxygen levels in the groundwater at wells 94/14 and 94/15 are lower than elsewhere across the site due to the presence of larger amounts of clay/silt and the reduction in flow rates to the river. Dissolved oxygen levels in 94/14 measured in June 2011 were only 5mg/l.

Such conditions will affect the rate of the natural attenuation of the ammonia, by conversion to nitrate, with consequent affects on the reduction of the nitrate level. The reduction of ammonia is primarily a function of dilution as generally it is not susceptible to significant transformation by chemical or biochemical reactions.

Therefore, it is considered that the elevated levels of ammonia in wells 94/14 and 94/15 and nitrate in well 94/25 is a function of the nature of the subsoils at these locations and, as such, are not inconsistent with the model predictions

It is noted that the model predicts a maximum nitrate concentration of 14mg/l after 10 years. While values lower than this have already been recorded in some of the monitoring wells, it is possible nitrate values will not decline to this level across the entire site, if the nitrate levels in the groundwater entering the site from up hydraulic off-site source areas are high. This is particularly relevant where farming activities are likely to be the predominant activity in the catchments up hydraulic gradient of the site to the north.



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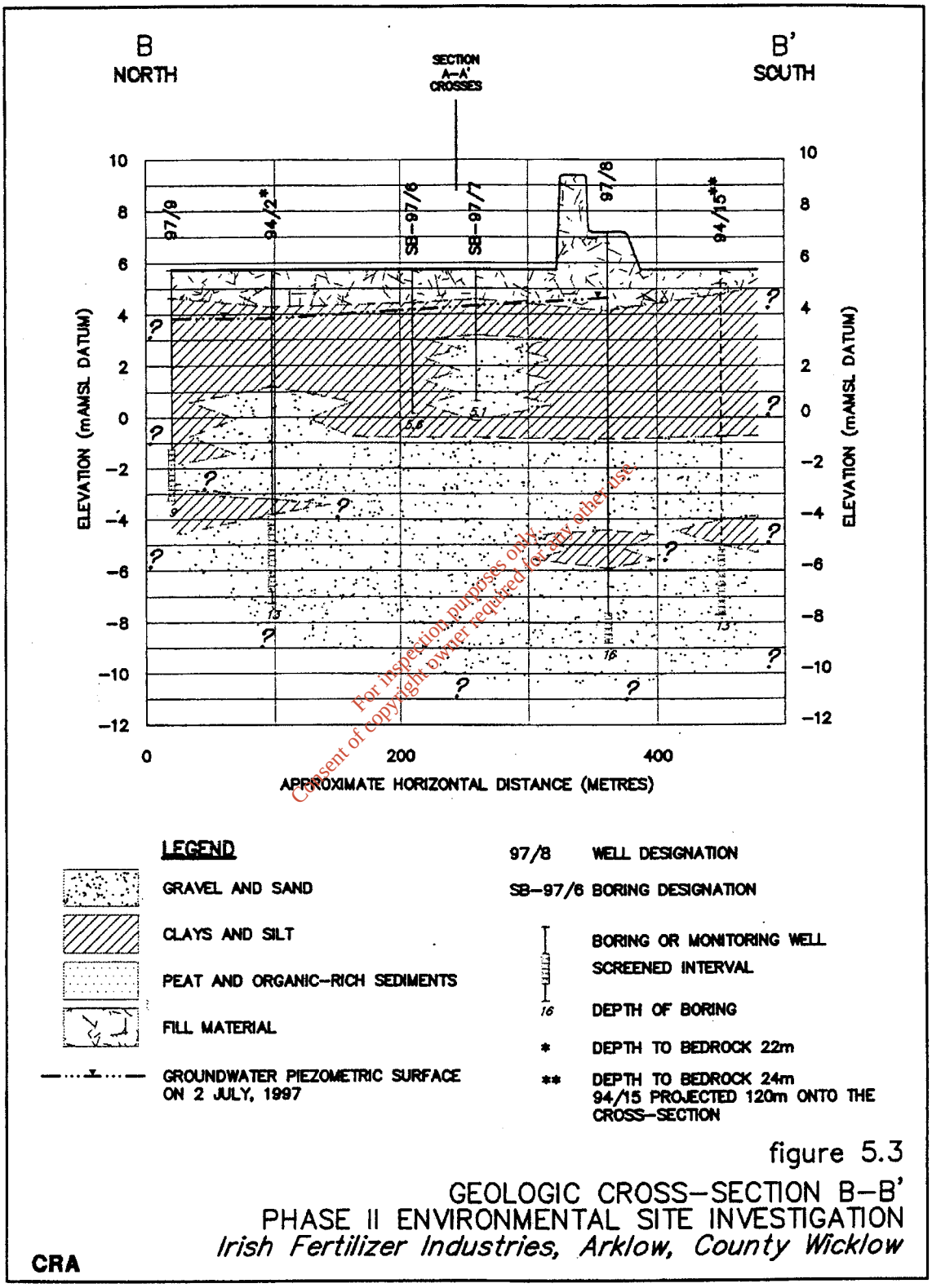
However, in general terms the monitoring results do show a trend of declining ammonia and nitrate concentrations over time even in monitoring wells 94/14 and 94/15 which indicates that natural attenuation is occurring across the site.

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**Figure 4.1 North to South Cross Section through the Production Area**




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## 4.3. Nitrogen Loading Study and Risk Assessment

In the revised 2007 Report, PM assessed the ammonia and nitrogen loading to the river associate with groundwater discharge. This was done using a groundwater and contaminant flux model to calculate the volume of groundwater reaching the river and the associated ammonia and nitrate load (kg/day) and contaminant flux ($m^3$/day).

The flux equation used was:

$$Contaminant\ Flux = K \times \frac{gwl_1 - gwl_2}{d} \times ws \times at \times conc$$

This is a standard equation applied for the calculation of contaminant flux and the following data obtained from the 1997 investigations were used:

The hydraulic conductivity value (k) was from the test results for the well closest to the river which was the highest value in the range of testing deemed reliable. This a conservative approach and most likely overestimates the contaminant flux, as it ignores the lower conductivity in areas where the subsoils comprises, silts, clays and gravels.

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Aquifer Thickness (at) is the thickness of the entire gravel sequence, excluding silt and clay layers. It does not take into consideration groundwater flow in the weathered parts of the top of the bedrock aquifer. It was also assumed that the concentration of the contaminants in the aquifer unit was constant throughout, whereas the 1997 study indicated that the highest levels occur in the upper gravel zone, with very little contamination at depth. This again is a conservative and more than likely overestimates the contaminant flux to the river.

The hydraulic Gradient (gwl1-gwl2/d) is the gradient between the river and the nearest well used to provide the hydraulic conductivity and was more than 1 metre. This indicated a gradient of almost 0.05%, which PM did not consider realistic because the water in the gravels, particularly along the river, is semi-confined by a clay/silt layer. It is also possible that alluvium in the river bed restricts the flow of groundwater from the gravels to the river.

A gradient of 0.05 would over estimate the groundwater flux to the river. As an alternative, PM calculated the gradient based on the average groundwater gradient of the wells in the gravels across the site calculated at 0.001. This is on the basis that the groundwater flow in the aquifer will be equal to the groundwater discharge to the river when in equilibrium. This assumption does not take account of lower permeability conditions for example due to thick clays along the river at 94/14 and 94/15. But given the very flat topography of the site and the location of the site in the floodplain, the gradient used by PM reflects the actual position. Because of the above assumptions OCM considers that the flux model as applied is generally conservative.



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*4.3.1. Risk Assessment for Ammonia Toxicity*

The ammonia loading to the river from the groundwater was estimated at 118kg/day based on the use of groundwater concentrations monitored in 2007. Applying the relevant dilution factors gave a total ammonia (as N) concentration ranging from 1.38 – 0.09mg/l at low and average flows in the river.

However as indicated in the PM Risk Assessment, it is un-ionised ammonia and not total ammonia that is toxic to aquatic species. Assuming a pH of 7.4 and a temperature of 25C, it was estimated that only 1.4% of the total ammonia is un-ionised, which equates to between 0.019 and 0.001mg/l at the low and average flow rates.

The risk assessment indicated that acute toxicity (48 hour or less exposure duration) to invertebrates occurs at between 0.53 to 22.8mg/l of un-ionised ammonia. It was concluded that aquatic species and in particular fish, which are most sensitive to ammonia toxicity, were not at risk from the groundwater discharge'

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*4.3.2. Risk Assessment for Oxygen Depletion from Ammonia*

The first element of risk assessed by PM was oxygen depletion in the Avoca River. Because ammonia is oxidised to nitrate in the presence of oxygen, it has the potential to reduce the dissolved oxygen level in the river. PM concluded that the risk of oxygen depletion associated with ammonia in the groundwater was insignificant.

The concentrations of ammonia and associated Nitrous Biochemical Oxygen Demand (NBOD) predicted by PM are shown on Table 4.6.

Table 4.6

| River Flow | Total Ammonia Concentrations (mg/l) | NBOD Concentrations (mg/l of $O_2$) |
|---|---|---|
| Low | 1.38 | 6.31 |
| 95%ile | 0.70 | 3.20 |
| Average | 0.09 | 0.41 |



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*4.3.3. OCM Surface Water Monitoring Programme 2011-06-30*

OCM monitored surface water quality in the Avoca River at three locations in June 2011 to identify any impact on the water quality and to support the PM Risk Assessment findings.

The monitoring locations are illustrated on Figure 2.2. SW-1 is upstream of the entire site. SW-2 is downstream of the Production Area, while SW-3 is downstream of the entire site.

Prior to the collection of the samples, field parameters, including pH, electrical conductivity and temperature were taken. The field monitoring results are shown on Table 4.7.

**Table 4.7 Surface Water Field Parameters**

| Location | Date | pH | Electrical Conductivity | Temperature |
|---|---|---|---|---|
| SW-1 Upstream | 20/06/2011 | 8.57 | 92 | 14.2 |
| SW-2 Mid stream | 20/06/2011 | 8.61 | 102 | 14.4 |
| SW-3 Downstream | 20/06/2011 | 8.47 | 79 | 14.4 |

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The samples were collected in accordance with OCM Surface Water Sampling Protocol, a copy of which is included in Appendix 3. All the samples were placed in laboratory prepared containers and stored in coolers to maintain sample temperature at approximately 4°C. Chain of custody (COC) documentation was completed and accompanied the samples to the Jones Environmental Forensics Ltd, a UKAS accredited laboratory for the analysed parameters. The laboratory method detection limits were below the comparative standards used for the assessment of the sediments and water samples.

The monitoring results are presented in Table 4.8, which includes for comparative purposes, the 2009 Surface Water Environmental Quality Standards (EQS) specified by the EPA. The full laboratory results are included in Appendix 4.

**Table 4.8 Surface Water Quality Results**

| Parameter | SW-1 | SW-2 | SW-3 | EQS |
|---|---|---|---|---|
| **Sulphate** mg/l | 7.90 | 8.21 | 8.24 | |
| **Nitrate as $NO_3$** mg/l | 3.1 | 2.8 | 2.6 | |
| **Total Ammonia as $NH_3$ mg/l & $NH_4$** | | | | |
| **UN-Ionised Ammonia (calculated)** | 0.0011 | 0.0025 | 0.0025 | |
| **COD mg/l** | 12 | 12 | 13 | |
| **Dissolved Oxygen mg/l** | 10 | 10 | 10 | |

NAC denotes No Abnormal Change



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* denotes mean threshold level for good status river water body

The nitrate and sulphate levels are significantly lower than the EQS, with no significant difference between the sample locations. The dissolved oxygen and COD are indicative of good water quality.

The ammonia ($NH_3$) concentrations are elevated upstream and downstream of the facility and exceed the EQS at all three sample locations. However there is a slight increase in levels downstream of the Production Area. The ammonia in the groundwater appears to be contributing to the increase in levels in the river downstream of the site.

Following consultation with the analytical laboratory an assessment of the proportion of the ammonia that is un-ionised was made based on the following conversation data provided by the laboratory.

Jones Analytical Laboratory indicate that the ammonium ion is largely predominant at neutral or slightly basic pH: the ratio of the ammonium to the ammonia concentration is equal to 100:1 at a pH of 7.4 and a temperature of 20°C.

Based on the likely percentage of un-ionised ammonia as indicated on Table 4.7 it is unlikely that the un-ionised ammonia concentrations downstream of the Production Area are affecting the river ecosystems.

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*4.3.4. Risk of Impact from Nitrate on Aquatic Biota*

Because the most sensitive aquatic species are fish, the PM assessment was based on nitrate levels that are toxic to fish. The nitrate flux loading calculation it was estimated that the daily nitrate loading as N from groundwater was 59kg/day.

Allowing for dilution, the concentration of nitrate (as N) was calculated as 0.69mg/l for low flow and 0.04mg/l for the 95%ile flow. Toxic effects on fish are not noted until nitrate concentrations exceed 1000mg/l. Therefore it was assumed that the risk posed by nitrate to aquatic species sensitive to nitrate was low. The recent surface water monitoring results confirm the low levels of nitrate in the river downstream of the Production Area.

*4.3.4.1. Risk of Eutrophication*

PM deemed the risk of eutrophication, as low as the primary driver for this process is excess phosphorous and not nitrate. For this reason the risk posed was considered to be insignificant.



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#### 4.3.4.2. *Risk to Shelton Abbey Groundwater Wells*

There was and remains no risk of impact on these wells given their location 750m up hydraulic gradient of the facility.

### *4.3.5. OCM Assessment*

The over all conclusion on the 2007 nitrogen loading risk assessment was that the ammonia and nitrate levels in the groundwater were not having a significant impact on the Avoca River. OCM concurs with this conclusion. It is acknowledged that the river was already impacted upstream by mine drainage, but this primarily related to pH and heavy metals. Based on the surface water sampling programme undertaken in June 2011, ammonia (as $NH_3$) concentrations while elevated upstream, do increase slightly downstream of the Production Area. However, the increase in unionised ammonia is considered to be low.

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# 5. CONCLUSIONS & RECOMMENDATIONS

The primary sources of the groundwater contaminants of concern (ammonia and nitrate) have been removed. While elevated ammonia and nitrates are present in the groundwater, there has been a significant reduction in levels since 2007.

At 10 of the 12 groundwater monitoring wells the ammonia and nitrate levels are already below the concentrations predicted in the groundwater modelling completed in 2007, which demonstrates that natural attenuation is proving effective.

The attenuation rate has been slower than predicted by the model in the southern part of the Production area. OCM considers this is associated with the presence of very thick silt/clay subsoils in this area, which restricts the rate of groundwater through put to the river resulting in low oxygen levels and slowing down the rate of ammonia degradation in this area. .

The latest surface water monitoring results indicate that there is no significant difference in nitrate, sulphate or COD between the monitoring locations up and downstream of the Production Area. The ammonia concentrations do increase slightly downstream of the Production Area and may be associated with groundwater recharge, however the increases are not significant.

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OCM considers therefore that the environmental risk associated with the Production Area is insignificant.

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# APPENDIX 1

1994, 1995 and 1997 Investigations Reports (CD)

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# APPENDIX 2

PM AER

PM 2007 Risk Assessment

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# APPENDIX 3

OCM Surface Water Sampling Protocol

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environmental management for business

# STANDARD OPERATING PROCEDURE

# SURFACE WATER SAMPLING

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The primary objective of surface water sampling is to evaluate the chemical quality of a water body. The purpose of this procedure is to ensure that representative samples of surface water are collected and documented using consistent methods to ensure sample integrity. Surface water grab samples may be collected from rivers, streams, lakes and wetlands. In cases where the depth of the surface water body prevents sampling from the banks of the water body, sampling from, a boat may be required.

## 1.0 SAMPLING PROCEDURES

### 1) 1.1 Equipment Needed

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- Personal protective clothing and equipment as required in the site-specific risk assessment.
- Decontamination equipment and supplies if known contaminated site.
- Temperature probe EC meter, pH meter, dissolved oxygen meter.
- Appropriate sample containers (some will be pre-preserved), labels and chain of custody documentation.
- Field logbook.
- Hard plastic cooler with ice pack.

### 1.2 Field Parameter Measurement

Measurements of field parameters of pH, temperature and electrical conductivity are made during sampling. Note visual (colour, turbidity) and odour (e.g hydrocarbon, hydrogen sulphide) characteristics in the field logbook.



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## 1.3 Collection of Water Samples

All samples for chemical analysis will be placed in laboratory prepared bottles. The types of sample containers and preservative required for each type of analysis are described in the workplan. If required, preservatives will be placed in the sample containers prior to collecting the samples.

The following procedure will be used -

1) Slowly submerge unpreserved one-liter amber glass or plastic-capped bottles completely into the water. Open and fill bottle from below the water surface. If wading is required, approach the sample site from downstream and do not enter the actual sample area. Do not disturb bottom sediments. Open-end of the bottle should be pointed at approximately 90° to the upstream direction, in undisturbed gently flowing water. This procedure will be performed to minimize the effects due to high turbulence and aeration, or if surface scum is prevalent.

2) Collect a sufficient volume of water to fill all sample containers.

3) For VOC analysis. Pour the samples slowly into the laboratory prepared 40 ml glass vial. Overfill each vial slightly to eliminate air bubbles, a convex meniscus should be present at the top of the vial. Ensure that the Teflon liner of the septum cap is facing inward and that no bubbles are entrapped. After capping securely, turn bottle upside-down, tap it against your other hand, and observe sample water for bubbles. If bubbles are observed, remove the cap, overfill the vial and reseal. Repeat this step for each vial until the samples with no bubbles are obtained.

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4) Obtain the semi-volatile compound/pesticides/PCBs sample(s) by transferring the water to a laboratory prepared 1000 ml amber glass bottle with Teflon-lined cap. Fill the bottle to the bottom of the neck and follow steps 4, 5 and 6 above.

5) Dissolved metals (if necessary) may require filtering the sample water through a .45 micron filter. The water is collected in a 1 litre, unpreserved, plastic or glass bottle with $HNO_3$ preservative. Filtering must be done within 15 minutes of sample collection.

6) Obtain the total metals sample by directly transferring the water into a laboratory prepared 1000 ml plastic or glass bottle with $HNO_3$ preservative. Ensure the pH of the metals sampled is less than 2 by pouring off an aliquot in a clean jar and testing for pH using litmus paper.

7) Collect and prepare Field QA/QC samples in accordance with separate SOP.

8) Place a label on the container and enter the following information: -

   Client/Site Name
   Date Collected
   Time Collected
   Analysis



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Preservative
Sample Identification Number

9) Place custody seals on the container caps. As soon as possible, place sample containers in a cooler with ice and maintain at 4°C. Surround the bottles with packaging.

10) Record pertinent information in the field logbook and on the Field Data Sheet for Sampling Location. Complete chain-of-custody form, place in cooler and seal and label the cooler.

11) Be sure to record all data required on the Field Data Sheet or Sampling Location and appropriate entries into the field logbook.

12) Decontaminate all sampling equipment according to procedure.

END.

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# APPENDIX 4

Laboratory Results

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# *Jones Environmental Laboratory*

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O'Callaghan Moran & Associates
Granary House
Rutland Street
Cork
Ireland

[redacted]

**No.4225**

| | |
|---|---|
| **Attention :** | Barry Sexton |
| **Date :** | 27th June, 2011 |
| **Your reference :** | IF1 |
| **Our reference :** | Test Report 11/4807 Batch 1 |
| **Location :** | HOLFELD PLASTICS ARKLOW |
| **Date samples received :** | 21st June, 2011 |
| **Status :** | Final report |
| **Issue :** | 1 |

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Four samples were received for analysis on 21st June, 2011 which was completed on 27th June, 2011 Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

**J W Farrell- Jones CChem FRSC**
**Chartered Chemist**



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*Jones Environmental Laboratory*

**Client Name:** O'Callaghan Moran & Associates

**Reference:** IF1

**Location:** HOLFELD PLASTICS,ARKLOW

**Contact:** Barry Sexton

**JE Job No.:** 11/4807

**Report : Liquid**

**Liquids/products:** V=40ml vial, G=glass bottle, P=plastic bottle
H=$H_2SO_4$, Z=ZnAc, N=NaOH, HN=$HN0_3$

Please see attached notes for all abbreviations and acronyms

| J E Sample No. | 1-5 | 6-10 | 11-15 | 16-20 | | | | | | | LOD | Units | Method No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | SW-1 | SW-2 | SW-3 | BH94/14 | | | | | | | | | |
| Depth | | | | | | | | | | | | | |
| COC No / misc | | | | | | | | | | | | | |
| Containers | V H P G | V H P G | V H P G | V H P G | | | | | | | | | |
| Sample Date | 20/06/2011 | 20/06/2011 | 20/06/2011 | 20/06/2011 | | | | | | | | | |
| Sample Type | Surface Water | Surface Water | Surface Water | Ground Water | | | | | | | | | |
| Batch Number | 1 | 1 | 1 | 1 | | | | | | | | | |
| Date of Receipt | 21/06/2011 | 21/06/2011 | 21/06/2011 | 21/06/2011 | | | | | | | | | |
| Sulphate # | 7.90 | 8.21 | 8.24 | 1116.75 | | | | | | | <0.05 | mg/l | TM38/PM0 |
| Nitrate as NO3 # | 3.1 | 2.8 | 2.6 | 85.6 | | | | | | | <0.2 | mg/l | TM38/PM0 |
| Ammoniacal Nitrogen as NH3 # | 0.11 | 0.25 | 0.25 | 272.45 | | | | | | | <0.03 | mg/l | TM38/PM0 |
| COD | 12 | 12 | 13 | <7 | | | | | | | <7 | mg/l | TM57/PM0 |
| Dissolved Oxygen | 10 | 10 | 10 | 5 | | | | | | | <1 | mg/l | TM59/PM0 |

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## *Jones Environmental Laboratory*

**Client Name:** O'Callaghan Moran & Associates **VOC Report :** **Liquid**

**Reference:** IF1

**Location:** HOLFELD PLASTICS,ARKLOW

**Contact:** Barry Sexton

**JE Job No.:** 11/4807

| J E Sample No. | 1-5 | 6-10 | 11-15 | 16-20 | | | | | | | LOD | Units | Method No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | SW-1 | SW-2 | SW-3 | BH94/14 | | | | | | | | | |
| Depth | | | | | | | | | | | | | |
| COC No / misc | | | | | | | | | | | | | |
| Containers | V H P G | V H P G | V H P G | V H P G | | | | | | | | | |
| Sample Date | 20/06/2011 | 20/06/2011 | 20/06/2011 | 20/06/2011 | | | | | | | | | |
| Sample Type | Surface Water | Surface Water | Surface Water | Ground Water | | | | | | | | | |
| Batch Number | 1 | 1 | 1 | 1 | | | | | | | | | |
| Date of Receipt | 21/06/2011 | 21/06/2011 | 21/06/2011 | 21/06/2011 | | | | | | | | | |
| **VOC MS** | | | | | | | | | | | | | |
| Dichlorodifluoromethane | <2 | <2 | <2 | <2 | | | | | | | <2 | ug/l | TM15/PM10 |
| Methyl Tertiary Butyl Ether # | <1 | <1 | <1 | <1 | | | | | | | <1 | ug/l | TM15/PM10 |
| Chloromethane # | <3 | <3 | <3 | <3 | | | | | | | <3 | ug/l | TM15/PM10 |
| Vinyl Chloride | <2 | <2 | <2 | <2 | | | | | | | <2 | ug/l | TM15/PM10 |
| Bromomethane | <1 | <1 | <1 | <1 | | | | | | | <1 | ug/l | TM15/PM10 |
| Chloroethane # | <3 | <3 | <3 | <3 | | | | | | | <3 | ug/l | TM15/PM10 |
| Trichlorofluoromethane # | <3 | <3 | <3 | <3 | | | | | | | <3 | ug/l | TM15/PM10 |
| 1,1-Dichloroethene # | <3 | <3 | <3 | <3 | | | | | | | <3 | ug/l | TM15/PM10 |
| Dichloromethane # | <3 | <3 | <3 | <3 | | | | | | | <3 | ug/l | TM15/PM10 |
| trans-1-2-Dichloroethene # | <3 | <3 | <3 | <3 | | | | | | | <3 | ug/l | TM15/PM10 |
| 1,1-Dichloroethane # | <3 | <3 | <3 | <3 | | | | | | | <3 | ug/l | TM15/PM10 |
| cis-1-2-Dichloroethene # | <3 | <3 | <3 | <3 | | | | | | | <3 | ug/l | TM15/PM10 |
| 2,2-Dichloropropane | <1 | <1 | <1 | <1 | | | | | | | <1 | ug/l | TM15/PM10 |
| Bromochloromethane # | <2* | <2* | <2* | <2* | | | | | | | <2 | ug/l | TM15/PM10 |
| Chloroform # | <2* | <2* | <2* | <2* | | | | | | | <2 | ug/l | TM15/PM10 |
| 1,1,1-Trichloroethane # | <2 | <2 | <2 | <2 | | | | | | | <2 | ug/l | TM15/PM10 |
| 1,1-Dichloropropene # | <3 | <3 | <3 | <3 | | | | | | | <3 | ug/l | TM15/PM10 |
| Carbon tetrachloride # | <2 | <2 | <2 | <2 | | | | | | | <2 | ug/l | TM15/PM10 |
| 1,2-Dichloroethane # | <2 | <2 | <2 | <2 | | | | | | | <2 | ug/l | TM15/PM10 |
| Benzene # | <1 | <1 | <1 | <1 | | | | | | | <1 | ug/l | TM15/PM10 |
| Trichloroethene # | <3 | <3 | <3 | <3 | | | | | | | <3 | ug/l | TM15/PM10 |
| 1,2-Dichloropropane # | <2* | <2* | <2* | <2* | | | | | | | <2 | ug/l | TM15/PM10 |
| Dibromomethane # | <3 | <3 | <3 | <3 | | | | | | | <3 | ug/l | TM15/PM10 |
| Bromodichloromethane # | <2 | <2 | <2 | <2 | | | | | | | <2 | ug/l | TM15/PM10 |
| cis-1-3-Dichloropropene | <2 | <2 | <2 | <2 | | | | | | | <2 | ug/l | TM15/PM10 |
| Toluene # | <2 | <2 | <2 | <2 | | | | | | | <2 | ug/l | TM15/PM10 |
| trans-1-3-Dichloropropene | <2 | <2 | <2 | <2 | | | | | | | <2 | ug/l | TM15/PM10 |
| 1,1,2-Trichloroethane # | <2 | <2 | <2 | <2 | | | | | | | <2 | ug/l | TM15/PM10 |
| Tetrachloroethene # | <3 | <3 | <3 | <3 | | | | | | | <3 | ug/l | TM15/PM10 |
| 1,3-Dichloropropane # | <2 | <2 | <2 | <2 | | | | | | | <2 | ug/l | TM15/PM10 |
| Dibromochloromethane # | <2 | <2 | <2 | <2 | | | | | | | <2 | ug/l | TM15/PM10 |
| 1,2-Dibromoethane # | <2 | <2 | <2 | <2 | | | | | | | <2 | ug/l | TM15/PM10 |
| Chlorobenzene # | <2 | <2 | <2 | <2 | | | | | | | <2 | ug/l | TM15/PM10 |
| 1,1,1,2-Tetrachloroethane # | <2 | <2 | <2 | <2 | | | | | | | <2 | ug/l | TM15/PM10 |
| Ethylbenzene # | <2 | <2 | <2 | <2 | | | | | | | <2 | ug/l | TM15/PM10 |
| p/m-Xylene # | <3 | <3 | <3 | <3 | | | | | | | <3 | ug/l | TM15/PM10 |
| o-Xylene # | <2 | <2 | <2 | <2 | | | | | | | <2 | ug/l | TM15/PM10 |
| Styrene # | <2 | <2 | <2 | <2 | | | | | | | <2 | ug/l | TM15/PM10 |
| Bromoform # | <2 | <2 | <2 | <2 | | | | | | | <2 | ug/l | TM15/PM10 |
| Isopropylbenzene # | <3 | <3 | <3 | <3 | | | | | | | <3 | ug/l | TM15/PM10 |
| 1,1,2,2-Tetrachloroethane | <4 | <4 | <4 | <4 | | | | | | | <4 | ug/l | TM15/PM10 |
| Bromobenzene # | <2 | <2 | <2 | <2 | | | | | | | <2 | ug/l | TM15/PM10 |
| 1,2,3-Trichloropropane # | <3 | <3 | <3 | <3 | | | | | | | <3 | ug/l | TM15/PM10 |
| Propylbenzene # | <3 | <3 | <3 | <3 | | | | | | | <3 | ug/l | TM15/PM10 |
| 2-Chlorotoluene # | <3 | <3 | <3 | <3 | | | | | | | <3 | ug/l | TM15/PM10 |
| 1,3,5-Trimethylbenzene # | <3 | <3 | <3 | <3 | | | | | | | <3 | ug/l | TM15/PM10 |
| 4-Chlorotoluene # | <3 | <3 | <3 | <3 | | | | | | | <3 | ug/l | TM15/PM10 |
| tert-Butylbenzene # | <3 | <3 | <3 | <3 | | | | | | | <3 | ug/l | TM15/PM10 |
| 1,2,4-Trimethylbenzene # | <3 | <3 | <3 | <3 | | | | | | | <3 | ug/l | TM15/PM10 |
| sec-Butylbenzene # | <3 | <3 | <3 | <3 | | | | | | | <3 | ug/l | TM15/PM10 |
| 4-Isopropyltoluene # | <3 | <3 | <3 | <3 | | | | | | | <3 | ug/l | TM15/PM10 |
| 1,3-Dichlorobenzene # | <3 | <3 | <3 | <3 | | | | | | | <3 | ug/l | TM15/PM10 |
| 1,4-Dichlorobenzene # | <3 | <3 | <3 | <3 | | | | | | | <3 | ug/l | TM15/PM10 |
| n-Butylbenzene # | <3 | <3 | <3 | <3 | | | | | | | <3 | ug/l | TM15/PM10 |
| 1,2-Dichlorobenzene # | <3 | <3 | <3 | <3 | | | | | | | <3 | ug/l | TM15/PM10 |
| 1,2-Dibromo-3-chloropropane | <2 | <2 | <2 | <2 | | | | | | | <2 | ug/l | TM15/PM10 |
| 1,2,4-Trichlorobenzene | <3 | <3 | <3 | <3 | | | | | | | <3 | ug/l | TM15/PM10 |
| Hexachlorobutadiene | <3 | <3 | <3 | <3 | | | | | | | <3 | ug/l | TM15/PM10 |
| Naphthalene | <2 | <2 | <2 | <2 | | | | | | | <2 | ug/l | TM15/PM10 |
| 1,2,3-Trichlorobenzene | <3 | <3 | <3 | <3 | | | | | | | <3 | ug/l | TM15/PM10 |

Please see attached notes for all abbreviations and acronyms

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# NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

## SOILS

Please note we are only MCERTS accredited for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. If we are instructed to keep samples, a storage charge of £1 (1.5 Euros) per sample per month will be applied until we are asked to dispose of them.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C

Asbestos screens where requested will be undertaken by a UKAS accredited laboratory.

## WATERS

Please note we are not a Drinking Water Inspectorate (DWI) Approved Laboratory . It is important that detection limits are carefully considered when requesting water analysis.

UKAS accreditation applies to surface water and groundwater and one other matrix which is analysis specific, any other liquids are outside our scope of accreditation

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples. All samples are treated as groundwaters and analysis performed on settled samples unless we are instructed otherwise.

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## DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any analysis that may be compromised highlighted on your schedule/ report by the use of a symbol.

*The use of any of the following symbols indicates that the sample was deviating and the test result may be unreliable:*

| | |
|---|---|
| $ | Sample temperature on receipt considered inappropriate for analysis requested. |
| ^ | Samples exceeding recommended holding times. |
| & | Samples received in inappropriate containers (e.g. volatile samples not submitted in VOC jars/vials). |
| ~ | No sampling date given, unable to confirm if samples are with acceptable holding times. |

## SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130%. Results are not surrogate corrected.

## AQCs

Where AQC's fall outside UKAS/MCERTS criteria analysis is repeated if possible.

## NOTE

Data is only accredited when all the requirements of our Quality System have been met. In certain circumstances where the requirements have not been met, the laboratory may issue the data in its final report if it believes that the validity of the data has not been conpromised but will remove the accreditation. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.



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**ABBREVIATIONS and ACRONYMS USED**

| | |
|---|---|
| # | UKAS accredited. |
| M | MCERTS accredited. |
| NAD | No Asbestos Detected. |
| ND | None Detected (usually refers to VOC and/SVOC TICs). |
| SS | Calibrated against a single substance. |
| * | Analysis subcontracted to a Jones Environmental approved laboratory. |
| W | Results expressed on as received basis. |
| + | Accreditation has been removed from this result see 'Note' on previous page. |
| ++ | Result outside calibration range, results should be considered as indicative only and are not accredited. |
| SV | Surrogate recovery outside performance criteria. This may be due to a matrix effect. |
| DR | Dilution required. |

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| Test Method No. | Description | Prep Method No. (if appropriate) | Description | UKAS | MCERTS (soils only) | Analysis done on As Received (AR) or Air Dried (AD) | Solid Results expressed on Dry/Wet basis |
|---|---|---|---|---|---|---|---|
| TM15 | VOC - Target by GC-MS, modified USEPA 8260 | PM10 | VOC GC-MS | | | | |
| TM15 | VOC - Target by GC-MS, modified USEPA 8260 | PM10 | VOC GC-MS | Yes | | | |
| TM38 | SO4,Cl,NO3,NO2,F,PO4, Amm N2,ThioCN by Aquakem | PM0 | No Preparation | Yes | | | |
| TM57 | COD by Colourimetric measurement | PM0 | No Preparation | | | | |
| TM59 | Dissolved oxygen using DO meter | PM0 | No Preparation | | | | |

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BORDNAMÓNA

ENVIRONMENTAL PRODUCTS

**An evaluation of the nature and extent of groundwater contamination at the IFI Industrial facility at Arklow, Co. Wicklow including an assessment of the natural protection afforded the various water bearing strata beneath the site.**

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Report No.: EPA W825

Attention: Ms. Niamh Healy
Process Engineer
IFI
Arklow
Co. Wicklow

Prepared by: Dr. Hubert Henry
Head: Water and Wastewater Section

Date: 27 October 1994

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- 3.2 Hydrology/Hydrogeology
- 3.3 Chemical Analysis of Soil and Groundwater Samples

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## 1.0 INTRODUCTION

The IFI industrial site is located in the Avoca river valley about two miles upstream of Arklow town. Production at the facility has continued since 1965 although major changes in the nature and volumes of products manufactured at the plant have occurred over the years, particularly in the 1980's.

The site is situated on an alluvium flood plain which is bounded on the north and south by steep tree lined slopes and is protected from flooding of the River Avoca by a series of earthen embankments. The site, which occupies an area of 50 hectares, is divided into two separate parts, the plant or production area (approximately 2 - 3m O.D.) to the west and the mainly disused landfill area (approximately 4m O.D.) to the east of the site.

As part of an ongoing environmental monitoring and control strategy at the plant and in response to a request by the local authority, the management of IFI commissioned a comprehensive hydrological/hydrogeological investigation at the site. The study, which was carried out by ESB International (in conjunction with IGSL and Bord na Móna Environmental Products) was completed in June 1994 and focused on the nature and degree of groundwater contamination in a series of shallow and deep monitoring boreholes across the entire site (plant and landfill areas). The findings of the investigation are presented in a detailed report "Irish Fertilizer Industries, Arklow Environmental Site Investigation" submitted to IFI in July 1994 (No. PA 514-R1).

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In order to establish the present and predict the future state of the groundwaters at the site Bord na Móna Environmental Products have been requested to examine and interpret the ESBI report with a view to:

(i) Assessing the nature, extent and volumes of groundwater contamination beneath the IFI site, at the site boundaries and beyond the boundaries along a hydraulic gradient.

(ii) Describing the natural barrier which is afforded the middle and lower gravel aquifers against the subsurface migration of contaminants specific to the IFI industrial activity.

This report presents the results of the report interpretation and presents the discussion in the context of existing EC legislation. A short literature review on the fate and transport of contaminants (specific to the IFI site) in subsurface and groundwater systems is also presented.



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## 2.0 THE FATE AND TRANSPORT OF CONTAMINANTS IN THE SUBSURFACE

When assessing the potential of groundwater contamination from an industrial process and associated landfill activity the fate and transport of the different contaminated leachate constituents must be considered. The characteristics of the leachates from the IFI plant and landfill areas are such that several components must be removed by soil/subsurface renovation or attenuation if groundwater pollution is to be avoided. These components include:

(i) Organic components yielding BOD and COD loads.

(ii) Compounds consisting of nitrogen, phosphorous and salts of varying solubilities.

(iii) Organic solvents and hydrocarbons.

(iv) Heavy metals.

The depth within a soil/subsurface profile at which removal or renovation of various contaminants is complete varies with the size of particles, the soil texture and the rate of water movement e.g. contaminants will move greater distances in coarse soils where inputs or application rates are high. It is well accepted that the most important factors which govern the removal efficiency in subsurface materials are:

(i) The presence of clays or other materials with a high specific surface area and ion exchange capacity.

(ii) The thickness of the unsaturated zone.

The properties of the subsurface media at the IFI site are such that a number of mechanisms are available to act on the waste components generated on the site, thereby, effecting at least some degree of attenuation. These mechanisms include filtration, sorption, preciption, chemical alteration and oxidation/biological transformations.

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### 2.1 Migration of Specific Contaminants Beneath the IFI Site

#### 2.1.1 Nitrogen

The two forms of nitrogen which are of most concern are ammonium ions ($NH_4^+$) and nitrates ($NO_3^-$). Movement of ammonium ions in the subsurface can be retarded by adsorption, cation exchange, incorporation into microbial biomass or released to the atmosphere in gaseous form. Adsorption mechanisms are generally considered to be the most effective and is directly related to the specific area of the subsurface material. Adsorption of $NH_4^+$ onto soil clay colloids has been shown to the a very effective attenuation process. However, adsorption is a finite process and once the adsorptive capacity of a soil or subsurface material is exceeded then, the $NH_4^+$ ion will migrate greater distances to "unoccupied" clay colloids.



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Retardation of ammonium migration can also occur by ion exchange processes, however, this is also a finite process and, where a migrating leachate contains large amounts of $NH_4^+$, saturation of subsurface materials can quickly occur. The efficiency of the ion exchange process is directly related to the cation exchange capacity of the subsurface material i.e. the higher the CEC the greater the ion exchange attenuation process. Clayey/silty materials, for example, will have a CEC greater than 10 times that of a sand or gravel material (i.e. 100 meq/100g and 10 meq/100g respectively) therefore, the restriction of $NH_4^+$ movement in subsurface layers will be significantly more marked in clay materials.

Nitrate-Nitrogen may enter the subsurface directly from the IFI plant area and landfills or may be generated in the unsaturated zone beneath the site by the nitrification of $NH_4^+$ ions contained in the migrating leachate. Because nitrate is a negatively charged ion it is not attracted to negatively charged soil colloids and as such is more mobile than the ammonium. Nitrate is referred to as a "conservative" contaminant and, because of its mobility, is a good indication of the outer extremities of a migrating pollution plume. Nitrate may, however, be removed by denitrification in the saturated reducing zones of subsurface materials but this requires a ready source of carbon as the denitrification process requires a considerable energy supply.

### 2.1.2 Phosphorus

Phosphorus is very effectively restricted from moving in the subsurface by a combination of adsorption and precipitation processes. It is generally accepted that phosphate is not a significant cause for concern with respect to subsurface contamination because of the efficiency of the retardation reactions in soils. It is again the case that high clay content soils are more effective barriers to phosphate migration whereas highly permeable sand and gravel materials may result in the transport of $PO_4$-P over considerably greater distances. Because of the presence of alluvial clays and subsurface laminated clays at the IFI site phosphate migration is not considered to be a significant problem.

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### 2.1.3 Heavy Metals

Migration of heavy metals constituents in the subsurface is largely restricted by the adsorption and ion exchange reactions. The efficiency of the attenuation process is governed by the valency of the metal and the cation exchange capacity (and specific surface area) of the subsurface material. Preferential removal of certain metals have been consistently demonstrated in previous studies. Migration of heavy metal constituents in the saturated zone is generally along a local hydraulic gradient with attenuation in the saturated zone reduced due to a decrease in the ionic strength of the subsurface materials.

### 2.1.4 Organic Solvents and Hydrocarbons

Migration of organic contaminants in the unsaturated zone is governed by a number of factors relating to the nature of the organic compound itself (density, solubility, biodegradability etc.) and the subsoil through which it passes. The dominant restriction processes are absorption, adsorption and biological transformation.



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Organic contaminants can reach the saturated zone either dissolved in water or as an immiscible organic liquid phase. The subsurface transport of these contaminants differ significantly and their ultimate hydrogeological migration patterns are governed by many different factors.

(i) Dissolved Organics

The migration of dissolved organics in groundwater systems is controlled by:

- Advection
- Dispersion
- Sorption (retardation)
- Chemical/biological transformations

Advection is the dominant factor controlling migration in a gravel aquifer such as that existing at the IFI site. Advection is the process by which solvents are transported by the bulk motion of flowing groundwater. Hydraulic gradient is the term used to describe the magnitude of this driving force. The gradient existing at the IFI site is generally low and complicated by many factors (tidal influences, alluvial and impermeable clay deposits, etc.), however, it is considered that migration along the northwest to southeast hydraulic gradient would be the general migration pattern for dissolved organic contaminants.

The influence of the other factors such as dispersion, sorption and chemical/biological transformations are difficult to estimate. However, it is likely that all these factors are involved to a greater or lesser degree. For example the gravel strata do not offer a significant opportunity of contaminant retardation due to adsorption since there is a low level of solid organic matter content in the aquifer. However restriction in the clay layers is likely to be much more significant.

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(ii) Immiscible Organics

Organic compounds differ widely in their solubility from infinitely immiscible polar compounds such as methanol to extremely low solubility compounds such as Toluene. The migration of the immiscible organic liquids in the subsurface is governed by its:

- Density
- Viscosity

Density differences of about 1% are known to influence fluid movements significantly. With few exceptions, the densities of organic liquids differ from that of water by more than 10%.

In general it is usual to consider immiscible organic liquids as belonging to one of two groups:

- Those that have density greater than that of water (dense, non-aqueous - phase liquids or DNAPL's) and;

- Those which have a density less than that of water (light non-aqueous - phase liquids or LNAPL's).

NAPL's which are released into the subsurface will generally not migrate in the same pattern as other leachate constituents. There is evidence to suggest that the materials (e.g. toluene) may in fact migrate against a hydraulic gradient. Substances which are only slightly soluble may phase separate at the top (LNAPL) or the bottom (DNAPL) of a water bearing strata e.g. the upper gravels at the IFI site and slowly release soluble contaminants into the aqueous phase which may then migrate along the dominant hydraulic gradient.

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## 3.0 SITE INVESTIGATIONS

### 3.1 Subsurface Strata

The geology of the site is made up of a complex mixture of older Ordoviaan sedimentary rocks comprising of shales and mudstones in association with younger Carboniferous limestones and Tertiary chalks. The younger rock formations have been removed by erosion forces (river and glacial) to expose the Ordoviaan shales at numerous locations around the 50 hectare site. The area has also been subjected to intense glacial activity which together with the hardrock geology has combined to give a complex subsurface succession of Alluvium, peaty, gravel and low permeability clays overlying mudstone and shale bedrock.

Investigations at the site have demonstrated that a number of discrete subsurface strata occur beneath most of the site. This section describes each of these separate layers with respect to the expected contaminant restriction or attenuation properties which they possess. A total of seven separate strata were identified beneath the site. The nature of each of these layers i.e. nominal pore size, cation exchange capacity, specific surface areas, permeabilities, and thickness or depth are such that they will permit or restrict contaminant migration to greatly varying degrees. The following table presents the seven separate water bearing layers identified at the site and details the nature of the materials contained therein. The assumed pollution restriction or attenuation properties of the various materials are based on descriptions and analytical results presented in the ESBI report.

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| Table 1: The nature of the subsurface material present beneath the IFI facility including details of the nominal pollution restriction properties of the industrial strata. | | | |
|---|---|---|---|
| Strata | Constituent | Average thickness m | Comment on attenuation properties |
| 1 Man made fill material | Landfill: Gypsum and carbon slurries rubble plastic and fill.<br>Plant area: Hardcore fill comprising of rubble/shale mix | 3.1 | Poor attenuation by ion exchange or adsorption with rapid migration of contaminants along zones or "preferred pathways" due to the heterogenous nature of the material and the large nominal pore size. |
| 2 Alluvium | Silty clay, peaty material | 3.0<br>3.1 | Very good contaminant restriction properties. The high surface area of the clay and peaty materials (up to .5$m^2/g$) can facilitate sorption processes. The cation exchange properties of both materials are very high :<br>Clay silt (USDA classification) - 60 - 80 meq/100g<br>Peaty material (Von post >5) - >100 meq/100g |
| 3 Upper gravels | Dense medium to coarse gravels with some cobbles and boulders | 2.5 | Generally poor in contaminant restriction. The dense nature of the material may result in some contamination attenuation by filtration, however, the adsorption and ion exchange properties of this material would be very low. |
| 4 Upper laminated clays | Stiff grey/brown laminated clay | 1.3 | Although the clay layer is generally very thin (1m or less in places) the nature of the material is such that it constitutes an excellent barrier to the migration of all the contaminants from the leachate plume. The high clay content provides an abundance of sites for ion exchange and sorptions processes to occur and the tight nature of the matrix (permeability 1.24 x $10^{-10}$m/s) provides an efficient physical barrier. |
| 5 Middle gravels | Dense coarse angular gravel | 3.2 | As for the upper gravel layer. |
| 6 Lower glacial clays | Brown stiff clay/silt with some gravel | 2.1 | The presence of this layer cannot be fully substantiated throughout the site. However, as with the upper clay layer its presence is extremely important in that it constitutes an effective hydraulic division between the middle and lower water bearing gravels. From the limited information available it is suggested that the thickness of this layer is greater than that existing in the upper clay layer. It is, therefore, considered that the lower gravel layer is very well protected by this strata. |
| 7 Lower gravels/bedrock | Same as middle gravels (also evidence of silty material) | 5.8 | Poor attenuation within gravels but the water bearing strata is well protected by layers above. |

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## 3.2 Hydrology/Hydrogeology

The surface water hydrology of the IFI site is dominated by the presence of the Avoca River. Surface water from the 50 hectare site is diverted into an array of on-site drains and canals which eventually drain to the Avoca River via the effluent settling pond. Assuming an average annual rainfall of 1000mm and a nominal evaporation rate of 40% it is estimated that the average yearly effective rainfall on the IFI site is in the region of 30 x $10^3$ $m^3$ $yr^{-1}$ (with over twice the monthly rainfall in December compared to June). When the average flow rate of the Shelton Abbey Canal and the drain flowing north south from the plant access road is considered then the quantities of rain water which directly recharge the groundwater bodies beneath the site in minimal.

Examination of the results presented in the site investigation (ref. geological cross sections A-A to F-F) present a complicated picture of the hydrogeological conditions beneath the site. There is insufficient evidence to establish conclusively that each of the identified strata are operating as separate or distinct hydrological entities. It is possible that there are interactions between the upper and middle gravels at locations where the dividing clays are at a minimum. However, direct hydrological links between the upper and lower gravels is significantly less likely due to a combination of the upper and lower clay boundaries. It is likely that the upper and possibly the middle gravel aquifers are recharged by diffuse flow from adjoining gravel areas to the north and west of the site. However, given the permeability readings recorded for these gravel layers (3.5 - 8.1 x $10^{-5}$ $ms^{-1}$) and the extremely low hydraulic gradients observed (0.001 - 0.002) it is likely that groundwater movement is very slow or static and consequently any contamination of these water bearing strata is likely to remain there for a considerable time. The relatively low permeabilities recorded in the gravels indicate that the area is very poor yielding and as such constitutes a groundwater resource of minor importance. A combined advantage of the low permeability and hydraulic gradients observed in the investigation is that contaminated groundwater is unlikely to "reach and contaminate other aquatic systems or eco-systems" (Article 4 of EU directive 80/68/EEC). A notable exception to this is that there is a distinct possibility of a hydrogeological connection between the upper gravel aquifer and the River Avoca at the western end of the site in the vicinity of borehole 94/14. Therefore, the possibility of surface water contamination from migrating contaminants cannot be discounted and may require further investigation.

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It is highly probable that the presence of the low permeability clay/silt layers between the upper, middle, and lower gravel aquifers restrict or even eliminate any hydrological links between them. The extremely low permeability of the upper laminated clays (1.2 x $10^{-10}$ $ms^{-1}$) is put in perspective when it is considered that the recorded value is significantly less than that considered suitable in the substratum materials beneath a hazardous waste landfill (1.0 x $10^{-9}$ $ms^{-1}$) (Amended proposal for a council directive on the landfill of waste COM (93) 275). Apart from the upper, middle and lower gravels none of the other water bearing strata identified are considered to have any groundwater yielding potential.



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## 3.3 Chemical Analysis of the Subsoil and Groundwater Samples

### 3.3.1 Soil and Subsurface Material Analysis

Surface soil, sediment and subsoil samples from various locations around the site were analysed for a range of contaminants in accordance with recognised standard methods. The results of the findings are presented in section 6.3 (Tables 6.1 - 6.3) of the ESBI report. The results presented are referenced to the Dutch contaminated land standards (which are likely to become the European standards within the next 12 - 18 months). The results generated show that attenuation of the heavy metals (Table 6.1) is largely complete in the man made fill material and underlying Alluvium layers (where elevated Zn, Cu, Pb, and Ni concentrations were recorded). The Dutch "C" values were not exceeded in any of the samples analysed. Elevated sulphur levels and decreased pH values were, however, recorded in many of the samples analysed although the significance of this can not be solely attributed to contamination from the site activities. Analysis of the subsurface materials for organic compounds and hydrocarbons (Table 6.3) again suggests that contaminant levels are minimal and largely restricted to the upper alluvium areas where it would appear that attenuation is largely complete.

### 3.3.2 Groundwater Analysis

A series of groundwater samples were collected from an array of monitoring boreholes around the site. The results of the analysis are presented in section 6.4 (Tables 6.4 - 6.8) of the ESBI report.

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An important consideration in any groundwater monitoring investigation involving separate water bearing strata is the effective sealing of the separate layers during borehole advancement. This must be carefully controlled to ensure that no unnecessary hydrogeological link is inadvertently made from a contaminated upper layer to pristine lower aquifers. It is not clear from the information to hand if such precautions were taken during this investigation. Therefore, the following discussion is made on the assumption that all the necessary action to prevent this vertical short circuiting of contaminants was taken.

In summary, the results obtained demonstrate that the waters in the upper gravel aquifer beneath the production plant area and the landfills region is considerably contaminated by elevated conductivity values, heavy metals, nitrogen compounds ($NH_3$ and $NO_3$) and total hydrocarbon contents. This result is significant when the possible link with the River Avoca described in section 3.2 is considered and highlights the requirements for additional investigative work at the site. The apparent contamination of the middle gravel aquifer is cause for more concern. Elevated ammonia and nitrate levels in addition to phosphate, sulphate, chloride and conductivity values considerably above background values were recorded in the groundwater samples in the middle gravel layer at both the plant and landfill sampling locations. This may suggest that the adsorptive or contaminant restriction capacity of the upper laminated clay layer has been exceeded especially for the ammonium ion where values of up to 2800mgl$^{-1}$ $NH_3$-N were recorded in sample 94/15A.



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The ammonia values recorded beneath the landfill are were considerably lower in the upper gravels (up to 678mgl$^{-1}$) and barely above background levels in the middle gravel aquifer. High and variable nitrate values were recorded in the upper and middle gravels this is attributed to the "conservative" nature of the nitrate ion which is largely unimpeded in its migration in the saturated zone. It is also highly significant that elevated nitrate levels were recorded in one sample from the lower gravel/bedrock aquifer i.e. 52.1mgl$^{-1}$ from 94/15B.

Therefore, a definite contamination link has been established between the upper gravels and the lower gravel/bedrock aquifer despite the presence of the clay protection strata detailed in 3.1 and 3.2. It is strongly recommended that IFI technical staff undertake an ongoing monitoring programme which will monitor the conservative indicator parameters in the various gravel aquifers and, thereby, track or predict the migration of the outer extremities of the contaminant plume. This could be accomplished with minimum cost and effort by including only the conservative parameters (i.e. $NO_3$-N, $Cl^-$, and Conductivity) in the monitoring programme.

Elevated Cu, Zn, Ni, and As levels recorded in the lower gravel aquifer may indicate a metal contaminant plume input from disused tailings or metal rich strata associated with the former Avoca mines.

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## 4.0 GROUNDWATER VULNERABILITY AT THE IFI INDUSTRIAL SITE

There is insufficient information presented in the site investigation report to calculate the volumes of contaminated groundwater at or beyond the IFI boundaries. However, the survey has highlighted a number of factors which indicate that the nature and extent of the contamination recorded in the groundwaters beneath the site is largely restricted to the upper water bearing strata. Furthermore, and possibly of more importance, it would appear that the hydrological and hydrogeological conditions at the site are such that migration of a contamination plume either horizontally or vertically through the saturated zone is minimised due to:

(a) The presence of an upper and lower low permeability clay lens which act as effective hydraulic barriers and;

(b) The low hydraulic gradients recorded together with the medium - low permeability values (for both gravel and bedrock aquifers) would indicate that groundwater movement to adjacent water bodies is minimal. It is, therefore, considered that the general requirements of Article 4 in the EU groundwater protection directive (80/68/EEC) are been satisfied at the site.

On a less optimistic note there is evidence of contamination in the middle aquifer beneath the laminated clay layer. This may indicate that this protective layer is not continuous across the entire site and that a distinct hydraulic link exists between the upper and middle gravel layers. Alternatively, it may suggest that the attenuation capacity of the clay colloids have been exceeded and that migration of certain contaminants, particularly the conservative parameters, to the deeper hydrogeological strata is now occurring. It is recommended that this possible migration of contaminants is routinely monitored in the future by examining the $NO_3$-N, $Cl^-$ and Conductivity levels in the existing array of monitoring wells. In addition, it is considered necessary to introduce a management plan at the site in order to reduce the infiltration of excess waters through the contaminated sections of the landfill and plant area. This management plan, which may consist of the installation of an effective array of surface drains in addition to appropriate surface slope management, will have an ultimate aim of reducing contaminant inputs to the saturated zone.

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## 5.0 CONCLUSIONS

Hydrological movements at the IFI site occur in a complex series of subsurface strata. The three distinct gravel aquifers are the most significant water bearing bodies present. There is no concrete evidence of any direct hydrogeological link between the separate strata. The possibility that the upper, middle and lower gravels are operating as separate hydrological entities cannot, therefore, be discounted.

The presence of a number of low permeability alluvium and clay strata in the subsurface beneath the IFI site provides an effective barrier to the vertical migration of contaminants from the upper to the middle and lower gravel aquifers.

The possible hydraulic link between the contaminated upper gravels and the River Avoca is cause for concern and may warrant further investigations.

Groundwater analysis has demonstrated that middle gravel aquifer is contaminated to some degree by elevated Nitrogen ($NO_3$ and $NH_3$), phosphate, sulphate and chloride levels as well as increased specific conductivity values. It is possible that this is due to an exhaustion of the adsorptive or chemical attenuation capacities of the protective clay strata. The migration of the contaminant plume in the subsurface must therefore be routinely monitored by the IFI technical staff by measuring the "conservative" elements of the contaminant plume (i.e. $NO_3$ $Cl^-$ conductivity).

It is considered that the vertical or lateral migration of contaminants in the subsurface to adjacent water bodies (surface water or groundwater) beyond the site boundaries is minimal. This is due to a combination of the low permeabilities of the various water bearing strata, the low hydraulic gradient observed and the attenuation properties of the alluvium and upper/lower clay layers. Therefore, the general requirements of the EU groundwater protection directive 80/68/EEC (Article 4) would appear to be satisfied at the site although further evaluation of the site boreholes would have to be undertaken in order to conclusively demonstrate with all aspects of the document.

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Further investigative studies on the existing array of monitoring boreholes at the site should be initiated to validate some of the observations made in the previous surveys.



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# BORD NA MÓNA

ENVIRONMENTAL DIVISION

*An Environmental Assessment of the Chemical and Biological Quality of the Avoca River Upstream and Downstream of the IFI Industrial Facility at Arklow, Co. Wicklow.*

- An Interim Report -

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**Project Nos.:** ELSW987/ELSWB25

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4.1 Description of results
4.1.1 Chemical analysis of river water and effluent samples

5.0 APPENDICES

Appendix 1 Location of site

Appendix 2 Location of sampling stations

Appendix 3 Schematic representation of conductivity plume along Avoca river

Appendix 4 Schematic representation of conductivity levels along Avoca river

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## 1.0 INTRODUCTION

The IFI fertiliser production plant is located in the Avoca river valley about two miles upstream from Arklow town. This factory has been in operation since 1965 and at the present time it is considered to be one of the largest fertiliser producing facilities in Ireland. However, over the last 10-15 years, major changes have occured in relation to the nature and volume of products manufactured at the plant.

The site occupies a total area of approximately 50 hectares and is divided into two separate parts, the IFI production/plant area to the west and a landfill area to the east. The site forms a flat flood plain in a rather steep valley bounded to the north and south by tree covered slopes and is protected from flooding of the River Avoca by a series of earthen embankments. The Avoca river runs parallel to the site in a south easterly direction.

As part of the local government water licence requirements, IFI Ltd. were requested to carry out a comprehensive study of the river water and sediment quality in the Avoca river upstream and downstream of the factory site. Bord na Mona, Environmental Division were commissioned by IFI Ltd. to undertake and complete this investigation. It was agreed with IFI to carry out a full assessment of the site on three separate occasions over a 12 month period: February 1995, June 1995 and December 1995/January 1996. In addition, two sampling events examining the general chemical quality of the river water and sediment were arranged for March/April 1995 and September 1995.

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This report presents a preliminary account of the sampling events which took place on 8/2/95 and 4/4/95. This interim report preceeds a comprehensive final report which will be submitted on completion of a 12 month monitoring programme. The results of the chemical/biological river water and sediment analysis undertaken at the site are described in addition to a detailed discussion of the implications of such findings.



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## 2.0 METHODOLOGY

### 2.1 Sampling

The site was visited by 2 technical staff from Bord na Mona Environmental Division on 8/2/95 and 4/4/95 and both investigations were undertaken with the assistance of Ms. Niamh Healy, Process Engineer, Irish Fertilisers Industries. Appendix 1 describes the general location of the IFI site.

In order to give a representative picture of the overall river water and sediment biological/chemical quality, a total of 13 stations at a range of locations were sampled upstream and downstream of the IFI facility. The sampling locations were chosen to help establish the upstream quality of the river and its tributaries as well as the mixing zone downstream of the factory discharge pipe. Table 3.1.1 and Appendix 2 demonstrate the approximate locations of the stations.

An 18 ft boat was used to gain access to the sampling stations. During the initial sampling event (8/2/95), a total of 2 water samples were collected at each location. The first sample was collected in a clean 2.5 l polypropylene plastic container and was used for chemical analysis. The second sample was collected in a presterilised 300ml sterilin plastic container and used for microbiological determinations. In addition, sediment samples were taken at each sampling station using a specialised piece of equipment called an Ekman grab and transferred directly to polythene sampling bags. During the second sampling occasion, which took place on 4/4/95, samples were collected to determine only the chemical quality of the river water and final effluent. In both cases, sampling was in strict accordance with recognised standard procedures.

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### 2.2 Contaminant Plume Dispersion (Mixing Zone)

A number of electrical conductivity measurements were taken both laterally and vertically through the water column downstream of the discharge point to help assess the dilution plume at the factory outfall. In addition, a number of stations were sampled upstream of the factory in order to assess the direct effect of inputs from streams, river tributaries and the disused mine tailings pond adjacent to the River bank.



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Three separate lateral transects, 5m from the North bank, the middle of the river and 5m from the South bank were established. Readings were taken equidistant along the transect upstream and downstream of the outfall using a portable WTW conductivity meter (calibrated on site using CRM standards). The results of the investigations were graphically represented in order to demonstrate the migration of the plume. While it is accepted that the containment plume from the IFI facility is multicomponent it is nonetheless considered that the total ion concentration (as measured by electrical conductivity) will yield an acceptable estimation of contaminant movement, dispersion and attenuation.

## 2.3 Analysis

All samples were returned to the laboratory for analysis. Subsequent analysis was carried out in strict accordance with recognised standard methods as detailed in Table 2.1.

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| TABLE 2.1: PROPOSED CHEMICAL AND BIOLOGICAL ANALYSIS OF WATER AND SEDIMENT SAMPLES | |
|---|---|
| Parameter | Method of analysis |
| BOD | APHA 5210 B |
| pH | APHA 4500 $H^+B$ |
| Suspended Solids | APHA 2540D |
| Conductivity | APHA 2510 B |
| Ammonia | APHA 4500 $NH_3F$ |
| Nitrates | APHA 4500 $NO_3$ |
| Total Kjeldahl Nitrogen | Automated Kjeldahl Method |
| Chlorophyll | Documented in house Method based on APHA 10200 H |
| Lead | ASTM D 3559-90 |
| Copper | ASTM D 1688-90 |
| Zinc | ASTM D 1691-90 |
| Iron | ASTM D 1068-90 |
| Biological indicators | FBA Identification System |

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## 2.4 Quality Control

The Environmental Products Laboratory complex is at present actively pursuing an ILAB accreditation status. When achieved, the Environmental Products Laboratories will have a wider accredited scope than any other laboratory in the country ranging from wet chemistry to analytical chemistry to microbiology. A stringent six point quality control approach is at present implemented in the laboratories.

(i) Controlled chain of custody.

(ii) Operator competence - all analysts must be suitably qualified to carry out required analysis.

(iii) Certified Reference Materials (CRM). The accuracy of a series of determinations is checked against known standards.

(iv) Duplicate - 10% duplication is normal only.

(v) Quality Control Charts.

(vi) Inter Laboratory Testing - The Environmental Products Laboratories are members of the W.R.C. Aquacheck scheme.

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## 3.0 RESULTS OF SAMPLING EVENT - 8/2/95

The results of the investigations carried out by Bord na Mona on 8/2/95 are presented as follows:

Table 3.1 Sample identification and locations.

Table 3.2 Results of general chemical analysis of river water and effluent samples.

Table 3.3 Results of metal analysis of water samples.

Table 3.4 Results of general chemical analysis of sediment samples.

Table 3.5 Summary list of macroinvertebrate species identified during the survey.

Table 3.6 Results of biological analysis of river water samples.

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| TABLE 3.1 LOCATION OF SAMPLING STATIONS | | |
|---|---|---|
| Our reference | Your reference | Location |
| W987-1 | S1 | Aughrim River |
| W987-4 | S2 | Avoca River |
| W987-7 | S3 | Confluence of Avoca and Aughrim Rivers |
| W987-10 | S4 | Adjacent to start of tailings pond |
| W987-13 | S5 | Adjacent to middle of tailings pond |
| W987-16 | S6 | Adjacent to end of tailings pond |
| W987-19 | S7 | Downstream of IFI bridge |
| W987-22 | S8 | Adjacent to middle of site (opposite tower) |
| W987-25 | S9 | Adjacent to end of site (IFI outfall) |
| W987-28 | S10 | Downstream of rapid section after IFI outfall |
| W987-31 | S11 | Adjacent to start of IFI landfill |
| W987-34 | S12 | Upstream of Iropharm outfall |
| W987-37 | S13 | Stream entering Avoca River downstream from IFI bridge |
| W987-38 | S14 | IFI final effluent 8/2/95 |
| W987-39 | S15 | IFI final effluent 9/2/95 |

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| TABLE 3.2 RESULTS OF CHEMICAL ANALYSIS OF RIVER WATER AND EFFLUENT SAMPLES | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Sample | BOD $mgl^{-1}$ | Conductivity $\mu Scm^{-1}$ | Suspended Solids $mgl^{-1}$ | pH pH units | $NH_3$-N $mgl^{-1}$ | $NO_3$-N $mgl^{-1}$ | TKN $mgl^{-1}$ | Chlorophyll $mgm^{-3}$ |
| S1 | <1 | 114 | 9 | 7.4 | <0.05 | 3.2 | 2.8 | <0.1 |
| S2 | <1 | 117 | 16 | 6.2 | <0.05 | 1.9 | 2.0 | <0.1 |
| S3 | <1 | 120 | 13 | 6.6 | <0.05 | 2.7 | 2.9 | <0.1 |
| S4 | <1 | 118 | 10 | 7.7 | <0.05 | 2.7 | 2.0 | <0.1 |
| S5 | <1 | 120 | 8 | 7.0 | <0.05 | 2.6 | 1.6 | <0.1 |
| S6 | <1 | 135 | 37 | 7.0 | 2.7 | 3.2 | 4.2 | <0.1 |
| S7 | <1 | 132 | 5.5 | 7.1 | 1.2 | 3.1 | 3.3 | <0.1 |
| S8 | <1 | 370 | 4 | 9.6 | 48 | 24.9 | 49.3 | <0.1 |
| S9 | <1 | 1893 | 9 | 9.7 | - | 186 | 393 | <0.1 |
| S10 | <1 | 253 | 5 | 9.5 | 26 | 14.3 | 28.3 | <0.1 |
| S11 | <1 | 171 | 3 | 8.3 | 66 | 7.9 | 81 | <0.1 |
| S12 | <1 | 115 | 10 | 7.2 | <0.05 | 2.6 | 3.7 | <0.1 |
| S13 | 2 | 259 | 19 | 7.8 | 0.13 | 9.4 | 2.6 | <0.1 |
| S14 | <2 | 3790 | 18 | 10.2 | 1650 | 259 | 1850 | <0.1 |
| S15 | <2 | 2930 | 14 | 10.6 | 3375 | 272 | 3495 | <0.1 |

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| TABLE 3.3 RESULTS OF METAL ANALYSIS OF RIVER WATER AND EFFLUENT SAMPLES | | | | |
|---|---|---|---|---|
| Sample | Pb $mgl^{-1}$ | Cu $mgl^{-1}$ | Zn $mgl^{-1}$ | Fe $mgl^{-1}$ |
| S1 | <0.01 | <0.02 | <0.02 | 0.06 |
| S2 | <0.01 | 0.02 | 0.37 | <0.05 |
| S3 | <0.01 | <0.02 | 0.23 | <0.05 |
| S4 | <0.01 | <0.02 | 0.22 | 0.09 |
| S5 | <0.01 | <0.02 | 0.21 | 0.14 |
| S6 | <0.01 | <0.02 | 0.17 | 0.38 |
| S7 | <0.01 | <0.02 | 0.20 | 0.40 |
| S8 | <0.01 | 0.03 | 0.09 | 0.26 |
| S9 | <0.01 | 0.03 | 0.15 | 0.55 |
| S10 | <0.01 | <0.02 | 0.16 | 0.54 |
| S11 | <0.01 | 0.02 | 0.15 | 0.51 |
| S12 | <0.01 | <0.02 | 0.20 | 0.16 |
| S13 | <0.01 | <0.02 | <0.02 | 0.13 |
| S14 | <0.01 | 0.03 | 0.13 | <0.05 |
| S15 | <0.01 | <0.02 | 0.06 | <0.05 |

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| TABLE 3.4 RESULTS OF CHEMICAL ANALYSIS OF RIVER SEDIMENT SAMPLES | | | | | |
|---|---|---|---|---|---|
| Sample | pH<br>pH units | Pb<br>µg/g | Cu<br>µg/g | Zn<br>µg/g | Fe<br>µg/g |
| S1 | 7.4 | 15.6 | 25.5 | 85.7 | 30403 |
| S2 | 6.2 | 82.6 | 78.2 | 99.8 | 30823 |
| S3 | 4.9 | 63.9 | 97.0 | 88.9 | 34624 |
| S4 | 4.7 | 52.5 | 80.5 | 113 | 37727 |
| S6 | 8.8 | 53.3 | 56.8 | 119 | 28154 |
| S7 | 4.2 | 566 | 973 | 292 | 51016 |
| S8 | 7.6 | 109 | 112 | 219 | 33251 |
| S9 | 6.1 | 30.2 | 89.1 | 269 | 36663 |
| S10 | 5.7 | 42.5 | 44.5 | 60.6 | 16167 |
| S11 | 4.9 | 207 | 189 | 185 | 41313 |
| S12 | 6.6 | 50.8 | 76.0 | 106 | 23041 |

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## TABLE 3.5 SUMMARY LIST OF MACROINVERTEBRATE SPECIES IDENTIFIED DURING THE SURVEY

List of Macroinvertebratees Recorded

Phylum Uniramia

Order Plecoptera
- Family Perlodidae
- Family Nemouridae
  - *Amphinemura*

Order Diptera
- Family Chironomidae
  - *Chironmous*

Order Coleoptera
- Family Chrysomelidae
- Family Elminthidae
  - *Elmis aenia*
- Family Dytiscidae
  - *Dytiscus*

Order Trichoptera
- Family Sericostomatidae
- Family Psychomyidae
- Family Rhyacophilidae
  - *Rhyacophila*

Order Ephemerotera
- Family Ecdyonurus
  - *Ecdonurus*

Phylum Annelida

Class Clitellata
- Subclass Oligochaeta
- Family Tubificdae

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| TABLE 3.6 RESULTS OF BIOLOGICAL QUALITY OF RIVER SAMPLES | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Organism | Sampling Stations | | | | | | | | | | | |
| | S1 | S2 | S3 | S4 | S5 | S6 | S7 | S8 | S9 | S10 | S11 | S12 |
| Perlodidae | - | - | - | - | 1 | - | - | - | - | - | - | - |
| *Amphinemura* | - | - | - | - | 1 | - | - | - | - | - | - | - |
| *Chironomus* | - | - | - | - | 1 | - | 8 | - | - | - | 1 | - |
| Tubificidae | - | - | - | - | 3 | - | - | - | - | - | - | - |
| *Elmis aenea* | - | - | - | - | - | 1 | 1 | - | - | - | - | - |
| Chrysomelidae | - | - | - | - | - | 1 | - | - | - | - | - | - |
| Sericostomatidae | - | - | - | - | - | 1 | - | - | - | - | 4 | - |
| *Dytiscus* | - | - | - | - | - | - | 1 | - | - | - | - | - |
| Psychomyidae | - | - | - | - | - | - | 1 | - | - | - | - | - |
| *Ecolyonurus* | - | - | - | - | - | - | - | - | - | - | 1 | - |
| *Rhyacophila* | - | - | - | - | - | - | - | - | - | - | 2 | - |

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## 3.1 DESCRIPTION OF RESULTS

### 3.1.1 Chemical analysis of river water, effluent and sediment samples

The location of the various sampling stations are described in Appendix 2 and Table 3.1. The results of the chemical analysis of the river water, effluent and sediment samples taken upstream and downstream of the IFI site are presented in Tables 3.2, 3.3 and 3.4.

The chemical quality of the river water samples taken upstream of the factory site (S1-S7, S13) was generally good. These samples exhibited low levels of organic (BOD) content, nitrogen ($NO_3$-N, $NH_3$-N and TKN) content and suspended solids levels. No chlorophyll was detected in any of the samples analysed. The levels of lead and copper in the river water samples S1-S7 were low. However, significant quantities of zinc and iron were present in all samples. The results of this study highlight elevated levels of conductivity and $NO_3$-N in the sample taken from the water course entering the Avoca river downstream of the IFI bridge (S13). The elevated levels in this sample is significant in that they indicate nitrogen inputs to the river from sources other than the IFI facility. This may be from diffuse agricultural run-offs or onsite sewage disposal facilities adjacent to the stream. In particular, sample S8, taken from the river water course adjacent to the middle of the factory site, showed a marked increase in pH, conductivity, $NO_3$-N and TKN with respect to the upstream samples. This is a somewhat surprising result and may indicate the migration of the nitrogen plume against the river flow, possibly due to tidal action. Results of metal analysis of sample S8 was, however, similar to the levels of metals recorded in river water samples S1-S7 and S13.

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Elevated levels of pH, conductivity, $NO_3$-N, $NH_3$-N, and TKN were recorded in the River water sample taken adjacent to the effluent discharge pipe (S9). The elevated nitrogen levels highlight the significance of the discharge from the IFI site.

The degree and extent of organic and inorganic contamination of the river water downstream of the factory effluent discharge pipe was also investigated (samples S10, S11 and S12). Sample S10, taken from the water course downstream of the rapid section of the river (Appendix 2) contained significant levels of nitrogen contamination and similarly high pH and conductivity values. The degree of contamination in the sample of river water taken adjacent to the landfill site (S11) was marginally lower than the corresponding values of sample S10. However, $NH_3$-N levels were higher than that observed in sample S10. The pH, conductivity, suspended solids, nitrogen and metal content of sample S12 were similiar to the levels recorded in the samples taken upstream of the factory discharge pipe. This indicates that the contaminat plume is adequately dispersed at this location (S12) and generally agrees with the results of the conductivity measurements (Appendices 3 and 4).



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Two samples of effluent were also analysed prior to the discharge to the Avoca river (S14, S15). The pH and conductivity values recorded in samples S14 and S15 were extremely high. Elevated $NH_3$-N, $NO_3$-N, and TKN levels were also recorded. From our estimations on flow data for the Aughrim river and Avonmore river (January to March, 1990-1995) and assuming a typical average daily effluent flow of 4450$m^3$/d, a 1:177 dilution factor is available in the water course adjacent to the IFI site. This is an extremely conservative estimation and the above calculation was made excluding the flow data for the Avonbeg river (no data available). Based on the concentration (Table 3.2) and volume (4,450$m^3$/d) of effluent being discharged the estimated loadings to the river are 11,182 Kg$NH_3$-N/d (of which approximately 20% is in the unionised form) and 1,181 Kg$NO_3$-N/d.

The contaminant plume is demonstrated to remain intact as a single entity at the North bank of the river at a lateral distance of approximately 250 m downstream of the discharge pipe (Appendices 3 and 4). The presence of a turbulent stretch (rapid section) immediately downstream of the discharge does not appear to facilitate good mixing. The horizontal migration of the plume across the river profile occurs at the first river meander adjacent to the landfill site.

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Chemical analysis of river water sediment samples in the vicinity of the IFI site was also undertaken by Bord na Móna Environmental Division. Metal analysis of the sediment samples were shown to be extremely variable, with all samples displaying extremely high levels of iron. In particular, sample S7 showed a marked increase in iron content with respect to other sediment samples taken upstream and downstream of the site. The lead contents of the various samples were extremely variable ranging from 15.6µg/g (S1) to a maximum of 566.2µg/g for the sample taken downstream of the IFI bridge (S7). Sample S7 also exhibited markedly highly levels of copper and zinc than the corresponding values of other samples taken. In general, no pattern in the degree or extent of metal contamination was noted. The elevated copper and zinc recorded may be attributed to contamination from the adjacent disused Avoca mining site.

### 3.2.2 Biological analysis of river water samples

The results presented in Tables 3.5 and 3.6 summarise the main group of macroinvertebrates identified during the survey. A total of two taxonomic phyla were represented, namely, Phylum Uniramia and Phylum Annelida.

Macroinvertebrate species were only found at four of the twelve sampling stations. Sample S5 contained species from Family Perlodidae, Chironomidae and Tubificdae while representatives of Family Chrysomelidae, Elminthidae and Sericostomatidae were present in sample S6, taken adjacent to the end of the mine tailings pond. The sample taken



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downstream of the IFI bridge (sample S7) was shown to contain mainly *Chrionmous* species. Species from Family Sericostomatidae were predominant in sample S8 and members of Family Chironomidae, Ecdyonurus and Rhyacophilidae were also present.

The results demonstrate an extremely low score using species diversity indices (Trent Biotic Index, Simpsons Index). There is no evidence of biological difference in samples upstream and downstream of IFI outfall. It is, therefore, concluded that the poor biological quality of the river sediment may be due to toxic inputs from historic mining activity along the valley and in addition to possible on going leachates from the associated tailing ponds (both upstream and downstream of the IFI industrial site). The results of the biological survey suggest that the river is, at present, incapable of supporting any significant fish life (Salmonid or Cyprinid) due to the absence of a sustainable food source and the possible toxic of the river sediments.

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## 4.0 RESULTS OF ANALYSIS OF SUB-SAMPLING EVENT (4/4/95)

As described earlier, a sub-sampling event was also undertaken by Bord na Móna Environmental Division on 4/4/95. The location of the various samples are similiar to those described in Appendix 2 and Table 3.1. However, in this case the final effluent samples were sampled on 4/4/95 (S14) and 5/4/95 (S15). The results of the investigations are presented as follows:

Table 4.1 Results of general chemical analysis of river and effluent samples.

Table 4.2 Results of metal analysis of water samples.

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| TABLE 4.1 RESULTS OF CHEMICAL ANALYSIS OF RIVER WATER AND EFFLUENT SAMPLES | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Sample | BOD $mgl^{-1}$ | Conductivity $\mu Scm^{-1}$ | Suspended Solids $mgl^{-1}$ | pH pH units | $NH_3$-N $mgl^{-1}$ | $NO_3$-N $mgl^{-1}$ | TKN $mgl^{-1}$ | Chlorophyll $mgm^{-3}$ |
| S1 | <1 | 113 | 2 | 7.4 | 0.1 | 2.8 | 0.1 | 1.3 |
| S2 | <1 | 114 | 9 | 6.0 | 0.1 | 1.8 | 0.9 | 1.0 |
| S3 | <1 | 112 | 9 | 6.4 | 0.1 | 2.1 | 2.2 | 2.0 |
| S4 | <1 | 112 | 9 | 7.0 | 0.1 | 2.1 | 0.5 | 1.5 |
| S5 | <1 | 112 | 8 | 6.6 | 0.1 | 2.2 | 1.8 | 2.5 |
| S7 | <1 | - | 8 | 6.5 | 0.1 | 2.2 | 2.7 | 3.8 |
| S8 | <1 | 134 | 5 | 7.3 | 3.8 | 13.4 | 5.3 | 3.4 |
| S9 | <1 | 345 | 4 | 9.7 | 83.4 | 20.9 | 110 | 3.3 |
| S10 | <1 | 125 | 9 | 7.1 | 1.2 | 2.6 | 2.2 | 2.5 |
| S11 | <1 | 126 | 9 | 7.4 | 0.9 | 2.7 | 2.7 | 1.9 |
| S12 | <1 | 124 | 6 | 6.7 | 0.8 | 2.5 | 1.8 | 2.3 |
| S13 | <1 | 240 | 10 | 7.7 | <0.05 | 6.3 | 1.8 | 6.0 |
| S14 | 10 | 3750 | 14 | 9.9 | 1076 | 323 | 1360 | - |
| S15 | <2 | 3660 | 18 | 9.9 | 1036 | 358 | 1340 | - |

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| TABLE 4.2 RESULTS OF METAL ANALYSIS OF RIVER WATER AND EFFLUENT SAMPLES | | | | |
|---|---|---|---|---|
| Sample | Pb $mgl^{-1}$ | Cu $mgl^{-1}$ | Zn $mgl^{-1}$ | Fe $mgl^{-1}$ |
| S1 | <0.01 | <0.02 | <0.02 | 0.08 |
| S2 | <0.01 | 0.04 | 0.43 | 0.24 |
| S3 | <0.01 | <0.02 | 0.28 | 0.05 |
| S4 | <0.01 | <0.02 | 0.27 | 0.06 |
| S5 | <0.01 | <0.02 | 0.26 | 0.08 |
| S7 | <0.01 | <0.02 | 0.25 | <0.04 |
| S8 | <0.01 | <0.02 | 0.24 | 0.21 |
| S9 | <0.01 | <0.02 | 0.13 | 0.27 |
| S10 | <0.01 | <0.02 | 0.21 | 0.05 |
| S11 | <0.01 | <0.02 | 0.22 | <0.04 |
| S12 | <0.01 | <0.02 | 0.21 | <0.04 |
| S13 | <0.01 | <0.02 | <0.02 | 0.07 |
| S14 | <0.01 | 0.07 | 0.06 | 0.14 |
| S15 | <0.01 | 0.03 | 0.06 | 0.14 |

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## 4.1 DESCRIPTION OF RESULTS

### 4.1.1 Chemical analysis of river water and effluent samples

The results of the chemical analysis of the river water and effluent samples taken upstream and downstream of the IFI site are presented in Tables 4.1 and 4.2.

Analysis of the river water samples taken upstream of the IFI facility (S1-S7, S13) highlighted the generally good chemical quality of the river water at these sampling stations. The levels of BOD, $NO_3$-N, $NH_3$-N, TKN and suspended solids were low. Samples S1-S7 exhibited low levels of lead and copper while zinc and iron were present in markedly higher quantities in these samples. Like the previous sampling occasion (8/2/95), the results also highlight elevated conductivity and $NO_3$-N levels in the sample from the stream entering the Avoca River downstream of the IFI bridge (S13). Sample S8, which was taken adjacent to the middle of the IFI site, exhibited increased levels of conductivity, $NH_3$-N, $NO_3$-N, and TKN. These results were similar to those recorded on the previous sampling occasion in that the $NO_3$-N (and on this occasion the $NH_3$-N and TKN levels) were significantly above the levels recorded at other sampling stations located upstream of the discharge pipe. This may again be attributed to tidal movements or currents in the vicinity of the outfall. The increased mobility of the nitrate ion is also demonstrated here.

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The elevated levels of pH, conductivity and nitrogen ($NO_3$-N, $NH_3$-N, and TKN) in sample S9 highlights the signifigance of the discharge from the IFI facility. However, the results recorded in this sample are considerably lower than those recorded on the previous sampling occasion (8/2/95) despite the reduced dilution available in the river. This may be attributed to the decreased strength of the effluent on this sampling event or may be due to difficulty in obtaining similarly representative samples.

The chemical quality of the Avoca river downstream of the IFI discharge point was also examined (S10, S11, S12). The levels of conductivity and nitrogen ($NO_3$-N, $NH_3$-N, and TKN) were similar in samples S10, S11 and S12. However, the results of the inorganic analysis of these samples indicate that, while there was significant reductions in the contaminant levels recorded at sampling stations S10, S11 and S12, mixing was not quite complete (e.g. conductivity and $NH_3$-N levels remain slightly elevated).

Samples S14 and S15 are representative of the IFI effluent prior to discharge to the nearby water course. The levels of pH, conductivity and nitrogen ($NO_3$-N, $NH_3$-N, and TKN) in both samples were extremely high and once again highlight the quality of the discharge.



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The dilution available at the discharge, based on flow data for the Aughrim river and Avonmore river (April to June, 1990-1995) and assuming a typical average daily effluent flow of 4450$m^3$/d is 1:110. Once again, like the previous sampling occasion (8/2/95) this is an extremely conservative estimation and was made excluding the flow data for the Avonbeg river (no data available). The $NH_3$-N and $NO_3$-N loadings to the river on this sampling occasion were 4,699 kg/d (of which approximately 20% is in the unionised form) and 1,515 kg/d respectively. The contaminant plume is demonstrated in Appendix 4 and follows a similar pattern as in the previous sampling event. Migration of the plume occurs along the North bank and once again the presence of the rapid section downstream of the discharge point does not appear to facilitate good mixing. The final report will highlight in greater detail the mixing zone and assimilative capacity of the river.

It should be emphasised that the two sampling events described in previous sections indicate the initial situation at the site prior to the planned process upgradings at the factory. It is considered that the remaining evaluations (June, 1995, September 1995 and December 1995/January 1996) will demonstrate a significant improvement in the quality of the effluent and consequently the receiving water downstream of the discharge. An improvement in the biological status of the river is less likely.

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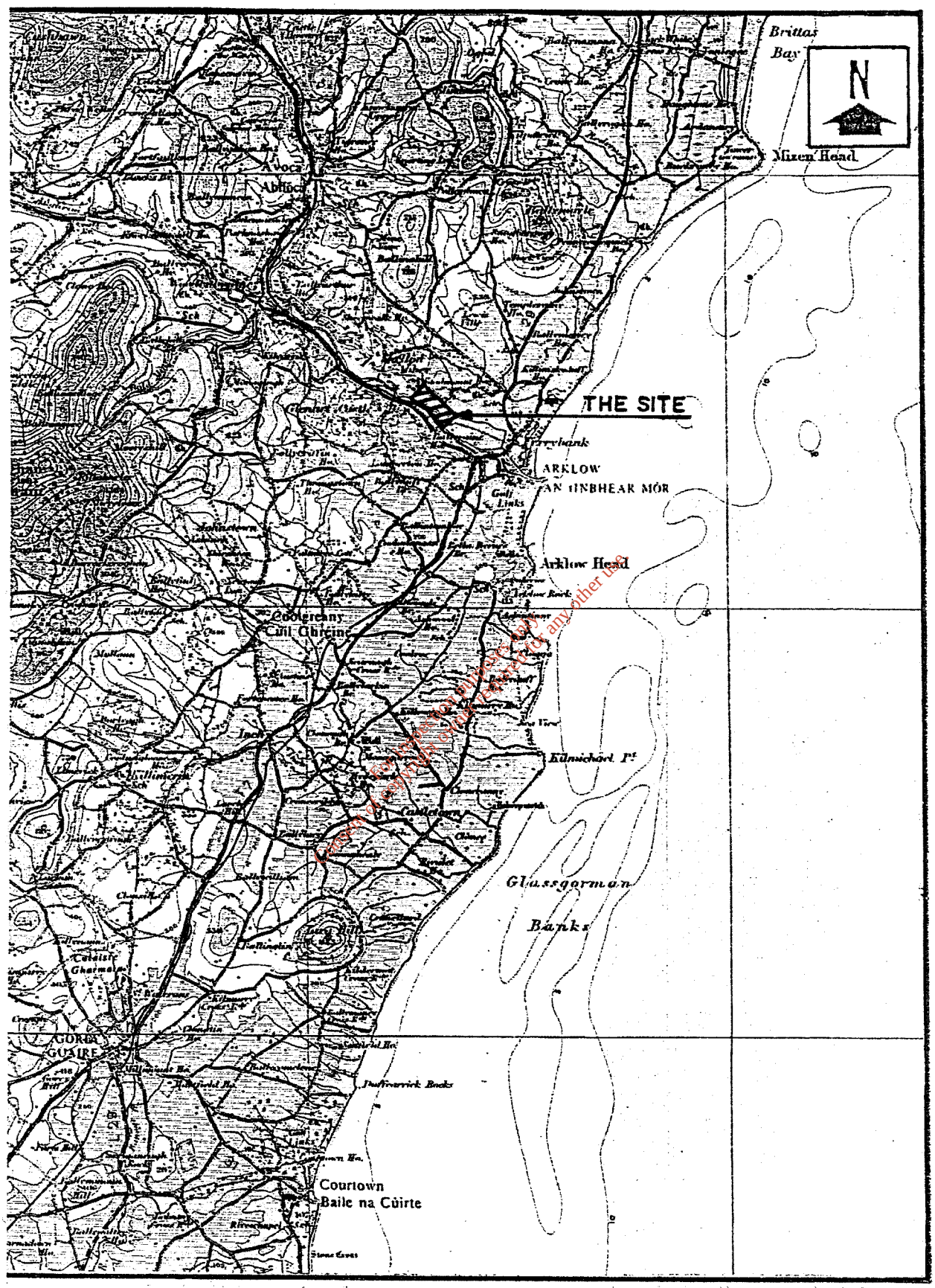
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# APPENDIX 1

## Location of site



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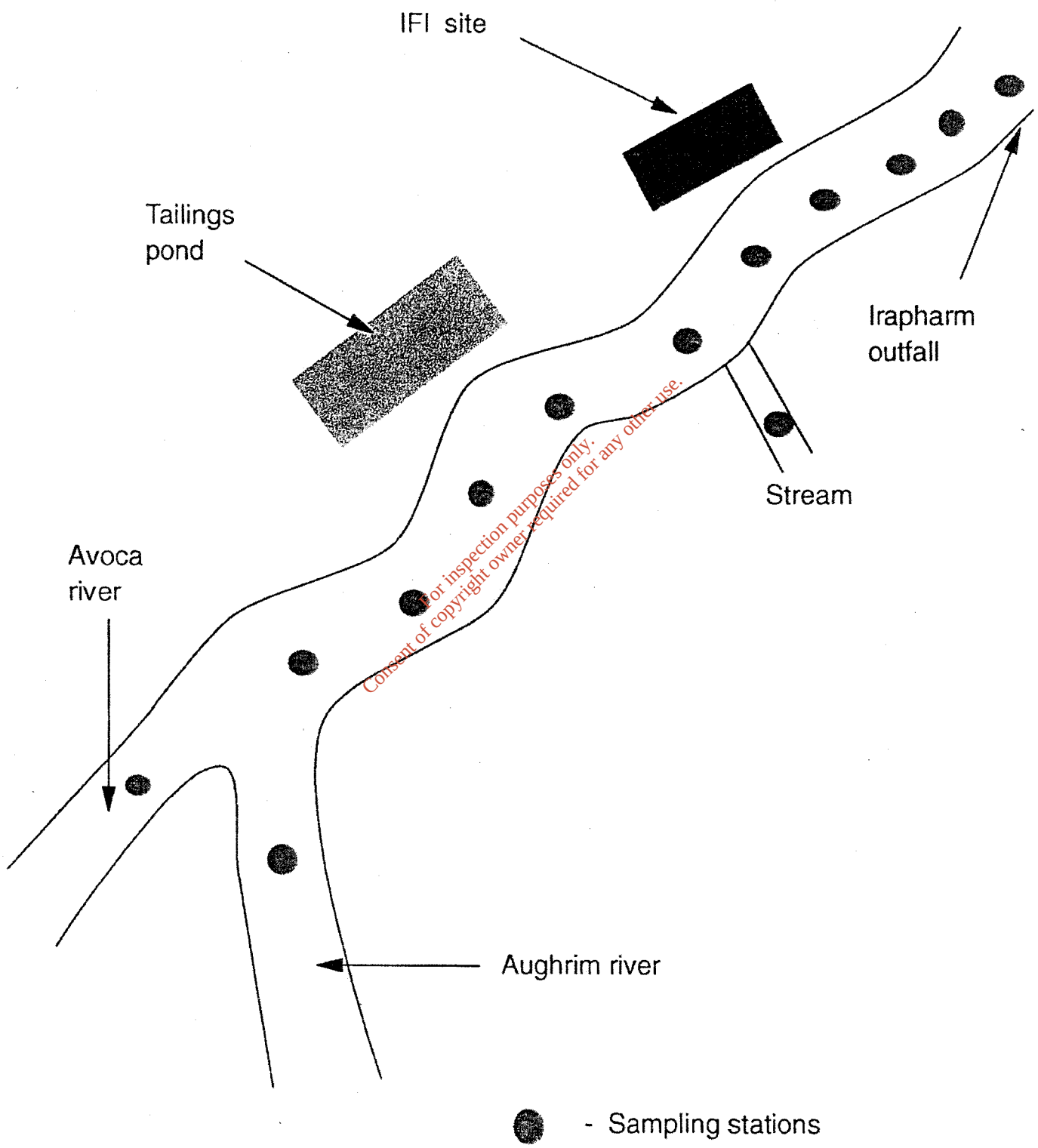
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# APPENDIX 2

## Location of sampling stations



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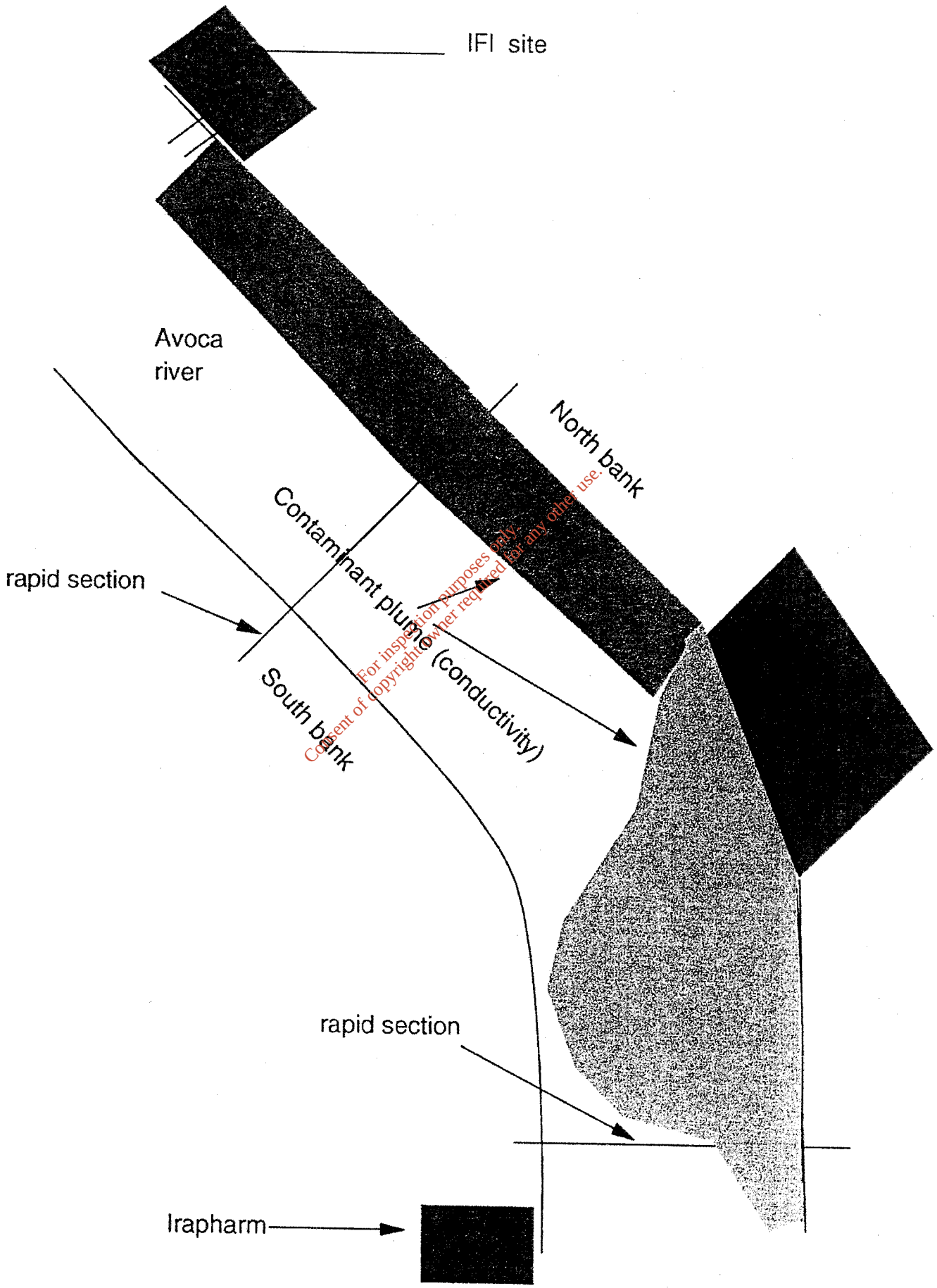
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# APPENDIX 3

## Schematic representation of conductivity plume along Avoca river



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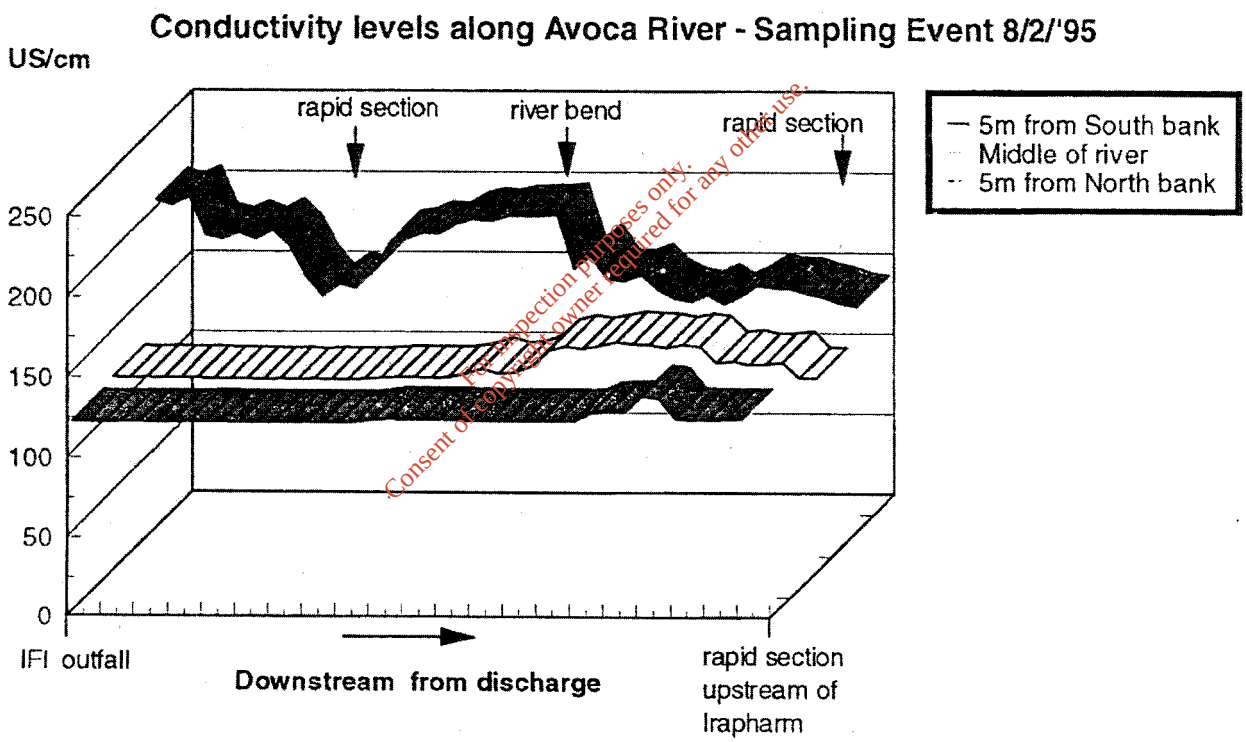
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# APPENDIX 4

## Schematic representation of conductivity levels along Avoca River

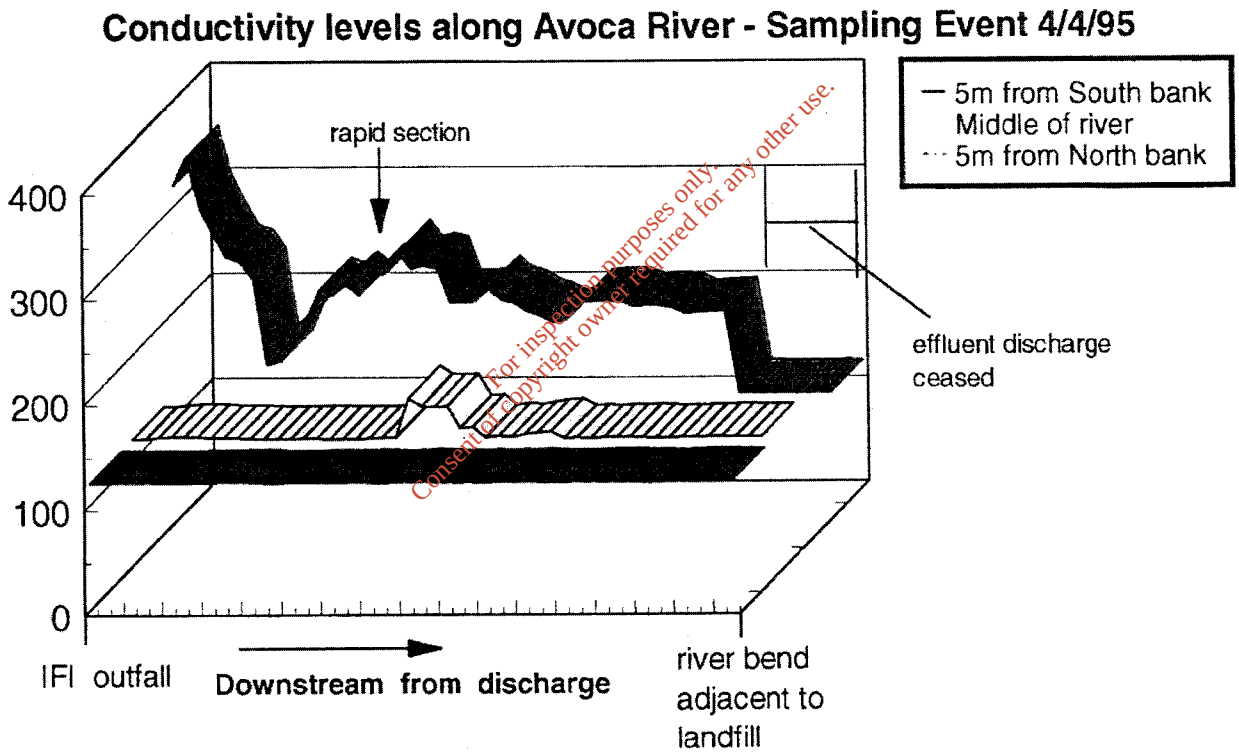


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# **APPENDIX 3** – EPA Licence Technical Amendment Data

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E dublin@pmgroup-global.com
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**File: 011258.04.160**
**EPA Ref: P0031-02/gc37ma.docx**

17 January 2012

Environmental Licensing Programme (ELP),
Environmental Protection Agency (EPA),
P.O. Box 3000,
Johnstown Castle Estate,
Co. Wexford

**Re:** Technical Amendment (Section 96(1) of the EPA Acts) Request – IPPC Licence Register No. P0031-02

To Whom It May Concern:

In relation to our previous letter regarding a technical amendment request dated 12 October 2011, and subsequent to a discussion with Dr Magnus Amajirionwu, Inspector of the Office of Environmental Enforcement on 03 January 2012, we would like to submit an amended drawing for the redrawing of the IPPC licensed site boundary. This request concerns a proposed change to the IPPC licence boundary at the facility in Avoca River Park near Arklow, Co. Wicklow. The proposed IPPC site boundary is outlined in Drawing No. 011258-22-SK-0004 Issue B.

Please do not hesitate to contact me at 01 4040797 or by email at mags.dalton@pmgroup-global.com if you have any questions on the above or you wish to request additional information regarding. Alternatively we would be happy to meet to discuss, if required.

Yours sincerely,

Mags Dalton
**EHS Manager**
On behalf of Holfeld Plastics Limited

Cc Mr Edmund Holfeld (Holfeld Plastics Ltd.)
Mr Brian Kealy (Holfeld Plastics Ltd

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ENVIRONMENTAL PROTECTION AGENCY
18 JAN 2012

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NOTES

SHELTON ABBEY

PHOSPHOGYPSUM POND

KEW CELL FOR INERTS

PHASE 1

PHASE 2

CARRIGEEN PHOSPHOGYPSUM POND

AVOCA RIVER

Lodge

Lodge

Weir

Ruin

N11 ARKLOW BYPASS

LEGEND

REVISED BOUNDARY OF HOLFELD PLASTICS LTD.

ENVIRONMENTAL PROTECTION AGENCY
18 JAN 2012

| ISSUE | DESCRIPTION | DRN | CHK | APP | DATE |
|---|---|---|---|---|---|
| B | REISSUED FOF INFORMATION | | | | |
| A | FOR INFORMATION | BD | FO'N | RO'D | FO'N |

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CLIENT: HOLFELD PLASTICS LTD

PM GROUP

PROJECT: EPA SUBMISSION

TITLE: REVISED IPPC SITE BOUNDARY FOR HOLFELD PLASTIC LTD.

CLIENT REF.

CLIENT ORG No.

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Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

Headquarters
P.O. Box 3000
Johnstown Castle Estate
County Wexford
Ireland

# TECHNICAL AMENDMENT B
# TO
# INTEGRATED POLLUTION PREVENTION & CONTROL LICENCE

| | |
|---|---|
| **Licence Register Number:** | P0031-02 |
| **Licensee:** | Holfeld Plastics Limited |
| **Location of Installation:** | Arklow<br>County Wicklow |

# *Reasons for the Decision*

The Environmental Protection Agency is satisfied, on the basis of the information available, that subject to compliance with the conditions of Integrated Pollution Prevention and Control (IPPC) licence Reg. No. P0031-02 granted on the 10th March 2000, (and amended on 31st December 2008) as well as any amendments noted herein, any emissions from the activity will comply with and not contravene any of the requirements of Section 83(5) of the Environmental Protection Agency Acts, 1992 to 2011.

# *Technical Amendment*

In pursuance of the powers conferred on it by Section 96(1)(c) of the Environmental Protection Agency Acts, 1992 to 2011, the Agency amends the licence, granted to Holfeld Plastics Limited, Avoca River Park, Arklow, County Wicklow.

Henceforth, the licence shall be read in conjunction with Amendment A issued on 31st December 2008, and the amendment set out below.

This technical amendment is limited to the following:

# *Amendments*

*Amend Condition 1.4 of the licence, to read as follows:*

1.4 For the purposes of this licence, the installation authorised by this licence is the area of land outlined in broken red line on Drawing No. 011258-22-SK-0004 (Revision B) *'Revised IPPC Site Boundary for Holfeld Plastic Ltd.'*, received by the Agency on 18th January 2012.

Any reference in this licence to "installation" shall mean the area thus outlined in broken red line. The licensed activities shall be carried on only within the area outlined.

This technical amendment shall be cited as Amendment B to the licence.

**Sealed by the Seal of the Agency on this the 18th day of May, 2012.**

**PRESENT when the seal of the Agency was affixed hereto**

**Mary Turner, Authorised Person**

ENVIRONMENTAL PROTECTION AGENCY
19 OCT 2011

PM GROUP

**File: 011258.04.160**
**EPA Ref: P0031-02/gc37ma.docx**

12 October 2011

Environmental Licensing Programme (ELP),
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**Re:** Technical Amendment (Section 96(1) of the EPA Acts) Request – IPPC Licence Register No. P0031-02

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To Whom It May Concern:

Following a meeting with Dr Magnus Amajirionwu, Inspector of the Office of Environmental Enforcement on 13.9.2011 at the Holfeld Plastics Ltd. facility, PM Group on behalf of Holfeld Plastics Ltd. would like to make a request for a technical amendment in line with Section 96(1) of the EPA Acts. This request concerns a proposed change to the IPPC licence boundary at the facility in Avoca River Park near Arklow, Co. Wicklow.

The proposed IPPC site boundary is outlined in Drawing No. 011258-22-SK-0004 in **Attachment 1**. It is proposed that the old IFI production area and the area north of the landfills and gypsum ponds be removed from the domain of the current HPL site IPPC boundary. The following sections outline the site history, clean-up activities conducted to date, regulatory context, summary of risk assessment undertaken, proposed future clean-up, progress to date and conclusions.

## 1. SITE HISTORY

The fertiliser site was historically split in three distinct zones:

- Production and Storage (Production area) – Production and storage area for fertiliser
- Gypsum ponds – storage areas for dewatering of gypsum slurry produced as by-product in 1970's.
- Landfills – disposal of domestic and other wastes.

The IFI business was liquidated and the site sold to HPL in 2005 at which time the IPC licence was transferred.

Project Management Limited t/a PM Group, a private company limited by shares, registered in Ireland. Company Registration No. 043789.

**Directors** K Kelly (Chairman), P McGrath (CEO), J Egan, D Flinter, B Gallagher, S Kelly, M Lynam, D Murphy, L O'Mahony, M Shelly, E Tarrant, L Westman,
**Secretary** J Sheehan **Associate Directors** P Byrne, P Coghlan, D Corrigan, P Daly, R Doyle, F Dunphy, K Elliott, M Farrelly, G Fitzgerald, L Foley, J French, C Gill, P Hallam, J Hamilton, JJ Hayes, P Heade, A Hennessy, T Hickey, F Kennedy, K Kenny, M Law, C Leddy, E Lee, J Leonard, M McAree, T McGrath, P McHugh, J McNelis, B Madden, L Manley, S Moloney, C Murphy, Niall Murphy, Niamh Murphy, D Nash, D Nugent, P O'Brien, J C O'Connell, D O'Dwyer, N O'Loughlin, B O'Neill, P O'Reilly, A O'Rourke, B O'Toole, J Phelan, L Phelan, A Rayner, A Redmond, B Roe, P Ryan, B Shelly, G Shelly, A Sweeney, P Swords, P Treacher, T Waters, T White

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## 2. CLEAN-UP ACTIVITIES

Earlier studies by IFI had identified known liabilities that have resulted in multiple clean-up projects over the last 6 years. These include:

- Decommissioning and removal of production plant;
- Hazardous waste disposal;
- Refurbishments of bulk storage sheds;
- Removal and disposal of asbestos roofing;
- Excavation and removal of diesel oil contaminated soils;
- Excavation and removal of PCB oil contaminated soils;
- General clean-up, reinstatement and landscaping of the site.

All remediation projects have been completed in good faith, at great expense, and serve to remove all known liabilities from the former production area.

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## 3. IPPC DIRECTIVE

Article 3 Paragraph (f) of the IPPC directive (96/61/EC) requires "the necessary measures are taken upon definitive cessation of activities to avoid any pollution risk and return the site of operation to a satisfactory state".

The issue of risk is addressed below in Section 4.

Article 6 of the directive requires that the application for permit "include the conditions of the site of the installation". In the absence of guidance, it is accepted in other European jurisdictions that the site condition at the time of transition into IPPC represents the baseline for regulation. And indeed the premise of IPPC is generally seen to be the protection of the environment as demonstrated by no deterioration.

All monitoring surveys of the site have shown a consistent improvement in site quality. The site condition is now significantly improved on the baseline condition at the time of licensing.

## 4. RISK ASSESSMENT

As part of the site boundary re-drawing PM Group on behalf of Holfeld Plastics commissioned Sean Moran (qualified hydrogeologist) of O' Callaghan Moran & Associates (OCM) to undertake an independent Environmental Risk Assessment for the old IFI production area. The report is included in **Attachment 2**.

The report assesses the progress of the Monitored Natural Attenuation (MNA) approach, PM Group's Site Residuals Management, Modelling and Risk Assessment Report (011258-22-RP-0005, issued to the Office of Environmental Enforcement) and provides a quantitative assessment of the residual risk.

The findings of the OMC report show that at 10 of the 12 groundwater monitoring wells the ammonia and nitrate levels are already below the concentrations predicted in the groundwater modelling completed in 2007. This demonstrates that natural attenuation is proving effective.



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As previously discussed with the EPA the attenuation rate has been slower than predicted in the southern part of the Production area. OCM considers this is associated with the presence of very thick silt/clay subsoils in this area, which restricts the rate of groundwater through put to the river resulting in low oxygen levels and slowing down the rate of ammonia degradation in this area.

Surface water monitoring carried out by OMC on the Avoca River indicates that there is no significant difference in nitrate, sulphate or COD between the monitoring locations up and downstream of the Production Area. The ammonia concentrations do increase slightly downstream of the Production Area but these increases are not considered significant. OCM considers therefore the environmental risk associated with the Production Area is considered insignificant.

Based on the findings from OMC's Risk Assessment the former production area should therefore be released from the licence.

As discussed, it is agreed that IPPC licence compliance monitoring of BH94/14 and BH94/15 (located within area proposed to be removed from IPPC licence boundary) will continue to be undertaken by Holfeld Plastics until such time as the EPA deem necessary. It is proposed that this requirement be reviewed annually as part of the Annual Environmental Report (AER).

Note: The area north of the landfills and gypsum ponds has been historically used for agricultural purposes only. Monitoring wells BH94/3 and BH97/7 are the closest bore holes in the area monitored in the last 8 years. In agreement with the EPA these bore holes are no longer monitored. Given that the hydraulic gradient of the site is towards the Avoca River and the areas historical use, the area north of the landfill presents no risk to the environment and therefore should be released from the licence.

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## 5. FUTURE CLEAN-UP

Following from Meeting Record issued by Dr Magnus Amajirionwu, Inspector of the Office of Environmental Enforcement following a meeting on 13.9.2011 Holfeld Plastics Ltd and PM Group are currently preparing a proposal for:

- A quantified risk assessment of all on-site landfills and provide details of outstanding works required to restore the closed landfill sites to EPA specifications and a timeframe for their completion;
- The Licensee shall consider the potential financial implications resulting from the quantified risk assessment of all on-site landfills and submit details of responsibilities and financial arrangements put in place.

This proposal will be issued to the EPA by Friday 14 October for the EPA's consideration.

It should be noted that the original bond of €500,000 is still in place. This was determined prior to completed works discussed in Section 2. A revision of this will be undertaken in light of reduced construction costs, above mentioned works and outcome of quantified risk assessment.

Further east of the site, the southern landfill has been previously capped to a design agreed with the EPA however the northern landfill was not capped to the same specification. Capping of the northern landfill will commence in line with recommendations issued as part of the above quantified risk assessment. The capping will be designed and engineered to the highest international standards and will only be implemented with the approval of the EPA.



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## 6. CONCLUSION

In summary, Holfeld Plastics Ltd proposes to re-draw the site boundary at Avoca River Park, Arklow, Co. Wicklow. The revised site boundary is presented in Drawing No. 011258-22-SK-0004. Please note that this request is accompanied by a review request fee of €126 in accordance with the EPA (Licensing Fees) Regulations 1994 to 2006.

We acknowledge and appreciate the time, effort and assistance of the EPA in progressing to our current position. The EPA has accepted that the priority zones are the southern zones, gypsum ponds and landfills, and has already agreed that the site monitoring be reduced to properly reflect risk posed by the site. We encourage the EPA to proceed with this pragmatic approach and its logical progression to release the requested fraction of the site.

Please do not hesitate to contact me at 01 4040797 or by email at mags.dalton@pmgroup-global.com if you have any questions on the above or you wish to request additional information regarding. Alternatively we would be happy to meet to discuss.

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Yours sincerely,

Mags Dalton

**EHS Manager**

On behalf of Holfeld Plastics Limited

Cc Mr Edmund Holfeld (Holfeld Plastics Ltd.)
Mr Brian Kealy (Holfeld Plastics Ltd.)



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# **APPENDIX 4** – 2011 Holfeld Plastics AER

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# Holfeld Plastics Ltd

## Environmental Support
## Project No.: IE0310761

# ANNUAL ENVIRONMENTAL REPORT 2011

**File No: IE0310761.22.040** **Document Number: IE0310761-22-RP-0001**

| CURRENT ISSUE | | | | | |
|---|---|---|---|---|---|
| Issue No: A | Date: 13/04/2012 | Reason for Issue: For EPA Submission | | | Customer Approval (if required) |
| Sign-Off | Originator | Checker | Reviewer | Approver | |
| Print Name | Rory O'Dwyer | Mags Dalton | | Mags Dalton | |
| Signature | Rory O'Dwyer | M Dalton | | M Dalton | |
| Date | 13/04/2012 | 13/4/2012 | | 13/4/2012 | |

| PREVIOUS ISSUES (Type Names) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Issue No. | Date | Originator | Checker | Reviewer | Approver | Customer | Reason for Issue |
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# 1. INTRODUCTION

Licensee Holfeld Plastics Limited

Licence Register Number P0031-02

The original licensee (Irish Fertilizer Industries Limited) went into liquidation on 8 November 2002 and the fertilizer process plants have been out of operation since then. All process equipment has been subsequently decommissioned and exported.

## 1.1 Historical Activities of Site

Irish Fertilizer Industries (IFI) was a joint venture company involving the State Company Nitrigin Eireann Teoranta (NET) and ICI plc. The company was the only fertilizer manufacturer in Ireland and operated three sites located in Cork, Belfast and Arklow.

The IFI Arklow site occupies 50 hectares in the Avoca Valley on the east coast of Ireland approximately 2.5 km north west of the town of Arklow in the flood plain of the Avoca River. The river flows along the southern boundary of the site and supplied all of the site water requirements except for drinking water.

The main products manufactured by IFI at the Arklow site were Calcium Ammonium Nitrate (CAN) and blends. Nitric Acid was produced mainly as an intermediate although there was a minor acid sales business.

The entire factory operation required the usual site services of water treatment, steam generation, laboratory activities and storage of raw materials, intermediates, products and ancillary materials.

Other nutrients which complement the range of fertilizer products were imported and blended as required.

## 1.2 Site IPPC History

The Arklow Factory was first granted an Integrated Pollution Control (IPC) Licence (register no. 31) by the Environmental Protection Agency (EPA) on 30 January 1997. The company applied for a review of the licence in mid 1999 to cover proposed significant changes in the site processes. The revised licence, (register no. 495), was issued on 10th March 2000. An application to transfer the IPC licence number 495 to Holfeld Plastics was made in September 2005. The transfer was successfully transferred on the 26th October 2005. One of the requirements of both licences is to prepare an Annual Environmental Report for submission to the EPA. This report details environmental performance at the site for the calendar year 2011.

Although all of the process plants were shut down since 2002 and the activity has ceased for in excess of 8 years, site monitoring activities have continued.

An application for a technical amendment has since been submitted to the EPA on 12 October 2011 where it is proposed that the old IFI production area and the area north of the landfills and gypsum ponds be removed from the domain of the current HPL site IPPC boundary. This technical amendment is currently with the

Environmental Licensing Programme of the EPA for consideration and it is expected that a decision will be made in 2012.

## 1.3 Company Organisation for Environmental Management

The site licence was transferred to Holfeld Plastics Limited upon their purchase of the site in 2005. The main activities since then have been the final decommissioning of processes and general site clean-up. In addition, the former bulk storage sheds have been fully refurbished for the relocation of the Holfeld Plastics manufacturing business. These activities have been completed under the direction of Mr. Edmund Holfeld, Managing Director, who has full responsibility for all site activities. In addition expert environmental advice has been provided by PM Group who has been involved with site environmental management in Arklow since the mid 1990s.

# 2. ENVIRONMENTAL DATA SUMMARY INFORMATION

This report details environmental performance at the site for the calendar year 2011. The relevant worksheets from the AER Returns Workbook have been included in hard copy in Appendix D of this report.

## 2.1 Emissions to Waters

There was no liquid effluent discharged to the Avoca River in 2011.

## 2.2 Waste Management

All waste generated on site is managed within the remit of the licence. The following are the types and quantities of waste that were managed during 2011.

**Holfeld Plastics:**

| Waste Type (EWC Code) | Quantity (kg unless stated otherwise) |
|---|---|
| Cardboard (20 01 01) | 62,656 |
| Plastics (20 01 39) | 60,542 |
| Mixed Municipal Waste (20 03 01) | 6,600 |
| Alum Swarf (20 01 40) | 2,500 |
| Alum Solids (20 01 40) | 4,160 |
| Mild Steel (20 01 40) | 480 |
| Waste Oil (13 02 06) | 1,640L |

## 2.3 Environmental Incidents and Complaints

There were no reported incidents or complaints in the calendar year 2011.

**Table 2.1:** Summary of Environmental Incidents 2011

| Date | Incident Description | Actions Taken |
|---|---|---|
| NONE | NONE | NONE |

# 3. ENVIRONMENTAL MANAGEMENT

## 3.1 Residual Management

A monitored natural attenuation programme with associated modelling was developed during 2004 for the soil and groundwater beneath the former process area of the site. This was been submitted to the Agency for agreement in 2004.

This groundwater model was updated in 2007 and was submitted as part of the Avoca River Park Site Residuals Management, Modelling and Risk Assessment report (PM report no. 011258-22-RP-0005).

### 3.1.1 Site Clean Up Activities

Earlier studies by IFI had identified known liabilities that have resulted in multiple clean-up projects over the last 6 years. These include:

- Decommissioning and removal of production plant;
- Hazardous waste disposal;
- Refurbishments of bulk storage sheds;
- Removal and disposal of asbestos roofing;
- Excavation and removal of diesel oil contaminated soils;
- Excavation and removal of PCB oil contaminated soils;
- General clean-up, reinstatement and landscaping of the site.

All remediation projects have been completed in good faith, at great expense, and serve to remove all known liabilities from the former production area.

### 3.1.2 Risk Assessment

As part of a recent request to the EPA for a site boundary re-drawing PM Group on behalf of Holfeld Plastics commissioned Sean Moran (qualified hydrogeologist) of O' Callaghan Moran & Associates (OCM) to undertake an independent Environmental Risk Assessment for the old IFI production area.

The report assesses the progress of the Monitored Natural Attenuation (MNA) approach, PM Group's Site Residuals Management, Modelling and Risk Assessment Report (011258-22-RP-0005, issued to the Office of Environmental Enforcement) and provides a quantitative assessment of the residual risk.

The findings of the OMC report show that at 10 of the 12 groundwater monitoring wells the ammonia and nitrate levels are already below the concentrations predicted in the groundwater modelling completed in 2007. This demonstrates that natural attenuation is proving effective.

As previously discussed with the EPA the attenuation rate has been slower than predicted in the southern part of the Production area. OCM considers this is

associated with the presence of very thick silt/clay subsoils in this area, which restricts the rate of groundwater through put to the river resulting in low oxygen levels and slowing down the rate of ammonia degradation in this area.

Surface water monitoring carried out by OMC on the Avoca River indicates that there is no significant difference in nitrate, sulphate or COD between the monitoring locations up and downstream of the Production Area. The ammonia concentrations do increase slightly downstream of the Production Area but these increases are not considered significant. OCM considers therefore the environmental risk associated with the Production Area is considered insignificant.

Based on the findings from OMC's Risk Assessment the former production area should therefore be released from the licence.

As discussed, it is agreed that IPPC licence compliance monitoring of BH94/14 and BH94/15 (located within area proposed to be removed from IPPC licence boundary) will continue to be undertaken by Holfeld Plastics until such time as the EPA deem necessary. It is proposed that this requirement be reviewed annually as part of the Annual Environmental Report (AER).

Note: The area north of the landfills and gypsum ponds has been historically used for agricultural purposes only. Monitoring wells BH94/3 and BH97/7 are the closest bore holes in the area monitored in the last 8 years. In agreement with the EPA these boreholes are no longer monitored. Given that the hydraulic gradient of the site is towards the Avoca River and the areas historical use, the area north of the landfill presents no risk to the environment and therefore should be released from the licence.

### 3.1.3 Future Clean Up Activities

Following from Meeting Record issued by Dr Magnus Amajirionwu, Inspector of the Office of Environmental Enforcement following a meeting on 13.9.2011 Holfeld Plastics Ltd and PM Group are currently progressing the following:

- A quantified risk assessment of all on-site landfills and provide details of outstanding works required to restore the closed landfill sites to EPA specifications and a timeframe for their completion;
- The Licensee shall consider the potential financial implications resulting from the quantified risk assessment of all on-site landfills and submit details of responsibilities and financial arrangements put in place.

It should be noted that the original bond of €500,000 is still in place. A revision of this will be undertaken in light of reduced construction costs, above mentioned works and outcome of quantified risk assessment.

Further east of the site, the southern landfill has been previously capped to a design agreed with the EPA however the northern landfill was not capped to the same specification. Capping of the northern landfill will commence in line with recommendations issued as part of the above quantified risk assessment. The capping will be designed and engineered to the highest international standards and will only be implemented with the approval of the EPA.

## 3.2 Contaminated Soil Removal

All contaminated soil has been removed from the site as previously reported. No removal of contaminated soil occurred during the calendar year 2011.

## 3.3 Sale of Property & Plant

There was no sale of property or plant in 2011.

## 3.4 Environmental Expenditure

The environmental expenditure in 2011 is shown in Table 3.1.

**Table 3.1:** Summary of Environmental Expenditure in 2011

| Item | Cost (€) |
|---|---|
| TEL Labs Monitoring | 1,862 |
| PM Professional Services | 16,690 |
| EPA Annual Fee | 8,318 |
| PCB Testing | 354 |
| Other | 224 |
| **Total** | **27,448** |

# 4. GROUNDWATER, LEACHATE AND SURFACE WATER MONITORING

This section provides the annual review of the groundwater, leachate and surface water quality (based on January 2012 results) at the Holfeld Plastics Site. It is submitted in support of the Annual Environmental Report (AER) and is an update to previous reports covering the period 1997 onwards. This update includes the data for key parameters of concern from one round of monitoring (Jan 2012). A second round of monitoring was conducted in February 2011 and was reported in last years AER.

Monitoring was carried out in accordance with the monitoring schedule agreed with the Environmental Protection Agency (EPA) (EPA letter ref: P0031-02/gc26pmd.doc).

A total of 11 groundwater monitoring wells, 4 leachate monitoring wells, and 4 surface water locations were sampled in 2011/12. It should be noted that monitoring was not carried out at certain borehole monitoring locations for reasons stated in Appendix B.

Samples were analysed for the parameters outlined in Table 4.1 below. All monitoring wells were purged prior to sampling. A schedule of the monitoring well sampling and purging information is provided in Appendix B.

The analytical results for all samples are given in the tables presented in Appendix A of this report. The location of all boreholes, leachate wells and surface water monitoring points are indicated on a drawing in Attachment 1.

**Table 4.1:** Monitoring Schedule

| Number | Location | Description | Monitoring Parameters |
|---|---|---|---|
| BH 97/2 | Southern Landfill | Groundwater downstream | Ammonia, Nitrate, VOC, COD |
| BH 97/6 | West Boundary | Representative of Upstream conditions (West) | Ammonia & Nitrate |
| BH 97/9 | NE Boundary | Representative of Upstream conditions (North) | Ammonia & Nitrate |
| BH 97/10 | Carbongypsum Pond | Groundwater below Southern Pond | Ammonia, Nitrate, Sulphate, COD |
| BH 97/11 | East Boundary | Representative of Downstream conditions (East) | Ammonia & Nitrate |
| BH 97/14 | SE Boundary | Representative of Downstream conditions (SE) | Ammonia & Nitrate |

| Number | Location | Description | Monitoring Parameters |
|---|---|---|---|
| BH 94/6 | Northern Landfill | Groundwater downstream | Ammonia, Nitrate, VOC, COD |
| BH 94/7 | Production Area | Representative of Production site condition | Ammonia & Nitrate |
| BH94/8 | Landfill Boundary | Representative of site boundary conditions | Ammonia & Nitrate |
| BH 94/14 | Southern Boundary | Representative of Downstream conditions (South) | Ammonia & Nitrate |
| BH 94/15 | Southern Boundary | Representative of Downstream conditions (South) | Ammonia & Nitrate |
| SW2 | North of Landfill | Surface Water run-off from North of Site into Landfill area | Ammonia, Nitrate, COD, pH |
| SW3 | East of Landfill | Surface Water run-off from northern boundary of North Landfill area | Ammonia, Nitrate, COD, pH |
| SW 4 | Shelton Canal | Surface Water downstream of Landfills | Ammonia, Nitrate, COD, pH |
| SW5 | East Boundary | Surface Water run-off from site | Ammonium, Nitrate, COD |
| L 97/1 | Southern Landfill | Landfill Leachate | Ammonia, Nitrate, VOC |
| L 97-2 | Phosphogypsum Pond | Pond Leachate | Sulphate, COD |
| L0 2/1 | Carbongypsum Pond | Pond Leachate | Sulphate, COD |
| L 97/4 | Northern Landfill | Landfill Leachate | Ammonia, Nitrate, VOC, COD |

## 4.1 Analytical Results

All analytical data, in tabular form, are presented in Appendix A. Tables 1 to 4 present the groundwater monitoring data; Table 5 is surface water data and Table 6 presents leachate quality and Table 7 presents VOC (Volatile Organic Compounds) analysis carried out on 4 samples (2 groundwater & 2 leachate) for January 2012.

The sampling locations are presented in Attachment 1.

In addition to the analytical interpretation, graphs of concentration vs. time for each of the groundwater boreholes sampled, leachate wells and surface water sampling points are included.

### 4.1.1 Groundwater Data

**Former Production Areas**

*Ammonia*

Ammonia concentrations recorded from groundwater borehole sampling in the former production areas have shown a slight decrease on values recorded historically. Reductions can be seen in BH94/15 and BH94/7. These overall decreases through time can be explained by the continued natural attenuation on the site and the fact that there are no longer are any inputs from the former production areas. There was a slight increase on 2009 figures at BH 94/14, however this value was still within historical norms.

BH 97/6, BH 97/9, BH97/14 and BH97/11 also in this area, display low and stable concentrations of ammonia through time.

*Nitrate*

Nitrate concentrations in the former production areas have also all shown a decrease on their respective values recorded in 2009. Reductions in concentration can be seen in BH97/9, BH97/14, BH94/7, BH94/14, and BH94/15. The value recorded in at BH97/6 does show a slight increase on the respective value recorded February 2011 but this value is within historical norms for this monitoring location. This shows continued natural attenuation on the site.

BH97/11, also in this area, displays low and stable concentrations of nitrate through time.

**Pond and Landfill Areas**

*Ammonia*

Four boreholes in this area of the site were sampled in the January 2012 round of monitoring. BH97/2, BH97/10, BH94/6 and BH94/8 continue to display a general decrease or steady state in ammonia concentrations.

*Nitrate*

Nitrate concentrations in this area of the site are low. BH97/10, BH94/6 and BH94/8 showed a general decrease or steady state in nitrate concentration levels with BH97/2 showing a slight increase. Although BH97/2 does show a slight increase the concentration value does fall within the historical maximum and minimum.

*Sulphate*

One borehole was sampled and analysed for sulphate in this round of monitoring (BH97/10). BH97/10 showed an increase in sulphate concentration; however the value recorded is within the historical maximum and minimum.

*Chemical Oxygen Demand (COD)*

BH97/2 and BH94/6 continued to show very low levels of COD and remain stable over the monitoring period 1997 to present. BH97/10 shows an increase in COD concentration but is generally within historical norms for that monitoring location.

*Volatile Organic Compounds (VOCs)*

No significant VOCs were detected in the groundwater samples taken in January 2012.

**Leachate Data**

Leachate data, summarised in Tables 6 and 7 in Appendix A, are generally consistent with the historical data. All leachate monitoring points are located in the pond and landfill area of the site.

*Ammonia*

Ammonia levels at L97/1 and L97/4 were generally within the historical ranges in the January 2012, however with a slight increase on February 2011 at L97/4.

*Nitrate*

Nitrate levels at L97/1 and L97/4 were generally within the historical ranges in the January 2012 round of analysis.

*Sulphate*

The Sulphate level at L97/2 was within the historical ranges in the January 2012 and round of analysis. Sulphate levels in L02/1 show a significant decrease on recent years.

*Chemical Oxygen Demand (COD)*

COD levels at L97/2, L02/1 and L97/4 were generally within the historical ranges in the January 2012 round of analysis.

*VOCs*

Only one VOC was recorded in the leachate sample taken in January 2012 at L97/1, namely Benzene at a concentration of 1µg/l. L 97/4 showed several VOCs in January 2012 including 1,1-Dichloroethane (11µg/l), 1,2-dichloroethylene (15µg/l), Benzene (6µg/l), Toluene (11µg/l), Ethylbenzene (14µg/l), trichloroethylene (2µg/l), m+p-Xylene (16µg/l), o-Xylene (6µg/l), 1,3,5-trimethylbenzene (2µg/l), 1,3-dichlorobenzene (1µg/l), 1,4-dichlorobenzene (1µg/l), naphthalene (2µg/l) and 1,2,4-trimethylbenzene (5µg/l). These results are all in line with results from previous years.

### 4.1.2 Surface Water Data

The surface water data, summarised in Table 5, show that most of the concentrations have remained relatively constant. There has been continuing general trend of decrease in ammonia and nitrate concentrations in January 2012 which correlates with a cessation of production activities.

*Ammonia*

Ammonia concentrations continued a general decrease in 2012 in all monitoring locations.

*Nitrate*

Nitrate concentrations at all surface water monitoring points reduced in the latest round of monitoring except for SW3 and SW5 which shows a slight increase in levels from 2011.

*Chemical Oxygen Demand (COD)*

Reductions of COD concentration were observed in SW2 and SW3. A slight increase has been observed at SW4 and SW5 with the concentration falling within the respective historical maximum and minimum.

*pH*

The pH values recorded at all locations were within acceptable limits (7.3 – 7.5) and indicate water that is neutral, with the exception of SW2, which was slightly outside the limit at 7.6.

### 4.1.3 Tables and Graphs

All graphs are provided in Appendix A along with the tables of results.

**Table 4.2:** Tables in Appendix A

| Table No. | Sample; Parameter |
|---|---|
| 1 | Groundwater; ammonia |
| 2 | Groundwater; nitrate |
| 3 | Groundwater; sulphate |
| 4 | Groundwater; COD |
| 5 | Surface water; all |
| 6 | Leachate; selected |
| 7 | VOCs, selected borehole and leachate points (January 2012) |

The following graphs are also included in Appendix A:

- Groundwater: Graphs of concentration vs. time showing levels of ammonia, sulphate, nitrate and COD are provided in graphs 1-11.
- Surface Water: Graphs of concentration vs. time showing levels of ammonia, nitrate, COD and pH are provided in graphs 12-15.

Leachate: Graphs of concentration vs. time showing levels of ammonia, sulphate, nitrate and COD are provided in graphs 16-19.

## 4.2 Summary

### 4.2.1 Production Area

It can clearly be seen that all boreholes to the north of the production area (BH97/9 & BH97/6), in the production area (BH94/7), to the south of the production area along the Avoca River (BH94/14 & BH94/15) and to the south of the production area north of the Carbon Black pond (BH97/14 & BH97/11) have all continued to show a general decrease in concentrations levels through natural attenuation.

### 4.2.2 North Pond

Surface water concentration measured at SW5 show a decrease of Ammonia levels while showing slight increase in Nitrate and COD levels.

L97/2, Leachate concentrations are as expected and remain constant relative to the surrounding ground water samples.

### 4.2.3 South Pond

BH 97/10 continues to show a steady state in concentration levels in comparison to recent year with some slight increases.

L02/1, Leachate concentrations are as expected and remain constant relative to the surrounding ground water samples. L02/1 showed a significant decrease in Sulphate levels in comparisons to previous year and is more in line with the value recorded in November 2007.

### 4.2.4 North Landfill

Borehole BH94/6 located to the south east corner of the site continues to show low concentration levels indicating that no contaminate is egressing from site via ground water.

Again for L97/4, Leachate concentrations are as is expected and remain constantly high relative to the surrounding ground water samples.

Surface water samples at SW2 & SW3 have generally reduced in comparison to 2010 values with some small exceptions, e.g. nitrate concentrations at SW3. Again SW4 which measures the canal down stream of the site clearly shows that there is no impact on the local environment and levels of ammonia and nitrate here have reduced further.

VOC levels recorded at the north landfill area are consistent with the low levels recorded in previous years. VOC in leachate can lead to odour problems, however this is and has not been the case for the site.

### 4.2.5 South Land Fill

Borehole BH97/2 is showing a decrease in ammonia levels and slight increase in Nitrate levels. BH94/15 is continuing to show a general decrease in concentration levels through natural attenuation.

L97/1 has shown a decrease in ammonia levels but a very slight increase in nitrate levels, however, these levels are very consistent with historical norms.

VOC levels recorded at the south landfill area are consistent with the low levels recorded in previous years. VOC in leachate can lead to odour problems, however this is and has not been the case for the site.

# 5. LANDFILL STATUS

This section of the report provides the landfill status information for both active and closed areas of the site. This report covers the period of the calendar year 2011.

## 5.1 Landfill Name and Licence Number

The landfill is known as the Holfeld Plastics Landfill Site and is operated in accordance with the Site's IPC Licence No. P0031-02.

## 5.2 Landfill Location and Description

Historical landfill operations at the Site can be separated into three main categories as follows:

- Disposal of phosphogypsum wastes from the production of phosphoric acid;
- Disposal of carbon from the ammonia plant; and
- Disposal of general plant wastes.

### 5.2.1 Phosphogypsum Wastes

Phosphogypsum wastes were produced during the manufacture of phosphoric acid. The phosphogypsum pond was constructed by the use of soil bunds around the perimeter of the pond and the natural alluvial clay and peat deposits formed the base of the pond. The phosphogypsum slurry was pumped to the pond where the phosphogypsum was allowed to settle with the water being drained from the pond by a series of drainage pipes through the bund and discharging into the drainage canal running through the landfill area. The gypsum pond was used for approximately 6 years (1967 - 1973) until the capacity was exhausted. At this time phosphogypsum wastes were diverted to the carbon pond which had been constructed by similar means immediately to the south of the phosphogypsum pond. The pond was covered with up to 0.6 metres of shale and topsoil and grassed.

### 5.2.2 Carbon Wastes

Carbon wastes, produced during the manufacture of ammonia, were diverted in slurry form to the carbon pond that had been constructed in the south-western corner of the landfill area. The carbon pond was constructed in a similar fashion to the phosphogypsum pond with soil embankments and the surface water was disposed of by drainage to the canal and by seepage into the ground. When exhausted the carbon pond was covered with up to 0.6 metres of shale and topsoil and grassed. Additional material made available during construction of the Arklow by-pass has been added bringing the total depth of cover material to 1 to 2 metres.

### 5.2.3 General Site Wastes

General solid wastes from the Site have been disposed of in two landfill areas immediately to the east of the phosphogypsum and carbon ponds, the Eastern Landfill, North and South. Wastes disposed of in these areas have historically included excavated clay, plastic bags, insulating materials, concrete blocks, bricks,

canteen wastes, dredgings from the drainage canals and effluent lagoon. The Northern Section also includes quantities of iron oxide cinder arising from the manufacture of sulphuric acid from local iron pyrite from the Avoca mines during the period 1972 to 1980.

The Eastern Landfill areas were constructed with either clay or shale embankments around the perimeters and the base being provided by the natural alluvial clay and peat deposits.

The Northern Section was closed and capped with shale and topsoil in 1984, after which time waste disposal activities started in the Southern Section. The western half of the Southern Section was completed in 1994/95 to allow construction of the Arklow by-pass with the Eastern Section in use until May 2001 for disposal of inert Site wastes. Capping work on the Eastern Section was completed in September 2002.

### 5.2.4 Western Landfill (Phase I)

The Eastern Landfill is located immediately alongside, and is visible from, the Bypass. IFI therefore submitted proposals to the EPA for the termination of disposal activities within the landfill and for re-location of landfill operations to a newly engineered cell within the (former) Phosphogypsum Pond, to be called the Western Landfill.

The Western Landfill (Phase I) was completed according to an agreed construction plan in May 2001. Landfill activities to the east of the Arklow Bypass then ceased and the active cell was closed off. Landfilling in the Western Landfill commenced on 27 May 2001.

## 5.3 Owner and/or Operator

The landfill site is owned and operated by Holfeld Plastics.

## 5.4 Area Occupied by Waste

The Landfill Areas occupy an area of approximately 13.5 hectares (34 acres).

## 5.5 Volume and Composition of Waste Deposited in 2011

There have been no wastes disposed of in the landfills in 2011.

## 5.6 Total Accumulated Quantities of Waste Deposited

At end of June 2006, the following are estimates of the extent of waste in the landfill area:

- Phosphogypsum Pond - 55,847 $m^3$ of gypsum
- Carbon/Phosphogypsum Pond - 137,801 $m^3$ of gypsum and approximately 19,080 $m^3$ of carbon black
- Northern Landfill - approximately 130,000 $m^3$ of waste

- Southern Landfill – approximately 59,588 $m^3$
- Western Landfill (Phase1) – approximately 2501 $m^3$

## 5.7 Results of Monitoring Programme

The results of monitoring undertaken in January 2012 are discussed in Section 4 above.

## 5.8 Landfill Operations Monitoring

Observational monitoring for odour and dust generation in the landfill area was recommended in the Landfill Operational and Closure Plan (LOCP). No noise monitoring was required at the landfill Site as all of the landfill have now been closed. No odours or excessive amounts of dust generation have been observed at the landfill site for the reporting period.

## 5.9 Summary of Development/Remedial Works Carried Out

There has been no further development of the landfill areas during 2011.

If monitoring shows that significant environmental pollution is occurring from the landfill areas, provisions are in place to provide remediation works if and when required.

Currently Holfeld Plastics is carrying out additional site investigations in relation to the Northern Landfill (East and West) with the aim of agreeing a final capping plan for the landfill cell with the EPA. This study is currently in progress and will be submitted to the EPA in due course.

## 5.10 Revisions to Landfill Operational Plan

A revised LOCP was developed in October 2001; this document incorporates the final details of the Western Landfill (Phase I).

## 5.11 Calculated Remaining Capacity

All of the site landfills have now ceased accepting waste.

## 5.12 Calculated Final Capacity of Site

All of the site landfills have now ceased accepting waste.

## 5.13 Progress on Restoration of Completed Cells

The restoration of the completed cells at the Holfeld Plastics landfill area has been progressing since June 1998. As part of the construction of the adjacent N-11 Arklow By-pass, IFI acquired significant volumes of excavated natural soils (predominantly clay) for use in the restoration of the completed landfill cells and for construction of the Western Landfill. This stockpiled material has been used for cell closure, screening mounds and construction of new landfill.

The cell closure included preliminary capping of the carbon pond, phosphogypsum pond and old landfill sections. Details have been included in the LOCP Update 2001. Capping work on the Eastern Section was completed in September 2002 as per the detailed proposals agreed with the Agency.

Trials with native tree and shrub species, for capping completion and screening, have also been undertaken at the Site.

As mentioned in Section 5.9 there is currently a project progressing with regard to the agreeing of the final capping plan for the remaining Northern Landfill (East and West). The outcome of this project will be submitted to the EPA in due course. Once this work has been agreed and in time the capping carried out, all landfill cells at the site will be capped as final.

# 6. UPDATE OF FINANCIAL PROVISIONS

## 6.1 Existing Finical Provisions

A summary of the existing Financial Provisions for the site, as provided in the Residual Management and Financial Provision (010911-22-RP-006) of 2005 is summarised in Table 6.1 below.

**Table 6.1** Existing Financial provision

| Environmental Liability | Likely Cost |
|---|---|
| Monitoring and Monitored Natural Attenuation Programme | € 100,000 |
| Hydrocarbon Contamination | € 7,000 |
| PCB Contamination | € 7,000 |
| Landfill Areas | € 305,000 |
| Asbestos Waste | € 60,000 |
| Oil Line in Arklow Harbour | € 21,000 |
| **Totals** | **€ 500,000** |

The above 2005 costs were based on estimated costs, at 2005 prices, for identified risks and known liabilities.

## 6.2 Update of Financial Provisions

Based on the existing Financial Provisions and subsequent works carried out on site, it is considered that the below financial provisions will be required to deal with the items detailed below.

### 6.2.1 Site Monitoring (incl. Monitored Natural Attenuation Programme)

Monitoring of the groundwater on site will still be required to confirm the monitored natural attenuation is occurring. Monitoring of the ponds and landfill areas will be required for surface water and groundwater. The monitoring should continue at the current frequency (twice yearly) as long as necessary to confirm the natural attenuation of the pollutant plumes.

An updated Residuals Management and Financial Provision is currently being drafted by Holfeld Plastics and will be submitted to the EPA in due course. This report will outline the updated financial provision required for the site monitoring, incl. the Monitored Natural Attenuation Programme.

## 6.3 Removal of Hydrocarbon & PCB Contaminated Soils and

As previously stated all contaminated soil has been previous removed inline with the sites Residual Management Plan.

## 6.4 Pond and Landfill Maintenance

The monitoring of the ponds and landfills will continue. As previously stated currently the risk of significant environmental impacts from the landfill areas is considered to be low. If the monitoring shows that significant environmental pollution is occurring form the landfill areas, remedial works may be required.

As mentioned previously, an additional investigation is in progress in order to agree a final capping plan for the Northern Landfill (East and West) with the EPA. In addition, the Residuals Management and Financial Provision is being updated also to reflect the costs of this proposed capping plan. Both of these studies are currently in progress and will be submitted to the EPA in due course.

## 6.5 Asbestos Waste

As previously reported all asbestos has been appropriately removed and disposed of from site.

## 6.6 Oil Contaminated Culvert in Arklow Harbour

As previously reported cleaning and disposal of oil from the oil contaminated culvert in Arklow harbour has occurred inline with the site's Residual Management Plan.

## 6.7 Financial Provision

As outlined above Holfeld Plastics are currently updating the Residuals Management and Financial Provisions. This will be submitted to the EPA in due course and will reflect the updated known risks and their associated costs. The environmental liabilities that will be costed are those outlined above, as follows:

| **Environmental Liability** | **Likely Cost** |
|---|---|
| Monitoring and Monitored Natural Attenuation Programme | To be updated |
| Landfill Areas | To be updated |
| **Total** | To be updated |

### 6.7.1 Proposed Financial Instruments

Holfeld Plastics have put in place a bank guarantee of €500,000 to cover for the known environmental liabilities on the site and this original bond is still in place. This bank guarantee should more than adequately cover known environmental liabilities on the site, but this will be confirmed on completion and submission of the updated Financial Provisions.

# APPENDIX A

## GROUNDWATER, LEACHATE AND SURFACE WATER MONITORING TABLES AND GRAPHS

Table 1
Groundwater Analytical results for Ammoniacal Nitrogen (mg/l) Results
July 97 to January 2012

| Borehole Number | Jul-97 | Jan-98 | Aug-98 | Mar-99 | Sep-99 | Apr-00 | Sep-00 | Mar-01 | Sep-01 | Feb-02 | Sep-02 | Mar-03 | Sep-03 | Feb-04 | Sep-04 | Jun-06 | Mar-07 | Nov-07 | EPA Mar-08 | Nov-08 | EPA Jun 09 | Oct-09 | Jun-10 | Aug-10 | Feb-11 | Jan-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 97/2 | 6.0 | 0.8 | 4.4 | 4.4 | 2.8 | 4.7 | 4.8 | 13.2 | 11 | 10 | 8.9 | 18 | 27 | 26 | 7 | 0.1 | 20 | 90 | 2.4 | 21 | 28 | 50 | 39 | 26 | 24 | 20 |
| 97/6 | 0.7 | 1.4 | 1.0 | 2.6 | 1.2 | 0.4 | 0.1 | 4 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 | 0.09 | 0.1 | | 0 | | 0.1 | 0.1 | | 0.12 | 0.38 |
| 97/9 | 0.2 | | | | | | 0.1 | 0.1 | | | | | 0.1 | | 0.1 | 0.1 | 0.6 | 0.1 | | 0 | | 0.1 | 0.1 | | 0.1 | 0.1 |
| 97/10 | 116.0 | 44.8 | 34.0 | 41.7 | 33.5 | 30.7 | 29.8 | 38.5 | 37 | 39 | 26 | 37 | 25 | 17 | 18 | 8 | 16 | 9.5 | | 10 | | 11 | 9.3 | | 8.7 | 9 |
| 97/11 | 0.4 | | | | | | 0.9 | | | | | | 0.1 | | | | | 0.16 | | 0.3 | | 0.57 | 0.39 | | 0.37 | 0.21 |
| 97/14 | 507.0 | | | | | | 328 | | | | | | 487 | | | 55 | 237 | 7.2 | | 4.3 | | 5.6 | 5.6 | | 4.7 | 5 |
| 94/6 | 1.9 | 1.7 | 1.7 | 0.9 | 1.7 | 1.6 | 0.1 | 1.6 | 1.3 | 1.8 | 0.8 | 1 | 3.5 | 1 | 9 | 1 | 1.4 | 1.2 | | 1.4 | | 1.2 | 1.5 | | 1.4 | 1.8 |
| 94/7 | 321.0 | | | | | | 140 | | | | | | 73 | | | 22 | 58 | 49 | | 42 | | 50 | 33 | | 44 | 34 |
| 94/8 | 437.0 | | | | | | 156 | | | | | | 262 | | | 3.7 | | | | 79 | | 102 | 91 | | 89 | 61 |
| 94/11 | 1.9 | | | | | | 0.1 | | | | | | 0.2 | | | | | | | / | | | | | | |
| 94/14 | 824.0 | 620.0 | 154.0 | 2.1 | 589 | 561 | 580 | 497 | 632 | 438 | 571 | 335 | 0.1 | 59 | 249 | 283 | 365 | 0.1 | 324 | 278 | 339 | 186 | | | | 240 |
| 94/15 | 4230.0 | 3210.0 | 4600.0 | 4209.0 | 3420 | 3274 | 2544 | 2690 | 3140 | 639 | 516 | 42 | 2280 | 96 | 418 | 218 | 391 | 320 | 310 | 285 | 295 | 304 | 242 | 234 | 220 | 197 |

Figures in Red represent EPA monitoring
NR = No Result
mg/l = Milligrams per litre

Table 2
Groundwater Analytical Results for **Nitrate** (mg/l)
July 97 to January 2012

| Borehole Number | Jul-97 | Jan-98 | Aug-98 | Mar-99 | Sep-99 | Apr-00 | Sep-00 | Mar-01 | Sep-01 | Feb-02 | Sep-02 | Mar-03 | Sep-03 | Feb-04 | Sep-04 | Jun-06 | Mar-07 | Nov-07 | EPA Mar 08 | Nov-08 | EPA Jun 09 | Oct-09 | Jun-10 | Aug-10 | Feb-11 | Jan-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 97/2 | 43 | 44 | 48 | 183 | 69 | 87 | 84 | 74 | 82 | 61 | 85 | 75 | 61 | 55 | 29 | 3 | 17 | 0.8 | 25 | 17 | 25 | 1 | 0.6 | 28 | 19 | 22 |
| 97/6 | 6 | 25 | 23 | 17 | 1 | 7 | 2 | 12 | 9 | 6.5 | 12 | 6 | 12 | 9 | 22 | 28 | 2 | 11 | | 11 | | 2 | 9 | | 4 | 7 |
| 97/9 | 99 | | | | | | 59 | 81 | | | | | 60 | | 48 | 35 | 39 | 35 | | 31 | | 33 | 33 | | 32 | 30 |
| 97/10 | 1 | 5 | 1 | 1 | 36 | 2.4 | 1 | 0.5 | 0.5 | 0.5 | 0.5 | 0.6 | 0.5 | 0.5 | 0.68 | 0.5 | 0.5 | 0.5 | | 0.5 | | 1 | 1 | | 1 | 1 |
| 97/11 | 14 | | | | | | 0.5 | | | | | | 0.6 | | | | | 0.5 | | 0.5 | | 1 | 1 | | 1 | 1 |
| 97/14 | 86 | | | | | | 96 | | | | | | 101 | | | 108 | 41 | 88 | | 73 | | 77 | 50 | | 62 | 57 |
| 94/6 | 1 | 5 | 1 | 7 | 1 | 2.9 | 6 | 1 | 0.5 | 0.5 | 0.5 | 0.8 | 0.6 | 0.5 | 0.69 | 0.5 | 0.5 | 0.5 | | 0.5 | | 1 | 0.6 | | 0.5 | 1 |
| 94/7 | 929 | | | | | | 312 | | | | | | 242 | | | 101 | 186 | 196 | | 133 | | 66 | 46 | | 22 | 9 |
| 94/8 | 1281 | | | | | | 403 | | | | | | 298 | | | 47 | | | | 140 | | 88 | 85 | | 54 | 25 |
| 94/11 | 2 | | | | | | 4 | | | | | | 5 | | | | | | | | | | | | | |
| 94/14 | 1803 | 1004 | 1700 | 1270 | 1470 | 625 | 1815 | 1137 | 836 | 1244 | 1016 | 1033 | 0.6 | 236 | 660 | 258 | 597 | 319 | 416 | 270 | 338 | 104 | | | | 76 |
| 94/15 | / | 7830 | 13120 | 9675 | 4685 | 7035 | 6348 | 5733 | 6049 | 1428 | 1739 | 123 | 3606 | 3033 | 1529 | 556 | 816 | 612 | 576 | 506 | 530 | 524 | 455 | 386 | 349 | 323 |

Figures in Red represent EPA monitoring

NR = No Result

mg/l = Milligrams per litre

Table 3
Groundwater Analytical Results for **Sulphate** (mg/l)
July 97 to January 2012

| Borehole Number | Jul-97 | Jan-98 | Aug-98 | Mar-99 | Sep-99 | Apr-00 | Sep-00 | Mar-01 | Sep-01 | Feb-02 | Sep-02 | Mar-03 | Sep-03 | Feb-04 | Sep-04 | Jun-06 | Mar-07 | Nov-07 | Nov-08 | Oct-09 | Jun-10 | Aug-10 | Feb-11 | Jan-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 97/2 | | | | | | | | | | | | | | | | | | | | | | 119 | | |
| 97/10 | 308 | 500 | 427 | 383 | 380 | 400 | 331 | 430 | 452 | 452 | 475 | 476 | 294 | 298 | 229 | 253 | 269 | 193 | 333 | 369 | 178 | | 345 | 493 |
| 94/11 | 321 | | | | | | 310 | | | | | | 260 | | | | | | | | | | | |
| 94/6 | | | | | | | | | | | | | | | | | | | | 1 | | | | |
| 94/15 | | | | | | | | | | | | | | | | | | | | | | 125 | | |

Figures in Red represent EPA monitoring

NR = No Result

mg/l = Milligrams per litre

Table 4
Groundwater Analytical Results for **Chemical Oxygen Demand** (mg/l)
July 97 to January 2012

| Borehole Number | Jul-97 | Jan-98 | Aug-98 | Mar-99 | Sep-99 | Apr-00 | Sep-00 | Mar-01 | Sep-01 | Feb-02 | Sep-02 | Mar-03 | Sep-03 | Feb-04 | Sep-04 | Jun-06 | Mar-07 | Nov-07 | Nov-08 | Oct-09 | Jun-10 | Aug-10 | Feb-11 | Jan-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 97/2 | 4 | 8 | 4 | 5 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 4 | 12 | 17 | 37 | 191 | 4 | 89 | 59 | 4 | 4 | 4 |
| 97/10 | 4 | 8 | 4 | 5 | 6 | 5 | 4 | 11 | 8 | 9 | 4 | 11 | 4 | 5 | 33 | 9 | 26 | 4 | 5 | 4 | 4 | | 4 | 12 |
| 94/6 | 4 | 10 | 4 | 5 | 5 | 7 | 9 | 5 | 4 | 19 | 4 | 9 | 4 | 272 | 13 | 4 | 29 | 4 | 4 | 4 | 4 | | 4 | 4 |
| 94/11 | 4 | | | | | | 4 | | | | | | 17 | | | | | | | | | | | |
| 94/15 | | | | | | | | | | | | | | | | | | | | | | 21 | | |

Figures in Red represent EPA monitoring

NR = No Result

mg/l = Milligrams per litre

Table 5
Surface Water Analytical Results (mg/l)
July 97 to January 2012

| Sample Location | Jan-98 | Aug-98 | Mar-99 | Sep-99 | Apr-00 | Sep-00 | Mar-01 | Sep-01 | Feb-02 | Sep-02 | Mar-03 | Sep-03 | Mar-04 | Sep-04 | Feb-05 | Jun-06 | Mar-07 | Nov-07 | Nov-08 | Oct-09 | Jun-10 | Feb-11 | Jan-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ammonia | | | | | | | | | | | | | | | | | | | | | | | |
| SW2 | 0.4 | 0.4 | 0.2 | 0.3 | 0.4 | 0.1 | 2.6 | | 0.5 | 0.1 | 0.2 | 0.1 | 0.1 | 0.09 | 0.1 | 0.1 | 0.09 | 0.2 | 0.18 | 0.1 | 0.1 | 0.28 | 0.1 |
| SW3 | 5.2 | 14.3 | 4.3 | 20.6 | 13.7 | 71 | 30.2 | | 41 | 21 | 64 | 11 | 17 | 6 | 4.1 | | 42 | 0.1 | 45 | 0.1 | | 148 | 92 |
| SW4 | 6.4 | 11.0 | 8.0 | 30.7 | 7.8 | 3.5 | 4.2 | 17 | 8 | 6.2 | 1.1 | 2 | 2.6 | 0.09 | 2 | 0.2 | 1 | 37 | 0.15 | 0.1 | 0.1 | 0.73 | 0.1 |
| SW5 | | | | | | | | | | | | | | | | | | 0.1 | 0.27 | 0.1 | 0.1 | 0.34 | 0.12 |
| Nitrate | | | | | | | | | | | | | | | | | | | | | | | |
| SW2 | 63.0 | 40.0 | | 0.5 | 41 | 31 | 51 | 34 | 42 | 34 | 34 | 35 | 40 | 30 | 35 | 38 | 39 | 24 | 21 | 15 | 28 | 31 | 25 |
| SW3 | 65.0 | 37.0 | 50.0 | 10 | 30 | 124 | 69 | 11 | 161 | 53 | 86 | 33 | 46 | 54 | 11 | | 65 | 34 | 29 | 24 | | 104 | 183 |
| SW4 | 80.0 | 115.0 | 81.0 | 11 | 91 | 91 | 57 | 31 | 56 | 53 | 45 | 38 | 53 | 35 | 41 | 41 | 43 | 188 | 29 | 17 | 25 | 37 | 29 |
| SW5 | | | | | | | | | | | | | | | | | | 31 | 29 | 17 | 5 | 30 | 34 |
| COD | | | | | | | | | | | | | | | | | | | | | | | |
| SW2 | 10.0 | 7.0 | 5.0 | 5 | 9 | 6 | 29 | 4 | 7 | 4 | 12 | 8 | 4 | 8 | 10 | 10 | 4 | 34 | 68 | 33 | 5 | 11 | 8 |
| SW3 | 4.0 | 26.0 | 5.0 | 5 | 31 | 53 | 18 | 25 | 233 | 24 | 26 | 34 | 19 | 49 | 16 | | 21 | 28 | 421 | 48 | | 31 | 30 |
| SW4 | 9.0 | 9.0 | 40.0 | 5 | 17 | 11 | 9 | 25 | 9 | 10 | 14 | 14 | 4 | 12 | 4 | 7 | 4 | 653 | 16 | 28 | 9 | 5 | 8 |
| SW5 | | | | | | | | | | | | | | | | | | 20 | 5 | 18 | 26 | 4 | 8 |
| pH | | | | | | | | | | | | | | | | | | | | | | | |
| SW2 | 7.9 | 7.5 | - | 7 | 6.7 | 6.9 | 6.3 | 7.5 | 7.2 | 7.5 | 7.4 | 7.3 | 7.4 | 7.6 | 7.5 | 7.1 | 7.2 | 7.8 | 7.5 | 7.3 | 7.8 | 7.4 | 7.6 |
| SW3 | 6.8 | 7.3 | 6.9 | 6.7 | 6.5 | 6.8 | 6.9 | 7.2 | 7.1 | 7.3 | 7.2 | 7.3 | 7.2 | 7.4 | 7.2 | | 7.2 | 7.4 | 7.3 | 6.7 | | 7.3 | 7.3 |
| SW4 | 7.2 | 6.8 | 5.9 | 6.8 | 6.5 | 6.3 | 7.3 | 7.2 | 6.9 | 7.1 | 7 | 7.2 | 7.3 | 7.3 | 7.4 | 7.2 | 7.1 | 7.4 | 7.3 | 6.8 | 7.5 | 7.1 | 7.3 |
| SW5 | | | | | | | | | | | | | | | | | | - | - | - | | | |

Table 6
Holfeld Plastics Limited, Kilmacanogue, Co. Wicklow
Leachate Analytical results (mg/l) Results
July 97 to January 2012

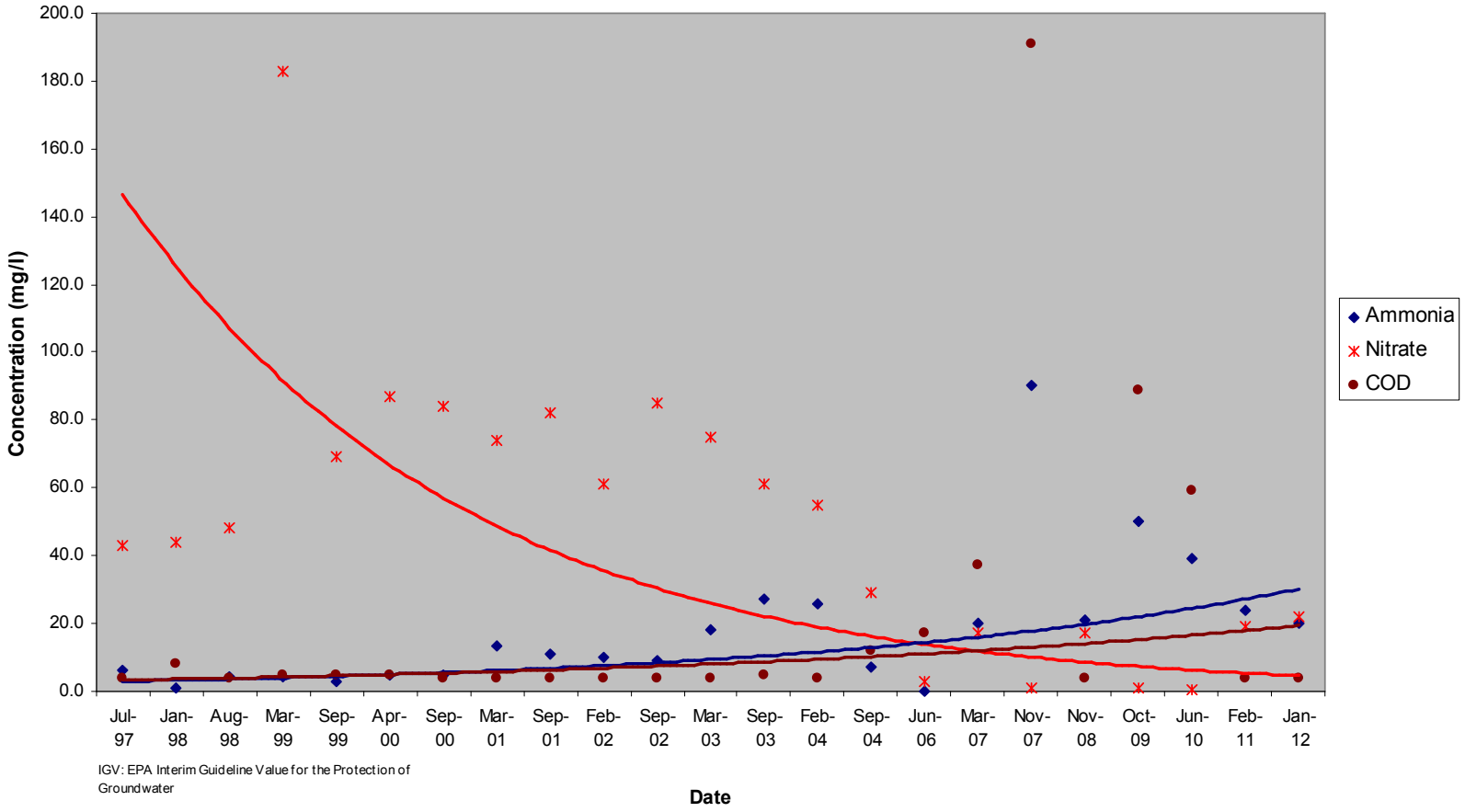
| Borehole Number | Jul-97 | Jan-98 | Aug-98 | Mar-99 | Sep-99 | Apr-00 | Sep-00 | Mar-01 | Sep-01 | Feb-02 | Sep-02 | Mar-03 | Sep-03 | Mar-04 | Sep-04 | Jun-06 | Mar-07 | Nov-07 | Nov-08 | Oct-09 | Jun-10 | Feb-11 | Jan-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ammonia | | | | | | | | | | | | | | | | | | | | | | | |
| L97/1 | 444.0 | 90.9 | 51.0 | 34.2 | 36.1 | 33.4 | 0.1 | 16.9 | 8.4 | 15 | 21 | 31 | 25 | 19 | 22 | 14 | 1 | 20 | 20 | 20 | 19 | 17 | 14 |
| L97/2 | 1.2 | 0.9 | 0.2 | 2.2 | 0.6 | 0.5 | 0.1 | 1.6 | 27 | 5 | 3 | 7.7 | 2 | 1.3 | 9 | 19 | 0.09 | - | - | - | - | - | - |
| L97/3-L02/1 | 4.4 | 1.5 | | | | | 0.1 | | | 800 | 1.9 | 0.7 | 2.4 | 2.5 | 19 | 4.2 | 1.3 | - | - | - | - | - | - |
| L97/4 | 849.0 | 1650.0 | 9.5 | 1128.0 | 1170 | 941 | 1205 | 469 | 3833 | 3350 | 1916 | 269 | 12 | 296 | 733 | 1012 | 428 | 390 | 543 | 599 | 653 | 357 | 500 |
| Sulphate | | | | | | | | | | | | | | | | | | | | | | | |
| L97/1 | 246.0 | 510.0 | 54.0 | 10.0 | 2 | 6.4 | 2 | 488 | 471 | 23 | 6 | 2 | 5 | 21 | 2 | 5 | 10 | - | - | - | - | - | - |
| L97/2 | 600.0 | 1240.0 | 1425.0 | 1263.0 | 1306 | 1465 | 6128 | 1535 | 1647 | 1755 | 2872 | 1322 | 2252 | 1478 | 1996 | 261 | 1392 | 1570 | 1439 | 1372 | 1414 | 1368 | 1440 |
| L97/3-L02/1 | 408.0 | 1221.0 | | | | | 731 | | | 6349 | 15476 | 4374 | 2413 | 3432 | 8157 | 1547 | 1615 | 620 | 1072 | 1379 | 1677 | - | 628 |
| L97/4 | 315.0 | 3536.0 | 5000.0 | 2630.0 | 1170 | 2455 | 2976 | 1522 | 9017 | 1883 | 7250 | 1435 | 2753 | 1433 | 2268 | 4210 | 1443 | - | - | - | | - | - |
| Nitrate | | | | | | | | | | | | | | | | | | | | | | | |
| L97/1 | 23.0 | 5.0 | 1.0 | 17.0 | 1 | 4.1 | 0.5 | 103 | 97 | 1.9 | 0.5 | 0.5 | 0.5 | 0.5 | 0.92 | 5 | 1.2 | 0.5 | 0.5 | 1 | 0.6 | 0.5 | 1 |
| L97/2 | 63.0 | 84.0 | 36.0 | 77.0 | 36 | 38 | 23 | 29 | 16 | 19 | 21 | 111 | 10 | 20 | 47 | 23 | 11 | - | - | - | - | - | - |
| L97/3-L02/1 | 20.0 | 40.0 | | | | | 195 | | | 1 | 2 | 3 | 1 | 0.9 | 10 | 15 | 1 | - | - | - | - | - | - |
| L97/4 | 15.0 | 5.0 | 1.0 | 50.0 | 10 | 5 | 2.5 | 0.5 | 2.5 | 0.5 | 2.5 | 0.5 | 4 | 0.5 | 0.74 | 3 | 0.5 | 0.5 | 0.7 | 1 | 0.5 | 0.5 | 1 |
| COD | | | | | | | | | | | | | | | | | | | | | | | |
| L97/1 | 62.0 | 87.0 | 115.0 | 120.0 | 125 | 62 | 848 | 4 | 6 | 622 | 124 | 142 | 2310 | 41 | 145 | 128 | 106 | - | - | - | - | - | - |
| L97/2 | 29.0 | 39.0 | 29.0 | 5.0 | 16 | 5 | 38 | 33 | 36 | 137 | 28 | 27 | 77 | 33 | 50 | 54 | 10 | 34 | 26 | 25 | 25 | 20 | 23 |
| L97/3-L02/1 | 4.0 | 6.0 | | | | | 4 | | | 4375 | 820 | 303 | 272 | 407 | 7075 | 525 | 238 | 41 | 117 | 385 | 4160 | - | 264 |
| L97/4 | 470.0 | 260.0 | 250.0 | 220.0 | 260 | 240 | 333 | 240 | 526 | 328 | 360 | 459 | 222 | 269 | 273 | 268 | 302 | 210 | 211 | 173 | 149 | 164 | 130 |

**Table 7: VOC Levels January 2012**

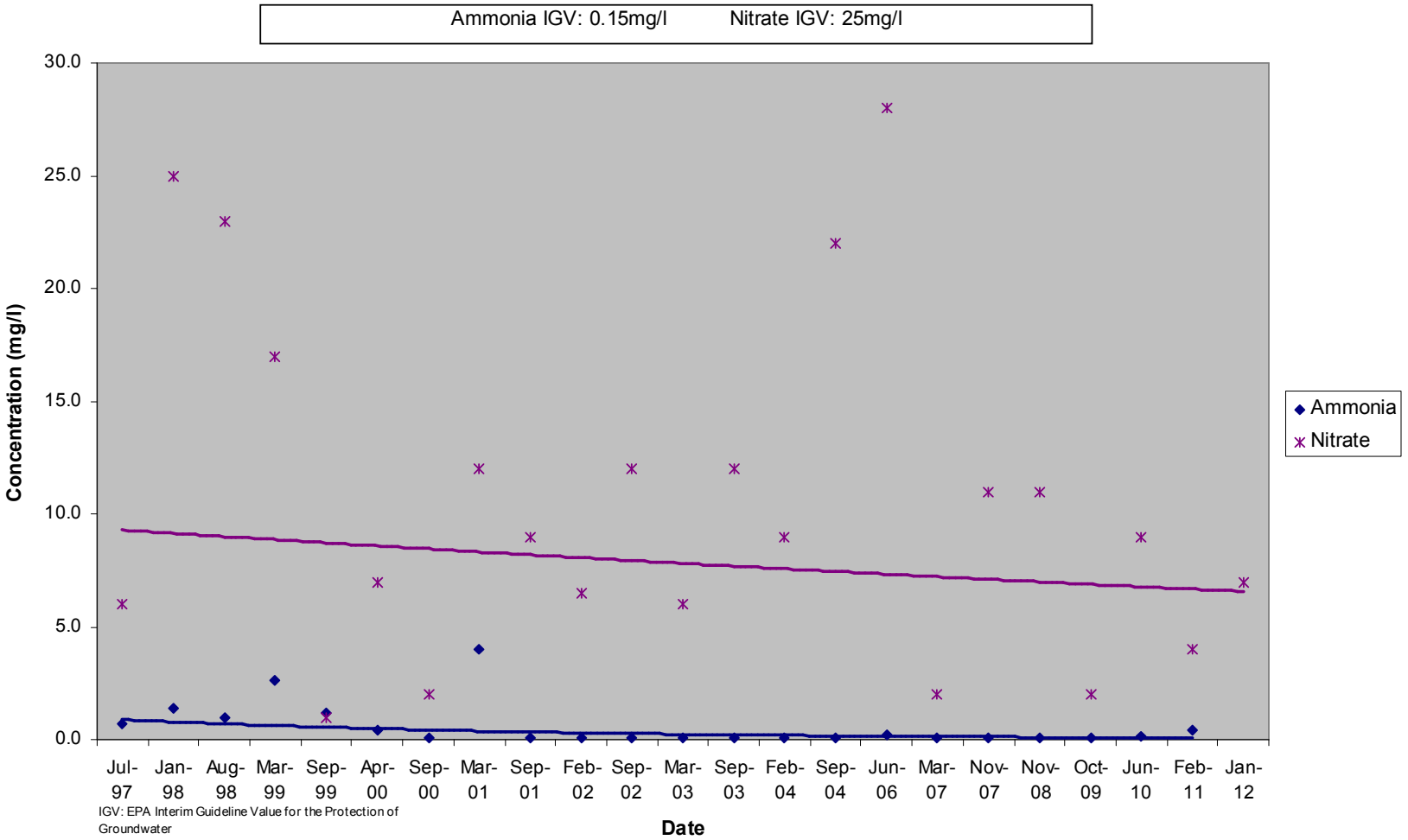
| Determinand | Sample ID / Lab ID | BH97/2 100093 | BH94/6 100099 | L97/4 100102 | L97/1 100103 |
|---|---|---|---|---|---|
| 1,1 Dichloroethylene | ug/l | <1 | <1 | <1 | <1 |
| Methylene Chloride | ug/l | <1 | <1 | <1 | <1 |
| Trans-1,2-dichloroethylene | ug/l | <1 | <1 | <1 | <1 |
| 1,1-dichloroethane | ug/l | <1 | <1 | 11 | <1 |
| 1,2-dichloroethylene | ug/l | <1 | <1 | 15 | <1 |
| 2,2-dichlororopane | ug/l | <1 | <1 | <1 | <1 |
| Bromochloromethane | ug/l | <1 | <1 | <1 | <1 |
| Chloroform | ug/l | <1 | <1 | <1 | <1 |
| 1,1,1-trichloroethane | ug/l | <1 | <1 | <1 | <1 |
| 1,1-dichloropropene | ug/l | <1 | <1 | <1 | <1 |
| Carbon tetrachloride | ug/l | <1 | <1 | <1 | <1 |
| Benzene | ug/l | 1 | 1 | 6 | 1 |
| 1,2-dichloroethane | ug/l | <1 | <1 | <1 | <1 |
| Trichloroethylene | ug/l | <1 | <1 | 2 | <1 |
| 1,2-dichloropropane | ug/l | <1 | <1 | <1 | <1 |
| Dibromomethane | ug/l | <1 | <1 | <1 | <1 |
| Bromodichloromethane | ug/l | <1 | <1 | <1 | <1 |
| cis-1,3-dichloropropene | ug/l | <1 | <1 | <1 | <1 |
| Toluene | ug/l | <1 | <1 | 11 | <1 |
| trans-1,3-dichloropropene | ug/l | <1 | <1 | <1 | <1 |
| 1,1,2-trichloroethane | ug/l | <1 | <1 | <1 | <1 |
| Tetrachloroethylene | ug/l | <1 | <1 | <1 | <1 |
| 1,3-dichloropropane | ug/l | <1 | <1 | <1 | <1 |
| Dibromochloromethane | ug/l | <1 | <1 | <1 | <1 |
| 1,2-dibromoethane | ug/l | <1 | <1 | <1 | <1 |
| Chlorobenzene | ug/l | <1 | <1 | <1 | <1 |
| 1,1,1,2-tetrachloroethane | ug/l | <1 | <1 | <1 | <1 |
| Ethylbenzene | ug/l | <1 | <1 | 14 | <1 |
| m+p-Xylene | ug/l | <1 | <1 | 16 | <1 |
| o-Xylene | ug/l | <1 | <1 | 6 | <1 |
| Styrene | ug/l | <1 | <1 | <1 | <1 |
| Bromoform | ug/l | <1 | <1 | <1 | <1 |
| Isopropylbenzene | ug/l | <1 | <1 | <1 | <1 |
| Bromobenzene | ug/l | <1 | <1 | <1 | <1 |
| 1,2,3-trichloropropane | ug/l | <1 | <1 | <1 | <1 |
| n-propylbenzene | ug/l | <1 | <1 | <1 | <1 |
| 2-chlorotoluene | ug/l | <1 | <1 | <1 | <1 |
| 1,3,5-trimethylbenzene | ug/l | <1 | <1 | 2 | <1 |
| 4-chlorotoluene | ug/l | <1 | <1 | <1 | <1 |
| Tert-butylbenzene | ug/l | <1 | <1 | <1 | <1 |
| 1,2,4-trimethylbenzene | ug/l | <1 | <1 | 5 | <1 |
| sec-butylbenzene | ug/l | <1 | <1 | <1 | <1 |
| p-isopropyltoluene | ug/l | <1 | <1 | <1 | <1 |
| 1,3-dichlorobenzene | ug/l | <1 | <1 | 1 | <1 |
| 1,4-dichlorobenzene | ug/l | <1 | <1 | 1 | <1 |
| n-butylbenzene | ug/l | <1 | <1 | <1 | <1 |
| 1,2-dichlorobenzene | ug/l | <1 | <1 | <1 | <1 |
| 1,2-dibromo-3-chloropropane | ug/l | <1 | <1 | <1 | <1 |
| 1,2,4-trichlorobenzene | ug/l | <1 | <1 | <1 | <1 |
| Hexachlorobutadiene | ug/l | <1 | <1 | <1 | <1 |
| Naphthalene | ug/l | <1 | <1 | 2 | <1 |
| 1,2,3-trichlorobenzene | ug/l | <1 | <1 | <1 | <1 |

Results expressed as ug/l (ppb)
unless stated otherwise

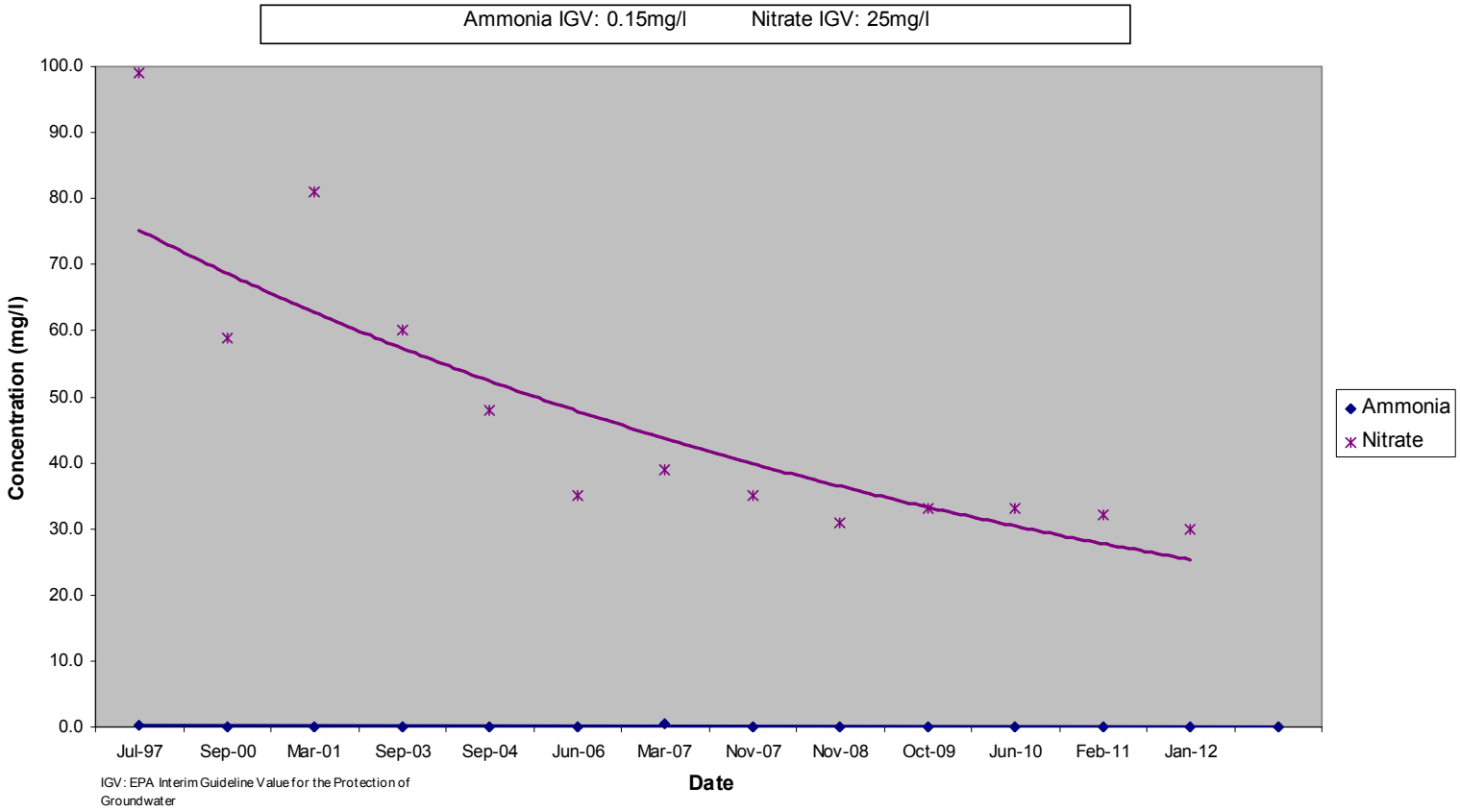
**Graph 1**
**Analytical Results for Monitoring Well 97/2**



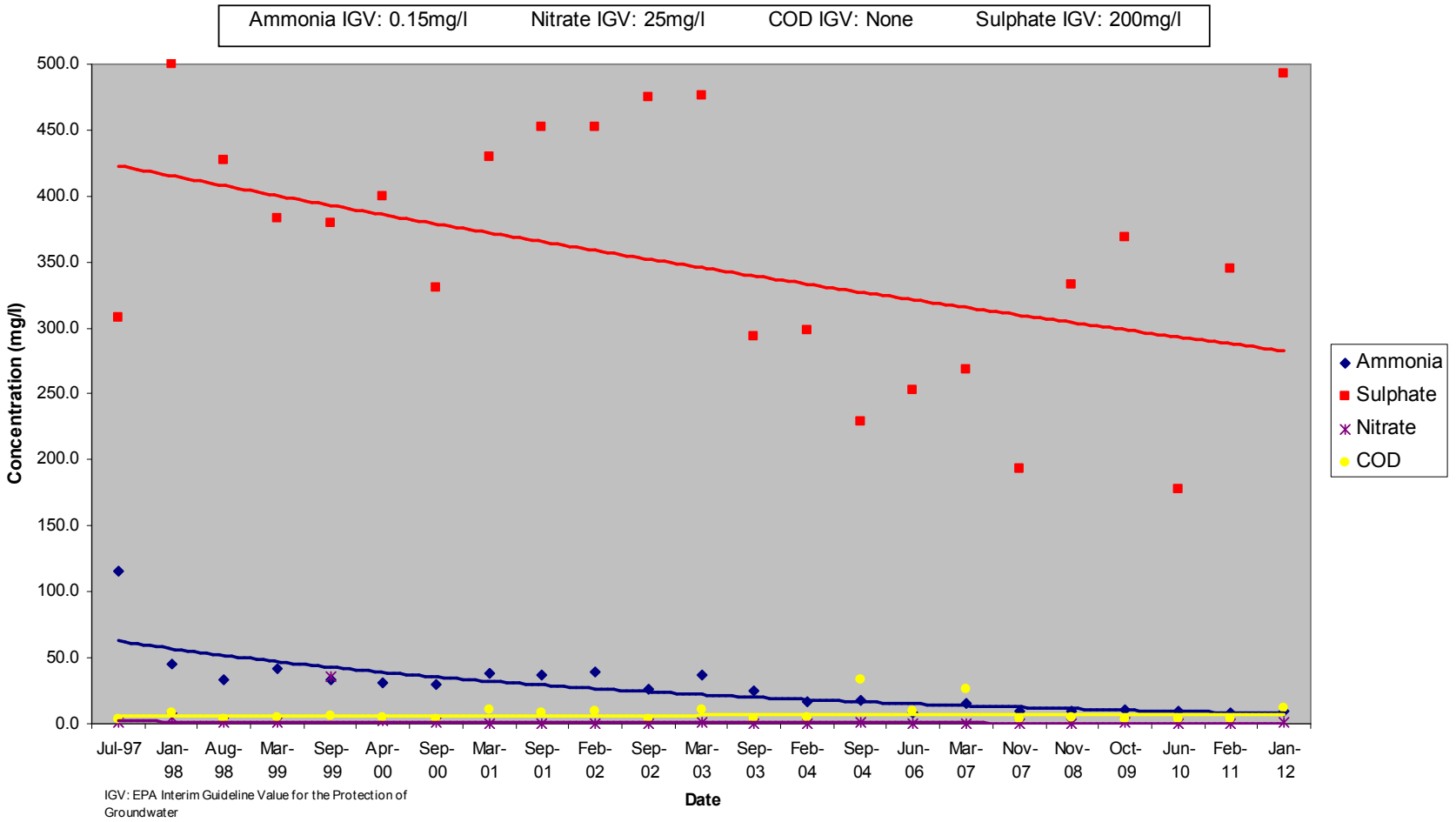
**Graph 2**
**Analytical Results for Monitoring Well 97/6**



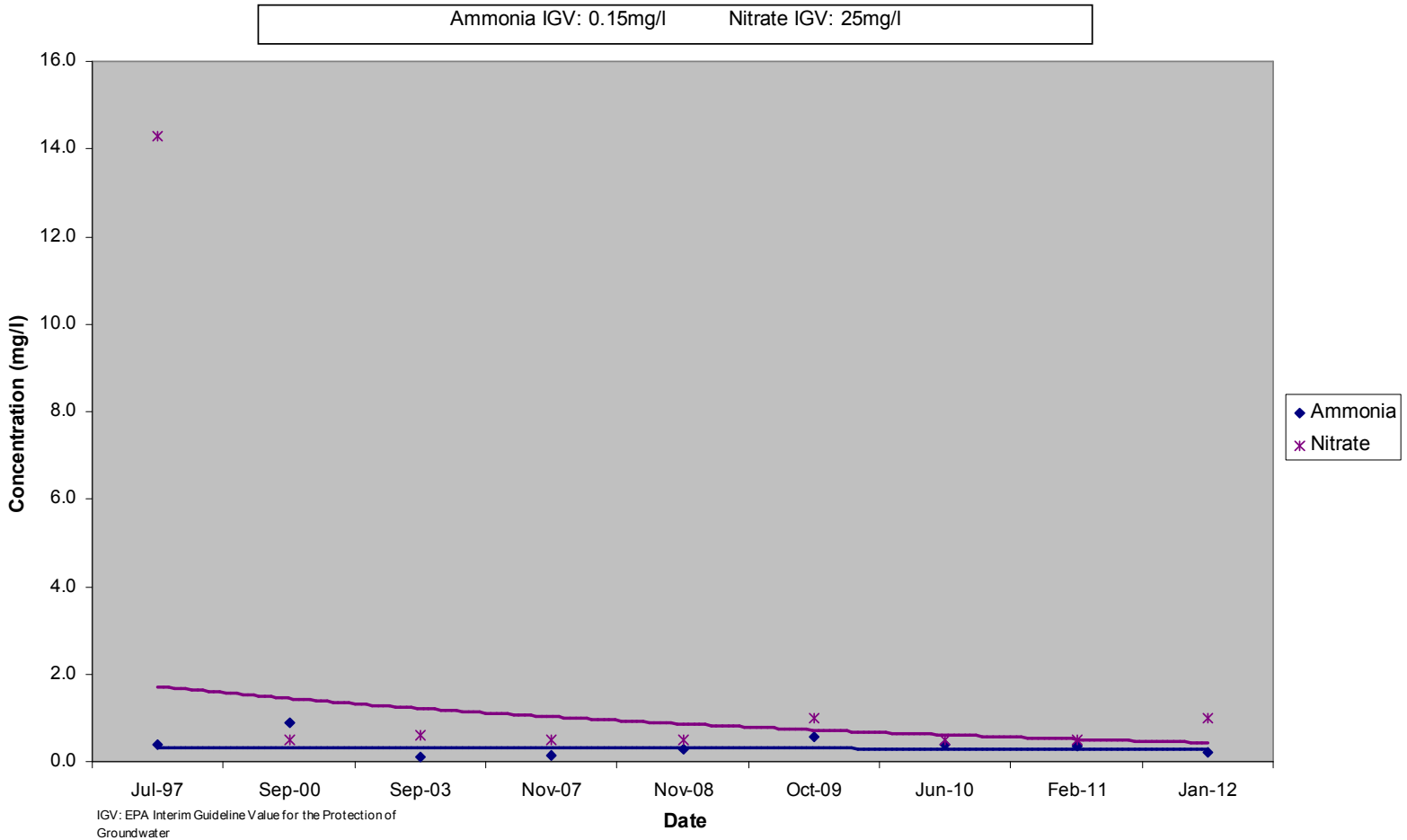
**Graph 3**
**Analytical Results for Monitoring Well 97/9**



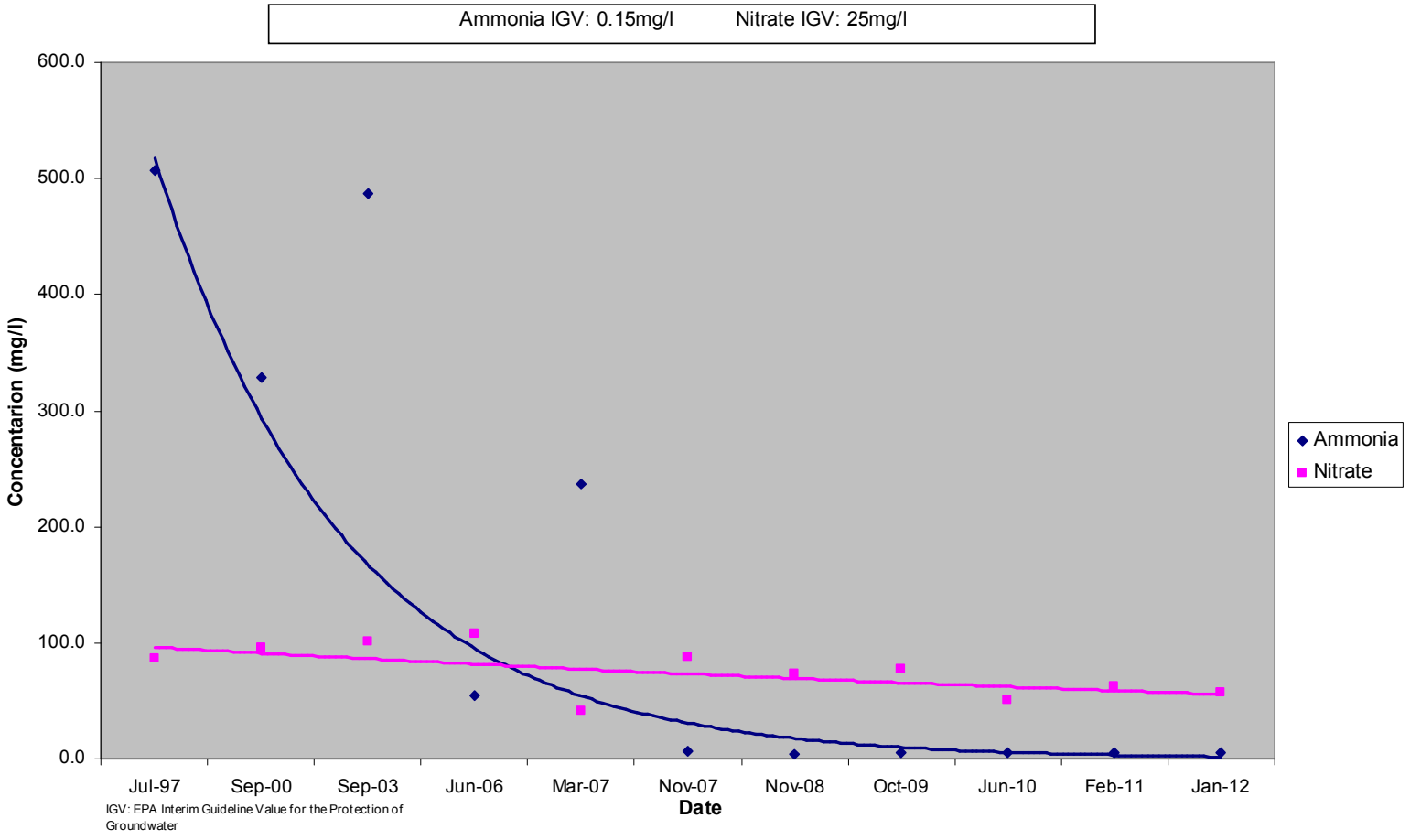
**Graph 4**
**Analytical Results for Monitoring Well 97/10**



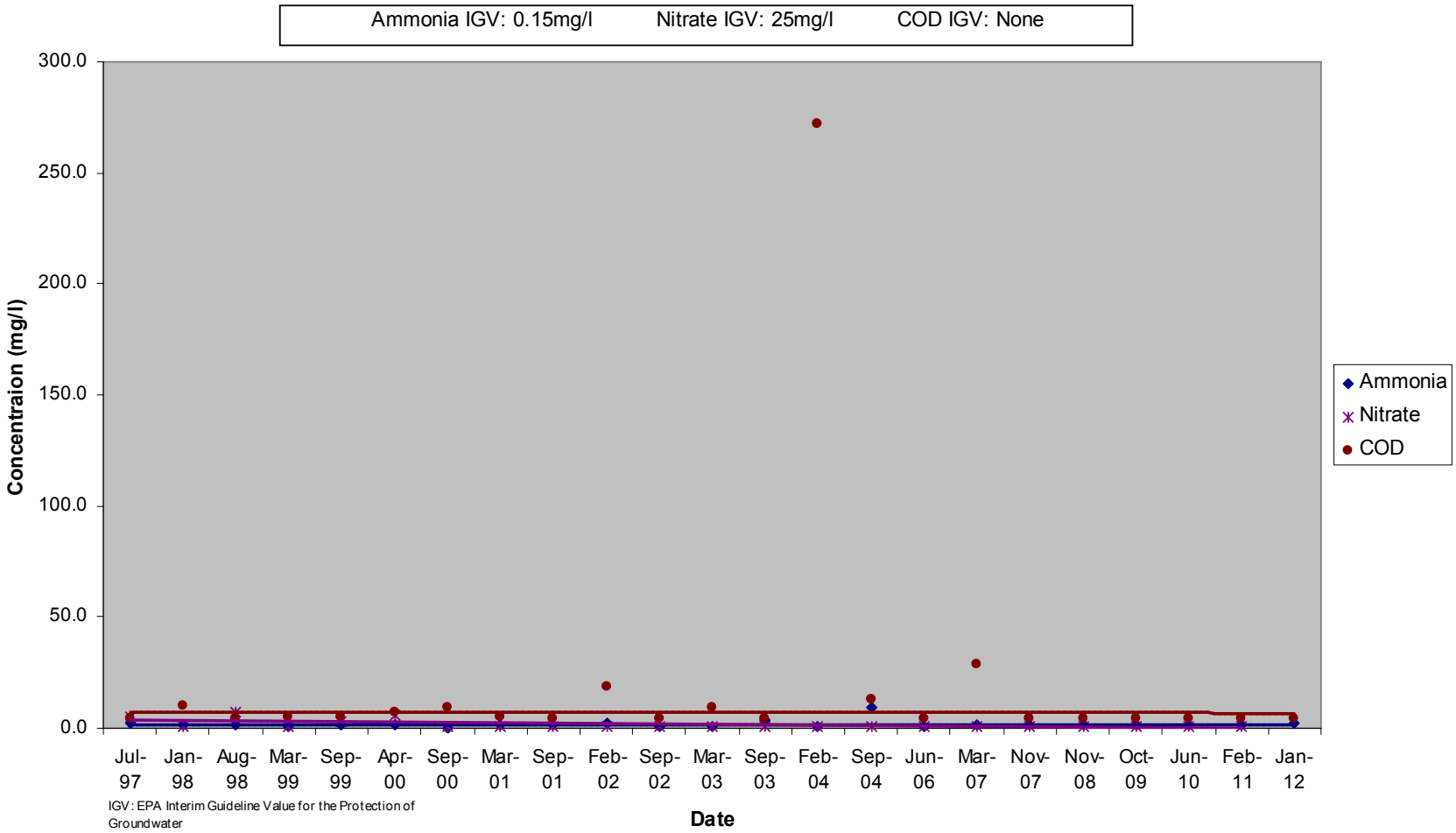
**Graph 5**
**Analytical Results for Monitoring Well 97/11**



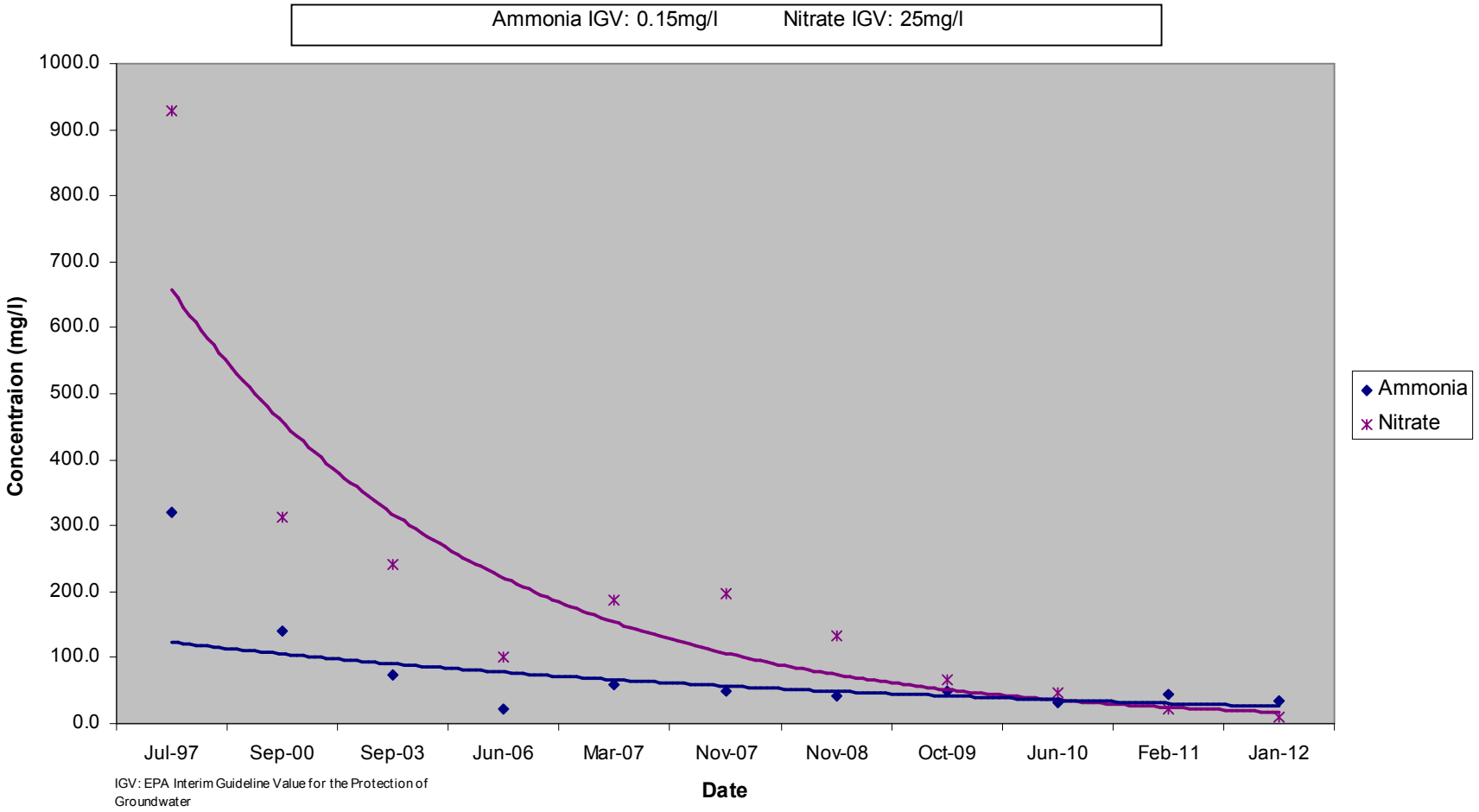
**Graph 6**
**Analytical Results for Monitoring Well 97/14**



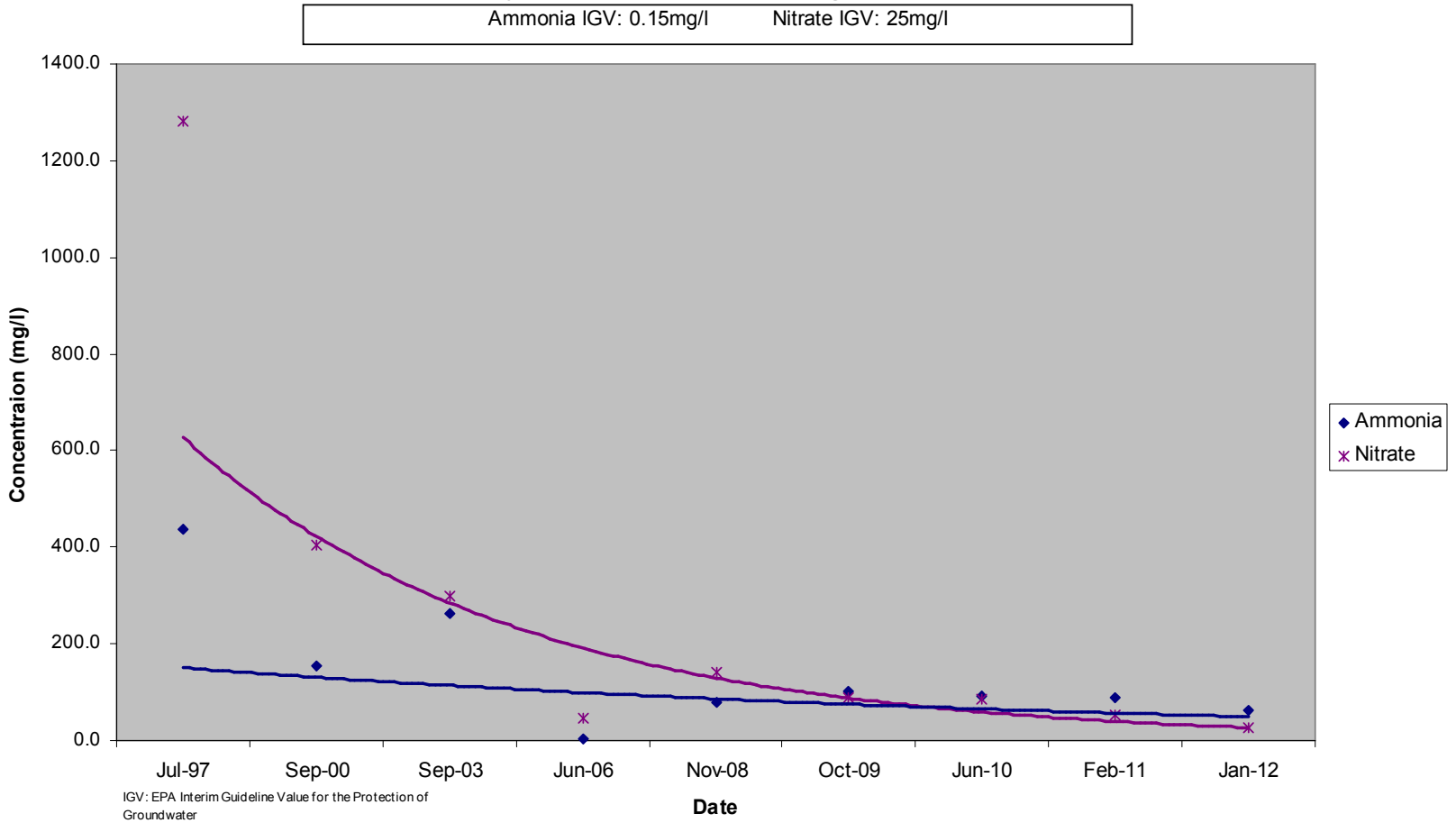
**Graph 7**
**Analytical Results for Monitoring Well 94/6**



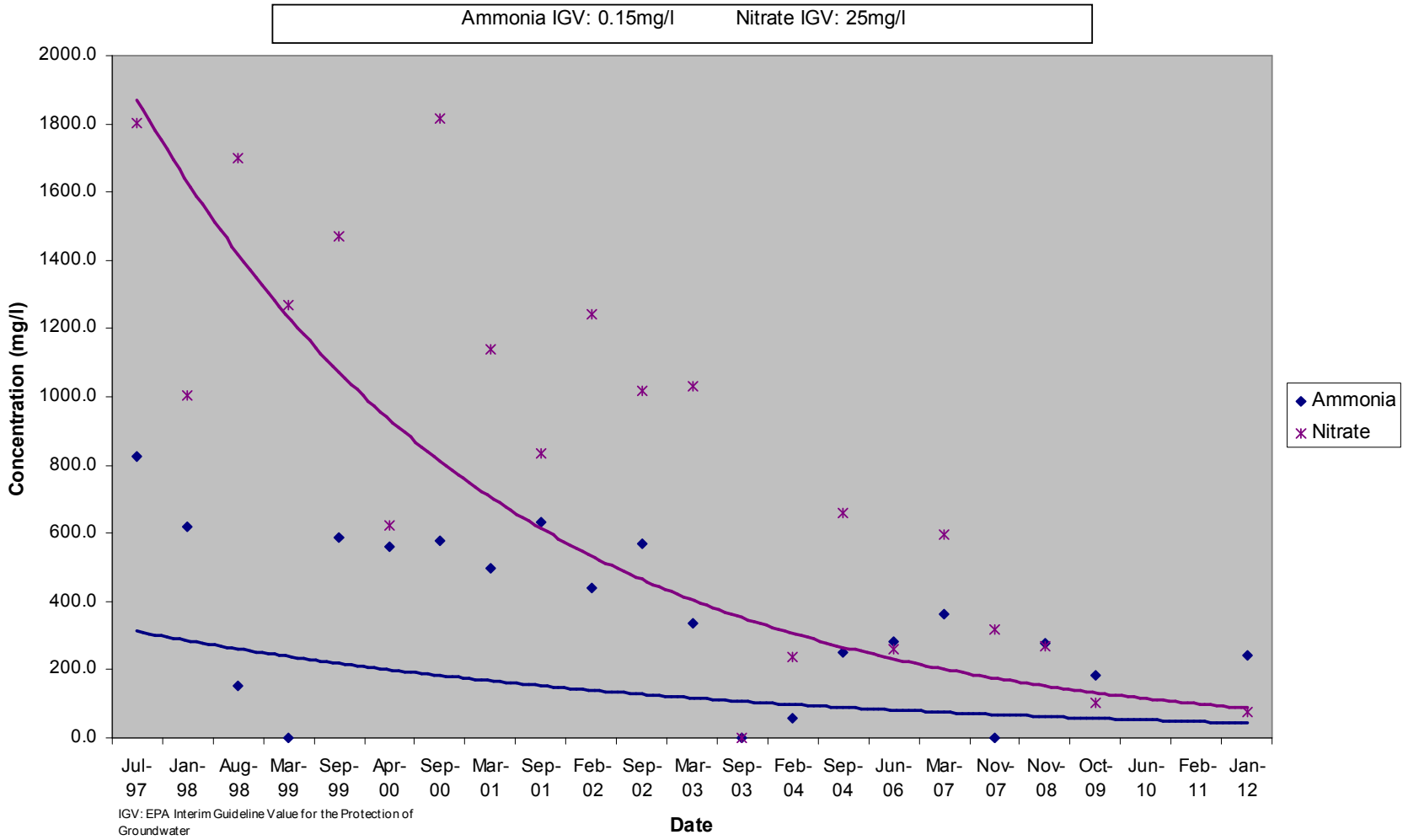
**Graph 8**
**Analytical Results for Monitoring Well 94/7**



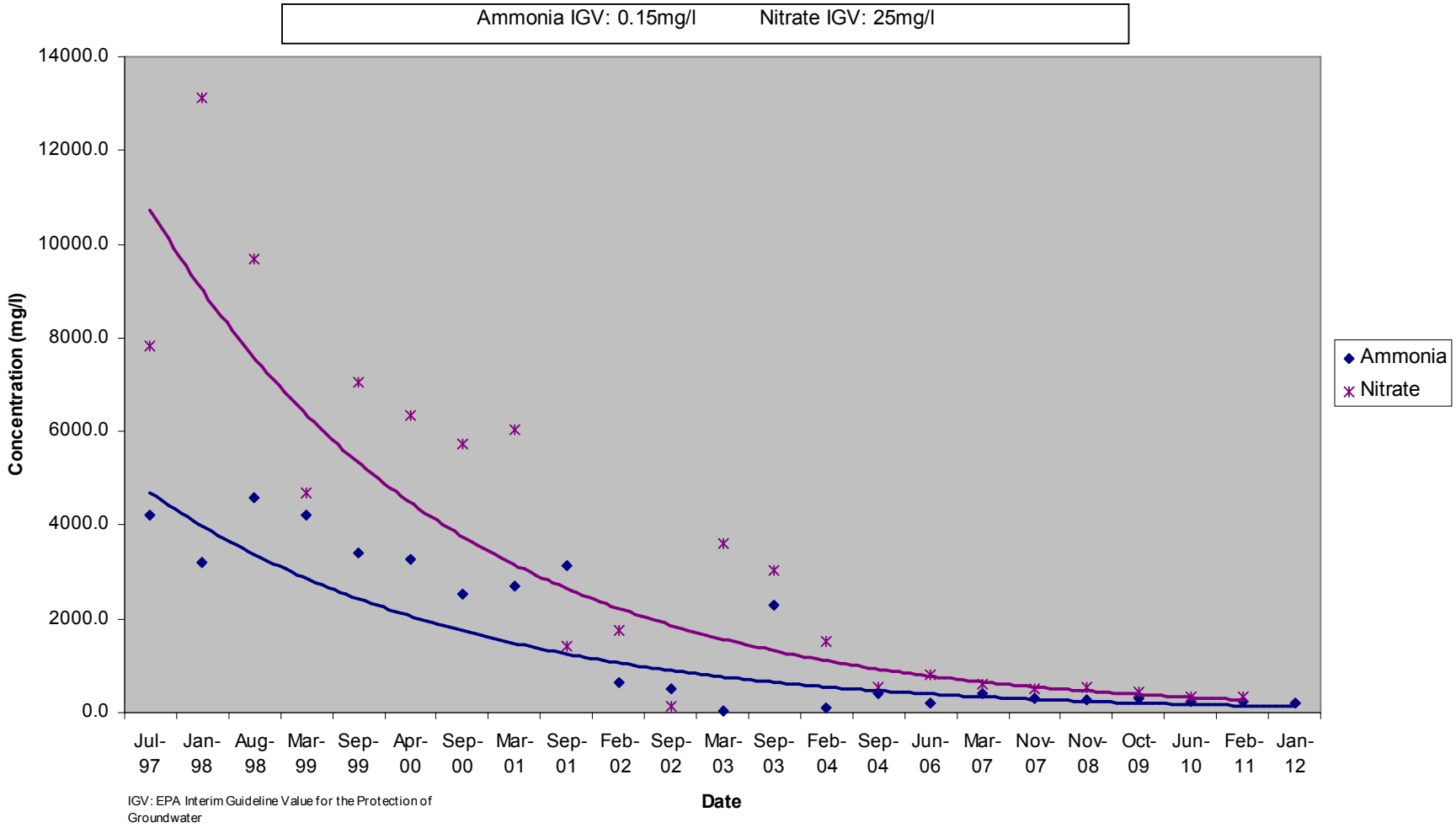
**Graph 9**
**Analytical Results for Monitoring Well 94/8**



**Graph 10**
**Analytical Results for Monitoring Well 94/14**

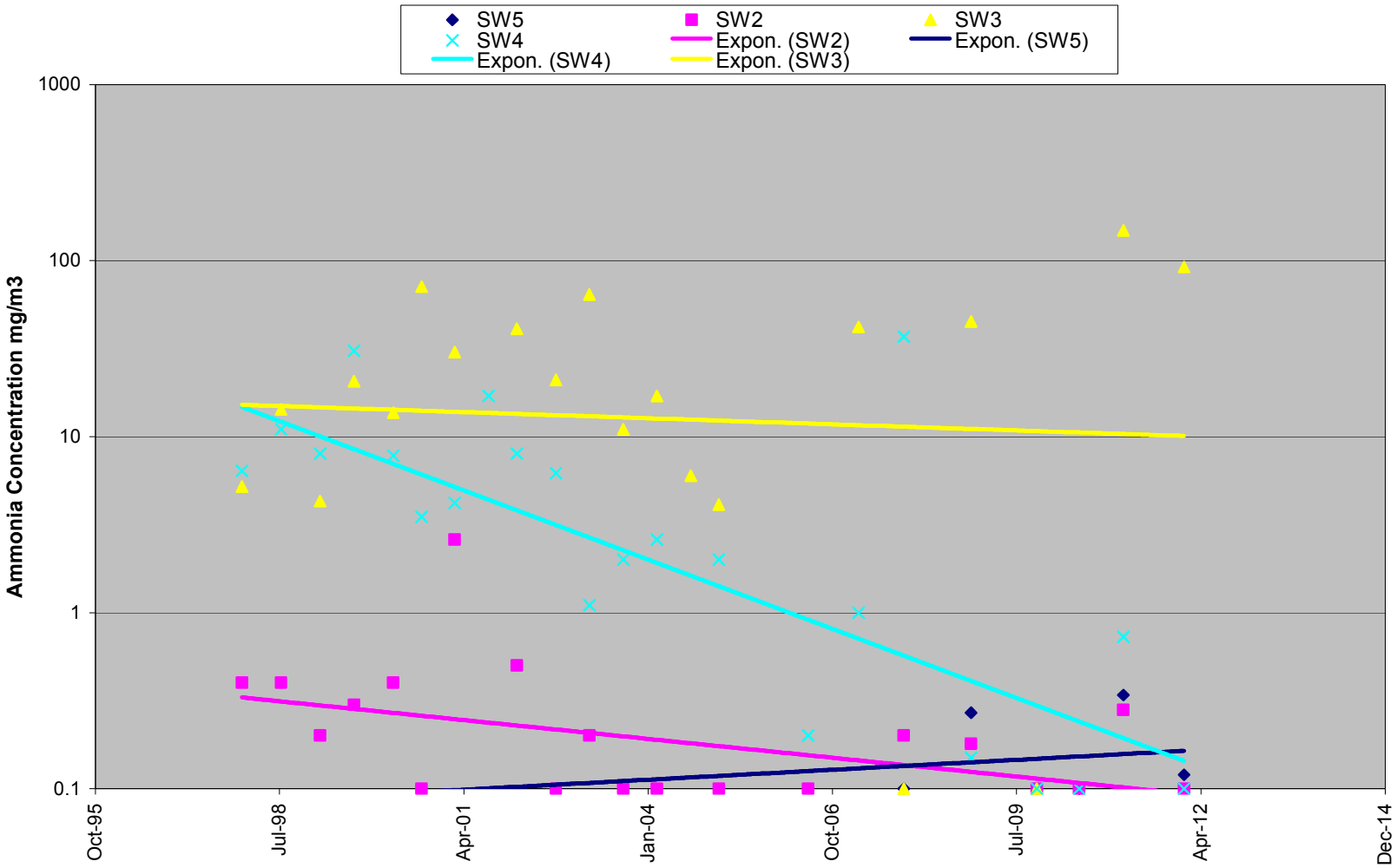


## Graph 11
## Analytical Results for Monitoring Well 94/15

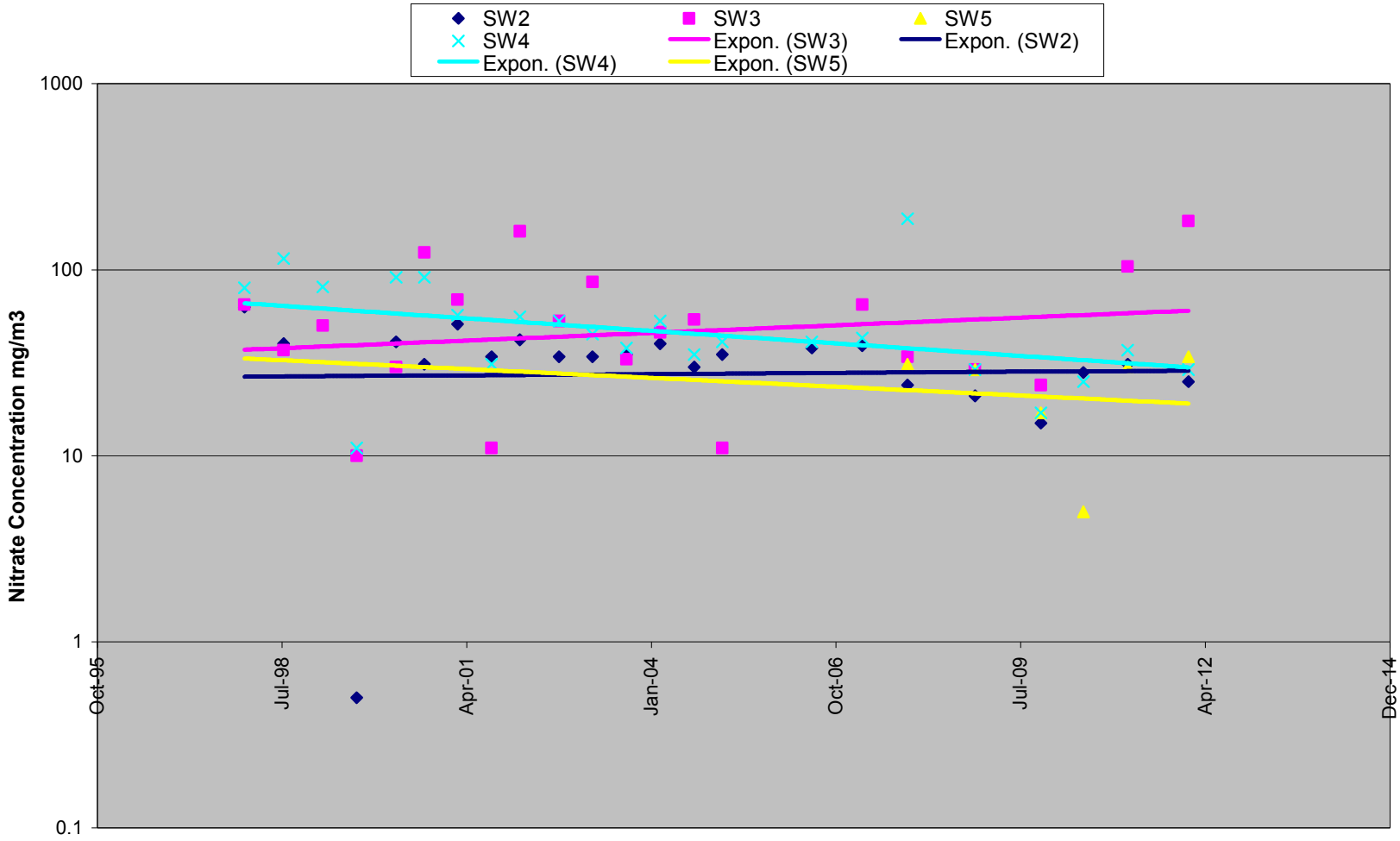



IGV: EPA Interim Guideline Value for the Protection of Groundwater

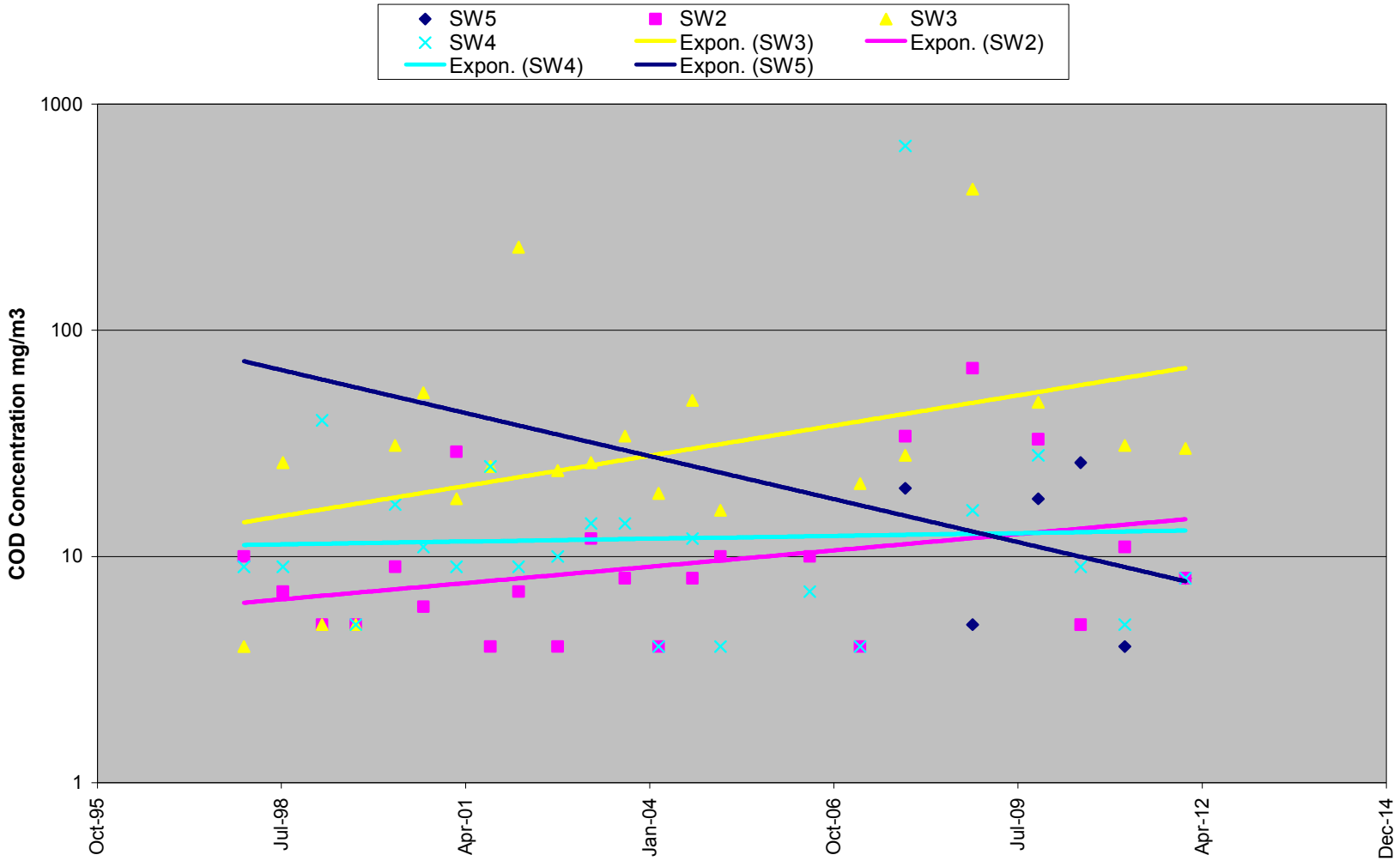
**Graph 12**
**Surface Water Ammonia Concentrations 1997 - 2012**



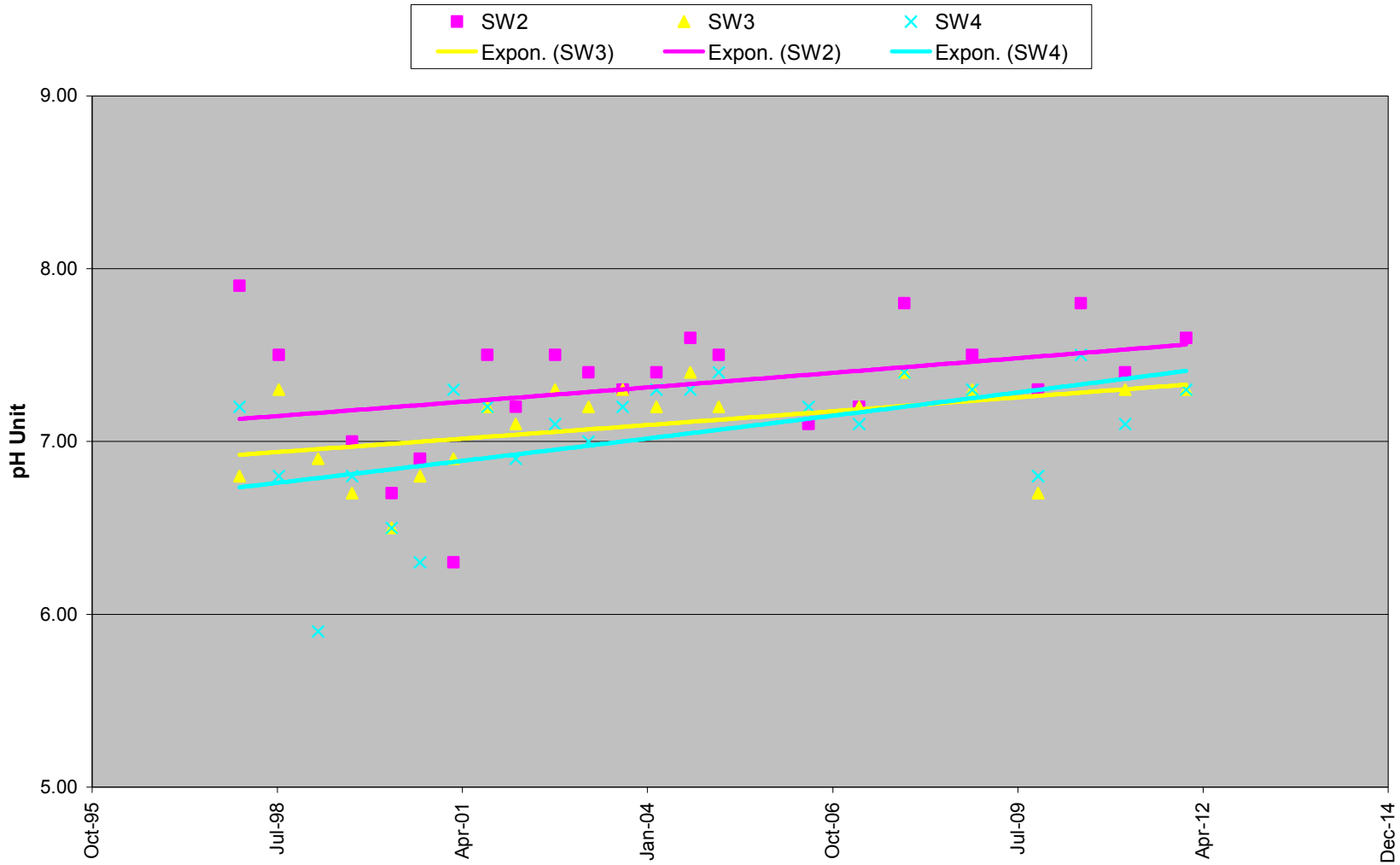
**Graph 13**
**Surface Water Nitrate Concentrations 1997 - 2012**



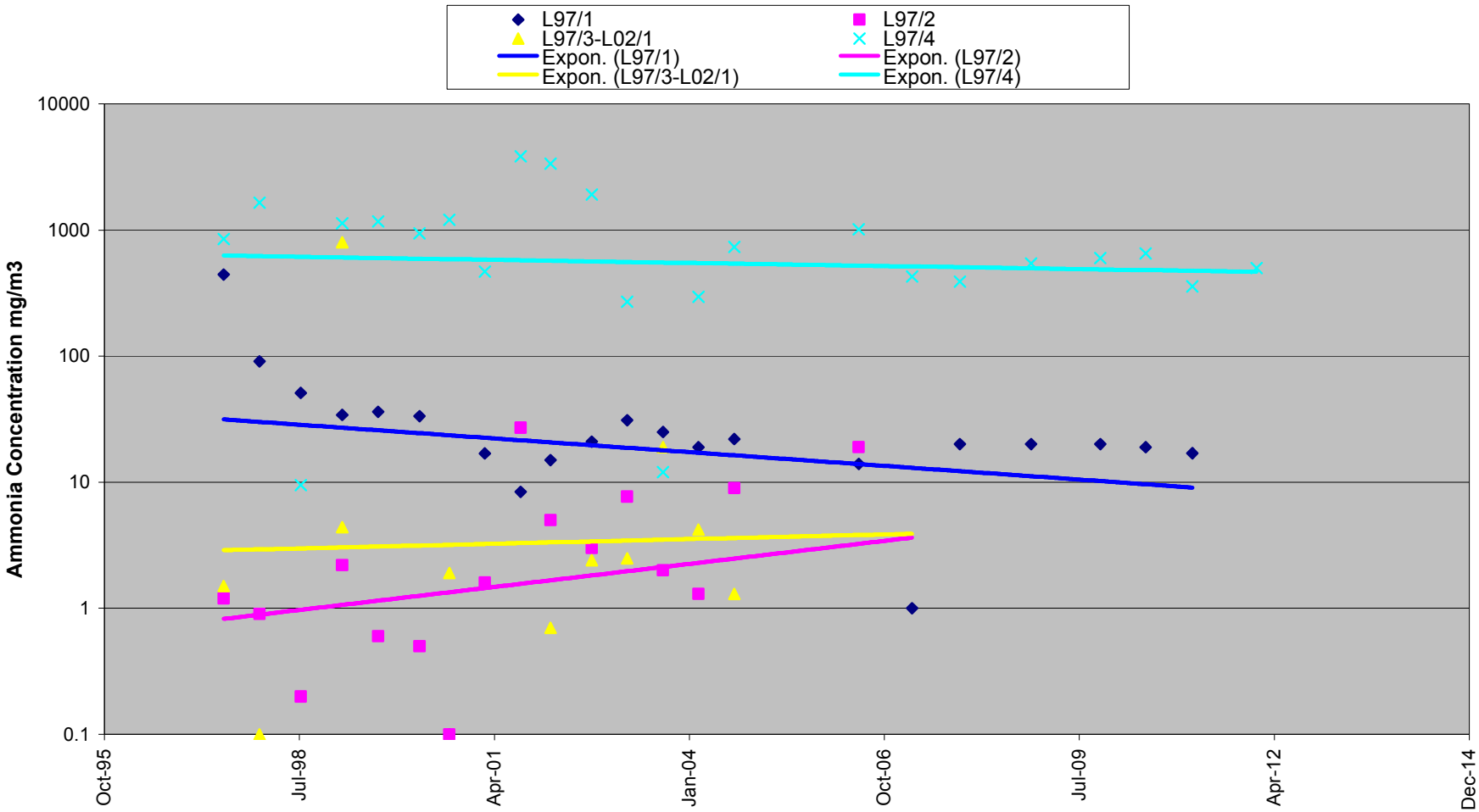
**Graph 14**
**Surface Water Chemical Oxygen Demand 1997 - 2012**



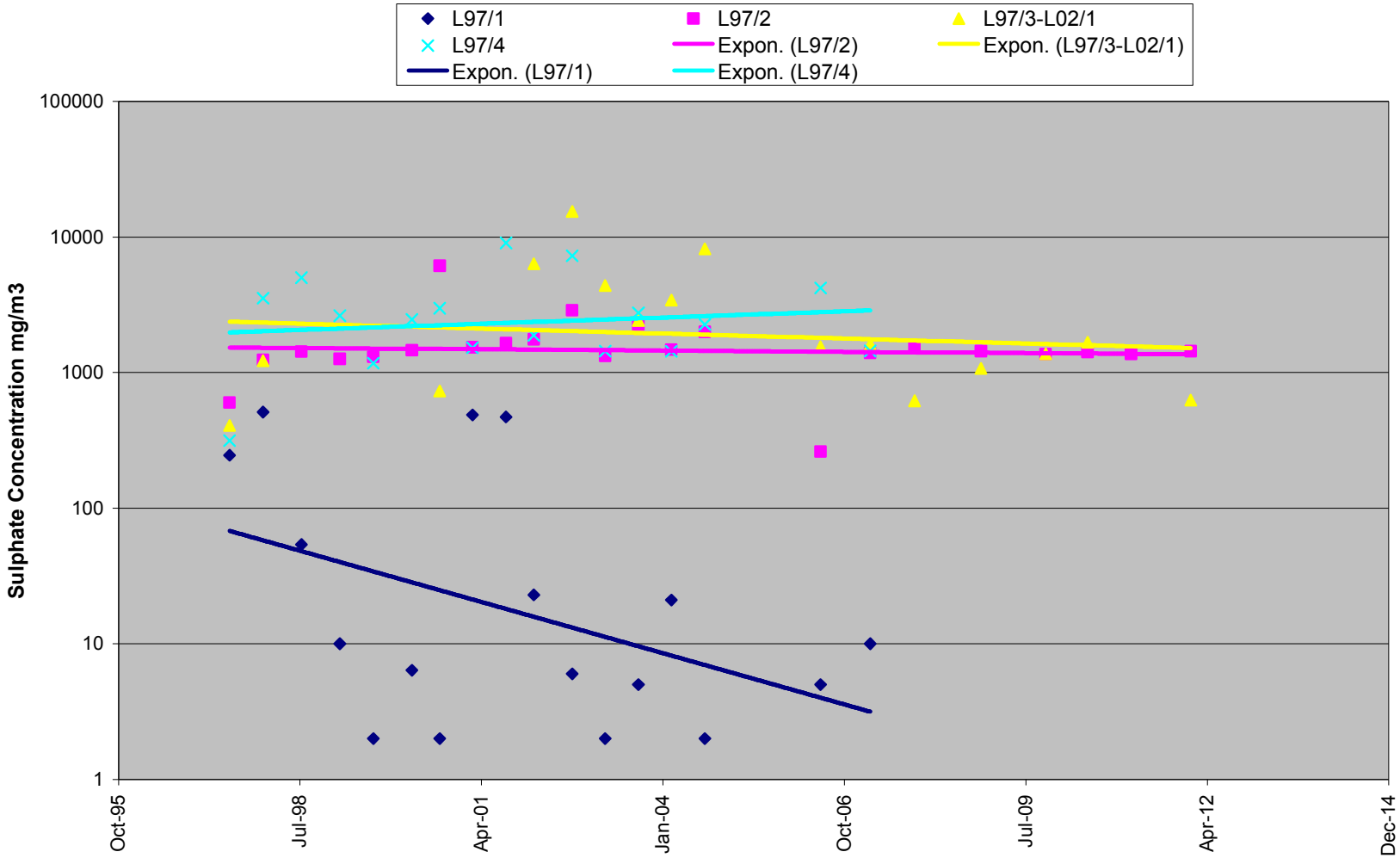
**Graph 15**
**Surface Water pH 1997 - 2012**



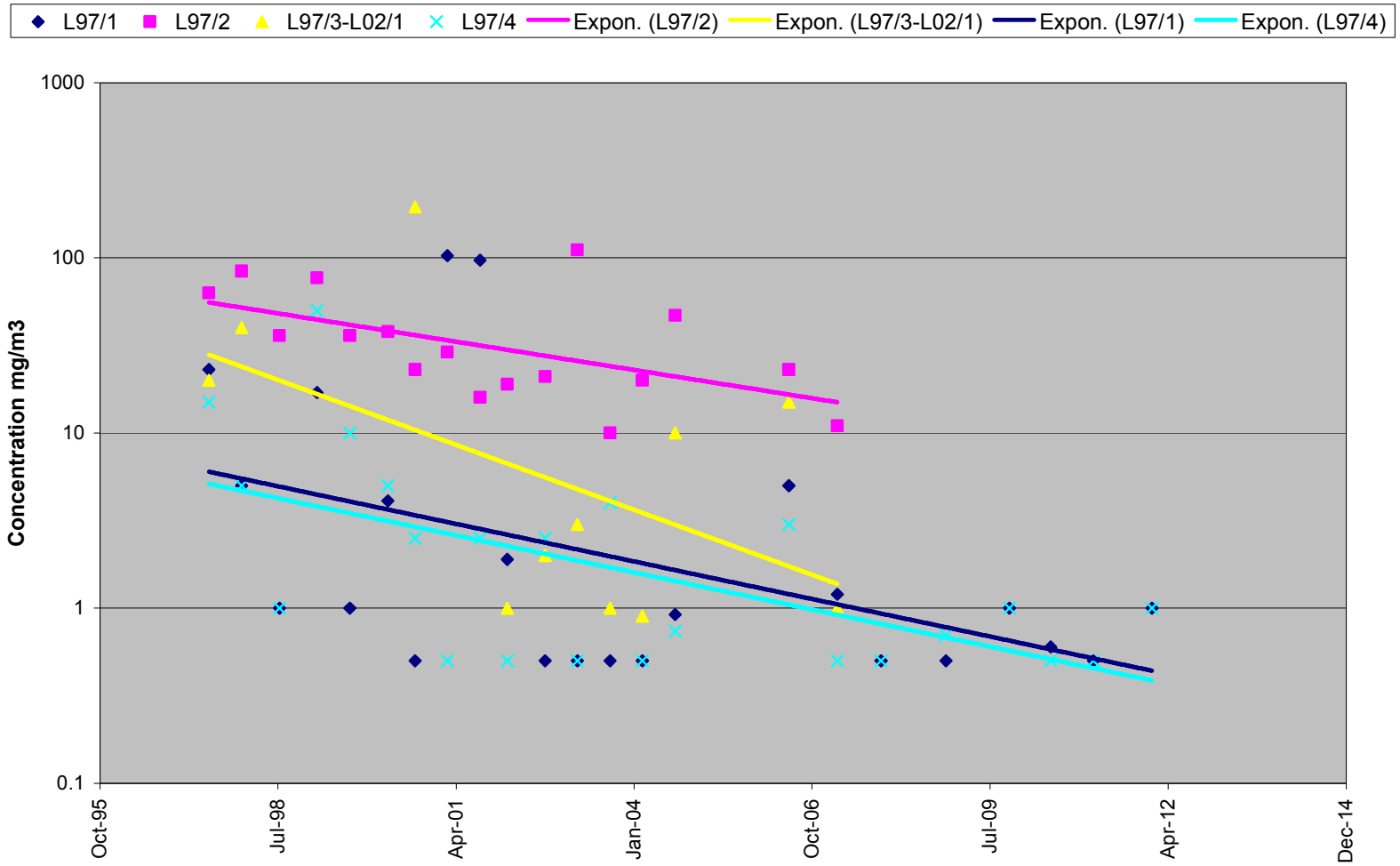
**Graph 16**
**Leachate Ammonia Concentrations 1997 - 2012**



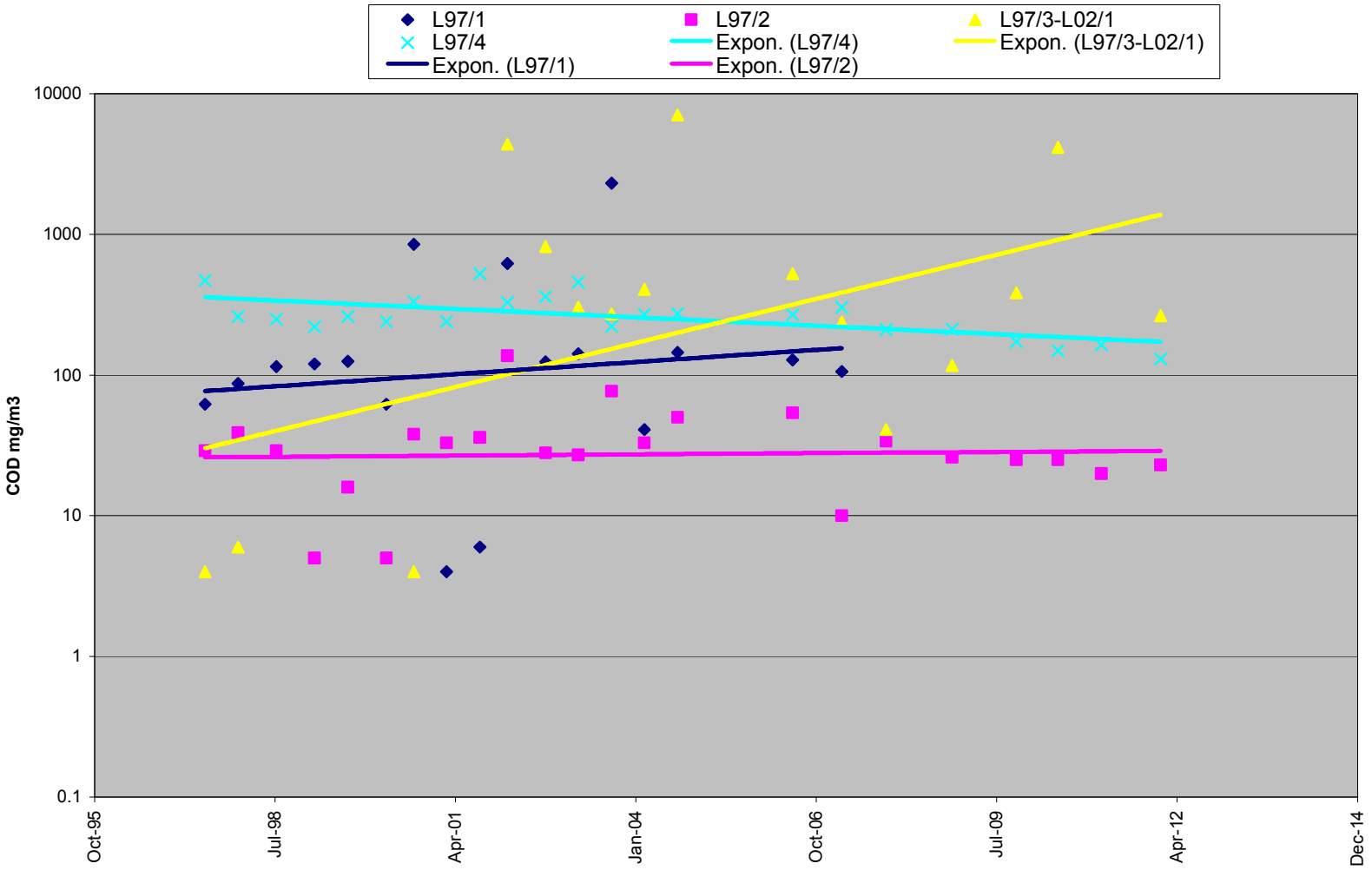
**Graph 17**
**Leachate Sulphate Concentrations 1997 - 2012**



**Graph 18**
**Leachate Nitrate Concentrations 1997 - 2012**



**Graph 19**
**Leachate COD 1997 - 2012**



# APPENDIX B

## MONITORING WELL SAMPLING AND PURGING INFORMATION (JANUARY 2012)

**Holfeld Plastics 2012**

| Date Sampled | Borehole | Water Level (M) | BH Depth (M) | Head(M) | Borehole Diameter (M) | Well Volume (cu. M) | Total Well Volume to Purge (cu. M) | Time required to purge 3 well volumes (Min) | Actual time taken purging the borehole (Min) | Number of well volume purged (Approx.) |
|---|---|---|---|---|---|---|---|---|---|---|
| 27 Jan. 2012 | SW2 | - | - | - | - | - | - | - | - | - |
| 27 Jan. 2012 | SW3 | - | - | - | - | - | - | - | - | - |
| 27 Jan. 2012 | SW4 | - | - | - | - | - | - | - | - | - |
| 27 Jan. 2012 | SW5 | - | - | - | - | - | - | - | - | - |
| 27 Jan. 2012 | BH 97/10 | 3.64 | 13.33 | 9.69 | 0.05 | 0.0190 | 0.0571 | 0.95 | 10 | 30 |
| 27 Jan. 2012 | BH 94/15 | 2.1 | 13.04 | 10.94 | 0.11 | 0.1040 | 0.3119 | 5.20 | 10 | 6 |
| 27 Jan. 2012 | BH 94/14 | 2.2 | 10.59 | 8.39 | 0.11 | 0.0797 | 0.2392 | 3.99 | **25 | 3 |
| 27 Jan. 2012 | BH 97/2 | 5.15 | 14.9 | 9.75 | 0.05 | 0.0191 | 0.0574 | 0.96 | 10 | 31 |
| 27 Jan. 2012 | BH 94/11++ | | | | 0.02 | 0.0000 | 0.0000 | D | R | Y |
| 27 Jan. 2012 | LO 2/1++ | 3.25 | 5.41 | 2.16 | 0.02 | 0.0007 | 0.0020 | 0.68 | **10 | 3 |
| 27 Jan. 2012 | L 97/4++ | 2.34 | 5.2 | 2.86 | 0.05 | 0.0056 | 0.0168 | 5.62 | 15 | 8 |
| 27 Jan. 2012 | BH 97/11* | 1.22 | 13.07 | 11.85 | 0.05 | 0.0233 | 0.0698 | 1.16 | **15 | 5 |
| 27 Jan. 2012 | L 97/2+ | 1.4 | 3.4 | 2 | 0.05 | 0.0039 | 0.0118 | 1.96 | 10 | 15 |
| 27 Jan. 2012 | L 97/1+* | 2.92 | 6.73 | 3.81 | 0.05 | 0.0075 | 0.0224 | 3.74 | **25 | 4 |
| 27 Jan. 2012 | BH 97/9 | 2.21 | 9.42 | 7.21 | 0.05 | 0.0142 | 0.0425 | 0.71 | 5 | 21 |
| 27 Jan. 2012 | BH 97/6 | 3.02 | 9.48 | 6.46 | 0.05 | 0.0127 | 0.0381 | 0.63 | 5 | 24 |
| 27 Jan. 2012 | BH 94/6 | 0.42 | 8.58 | 8.16 | 0.11 | 0.0775 | 0.2326 | 3.88 | 10 | 7 |
| 27 Jan. 2012 | BH 97/14 | 1.16 | 11.87 | 10.71 | 0.11 | 0.1018 | 0.3053 | 5.09 | 15 | 9 |
| 27 Jan. 2012 | BH 94/7 | 1.63 | 6.04 | 4.41 | 0.11 | 0.0419 | 0.1257 | 2.10 | 10 | 14 |
| 27 Jan. 2012 | BH 94/8 | 1.81 | 11.12 | 9.31 | 0.11 | 0.0885 | 0.2654 | 4.42 | 10 | 7 |

**Waiting time included

**NOTES**

1. BH 94/11 went dry after purging just 1 well volume.

2. The pump provided by Holfeld Plastics was used in most of the boreholes where there is a steady flow while the pump was running. The pump purges at least 1 litre per second (0.06cu.m per min).

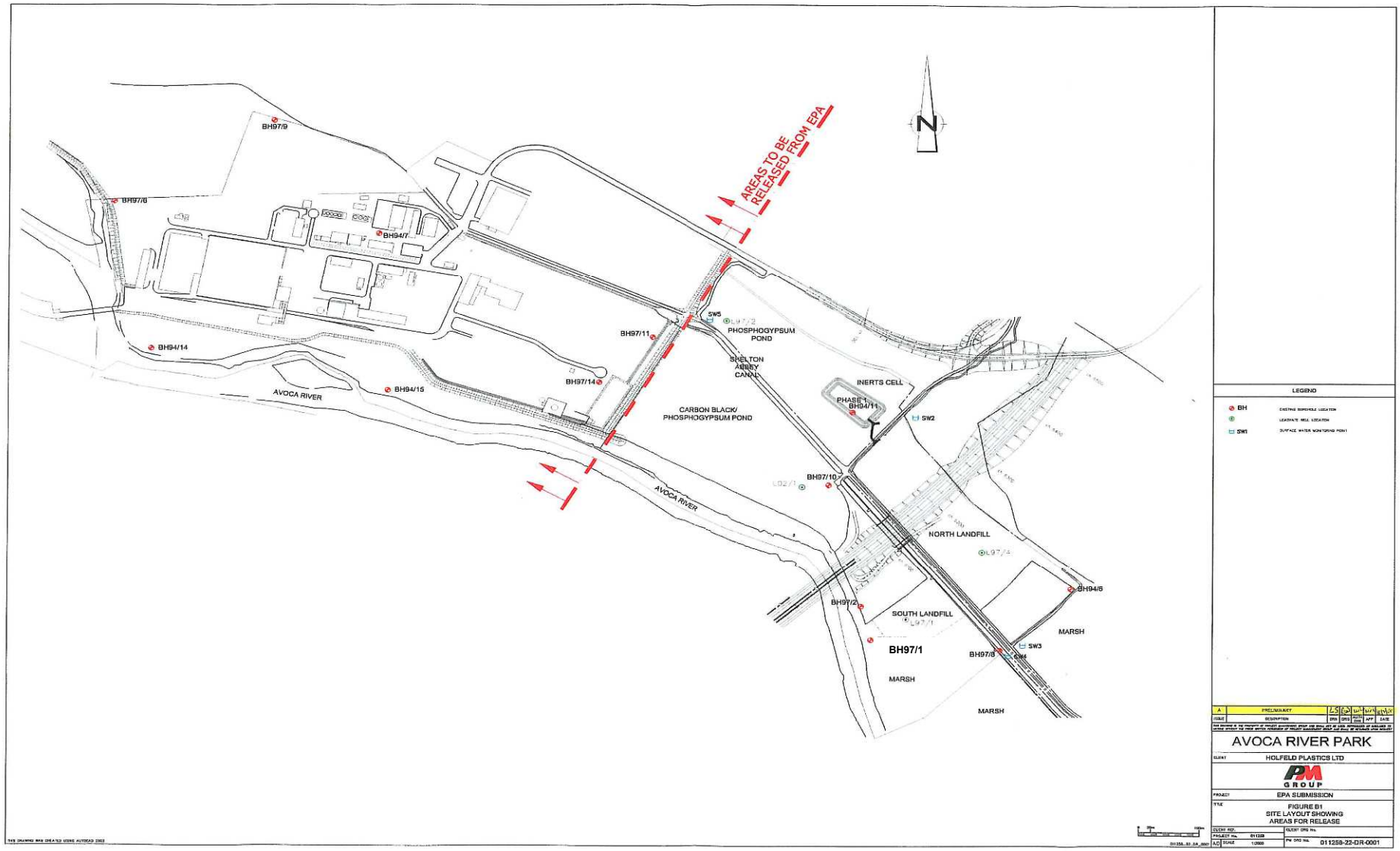
3. In cases where there is no steady flow, the pump was turned off, and boreholes were allowed to fill up before purging the boreholes again. This done at least 3 times to draw out 3 well volumes. These were boreholes(*) BH97/11, L97/1and L97/4.

4. A Watera Pump(+) which purges 1 litre every 10 seconds (0.006 cu.m per min.)was used on L97/1 and L97/2.

5. An ISCO D150(++) pump (1 litre per 20 seconds or 0.003cu.m per min.) was used on boreholes BH94/11 and LO2/1.

# APPENDIX C

## SITE MAP SHOWING SAMPLING LOCATIONS


AREAS TO BE RELEASED FROM EPA
BH97/9
BH97/6
BH94/7
BH94/14
BH94/15
AVOCA RIVER
BH97/11
SW5
PHOSPHOGYPSUM POND
SHELTON ABBEY CANAL
BH97/14
CARBON BLACK/ PHOSPHOGYPSUM POND
INERTS CELL
PHASE 1
BH94/11
SW2
BH97/10
AVOCA RIVER
NORTH LANDFILL
BH94/6
BH97/2
SOUTH LANDFILL
MARSH
BH97/1
SW3
BH97/8
MARSH
MARSH
LEGEND
BH
SW1
AVOCA RIVER PARK
HOLFELD PLASTICS LTD
EPA SUBMISSION
FIGURE B1
SITE LAYOUT SHOWING
AREAS FOR RELEASE
011258-22-DR-0001

# APPENDIX D

## AER RETURNS WORKBOOK (RELEVANT WORKSHEETS ONLY)

Environmental Protection Agency

Guidance to completing the PRTR workbook

# AER Returns Workbook

Version 1.1.13

| REFERENCE YEAR | 2011 |
|---|---|

**1. FACILITY IDENTIFICATION**

| | |
|---|---|
| Parent Company Name | Holfeld Plastics Limited |
| Facility Name | Holfeld Plastics Limited |
| PRTR Identification Number | P0031 |
| Licence Number | P0031-02 |

Waste or IPPC Classes of Activity

| No. | class_name |
|---|---|
| 5.5 | The manufacture of artificial fertilizers, not included in paragraphs 5.12 to 5.17. |
| 5.4 | The manufacture of inorganic chemicals, not included in paragraphs 5.12 to 5.17. |

| | |
|---|---|
| Address 1 | Avoca River Park |
| Address 2 | Arklow |
| Address 3 | Co. Wicklow |
| Address 4 | |
| | |
| | Wicklow |
| Country | Ireland |
| Coordinates of Location | -6.18108 52.8120 |
| River Basin District | IEEA |
| NACE Code | 2016 |
| Main Economic Activity | Manufacture of plastics in primary forms |
| **AER Returns Contact Name** | Brian Kealy |
| **AER Returns Contact Email Address** | bkealy@holfeld-plastics.com |
| **AER Returns Contact Position** | Director |
| **AER Returns Contact Telephone Number** | +353 (0) 402 41234 |
| **AER Returns Contact Mobile Phone Number** | |
| **AER Returns Contact Fax Number** | +353 (0) 402 41235 |
| **Production Volume** | 0.0 |
| **Production Volume Units** | |
| **Number of Installations** | 0 |
| **Number of Operating Hours in Year** | 0 |
| **Number of Employees** | 0 |
| **User Feedback/Comments** | |
| **Web Address** | |

**2. PRTR CLASS ACTIVITIES**

| Activity Number | Activity Name |
|---|---|
| 50.1 | General |
| 50.1 | General |

**3. SOLVENTS REGULATIONS (S.I. No. 543 of 2002)**

| | |
|---|---|
| Is it applicable? | No |
| Have you been granted an exemption ? | No |
| If applicable which activity class applies (as per Schedule 2 of the regulations) ? | |
| Is the reduction scheme compliance route being used ? | |

**5. ONSITE TREATMENT & OFFSITE TRANSFERS OF WASTE** | PRTRid : P0031 | Facility Name : Holfeld Plastics Limited | Filename : P0031_2011.xls | Return Year : 2011 | 04/04/2012 10:55

**Please enter all quantities on this sheet in Tonnes** 3

| Transfer Destination | European Waste Code | Hazardous | Quantity (Tonnes per Year) | Description of Waste | Waste Treatment Operation | Method Used | | Location of Treatment | Haz Waste : Name and Licence/Permit No of Next Destination Facility Non Haz Waste: Name and Licence/Permit No of Recover/Disposer | Haz Waste : Address of Next Destination Facility Non Haz Waste: Address of Recover/Disposer | Name and License / Permit No. and Address of Final Recoverer / Disposer (HAZARDOUS WASTE ONLY) | Actual Address of Final Destination i.e. Final Recovery / Disposal Site (HAZARDOUS WASTE ONLY) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | M/C/E | Method Used | | | | | |
| Within the Country | 20 01 40 | No | 7.14 | metals | R4 | M | Weighed | Offsite in Ireland | Hegarty Metals,WP05/04 | Hegarty Metal Processors(International) Ltd,Ballysimon Road,Limerick,N/A,Ireland | | |
| Within the Country | 20 03 01 | No | 6.6 | mixed municipal waste | D1 | C | Volume Calculation | Offsite in Ireland | Arklow Waste Disposal,WCP/WW/09/0557/01 | South Beach ,Arklow ,Co Wicklow,N/A,Ireland | | |
| Within the Country | 13 02 06 | Yes | 1.47 | synthetic engine, gear and lubricating oils | R9 | C | Volume Calculation | Offsite in Ireland | ENVA Ireland Ltd,WO184-01 | Clonminam Industrial Estate,Portlaoise,Co Laois,N/A,Ireland | ENVA Ireland Ltd,WO184-01,Smithstown Industrial Esate,Shannon,Co. Clare,N/A,Ireland | Clonminam Industrial Estate,Portlaoise,Co Laois,N/A,Ireland |
| Within the Country | 20 01 01 | No | 62.656 | paper and cardboard | R3 | M | Weighed | Offsite in Ireland | CGreen Recycling Limited,WFP-WW-10-0019-01 | The Murrough,N/A,Wicklow Town,N/A,Ireland | | |
| Within the Country | 20 01 39 | No | 60.542 | plastics | R3 | M | Weighed | Offsite in Ireland | CGreen Recycling Limited,WFP-WW-10-0019-01 | The Murrough,N/A,Wicklow Town,N/A,Ireland | | |

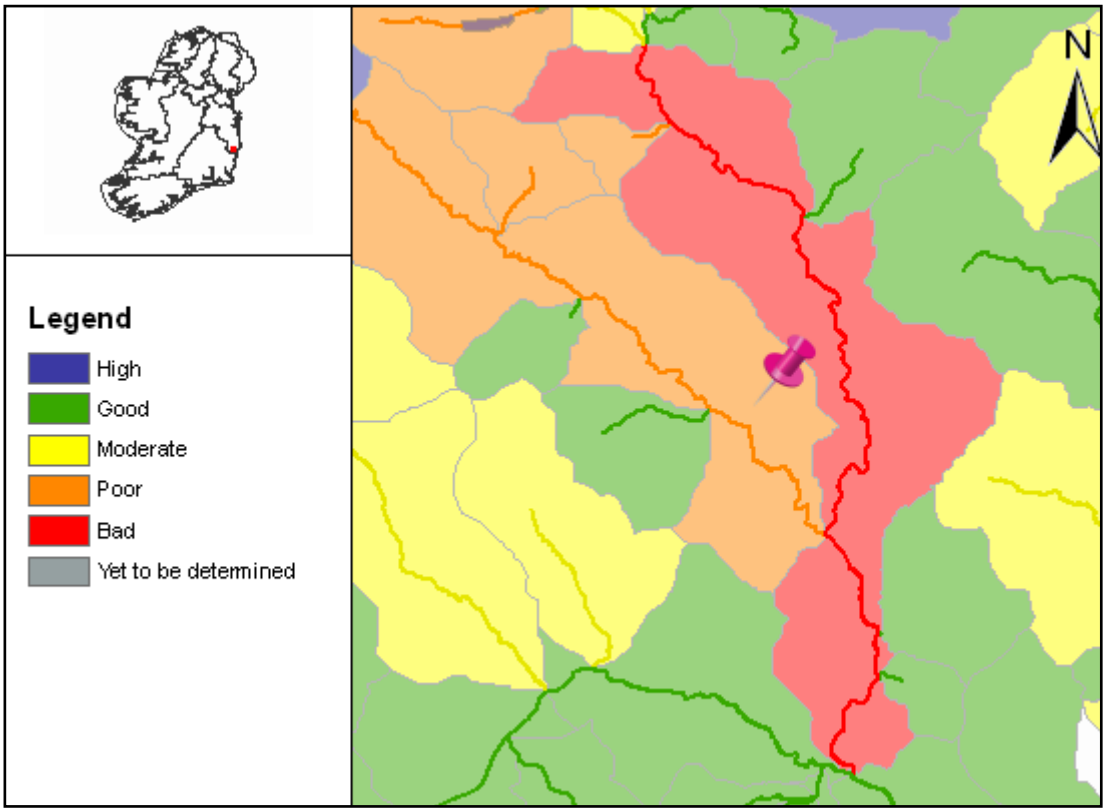
* Select a row by double-clicking the Description of Waste then click the delete button

Link to previous years waste data
Link to previous years waste summary data & percentage change

# **APPENDIX 5** – WFD Water Body Reports

water matters
'our Plan'

## Full Report for Waterbody Avoca Upper




River Basin Management Plans (RBMPs) have been published for all River Basin Districts in Ireland in accordance with the requirements of the Water Framework Directive. The WaterMaps viewer is an integral part of the River Basin Management Plan and provides access to information at individual waterbody level and at Water Management Unit level for all the River Basin Districts in Ireland.

The following report provides summary plan information about the selected waterbody (indicated by the pin in the map above) relating to its status, risks, objectives, and measures proposed to retain status where this is adequate, or improve it where necessary. Waterbodies can relate to surface waters (these include rivers, lakes, estuaries [transitional waters], and coastal waters), or to groundwaters. Other relevant information not included in this report can be viewed using the WaterMaps viewer, including areas listed in the Register of Protected Areas.

You will find brief notes at the bottom of some of the individual report sheets that will help you in interpreting the information presented. More detailed information can be obtained in relation to all aspects of the RBMPs at www.wfdireland.ie.

Date Reported to Europe:July 2010

Date Report Created 21/11/2019

water matters
'our Plan'

## Summary Information:

| | |
|---|---|
| **Water Management Unit:** | IE_EA_Avoca |
| **WaterBody Category:** | River Waterbody |
| **WaterBody Name:** | Avoca Upper |
| **WaterBody Code:** | IE_EA_10_1477 |
| **Overall Status:** | Bad |
| **Overall Objective:** | Restore_2027 |
| **Overall Risk:** | 1a At Risk |
| **Heavily Modified:** | No |



Report data based upon final RBMP, 2009-2015.

The information provided above is a summary of the principal findings related to the selected waterbody. Further details and explanation of individual elements of the report are outlined in the following pages.

Date Reported to Europe:July 2010

Date Report Created 21/11/2019

water matters
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## Status Report

| | |
|---|---|
| **Water Management Unit:** | IE_EA_Avoca |
| **WaterBody Category:** | River Waterbody |
| **WaterBody Name:** | Avoca Upper |
| **WaterBody Code:** | IE_EA_10_1477 |
| **Overall Status Result:** | Bad |
| **Heavily Modified:** | No |



| | Status Element Description | Result |
|---|---|---|
| | **Status information** | |
| Q | Macroinvertebrate status | Bad |
| PC | General physico-chemical status | Good |
| FPQ | Freshwater Pearl Mussel / Macroinvertebrate status | N/A |
| DIA | Diatoms status | N/A |
| HYM | Hydromorphology status | N/A |
| FIS | Fish status | N/A |
| SP | Specific Pollutants status (SP) | N/A |
| ES | Overall ecological status | Bad |
| CS | Overall chemical status (PAS) | n/a |
| EXT | Extrapolated status | N/A |
| MON | Monitored water body | YES |
| DON | Donor water bodies | N/A |

n/a - not assessed

**Status**
By 'Status' we mean the condition of the water in the waterbody. It is defined by its chemical status and its ecological status, whichever is worse. Waters are ranked in one of 5 status classes: High, Good, Moderate, Poor, Bad. However, not all waterbodies have been monitored, and in such cases the status of a similar nearby waterbody has been used (extrapolated) to assign status. If this has been done the first line of the status report shows the code of the waterbody used to extrapolate.

You can read more about status and how it is measured in our RBMP Document Library at www.wfdireland.ie (Directory 15 Status).

Date Reported to Europe:July 2010

Date Report Created 21/11/2019

water matters
'our Plan'

## Risk Report

**Water Management Unit:** IE_EA_Avoca

**WaterBody Category:** River Waterbody

**WaterBody Name:** Avoca Upper

**WaterBody Code:** IE_EA_10_1477

**Overall Risk Result:** 1a At Risk

**Heavily Modified:** No



| | Risk Test Description | | Risk |
|---|---|---|---|
| | **Diffuse Risk Sources** | | |
| RD1 | EPA diffuse model (2008) | 2a | Probably Not At Risk |
| RD2a | Road Wash - Soluble Copper | 2b | Not At Risk |
| RD2b | Road Wash - Total Zinc | 2b | Not At Risk |
| RD2c | Road Wash - Total Hydrocarbons | 2b | Not At Risk |
| RD3 | Railways | 2b | Not At Risk |
| RD4a | Forestry - Acidification (2008) | 2b | Not At Risk |
| RD4b | Forestry - Suspended Solids (2008) | 2b | Not At Risk |
| RD4c | Forestry - Eutrophication (2008) | 2a | Probably Not At Risk |
| RD5 | Overall Unsewered (2008) | 2b | Not At Risk |
| RD5a | Unsewered Areas - Pathogens (2008) | 2a | Probably Not At Risk |
| RD5b | Unsewered Phosphorus (2008) | 2b | Not At Risk |
| RD6a | Arable | 2a | Probably Not At Risk |
| RD6b | Sheep Dip | 2b | Not At Risk |
| RD6c | Forestry - Dangerous Substances | 2b | Not At Risk |
| RDO | Diffuse Overall -Worst Case (2008) | 2a | Probably Not At Risk |
| | **Hydrology** | | |
| RHY1 | Water balance - Abstraction | 2b | Not At Risk |
| | **Morphological Risk Sources** | | |
| RM1 | Channelisation (2008) | 2b | Not At Risk |
| RM2 | Embankments (2008) | 2b | Not At Risk |
| RM3 | Impoundments | 2b | Not At Risk |
| RM4 | Water Regulation | 2b | Not At Risk |
| RM5 | Intensive Landuse | | N/A |
| RMO | Morphology Overall - Worst Case (2008) | 2b | Not At Risk |
| | **Overall Risk** | | |
| RA | Rivers Overall - Worst Case (2008) | 1a | At Risk |

Date Reported to Europe:July 2010

Date Report Created 21/11/2019



| | | | |
|---|---|---|---|
| | **Point Risk Sources** | | |
| RP1 | WWTPs (2008) | 1a | At Risk |
| RP2 | CSOs | 2b | Not At Risk |
| RP3 | IPPCs (2008) | 2b | Not At Risk |
| RP4 | Section 4s (2008) | 2b | Not At Risk |
| RP5 | WTPs/Mines/Quarries/Landfills | | N/A |
| RPO | Overall Risk from Point Sources - Worst Case (2008) | 1a | At Risk |
| | **Q Value** | | |
| Q | EPA Q rating and Margaritifera Assessment | | N/A |
| | **Q/RDI or Point/Diffuse** | | |
| QPD | Q class/EPA Diffuse Model or worst case of Point and Diffuse (2008) | 1a | At Risk |
| | **Rivers Direct Impacts** | | |
| RDI1 | Rivers Direct Impacts - Dangerous Substances | | N/A |

**Risk**
By 'risk' we mean the risk that a waterbody will not achieve good ecological or good chemical status/potential at least by 2015. To examine risk the various pressures acting on the waterbody were identified along with any evidence of impact on water status. Depending on the extent of the pressure and its potential for impact, and the amount of information available, the risk to the water body was placed in one of four categories: 1a at risk; 1b probably at risk; 2a probably not at risk; 2b not at risk. Note that '2008' after the risk category means that the risk assessment was revised in 2008. All other risks were determined as part of an earlier risk assessment in 2005.

You can read more about risk assessment in our 'WFD Risk Assessment Update' document in the RBMP document library, and other documents at www.wfdireland.ie (Directory 31 Risk Assessments).

Date Reported to Europe:July 2010

Date Report Created 21/11/2019

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## Objectives Report

**Water Management Unit:** IE_EA_Avoca

**WaterBody Category:** River Waterbody

**WaterBody Name:** Avoca Upper

**WaterBody Code:** IE_EA_10_1477

**Overall Objective:** Restore_2027

**Heavily Modified:** No



| | Objectives Description | Result |
|---|---|---|
| | **Objectives information** | |
| OB1 | Prevent deterioration objective | No Status |
| OB2 | Restore at least good status objective | No Status |
| OB3 | Reduce chemical pollution objective | No Status |
| OB4 | Protected areas objective | Restore_2027 |
| OB5 | Northern Ireland Environment Agency objective | No Status |
| OBO | Overall objectives | Restore_2027 |

**Extended timescales**
Extended timescales have been set for certain waters due to technical, economic, environmental or recovery constraints. Extended timescales are usually of one planning cycle (6 years, to 2021) but in some cases are two planning cycles (to 2027).

**Objectives**
In general, we are required to ensure that our waters achieve at least good status/potential by 2015, and that their status does not deteriorate. Having identified the status of waters (this is given earlier in this report), the next stage is to set objectives for waters. Objectives consider waters that require protection from deterioration as well as waters that require restoration and the timescales needed for recovery. Four default objectives have been set initially:-

*Prevent Deterioration*
*Restore Good Status*
*Reduce Chemical Pollution*
*Achieve Protected Areas Objectives*

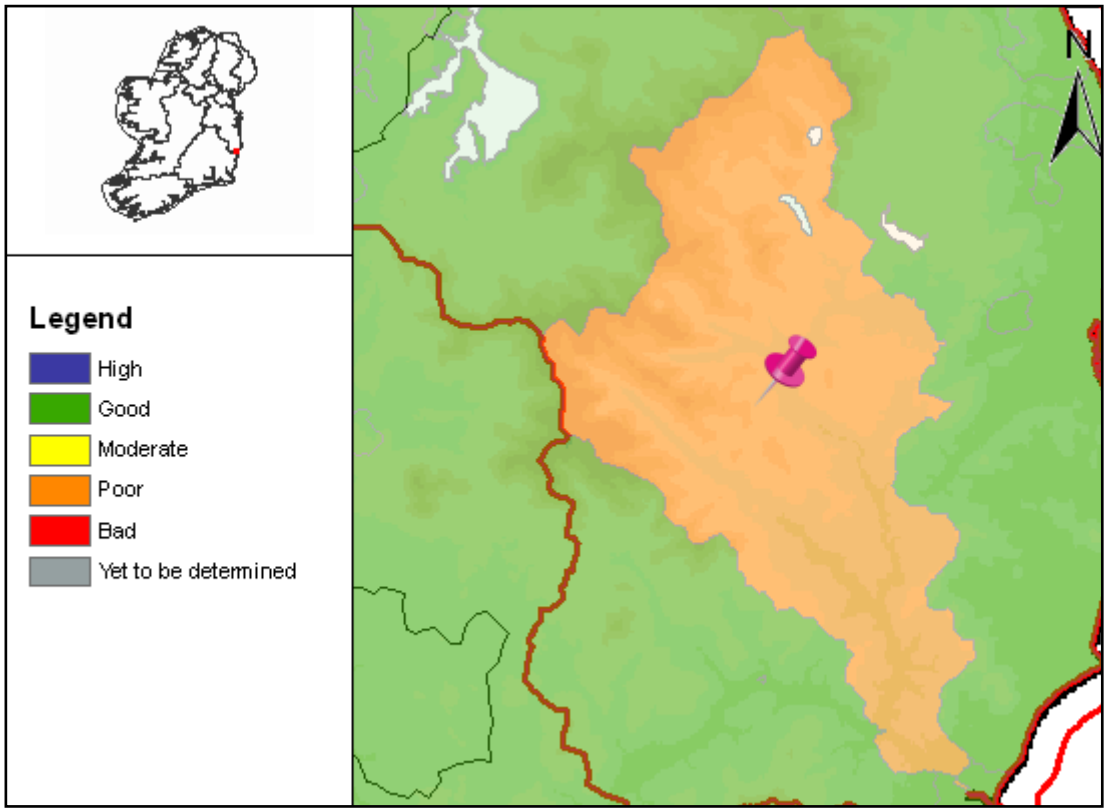
These objectives have been refined based on the measures available to achieve them, the latter's likely effectiveness, and consideration of cost-effective combinations of measures. Where it is considered necessary extended deadlines have been set for achieving objectives in 2021 or 2027.

Date Reported to Europe:July 2010

Date Report Created 21/11/2019

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## Full Report for Waterbody Wicklow Central (Avoca Mine)




River Basin Management Plans (RBMPs) have been published for all River Basin Districts in Ireland in accordance with the requirements of the Water Framework Directive. The WaterMaps viewer is an integral part of the River Basin Management Plan and provides access to information at individual waterbody level and at Water Management Unit level for all the River Basin Districts in Ireland.

The following report provides summary plan information about the selected waterbody (indicated by the pin in the map above) relating to its status, risks, objectives, and measures proposed to retain status where this is adequate, or improve it where necessary. Waterbodies can relate to surface waters (these include rivers, lakes, estuaries [transitional waters], and coastal waters), or to groundwaters. Other relevant information not included in this report can be viewed using the WaterMaps viewer, including areas listed in the Register of Protected Areas.

You will find brief notes at the bottom of some of the individual report sheets that will help you in interpreting the information presented. More detailed information can be obtained in relation to all aspects of the RBMPs at www.wfdireland.ie.

Date Reported to Europe:July 2010

Date Report Created 21/11/2019

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## Summary Information:

| | |
|---|---|
| **Water Management Unit:** | N/A |
| **WaterBody Category:** | Groundwater Waterbody |
| **WaterBody Name:** | Wicklow Central (Avoca Mine) |
| **WaterBody Code:** | IE_EA_G_007 |
| **Overall Status:** | Poor |
| **Overall Objective:** | LSO |
| **Overall Risk:** | 1a At Risk |
| **Heavily Modified:** | No |



Report data based upon final RBMP, 2009-2015.

The information provided above is a summary of the principal findings related to the selected waterbody. Further details and explanation of individual elements of the report are outlined in the following pages.

Date Reported to Europe:July 2010

Date Report Created 21/11/2019

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## Chemical and Quantitative Status Report

| | |
|---|---|
| **Water Management Unit:** | N/A |
| **WaterBody Category:** | Groundwater Waterbody |
| **WaterBody Name:** | Wicklow Central (Avoca Mine) |
| **WaterBody Code:** | IE_EA_G_007 |
| **Overall Status Result:** | Poor |
| **Heavily Modified:** | No |



| | Status Element Description | Result |
|---|---|---|
| | **Status information** | |
| INS | Status associated with saline intrusion into groundwater | N/A |
| DWS | Status associated with exceedances of water quality above specific standards | N/A |
| DS | Chemical status of groundwater due to pressure from diffuse sources of pollution | N/A |
| CLS | Chemical status of groundwater due to pressure from contaminated soil or land. | N/A |
| MS | Chemical status of groundwater due to pressure from mine sites (active or closed). | N/A |
| UAS | Chemical status of groundwater due to pressures from urban areas | N/A |
| GWS | General groundwater quality status | N/A |
| RPS | Status associated with MRP loading to rivers | N/A |
| TNS | Status associated with nitrate loading to transitional and coastal waters | N/A |
| SWS | Overall status associated with nutrient loadings to rivers and transitional and coastal waters | N/A |
| SQS | Status associated with dependant surface water quantitative status | N/A |
| GDS | Groundwater dependant terrestrial ecosystems status | N/A |
| QSO | Quantitative status overall | Good |
| CSO | Chemical status overall | Poor |
| OS | Overall status | Poor |

GS -HC : Good status High Confidence
GS- LC : Good status Low Confidence
n/a - not assessed

**Status**
By 'Status' we mean the condition of the water in the waterbody. It is defined by its chemical status and quantitative status, whichever is worse. Groundwaters are ranked in one of 2 status classes: Good or Poor.

You can read more about status and how it is measured in our RBMP Document Library at www.wfdireland.ie (Directory 15 Status).

Date Reported to Europe:July 2010

Date Report Created 21/11/2019

water matters
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## Risk Report

**Water Management Unit:** N/A

**WaterBody Category:** Groundwater Waterbody

**WaterBody Name:** Wicklow Central (Avoca Mine)

**WaterBody Code:** IE_EA_G_007

**Overall Risk Result:** 1a At Risk

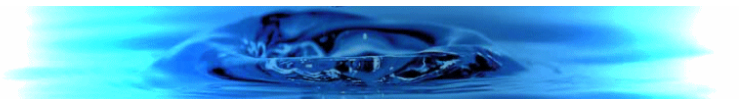
**Heavily Modified:** No



| | Risk Test Description | Risk |
|---|---|---|
| | **Groundwater Dependent Terrestrial Ecosystems** | |
| TE | GWDTE Risk | N/A |
| | **Groundwater Quality** | |
| DIF | Diffuse Elements (General) Risk | N/A |
| DW | Drinking Waters Risk | N/A |
| INT | Intrusions Risk | N/A |
| WB | Water Balance Risk | N/A |
| | **Groundwater Quality (General)** | |
| GQ | General Groundwater Quality Risk | N/A |
| | **Groundwater Quality (Point Risk)** | |
| CL | Contaminated Land Risk | N/A |
| LF | Landfill Risk | N/A |
| MI | Mine Risk | N/A |
| QY | Quarry Risk | N/A |
| UR | Urban Risk | N/A |
| UW | UWWT Risk | N/A |
| | **GW Diffuse Risk Sources** | |
| WB3 | Mobile Nutrients (NO3) | N/A |
| WB4 | Mobile Chemicals | N/A |
| WB5 | Clustered OSWTSs and leaking urban sewerage systems | N/A |
| | **GW Hydrology** | |
| WB1 | Water balance - Abstraction | N/A |
| WB2 | Abstraction - Intrusion | N/A |

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| | | | |
|---|---|---|---|
| | **GW Point Risk Sources** | | |
| WB10 | Risk from Point sources of pollution - Contaminated Land | | N/A |
| WB11 | Risk from Point sources of pollution - Trade Effluent Discharges | | N/A |
| WB12 | Risk from Point sources of pollution - Urban Wastewater Discharges | | N/A |
| WB6 | Risk from Point sources of pollution - Mines | | N/A |
| WB7 | Risk from Point sources of pollution - Quarries | | N/A |
| WB8 | Risk from Point sources of pollution - Landfills | | N/A |
| WB9 | Risk from Point sources of pollution - Oil Industry Infrastructure | | N/A |
| | **Overall Risk** | | |
| RA | Groundwater Overall - Worst Case | | N/A |
| | **Risk information** | | |
| CLR | Contaminated land risk | 2a | Probably Not At Risk |
| DR | Risk of groundwater due to pressure from diffuse sources of pollution | 2a | Probably Not At Risk |
| DWR | Risk associated with exceedances of water quality above specific standards | 2b | Not At Risk |
| GDR | Groundwater dependant terrestrial ecosystems risk | 2b | Not At Risk |
| GWR | General groundwater quality risk | 1a | At Risk |
| INR | Risk associated with saline intrusion into groundwater | 2b | Not At Risk |
| LR | Risk due to landfills sites/old closed dump sites | 2b | Not At Risk |
| MR | Mines risk | 1a | At Risk |
| NULL | Diffuse nitrates from agriculture risk | | N/A |
| QR | Risk due to quarries | 2b | Not At Risk |
| RA | Revised risk assessment | 1a | At Risk |
| RPR | Risk associated with MRP loading to rivers | 2a | Probably Not At Risk |
| SQR | Risk associated with dependant surface water quantitative status | 2b | Not At Risk |
| SWR | Overall risk associated with nutrient loadings to rivers and transitional and coastal waters | 2a | Probably Not At Risk |
| TNR | Risk associated with nitrate loading to transitional and coastal waters | 2b | Not At Risk |
| UAR | Risk of groundwater due to pressures from urban areas | 2b | Not At Risk |
| UWR | Risk due to direct discharges of urban wastewater | 2b | Not At Risk |

**Risk**
By 'risk' we mean the risk that a waterbody will not achieve good ecological or good chemical status/potential at least by 2015. To examine risk the various pressures acting on the waterbody were identified along with any evidence of impact on water status. Depending on the extent of the pressure and its potential for impact, and the amount of information available, the risk to the water body was placed in one of four categories: 1a at risk; 1b probably at risk; 2a probably not at risk; 2b not at risk. Note that '2008' after the risk category means that the risk assessment was revised in 2008. All other risks were determined as part of an earlier risk assessment in 2005.

You can read more about risk assessment in our 'WFD Risk Assessment Update' document in the RBMP document library, and other documents at www.wfdireland.ie (Directory 31 Risk Assessments).

Date Reported to Europe:July 2010

Date Report Created 21/11/2019

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## Objectives Report

**Water Management Unit:** N/A

**WaterBody Category:** Groundwater Waterbody

**WaterBody Name:** Wicklow Central (Avoca Mine)

**WaterBody Code:** IE_EA_G_007

**Overall Objective:** LSO

**Heavily Modified:** No



| | Objectives Description | Result |
|---|---|---|
| | **Objectives information** | |
| OB1 | Prevent deterioration objective | No Status |
| OB2 | Restore at least good status objective | LSO |
| OB3 | Reduce chemical pollution objective | No Status |
| OB4 | Protected areas objective | No Status |
| OBO | Overall objectives - objective | LSO |

**Extended timescales**
Extended timescales have been set for certain waters due to technical, economic, environmental or recovery constraints. Extended timescales are usually of one planning cycle (6 years, to 2021) but in some cases are two planning cycles (to 2027).

**Objectives**
In general, we are required to ensure that our waters achieve at least good status/potential by 2015, and that their status does not deteriorate. Having identified the status of waters (this is given earlier in this report), the next stage is to set objectives for waters. Objectives consider waters that require protection from deterioration as well as waters that require restoration and the timescales needed for recovery. Four default objectives have been set initially:-

*Prevent Deterioration*
*Restore Good Status*
*Reduce Chemical Pollution*
*Achieve Protected Areas Objectives*

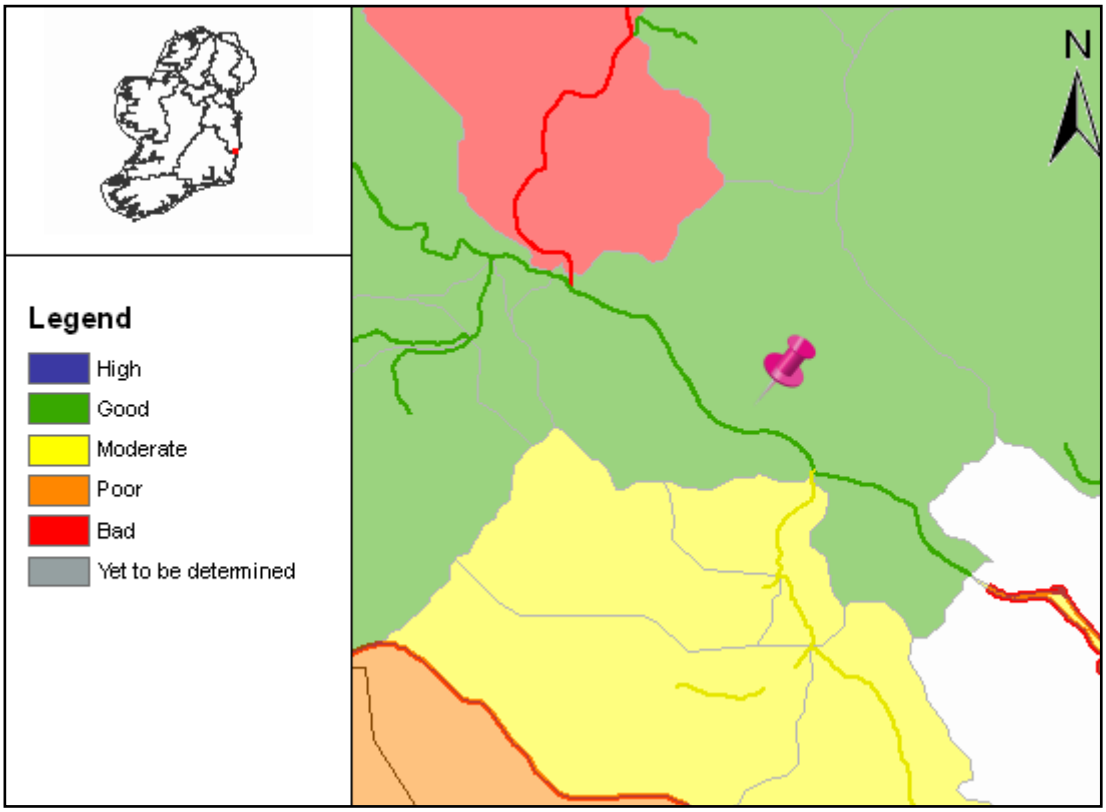
These objectives have been refined based on the measures available to achieve them, the latter's likely effectiveness, and consideration of cost-effective combinations of measures. Where it is considered necessary extended deadlines have been set for achieving objectives in 2021 or 2027.

Date Reported to Europe:July 2010

Date Report Created 21/11/2019

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## Full Report for Waterbody Avoca Lower




River Basin Management Plans (RBMPs) have been published for all River Basin Districts in Ireland in accordance with the requirements of the Water Framework Directive. The WaterMaps viewer is an integral part of the River Basin Management Plan and provides access to information at individual waterbody level and at Water Management Unit level for all the River Basin Districts in Ireland.

The following report provides summary plan information about the selected waterbody (indicated by the pin in the map above) relating to its status, risks, objectives, and measures proposed to retain status where this is adequate, or improve it where necessary. Waterbodies can relate to surface waters (these include rivers, lakes, estuaries [transitional waters], and coastal waters), or to groundwaters. Other relevant information not included in this report can be viewed using the WaterMaps viewer, including areas listed in the Register of Protected Areas.

You will find brief notes at the bottom of some of the individual report sheets that will help you in interpreting the information presented. More detailed information can be obtained in relation to all aspects of the RBMPs at www.wfdireland.ie.

Date Reported to Europe:July 2010

Date Report Created 21/11/2019

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## Summary Information:

| | |
|---|---|
| **Water Management Unit:** | IE_EA_Avoca |
| **WaterBody Category:** | River Waterbody |
| **WaterBody Name:** | Avoca Lower |
| **WaterBody Code:** | IE_EA_10_1611 |
| **Overall Status:** | Good |
| **Overall Objective:** | Protect |
| **Overall Risk:** | 1a At Risk |
| **Heavily Modified:** | No |



Report data based upon final RBMP, 2009-2015.

The information provided above is a summary of the principal findings related to the selected waterbody. Further details and explanation of individual elements of the report are outlined in the following pages.

Date Reported to Europe:July 2010

Date Report Created 21/11/2019

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## Status Report

| | |
|---|---|
| **Water Management Unit:** | IE_EA_Avoca |
| **WaterBody Category:** | River Waterbody |
| **WaterBody Name:** | Avoca Lower |
| **WaterBody Code:** | IE_EA_10_1611 |
| **Overall Status Result:** | Good |
| **Heavily Modified:** | No |



| | Status Element Description | Result |
|---|---|---|
| | **Status information** | |
| Q | Macroinvertebrate status | N/A |
| PC | General physico-chemical status | Good |
| FPQ | Freshwater Pearl Mussel / Macroinvertebrate status | N/A |
| DIA | Diatoms status | N/A |
| HYM | Hydromorphology status | N/A |
| FIS | Fish status | N/A |
| SP | Specific Pollutants status (SP) | N/A |
| ES | Overall ecological status | Good |
| CS | Overall chemical status (PAS) | n/a |
| EXT | Extrapolated status | N/A |
| MON | Monitored water body | YES |
| DON | Donor water bodies | N/A |

n/a - not assessed

**Status**
By 'Status' we mean the condition of the water in the waterbody. It is defined by its chemical status and its ecological status, whichever is worse. Waters are ranked in one of 5 status classes: High, Good, Moderate, Poor, Bad. However, not all waterbodies have been monitored, and in such cases the status of a similar nearby waterbody has been used (extrapolated) to assign status. If this has been done the first line of the status report shows the code of the waterbody used to extrapolate.

You can read more about status and how it is measured in our RBMP Document Library at www.wfdireland.ie (Directory 15 Status).

Date Reported to Europe:July 2010

Date Report Created 21/11/2019

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## Risk Report

**Water Management Unit:** IE_EA_Avoca

**WaterBody Category:** River Waterbody

**WaterBody Name:** Avoca Lower

**WaterBody Code:** IE_EA_10_1611

**Overall Risk Result:** 1a At Risk

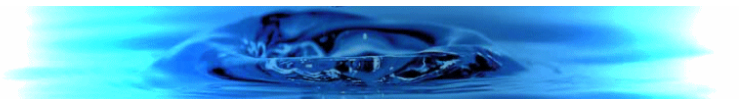
**Heavily Modified:** No



| | Risk Test Description | | Risk |
|---|---|---|---|
| | **Diffuse Risk Sources** | | |
| RD1 | EPA diffuse model (2008) | 2a | Probably Not At Risk |
| RD2a | Road Wash - Soluble Copper | 2b | Not At Risk |
| RD2b | Road Wash - Total Zinc | 2b | Not At Risk |
| RD2c | Road Wash - Total Hydrocarbons | 2b | Not At Risk |
| RD3 | Railways | 2b | Not At Risk |
| RD4a | Forestry - Acidification (2008) | 2b | Not At Risk |
| RD4b | Forestry - Suspended Solids (2008) | 2b | Not At Risk |
| RD4c | Forestry - Eutrophication (2008) | 2a | Probably Not At Risk |
| RD5 | Overall Unsewered (2008) | 2b | Not At Risk |
| RD5a | Unsewered Areas - Pathogens (2008) | 2a | Probably Not At Risk |
| RD5b | Unsewered Phosphorus (2008) | 2b | Not At Risk |
| RD6a | Arable | 2a | Probably Not At Risk |
| RD6b | Sheep Dip | 2b | Not At Risk |
| RD6c | Forestry - Dangerous Substances | 2b | Not At Risk |
| RDO | Diffuse Overall -Worst Case (2008) | 2a | Probably Not At Risk |
| | **Hydrology** | | |
| RHY1 | Water balance - Abstraction | 2b | Not At Risk |
| | **Morphological Risk Sources** | | |
| RM1 | Channelisation (2008) | 2b | Not At Risk |
| RM2 | Embankments (2008) | 2b | Not At Risk |
| RM3 | Impoundments | 2b | Not At Risk |
| RM4 | Water Regulation | 2b | Not At Risk |
| RM5 | Intensive Landuse | | N/A |
| RMO | Morphology Overall - Worst Case (2008) | 2b | Not At Risk |
| | **Overall Risk** | | |
| RA | Rivers Overall - Worst Case (2008) | 1a | At Risk |

Date Reported to Europe:July 2010

Date Report Created 21/11/2019



| | | | |
|---|---|---|---|
| | **Point Risk Sources** | | |
| RP1 | WWTPs (2008) | 2b | Not At Risk |
| RP2 | CSOs | 2b | Not At Risk |
| RP3 | IPPCs (2008) | 2b | Not At Risk |
| RP4 | Section 4s (2008) | 2b | Not At Risk |
| RP5 | WTPs/Mines/Quarries/Landfills | | N/A |
| RPO | Overall Risk from Point Sources - Worst Case (2008) | 2b | Not At Risk |
| | **Q Value** | | |
| Q | EPA Q rating and Margaritifera Assessment | | N/A |
| | **Q/RDI or Point/Diffuse** | | |
| QPD | Q class/EPA Diffuse Model or worst case of Point and Diffuse (2008) | 1a | At Risk |
| | **Rivers Direct Impacts** | | |
| RDI1 | Rivers Direct Impacts - Dangerous Substances | | N/A |

**Risk**
By 'risk' we mean the risk that a waterbody will not achieve good ecological or good chemical status/potential at least by 2015. To examine risk the various pressures acting on the waterbody were identified along with any evidence of impact on water status. Depending on the extent of the pressure and its potential for impact, and the amount of information available, the risk to the water body was placed in one of four categories: 1a at risk; 1b probably at risk; 2a probably not at risk; 2b not at risk. Note that '2008' after the risk category means that the risk assessment was revised in 2008. All other risks were determined as part of an earlier risk assessment in 2005.

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Date Reported to Europe:July 2010

Date Report Created 21/11/2019

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## Objectives Report

**Water Management Unit:** IE_EA_Avoca

**WaterBody Category:** River Waterbody

**WaterBody Name:** Avoca Lower

**WaterBody Code:** IE_EA_10_1611

**Overall Objective:** Protect

**Heavily Modified:** No



| | Objectives Description | Result |
|---|---|---|
| | **Objectives information** | |
| OB1 | Prevent deterioration objective | No Status |
| OB2 | Restore at least good status objective | No Status |
| OB3 | Reduce chemical pollution objective | No Status |
| OB4 | Protected areas objective | Protect |
| OB5 | Northern Ireland Environment Agency objective | No Status |
| OBO | Overall objectives | Protect |

**Extended timescales**
Extended timescales have been set for certain waters due to technical, economic, environmental or recovery constraints. Extended timescales are usually of one planning cycle (6 years, to 2021) but in some cases are two planning cycles (to 2027).

**Objectives**
In general, we are required to ensure that our waters achieve at least good status/potential by 2015, and that their status does not deteriorate. Having identified the status of waters (this is given earlier in this report), the next stage is to set objectives for waters. Objectives consider waters that require protection from deterioration as well as waters that require restoration and the timescales needed for recovery. Four default objectives have been set initially:-

*Prevent Deterioration*
*Restore Good Status*
*Reduce Chemical Pollution*
*Achieve Protected Areas Objectives*

These objectives have been refined based on the measures available to achieve them, the latter's likely effectiveness, and consideration of cost-effective combinations of measures. Where it is considered necessary extended deadlines have been set for achieving objectives in 2021 or 2027.

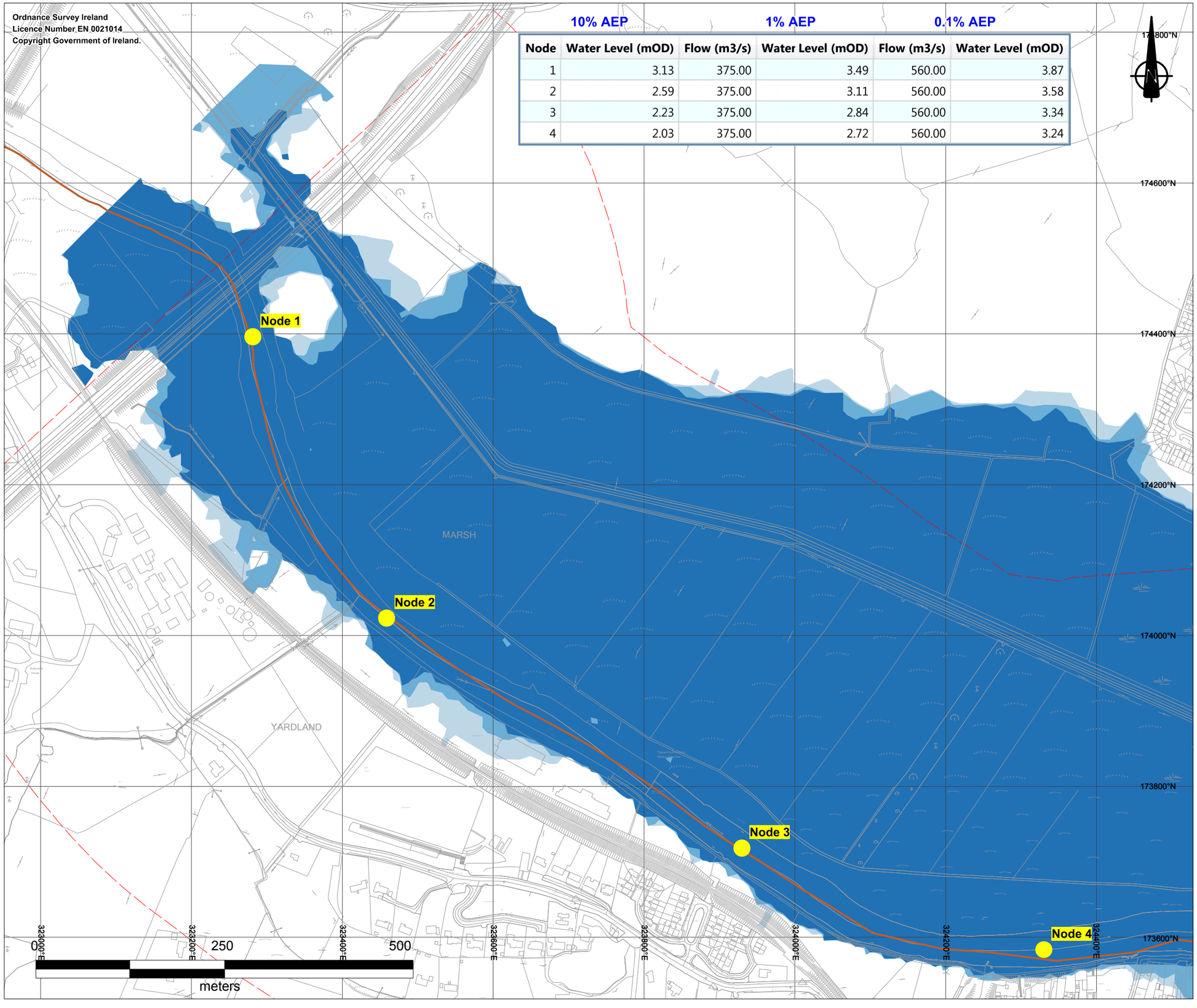
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Date Report Created 21/11/2019

# **APPENDIX 6** – Flood Maps

Ordnance Survey Ireland
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| | 10% AEP | | 1% AEP | | 0.1% AEP |
|---|---|---|---|---|---|
| Node | Water Level (mOD) | Flow (m3/s) | Water Level (mOD) | Flow (m3/s) | Water Level (mOD) |
| 1 | 3.13 | 375.00 | 3.49 | 560.00 | 3.87 |
| 2 | 2.59 | 375.00 | 3.11 | 560.00 | 3.58 |
| 3 | 2.23 | 375.00 | 2.84 | 560.00 | 3.34 |
| 4 | 2.03 | 375.00 | 2.72 | 560.00 | 3.24 |







## Legend

- 10% AEP Fluvial Extent
- 1% AEP Fluvial Extent
- 0.1% AEP Fluvial Extent
- Node Point
- Modelled River Centreline
- AFA Boundary

IMPORTANT USER NOTE:-
THE VIEWER OF THIS MAP SHOULD REFER TO THE DISCLAIMER, GUIDANCE NOTES AND CONDITIONS OF USE THAT ACCOMPANY THIS MAP.

# AVOCA RIVER (ARKLOW) FLOOD RELIEF SCHEME

BYRNELOOBY PHMcCARTHY

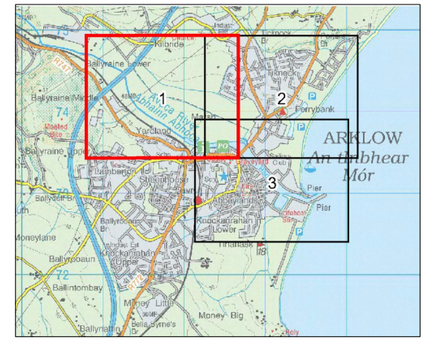
OPW
Oifig na nOibreacha Poiblí
The Office of Public Works

| | |
|---|---|
| Map Title | ARKLOW FLUVIAL FLOOD EXTENT MAP |
| Type: | EXTENT |
| Source: | FLUVIAL |
| Scenario: | CURRENT |

| | | | | |
|---|---|---|---|---|
| Drawn | NOB | Scale | 1:5,000 @ A3 | Map Number: E10999_EXFCD_F0_01 |
| Chkd. | SH | Date | 27/07/16 | Rev. F0 |
| Apprd. | KT | Status | FINAL | |

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## Legend

- 10% AEP Tidal Extent
- 0.5% AEP Tidal Extent
- 0.1% AEP Tidal Extent
- Modelled River Centreline
- AFA Boundary

IMPORTANT USER NOTE:-
THE VIEWER OF THIS MAP SHOULD REFER TO THE DISCLAIMER, GUIDANCE NOTES AND CONDITIONS OF USE THAT ACCOMPANY THIS MAP.

# AVOCA RIVER (ARKLOW) FLOOD RELIEF SCHEME

BYRNELOOBY PHMcCARTHY
OPW
Oifig na nOibreacha Poiblí
The Office of Public Works

| | |
|---|---|
| Map Title | ARKLOW COASTAL FLOOD EXTENT MAP |
| Type: | EXTENT |
| Source: | COASTAL |
| Scenario: | CURRENT |

| | | | | |
|---|---|---|---|---|
| Drawn | NOB | Scale | 1:5,000 @ A3 | Map Number: E10999_EXCCD_F0_01 |
| Chkd. | SH | Date | 29/07/16 | Rev.: F0 |
| Apprd. | KT | Status | FINAL | |

# **APPENDIX 7** – Trial Pit Records

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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Trial Pit Number** TP01 |
| **Machine :** 13 tonne excavator<br>**Method :** Trial Pit | **Dimensions** 1.0 w X 3.0 L X 3.4 | **Ground Level (mOD)** 3.12 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** (dGPS) 722660.2 E 675189.8 N | **Dates** 04/12/2019 | **Project Contractor** GII | **Sheet** 1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|
| | | | | | (0.40) | MADE GROUND: Grey brown sandy gravel with occasional plastic and concrete. | | |
| | | | | 2.72 | 0.40 | | | |
| | | | | | (0.10) | TARMACADAM | | |
| | | | | 2.62 | 0.50 | | | |
| 0.50<br>0.50-1.50 | EN<br>B | | | | | MADE GROUND: Blue grey gravel with plastic, concrete, wood and wires. Large cobbles and boulders present. | | |
| | | | | | (1.30) | | | |
| 1.50 | EN | | | | | | | |
| | | | Slow(1) at 1.70m. | | | | | ▽1 |
| | | | | 1.32 | 1.80 | Loose blue grey clayey GRAVEL. | | |
| | | | | | (0.30) | | | |
| | | | | 1.02 | 2.10 | Soft blue grey slightly silty CLAY with occasional decaying organic matter. | | |
| | | | | | (0.20) | | | |
| | | | | 0.82 | 2.30 | | | ▽2 |
| | | | Strong (2) at 2.30m. | | (0.10) | Soft black brown silty CLAY with organic matter. | | |
| 2.40-3.10 | B | | | 0.72 | 2.40 | Soft to firm grey blue silty CLAY. | | |
| | | | | | (0.70) | | | |
| | | | | 0.02 | 3.10 | Loose very sandy clayey GRAVEL. | | |
| | | | | | (0.30) | | | |
| | | | | -0.28 | 3.40 | Complete at 3.40m | | |

**Plan**

**Remarks**

Difficult digging between 0.5-1.8m BGL.
Perched water encountered at 1.7m BGL. Slow ingress.
Perched water encountered at 2.3m BGL. strong ingress.
Trial pit unstable due to groundwater.
Trial pit terminated due to groundwater.
Trial pit backfilled on completion.
Shear vane failed - material too soft at 2.5m

| Scale (approx) | Logged By | Figure No. |
|---|---|---|
| 1:25 | EOC | 9230-11-19.TP01 |

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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Trial Pit Number** TP02 |
| **Machine :** 13 Tonne excavator<br>**Method :** Trial Pit | **Dimensions** 1.0 w X 3.0 L X 3.2m D | **Ground Level (mOD)** 2.17 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722732.9 E 675071.3 N | **Dates** 10/12/2019 | **Project Contractor** GII | **Sheet** 1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|
| 0.10-0.70 | B | | | | (0.50) | MADE GROUND: Grey brown sandy Gravel with large angular cobbles. | | |
| 0.50 | EN | | Moderate (1) at 0.50m. | 1.67 | 0.50 | MADE GROUND: Medium dense brown clayey angular Gravel. Concrete, plastic and wire present. | | ▽1 |
| 1.00-1.70 | B | | | | (1.10) | | | |
| 1.50 | EN | | Strong (2) at 1.60m. | 0.57 | 1.60 | Soft to firm grey clayey SILT. | | ▽2 |
| 1.70-2.50 | B | | | | (0.40) | | | |
| | | | | 0.17 | 2.00 | Very soft to soft red brown grey mottled clayey SILT. | | |
| | | | | | (0.50) | | | |
| | | | | -0.33 | 2.50 | Soft blue grey silty CLAY. | | |
| 3.00-3.80 | B | | | | (0.70) | | | |
| | | | | -1.03 | 3.20 | Complete at 3.20m | | |

**Plan**

**Remarks**

Water encountered at 0.5m BGL.Slow ingress
Water encountered at 1.6m BGL. Strong ingress.
Layer of plastic sheeting at 1.6m BGL.
Trial pit terminated at 3.0m BGL.
Trial pit backfilled on completion.
Shear vein failed - material too soft -2.0m

| Scale (approx) | Logged By | Figure No. |
|---|---|---|
| 1:25 | EOC | 9230-11-19.TP02 |

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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Trial Pit Number** TP03 |
| **Machine :** 13 tonne excavator<br>**Method :** Trial Pit | **Dimensions** 1.0w X 3.0m L 3.7m | **Ground Level (mOD)** 2.30 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722719.3 E 675071.4 N | **Dates** 10/12/2019 | **Project Contractor** GII | **Sheet** 1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|
| 0.00-1.00 | B | | | | (0.30) | MADE GROUND: Red brown gravelly Clay with red brick fragments. | | |
| | | | | 2.00 | 0.30 | MADE GROUND: Large angular cobbles and boulders fill with concrete, bricks, steal and wood. | | |
| 0.50 | EN | | | | (0.60) | | | |
| | | | Moderate (1) at 0.80m. | 1.40 | 0.90 | Firm dark grey brown clayey SILT. | | ▽1 |
| 1.00-2.00 | B | | | | (0.30) | | | |
| | | | | 1.10 | 1.20 | Very soft to soft red orange grey mottled slightly silty CLAY. | | |
| 1.50 | EN | | | | | | | |
| | | | | | (1.50) | | | |
| 2.00-3.00 | B | | | | | | | |
| 2.50 | EN | | | | | | | |
| | | | | -0.40 | 2.70 | Very soft to soft grey slightly silty CLAY. | | |
| 3.00-3.70 | B | | | | (1.00) | | | |
| | | | | | | CLAY becoming very gravelly at 3.5m | | |
| | | | | -1.40 | 3.70 | Complete at 3.70m | | |

**Plan**

**Remarks**

Perched water encountered at 0.8m BGL.
Trial pit stable.
Trial pit backfilled on completion.
Shear vane failed - material too soft at 3.0m

| Scale (approx) | Logged By | Figure No. |
|---|---|---|
| 1:25 | EOC | 9230-11-19.TP03 |

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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Trial Pit Number** TP04 |
| **Machine :** 13 tonne excavator<br>**Method :** Trial Pit | **Dimensions** 1.0m W x 3.0m L x 3.3m D | **Ground Level (mOD)** 2.44 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722721.8 E 675157.4 N | **Dates** 10/12/2019 | **Project Contractor** GII | **Sheet** 1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|
| 0.00-1.00 | B | | | | (0.50) | MADE GROUND: Grey sandy Gravel with plastic and concrete. | | |
| 0.50 | EN | | | 1.94 | 0.50 | MADE GROUND: Grey sandy Gravel with large cobbles and boulders, plastic and concrete. | | |
| | | | Moderate (1) at 0.80m. | 1.54 | (0.40)<br>0.90 | Very soft black silty CLAY. | | ▽1 |
| 1.00-2.00 | B | | | 1.34 | (0.20)<br>1.10 | Very soft grey red brown mottled slightly silty CLAY. | | |
| 1.50 | EN | | | | (0.90) | | | |
| 2.00-2.80 | B | | | 0.44 | 2.00 | Very soft grey black slightly sandy slightly clayey SILT. | | |
| 2.50 | EN | | | | (0.80) | | | |
| 2.80-3.30 | B | | | -0.36 | 2.80 | Very soft dark grey slightly sandy slightly silty CLAY with decaying organic matter. | | |
| | | | | | (0.50) | | | |
| | | | | -0.86 | 3.30 | Complete at 3.30m | | |

**Plan**

**Remarks**

Perched water encountered at 0.8m BGL.
Trial pit collapse at 3.0m BGL.
Trial pit backfilled on completion.
Shear vane failed - material too soft at 2.0m

Logged in accordance BS5930:2015

| Scale (approx) | Logged By | Figure No. |
|---|---|---|
| 1:25 | EOC | 9230-11-19.TP04 |

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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Trial Pit Number** TP05 |
| **Machine :** 13 Tonne excavator<br>**Method :** | **Dimensions** 1.0m W X 3.0m D X 3.0m L | **Ground Level (mOD)** 2.04 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722716.1 E 675069.7 N | **Dates** 04/12/2019 | **Project Contractor** GII | **Sheet** 1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|
| 0.00-1.00 | B | | | | (0.20) | TOPSOIL | | |
| | | | | 1.84 | 0.20 | MADE GROUND: Medium dense grey brown sandy gravel fill with plastic and tarmac fragments -moderate hydrocarbon odour | | |
| 0.50 | EN | | | | (0.70) | | | |
| | | | | 1.14 | 0.90 | Firm to stiff black organic rich clayey SILT (Decaying vegetation present) | | |
| | | | | | (0.20) | | | |
| | | | | 0.94 | 1.10 | Very soft to soft grey brown clayey SILT (Hydrocarbon odour) | | |
| 1.10-1.40<br>1.20 | B<br>EN | | | | (0.30) | | | |
| | | | | 0.64 | 1.40 | Soft red brown mottled grey clayey SILT | | |
| 1.50-2.50 | B | | | | (1.30) | | | |
| 2.50<br>2.50-3.00 | EN<br>B | | | | | | | |
| | | | | -0.66 | 2.70 | Very soft to soft grey slightly silty CLAY | | |
| | | | | | (0.30) | | | |
| | | | | -0.96 | 3.00 | Complete at 3.00m | | |

**Plan**

**Remarks**

No water encountered
Shear vane failed material too soft at 1.2m
Trial Pit stable
Backfilled on compleetion

Logged in accordance BS5930:2015

| Scale (approx) | Logged By | Figure No. |
|---|---|---|
| 1:25 | EOC | 9230-11-19.TP05 |

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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Trial Pit Number** TP06 |
| **Machine :** 13 tonne excavator<br>**Method :** Trial Pit | **Dimensions** 1.0m W X 3.7m D X 3,0 L | **Ground Level (mOD)** 2.27 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722755.2 E 675132.8 N | **Dates** 06/12/2019 | **Project Contractor** GII | **Sheet** 1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|
| | | | | 2.18 | (0.09) 0.09 | TARMAC | | |
| 0.10-1.10 | B | | | | | MADE GROUND: Red grey sandy Gravel with red bricks, concrete and plastic fragments present. | | |
| | | | | | (0.41) | | | |
| 0.50 | EN | | | 1.77 | 0.50 | MADE GROUND: Red clay- fertilizer by product | | |
| | | | | | (0.50) | | | |
| | | | | 1.27 | 1.00 | Very soft dark brown black organic silty CLAY. | | |
| | | | | | (0.20) | | | |
| | | | | 1.07 | 1.20 | Soft to firm red brown mottled grey clayey SILT. | | |
| 1.30-2.30 | B | | | | | | | |
| 1.50 | EN | | | | | | | |
| | | | | | (1.30) | | | |
| 2.50-3.50 | B | | Moderate (1) at 2.50m. | -0.23 | 2.50 | Soft blue grey slightly silty CLAY. | | ▽1 |
| | | | | | (0.50) | | | |
| | | | | -0.73 | 3.00 | Very soft grey brown organic slightly silty CLAY. | | |
| | | | | | (0.30) | | | |
| | | | | -1.03 | 3.30 | Soft to firm grey brown organic slightly silty CLAY. | | |
| | | | | | (0.40) | | | |
| | | | | -1.43 | 3.70 | Complete at 3.70m | | |

**Plan**

**Remarks**

Water encountered at 2.5m BGL.
Trial pit terminated at 3.7m BGL.
Trial pit backfilled on completion.
Shear vane - 48 kPa - residual 22 kPa

| Scale (approx) | Logged By | Figure No. |
|---|---|---|
| 1:25 | EOC | 9230-11-19.TP06 |

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| Site | Trial Pit Number |
|---|---|
| Avoca River Park, Arklow | TP07 |

| Machine : 13 Tonne excavator<br>Method : Trial Pit | Dimensions<br>1.0m W X 3.6m D X 3.0m L | Ground Level (mOD)<br>2.23 | Client<br>FT Squared | Job Number<br>9230-11-19 |
|---|---|---|---|---|
| | Location<br>722798.6 E 675153.9 N | Dates<br>10/12/2019 | Project Contractor<br>GII | Sheet<br>1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|
| | | | | 2.14 | (0.09) 0.09 | TARMAC | | |
| | | | | | (0.21) | MADE GROUND: Blue grey sandy Gravel with steel, concrete and plastic fragments. | | |
| 0.30-1.10 | B | | | 1.93 | 0.30 | MADE GROUND: Red grey sandy Gravel with red bricks, concrete and plastic fragments present. | | |
| 0.50 | EN | | | | (0.20) | | | |
| | | | Moderate (1) at 0.60m. | 1.73 | 0.50 | MADE GROUND: Red clay - fertilizer by product | | ▽1 |
| | | | | | (0.50) | | | |
| | | | | 1.23 | 1.00 | MADE GROUND: Brown sandy Gravel with large cobbles and boulders. Fragments of plastic, red bricks, concrete and steel. | | |
| | | | | 1.13 | (0.10) 1.10 | | | |
| | | | Moderate (2) at 1.20m. | 1.03 | (0.10) 1.20 | | | ▽2 |
| | | | | 1.03 | (0.00) 1.20 | Very angular coarse cobbles. | | |
| 1.30-2.30 | B | | | 0.93 | 1.30 | Soft dark brown black organic silty CLAY. | | |
| 1.50 | EN | | | | (0.30) | Soft dark grey black clayey SILT with decaying organic matter. | | |
| | | | | 0.63 | 1.60 | Soft red brown grey mottled slightly sandy clayey SILT. | | |
| | | | | | | Soft to firm grey mottled slightly sandy clayey SILT. | | |
| | | | | | (1.00) | | | |
| 2.50 | EN | | | | | | | |
| 2.60-3.60 | B | | | -0.37 | 2.60 | Soft grey slightly silty CLAY. | | |
| | | | | | (1.00) | | | |
| | | | | -1.37 | 3.60 | Complete at 3.60m | | |

**Plan**

**Remarks**

Water encountered at 0.6m BGL.
Trial pit terminated at 3.6m BGL.
Trial pit backfilled on completion.
Shear vane failed -material too soft at 1.5m

| Scale (approx) | Logged By | Figure No. |
|---|---|---|
| 1:25 | JS | 9230-11-19.TP07 |

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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Trial Pit Number** TP08 |
| **Machine :** 13 Tonne excavator<br>**Method :** Trial Pit | **Dimensions** | **Ground Level (mOD)** 2.25 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722819.8 E 675075.3 N | **Dates** 10/12/2019 | **Project Contractor** GII | **Sheet** 1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|
| | | | | 2.18 | (0.07) 0.07 | TARMACADAM | | |
| 0.10-0.90 | B | | | | (0.43) | MADE GROUND: Blue grey clayey sandy Gravel with large angular cobbles and boulders. Red bricks, concrete and plastic fragments present. | | |
| 0.50 | EN | | Slow (1) at 0.50m. | 1.75 | 0.50 | MADE GROUND: Grey brown clayey Gravel with large angular cobbles. | | ▽1 |
| | | | | | (0.40) | | | |
| | | | | 1.35 | 0.90 | MADE GROUND: Red clay with dark brown clayey sandy Gravel with large angular cobbles and boulders. | | |
| | | | | | (0.30) | | | |
| 1.20-1.90 | B | | | 1.05 | 1.20 | MADE GROUND: Red clay- fertilizer by product | | |
| 1.50 | EN | | | | (0.70) | | | |
| | | | Moderate (2) at 1.90m. | 0.35 | 1.90 (0.10) | Soft dark brown black slightly sandy silty CLAY with organic matter. | | ▽2 |
| 2.00-2.90 | B | | | 0.25 | 2.00 | Soft brown mottled clayey SILT. | | |
| | | | | | (0.90) | | | |
| 2.50 | EN | | | | | | | |
| | | | | -0.65 | 2.90 | Soft brown grey mottled silty CLAY. | | |
| | | | | | (0.20) | | | |
| 3.10-3.50 | B | | | -0.85 | 3.10 | Firm blue grey orange slightly silty CLAY. | | |
| | | | | | (0.40) | | | |
| | | | | -1.25 | 3.50 | Complete at 3.50m | | |

**Plan**

**Remarks**

Water encountered at 0.5m BGL.
Water encountered at 1.9m BGL.
Trial pit terminated at 3.5m BGL.
Trial pit backfilled on completion.
Shear Vane - 55kPa - residual shear strength -27 kPa

| Scale (approx) | Logged By | Figure No. |
|---|---|---|
| 1:25 | EOC | 9230-11-19.TP08 |

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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Trial Pit Number** TP09 |
| **Machine :** 13 tonne excavator<br>**Method :** Trial Pit | **Dimensions** 1.0m W x 2.9m D x 3.0m L | **Ground Level (mOD)** 1.76 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722852 E 675030.6 N | **Dates** 10/12/2019 | **Project Contractor** GII | **Sheet** 1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|
| | | | | 1.69 | (0.07) 0.07 | TARMACADAM | | |
| 0.10-0.50 | B | | | 1.56 | (0.13) 0.20 | MADE GROUND: Blue grey sandy gravell with red brick and plastic fragments. | | |
| | | | | | (0.30) | MADE GROUND: Red brown sandy clayey Gravel with large angular cobbles, red bricks, plastic and concrete. | | |
| 0.50<br>0.50-1.50 | EN<br>B | | | 1.26 | 0.50 | MADE GROUND: Red clay possible tailings from fertilizer by product | | |
| | | | | | (1.00) | | | |
| | | | Slow (1) at 1.40m. | | | | | ▽1 |
| 1.50 | EN | | | 0.26 | 1.50 (0.10) | Soft dark brown black sandy silty CLAY with rootlets. | | |
| | | | | 0.16 | 1.60 (0.10) | Soft grey brown black sandy silty CLAY with rootlets. | | |
| 1.70-2.50 | B | | | 0.06 | 1.70 | Soft to firm dark grey clayey SILT. | | |
| | | | | | (0.70) | | | |
| | | | | -0.64 | 2.40 | Loose grey brown silty SAND. | | |
| 2.50<br>2.50-2.90 | EN<br>B | | | | (0.50) | | | |
| | | | Moderate (2) at 2.90m. | -1.14 | 2.90 | Complete at 2.90m | | ▽2 |

**Plan**

**Remarks**

Water encountered at 1.4m BGL.
Moderate water ingress at 2.9m BGL..
Trial pit terminated at 2.9m BGL.
Trial pit backfilled on completion.
Shear vane at 1.7m -30 kPa residual - 13 kPa

| Scale (approx) | Logged By | Figure No. |
|---|---|---|
| 1:25 | JS | 9230-11-19.TP09 |

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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Trial Pit Number** TP10 |
| **Machine :** 13 Tonne excavator<br>**Method :** Trial Pit | **Dimensions** 1.2m W X 4.5m D X 3.0m L | **Ground Level (mOD)** 2.05 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722909.8 E 675085.8 N | **Dates** 06/12/2019 | **Project Contractor** GII | **Sheet** 1/2 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|
| | | | | 1.98 | (0.07) 0.07 | TARMACADAM | | |
| 0.10-1.00 | B | | | | (0.23) | MADE GROUND: Blue grey sandy gravel with large angular cobbles | | |
| | | | | 1.75 | 0.30 | MADE GROUND: Brown red clayey sandy gravel fill with occasional red brick, plastic, concrete | | |
| 0.50 | EN | | Fast (1) at 0.60m. | | (0.50) | | | ▽1 |
| | | | | 1.25 | 0.80 | MADE GROUND: Brown red clayey sandy gravel fill with large angular cobbles and boulders with occasional red brick, plastic, concrete | | |
| | | | | | (0.50) | | | |
| | | | | 0.75 | 1.30 | Stiff dark brown organic rich clayey SILT | | |
| | | | | | (0.20) | | | |
| 1.50<br>1.50-2.50 | EN<br>B | | | 0.55 | 1.50 | Soft to firm grey clayey SILT | | |
| | | | | | (1.00) | | | |
| 2.50<br>2.50-3.00 | EN<br>B | | | -0.45 | 2.50 | Very soft to soft grey clayey SILT | | |
| | | | | | (0.50) | | | |
| 3.00-4.00 | B | | | -0.95 | 3.00 | Firm dark brown organic rich clayey SILT. | | |
| | | | | | (0.30) | | | |
| | | | | -1.25 | 3.30 | Soft to firm grey brown slightly organic silty CLAY | | |
| | | | | -1.35 | (0.10) 3.40 | Soft-firm grey brown organic silty CLAY | | |
| | | | | | (0.40) | | | |
| | | | | -1.75 | 3.80 | Grey medium loose gravelly SAND | | |
| | | | | | (0.20) | | | |
| | | | | -1.95 | 4.00 | | | |

**Plan**

**Remarks**

Shear Vane 2.5m 32 kPa , residual shear strength 14 kPa

Logged in accordance BS5930:2015

| Scale (approx) | Logged By | Figure No. |
|---|---|---|
| 1:25 | EOC | 9230-11-19.TP10 |

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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Trial Pit Number** TP10 |
| **Machine :** 13 Tonne excavator<br>**Method :** Trial Pit | **Dimensions** 1.2m W X 4.5m D X 3.0m L | **Ground Level (mOD)** 2.05 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722909.8 E 675085.8 N | **Dates** 06/12/2019 | **Project Contractor** GII | **Sheet** 2/2 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|
| | | | | | (0.30) | Brown soft-firm peaty CLAY | | |
| | | | | -2.25 | 4.30 | | | |
| | | | | | (0.20) | Grey brown very gravelly SAND | | |
| | | | | -2.45 | 4.50 | Complete at 4.50m | | |

**Plan**

**Remarks**

Trial pit stable
Backfilled on compleetion

Logged in accordance BS5930:2015

| Scale (approx) | Logged By | Figure No. |
|---|---|---|
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|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Trial Pit Number** TP11 |
| **Machine :** 13 Tonne Excavator<br>**Method :** Trial Pit | **Dimensions** 1.2m W x 3.2m D x 3.0m L | **Ground Level (mOD)** 1.93 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722934.6 E 675030.1 N | **Dates** 10/12/2019 | **Project Contractor** GII | **Sheet** 1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|
| | | | | | (0.50) | MADE GROUND: Grey brown sandy Gravel with large angular cobbles. | | |
| 0.50<br>0.50-1.50 | EN<br>B | | | 1.43 | 0.50 | MADE GROUND: Medium dense brown clayey angular Gravel. Concrete, plastic and wire present. | | |
| | | | | | (1.10) | | | |
| 1.50<br>1.50-2.50 | EN<br>B | | | 0.33 | 1.60 | Soft to firm grey clayey SILT. | | |
| | | | | | (0.40) | | | |
| | | | | -0.07 | 2.00 | Very soft to soft red brown grey mottled clayey SILT. | | |
| | | | | | (0.50) | | | |
| 2.50<br>2.50-3.20 | EN<br>B | | | -0.57 | 2.50 | Soft blue grey silty CLAY. | | |
| | | | | | (0.70) | | | |
| | | | | -1.27 | 3.20 | Complete at 3.20m | | |

**Plan**

**Remarks**

Water encountered at 0.5m and 1.6m BGL.
Plastic sheeting layer at 1.6m BGL.
Trial pit terminated at 3.0m BGL.
Trial pit backfilled on completion.
Shear vane at 1.8m BGL - 70 kPa - residual shear strength - 33 kPa
Shear vane at 3.0m BGL - 50 kPa - residual is 24 kPa

| Scale (approx) | Logged By | Figure No. |
|---|---|---|
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|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Trial Pit Number** TP12 |
| **Machine :** 13 Tonne excavator<br>**Method :** Trial Pit | **Dimensions** 1.0m W X 3.6m D X 3.0m L | **Ground Level (mOD)** 1.55 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722967.3 E 674987.8 N | **Dates** 06/12/2019 | **Project Contractor** GII | **Sheet** 1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|
| | | | Fast (1) at 0.20m. | 1.25 | (0.30) 0.30 | MADE GROUND: Blue grey gravel with large angular cobbles and boulders | | ▽1 |
| 0.50<br>0.50-1.40 | EN<br>B | | | 0.75 | (0.50) 0.80 | MADE GROUND: Mediun dense brown clayey sandy gravel with large angular cobbles and boulders, occasional plastic and red brick fragments. | | |
| | | | | 0.15 | (0.60) 1.40 | MADE GROUND: Brown clayey sandy gravel with large angular cobbles and boulders. | | |
| 1.50<br>1.50-2.50 | EN<br>B | | | -0.05 | (0.20) 1.60 | Firm to stiff grey brown organic silty CLAY | | |
| | | | | -0.95 | (0.90) 2.50 | Firm grey brown slightly organic silty CLAY | | |
| 2.50<br>2.50-3.20 | EN<br>B | | | -1.65 | (0.70) 3.20 | Firm brown grey brown organic rich silty CLAY large decaying tree roots present | | |
| 3.20-3.50 | B | | | -2.05 | (0.40) 3.60 | Grey brown very coarse gravelly SAND. | | |
| | | | | | | Complete at 3.60m | | |

**Plan**

**Remarks**

Unable to take shear vane due to water ingress
Major water ingress
TP terminated due to water ingress at 3.6m

Logged in accordance BS5930:2015

| Scale (approx) | Logged By | Figure No. |
|---|---|---|
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|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Trial Pit Number** TP13 |
| **Machine :** 13 Tonne excavator<br>**Method :** Trial Pit | **Dimensions** 1.0m W X 3.0m L X 4.5m W | **Ground Level (mOD)** 2.26 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722616 E 675006.5 N | **Dates** 01/12/2019 | **Project Contractor** GII | **Sheet** 1/2 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|
| 0.00-0.50 | B | | | | (0.50) | MADE GROUND: Grey brown gravelly sand with red brick plastic and metal | | |
| 0.50<br>0.50-1.50 | EN<br>B | | Slow (1) at 0.50m. | 1.76 | 0.50 | MADE GROUND: Red clay - fertilizer by product. | | ▽1 |
| 1.50<br>1.50-2.30 | EN<br>B | | | | (1.80) | | | |
| 2.50<br>2.50-3.50 | EN<br>B | | | -0.04 | 2.30 | Soft Orange brown mottled clayey SILT<br>Clay content increasing at 3.0m | | |
| 3.50-4.20 | B | | | -1.24 | (1.20)<br>3.50<br>(0.70) | Soft blue grey clayey SILT | | |

**Plan**

**Remarks**

Pit backfilled on completion
Shear vane failed at 3.5m ground too soft

Logged in accordance BS5930:2015

| Scale (approx) | Logged By | Figure No. |
|---|---|---|
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|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Trial Pit Number** TP13 |
| **Machine :** 13 Tonne excavator<br>**Method :** Trial Pit | **Dimensions** 1.0m W X 3.0m L X 4.5m W | **Ground Level (mOD)** 2.26 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722616 E 675006.5 N | **Dates** 01/12/2019 | **Project Contractor** GII | **Sheet** 2/2 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|
| | | | | -1.94 | 4.20 | Firm brown grey peaty CLAY with sand lenses | | |
| | | | | | (0.30) | | | |
| | | | | -2.24 | 4.50 | Complete at 4.50m | | |

**Plan**

**Remarks**

Pit backfilled on completion
Shear vane at 4.2m - 46 kPa - residual shear strength - 21 kPa

Logged in accordance BS5930:2015

| Scale (approx) | Logged By | Figure No. |
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|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Trial Pit Number** TP14 |
| **Machine :** 13 tonne excavator<br>**Method :** | **Dimensions** 1.0m W X 2.7m D X 3.0m L | **Ground Level (mOD)** 2.24 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722679.9 E 674953 N | **Dates** 10/12/2019 | **Project Contractor** GII | **Sheet** 1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|
| | | | | | (0.20) | MADE GROUND: Blue grey dense blue grey sandy gravel fill | | |
| | | | | 2.04 | 0.20 | | | |
| | | | | | (0.10) | MADE GROUND: Concrete slab | | |
| | | | | 1.94 | 0.30 | | | |
| 0.30-0.90 | B | | | | | MADE GROUND: Medium dense red brown sandy gravel fill with large angular cobbles and boulders, wood brick, redundant services | | |
| | | | | | (0.60) | | | |
| | | | | 1.34 | 0.90 | | | |
| | | | | | (0.30) | Soft to firm grey brown slightly sandy clayey SILT with decaying organic mater | | |
| 1.20-2.30 | B | | Slow(1) at 1.20m. | 1.04 | 1.20 | | | ▽1 |
| 1.50 | EN | | | | | Soft brown slightly silty organic CLAY | | |
| | | | | | (1.50) | | | |
| 2.30-2.70 | B | | | | | | | |
| | | | | -0.46 | 2.70 | | | |
| | | | | | | Complete at 2.70m | | |

**Plan**

**Remarks**

TP backfilled on completion
Water ingress - minor at 1.2m
Shear vane at 1.5m - 35 kPa
Pit collapse at 2.7m

Logged in accordance BS5930:2015

| Scale (approx) | Logged By | Figure No. |
|---|---|---|
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|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Trial Pit Number** TP15 |
| **Machine :** 13 Tonne Excavator<br>**Method :** Trial Pit | **Dimensions** 1.0m W X 1.4m D X 3.0m L | **Ground Level (mOD)** 2.79 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722592.9 E 674944.8 N | **Dates** 06/12/2019 | **Project Contractor** GII | **Sheet** 1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|
| | | | | | (0.50) | MADE GROUND:Light red brown gravelly sand with occasional concrete and metal | | |
| 0.50<br>0.50-1.40 | EN<br>B | | Moderate (1) at 1.10m. | 2.29 | 0.50<br>(0.90) | MADE GROUND: Dark grey brown very sandy gravel with metal, concrete and plastic (services encased in mass concrete) | | ▽1 |
| | | | | 1.39 | 1.40 | Complete at 1.40m | | |

**Plan**

**Remarks**

TP backfilled on completion
Moderate water ingress at 1.1m
Pit terminated services encountered in concrete

Logged in accordance BS5930:2015

| Scale (approx) | Logged By | Figure No. |
|---|---|---|
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| Site | Trial Pit Number |
|---|---|
| Avoca River Park, Arklow | TP16 |

| Excavation Method | Dimensions | Ground Level (mOD) | Client | Job Number |
|---|---|---|---|---|
| Trial Pit | 1.0m W X 1.2m D X 3.0m L | 2.21 | FT Squared | 9230-11-19 |
| | **Location** | **Dates** | **Project Contractor** | **Sheet** |
| | 722657.8 E 674919.3 N | 09/12/2019 | GII | 1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|
| 0.20-1.00 | B | | | | (0.50) | MADE GROUND: Grey sandy gravel with concrete blocks, plastic and tarmacadam | | |
| 0.50 | EN | | Moderate(1) at 0.50m. | 1.71 | 0.50 | MADE GROUND: Grey coarse sandy gravel with angular cobbles and bouldes | | ▽1 |
| 1.00-1.20 | B | | | 1.21 | 1.00 | | | |
| | | | | | (0.20) | Soft grey brown clayey organic SILT | | |
| 1.20 | EN | | | 1.01 | 1.20 | Complete at 1.20m | | |

**Plan**

**Remarks**

TP backfilled on completion
Moderate GW influx at 0.5m
Pit stable
Pit terminated due to services encased in mass concrete
Shear vane at 1.2m - 55 kPa - residual - 25 kPa

Logged in accordance BS5930:2015

| Scale (approx) | Logged By | Figure No. |
|---|---|---|
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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Trial Pit Number** TP17 |
| **Machine :** 13 Tonne excavator<br>**Method :** Trial Pit | **Dimensions** 1.0m W X 1.8m D X 3.0m L | **Ground Level (mOD)** 2.39 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722645.4 E 675140.7 N | **Dates** 12/12/2019 | **Project Contractor** GII | **Sheet** 1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|
| | | | | 2.32 | (0.07) 0.07 | TARMAC | | |
| 0.10-1.10 | B | | | | (0.23) | MADE GROUND: Blue grey sandy gravel | | |
| | | | | 2.09 | 0.30 | MADE GROUND: Red brown sandy gravel with metal, wires and plastic | | |
| 0.50 | EN | | | | (0.40) | | | |
| | | | | 1.69 | 0.70 | Firm black grey organic rich clayey SILT | | |
| | | | | | (0.40) | | | |
| 1.10-1.60 | B | | | 1.29 | 1.10 | Soft to firm black grey organic clayey SILT | | |
| | | | | | (0.20) | | | |
| | | | | 1.09 | 1.30 | Soft brown organic rich CLAY | | |
| 1.50 | EN | | | | (0.30) | | | |
| 1.60-1.80 | B | | | 0.79 | 1.60 | Grey brown gravelly SAND (organic rich) | | |
| | | | | | (0.20) | | | |
| | | | | 0.59 | 1.80 | Complete at 1.80m | | |

**Plan**

**Remarks**

TP backfilled on completion
No water encountered
Shear vane at 1.3m - 90 kPa - residual shear strength - 40 kPa
Pit unstable terminated at 1.8m due to collapse

Logged in accordance BS5930:2015

| Scale (approx) | Logged By | Figure No. |
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| Site | Trial Pit Number |
|---|---|
| Avoca River Park, Arklow | TP18 |

| Excavation Method | Dimensions | Ground Level (mOD) | Client | Job Number |
|---|---|---|---|---|
| Trial Pit | 1.0m W X 1.8m D X 3.0m L | | FT Squared | 9230-11-19 |
| | **Location** | **Dates** | **Project Contractor** | **Sheet** |
| | 722757.6 E 674978.2 N | 12/12/2019 | GII | 1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|
| | | | | | (0.07) 0.07 | TARMACADAM | | |
| | | | | | (0.33) | MADE GROUND: Blue grey gravelly sand fill with large angular cobbles and boulders, plastic and metal | | |
| 0.40-0.80 | B | | | | 0.40 | | | |
| 0.50 | EN | | | | | MADE GROUND: Blue grey gravelly sand fill with plastic, wood and metal | | |
| | | | | | (0.40) | | | |
| | | | Strong (1) at 0.80m. | | 0.80 | | | ▽1 |
| | | | | | (0.20) | Firm blue grey clayey SILT | | |
| 1.00-1.80 | B | | | | 1.00 | | | |
| | | | | | (0.80) | Soft grey brown organic rich silty CLAY | | |
| | | | | | 1.80 | | | |
| | | | | | | Complete at 1.80m | | |

**Plan**

**Remarks**

TP backfilled on completion
Perched water at 0.8m
Shear vane at 1.5m - 45 kPa - residual shear strength 22 kPa
Pit terminated at 1.8m water ingress

Logged in accordance BS5930:2015

| Scale (approx) | Logged By | Figure No. |
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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Trial Pit Number** TP19 |
| **Machine :** 13 TONNE EXCAVATOR<br>**Method :** | **Dimensions** 1.0m W X 4.5m D X 3.0m L | **Ground Level (mOD)** | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722782.8 E 674941.3 N | **Dates** 12/12/2019 | **Project Contractor** GII | **Sheet** 1/2 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|
| | | | | | (0.07) 0.07 | TARMACADAM | | |
| | | | | | (0.20) 0.27 | MADE GROUND: Blue grey gravelly sand fill with concrete, red brick, plastic and metal | | |
| | | | | | (0.08) 0.35 | TARMACADAM | | |
| 0.50<br>0.50-1.50 | EN<br>B | | | | (0.65) 1.00 | MADE GROUND: Grey brown sandy gravel fill with large angular cobbles and boulders, plastic, concrete and metal | | ▽1 |
| | | | Moderate (1) at 1.00m. | | | | | |
| 1.50<br>1.50-2.40 | EN<br>B | | | | (1.40) 2.40 | MADE GROUND: Black very soft silty clay fill with major plasiic, tree roots and metal present (strong odour like creosote) | | |
| 2.40-3.30<br>2.50 | B<br>EN | | | | (0.90) 3.30 | Soft red brown grey mottled silty CLAY | | |
| 3.30-4.20 | B | | | | (0.90) | Soft grey brown organic rich clayey SILT -becoming firm at 4.0m | | |

**Plan**

**Remarks**

Backfilled on completion
Perched water at 1.0m
Strong odour noted (possible creosote) at 2.4m
Shear vein at 2.5m - 32 kPa

Logged in accordance BS5930:2015

| Scale (approx) | Logged By | Figure No. |
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|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Trial Pit Number** TP19 |
| **Machine :** 13 TONNE EXCAVATOR<br>**Method :** | **Dimensions** 1.0m W X 4.5m D X 3.0m L | **Ground Level (mOD)** | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722782.8 E 674941.3 N | **Dates** 12/12/2019 | **Project Contractor** GII | **Sheet** 2/2 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|
| | | | | | 4.20 | Firm brown clayey pseudo fibrous PEAT | | |
| | | | | | (0.30) | | | |
| | | | | | 4.50 | Complete at 4.50m | | |

**Plan**

**Remarks**

Backfilled on completion
Perched water at 1.0m
Trial pit stable

Logged in accordance BS5930:2015

| Scale (approx) | Logged By | Figure No. |
|---|---|---|
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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Trial Pit Number** TP20 |
| **Machine :** 13 Tonne excavator<br>**Method :** | **Dimensions** 1.0m W X 2.3m D X 3.0m L | **Ground Level (mOD)** 2.27 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722729.1 E 674899.1 N | **Dates** 09/12/2019 | **Project Contractor** GII | **Sheet** 1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|
| 0.00-0.60 | B | | | | (0.60) | MADE GROUND: Grey brown clayey gravel with large angular cobbles and boulders, wood, concrete, plastic, metal. | | |
| 0.50 | EN | | | 1.67 | 0.60 | | | |
| 0.60-1.50 | B | | | | (0.90) | Very soft to soft grey brown slightly sandy clayey SILT (HC Odour noted) | | |
| 1.50 | EN | | | 0.77 | 1.50 | | | |
| 1.50-2.30 | B | | | | (0.80) | Very soft to soft grey brown slightly sandy clayey SILT becoming very wet | | |
| | | | | -0.03 | 2.30 | Complete at 2.30m | | |

**Plan**

**Remarks**

Odour noted possible creosote
Shear vane failed - ground too soft
Side wall unstable -pit terminated at 2.3m due to collapse

Logged in accordance BS5930:2015

| Scale (approx) | Logged By | Figure No. |
|---|---|---|
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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Trial Pit Number** TP21 |
| **Machine :** 13 Tonne excavator<br>**Method :** Trial Pit | **Dimensions** 1.0m W X 4.5m D X 3.0m L | **Ground Level (mOD)** 2.21 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722701.1 E 674894.8 N | **Dates** 09/12/2019 | **Project Contractor** GII | **Sheet** 1/2 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|
| | | | | | (0.20) | MADE GROUND: Blue grey sandy gravel with concrete, plastic and wood | | |
| | | | | 2.01 | 0.20 | | | |
| | | | | | (0.07) | TARMACADAM | | |
| 0.25-0.80 | B | | | 1.94 | 0.27 | | | |
| 0.50 | EN | | | | (0.53) | MADE GROUND: Grey brown very gravelly sand with plastic, concrete and wood | | |
| | | | | 1.41 | 0.80 | | | |
| | | | | | (0.30) | Firm to stiff grey brown silty CLAY | | |
| 1.10-2.00 | B | | | 1.11 | 1.10 | | | |
| 1.50 | EN | | | | (1.40) | Very soft to soft grey brown silty CLAY | | |
| 2.50 | EN | | | -0.29 | 2.50 | | | |
| 2.50-3.50 | B | | Slow(1) at 2.70m. | | (0.40) | Very soft red brown mottled silty CLAY | | ▽1 |
| | | | | -0.69 | 2.90 | | | |
| | | | | | (0.80) | Soft blue grey clayey SILT with occasional sand lenses | | |
| 3.50-4.30 | B | | | -1.49 | 3.70 | | | |
| | | | | | (0.40) | Soft blue grey silty CLAY with occasional sand lenses | | |

**Plan**

**Remarks**

Hydrocarbon odour in made ground
Slow water ingress
Shear vane at 3.9m - 52 kPa - residual shear strength - 38 kPa

Logged in accordance BS5930:2015

| Scale (approx) | Logged By | Figure No. |
|---|---|---|
| 1:25 | EOC | 9230-11-19.TP21 |

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|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Trial Pit Number** TP21 |
| **Machine :** 13 Tonne excavator<br>**Method :** Trial Pit | **Dimensions** 1.0m W X 4.5m D X 3.0m L | **Ground Level (mOD)** 2.21 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722701.1 E 674894.8 N | **Dates** 09/12/2019 | **Project Contractor** GII | **Sheet** 2/2 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|
| | | | | -1.89 | 4.10 | | | |
| | | | | | (0.20) | Soft grey brown organic rich slightly clayey sandy SILT | | |
| | | | | -2.09 | 4.30 | | | |
| | | | | | (0.20) | Soft to firm brown peaty CLAY with large tree rootlets | | |
| | | | | -2.29 | 4.50 | | | |
| | | | | | | Complete at 4.50m | | |

**Plan**

**Remarks**

Pit stable

Logged in accordance BS5930:2015

| Scale (approx) | Logged By | Figure No. |
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|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Trial Pit Number** TP22 |
| **Machine :** 13 Tonne excavator<br>**Method :** | **Dimensions** 1.0m W X 2.9m D X 3.0m L | **Ground Level (mOD)** 2.26 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722788.9 E 674803.4 N | **Dates** 09/12/2019 | **Project Contractor** GII | **Sheet** 1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|
| | | | | 2.16 | (0.10) 0.10 | MADE GROUND: Blue grey gravelly sandy fill | | |
| | | | | 2.06 | (0.10) 0.20 | TARMAC | | |
| 0.20-0.90 | B | | | | (0.30) | Dense grey brown sandy gravel fill with cobbles and boulders, plastic, concrete | | |
| 0.50 | EN | | | 1.76 | 0.50 | CONCRETE | | |
| | | | | 1.56 | (0.20) 0.70 | MADE GROUND: Dense grey brown clayey sandy gravel fill | | |
| | | | | 1.36 | (0.20) 0.90 | Soft grey brown organic rich peaty clayey SILT | | |
| 1.10-2.10 | B | | Slow (1) at 1.20m. | 1.16 | (0.20) 1.10 | Soft grey brown organic rich clayey SILT | | ▽1 |
| 1.50 | EN | | | | | | | |
| | | | | | (1.30) | | | |
| 2.40-2.90 | B | | | -0.14 | 2.40 | Soft grey clayey sandy SILT | | |
| 2.50 | EN | | | | (0.50) | | | |
| | | | | -0.64 | 2.90 | Complete at 2.90m | | |

**Plan**

**Remarks**

TP backfilled on completion
Shear vane failed at 2.0m - too soft
Perched water ta 1.2m
Pit terminated due to collapse at 2.9m

Logged in accordance BS5930:2015

| Scale (approx) | Logged By | Figure No. |
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|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Trial Pit Number** TP23 |
| **Machine :** 13 Tonne excavator<br>**Method :** | **Dimensions** 1.0m W X 4.5m D X 3.0m L | **Ground Level (mOD)** 2.05 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722845.3 E 674843.2 N | **Dates** 09/12/2019 | **Project Contractor** GII | **Sheet** 1/2 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|
| | | | | 1.98 | (0.07) 0.07 | TARMACADAM | | |
| 0.10-0.60 | B | | | | | MADE GROUND: Blue grey sandy gravel with plastic and concrete | | |
| | | | | | (0.53) | | | |
| 0.50 | EN | | | 1.45 | 0.60 | Stiff grey brown organic rich slightly sandy SILT | | |
| | | | | | (0.20) | | | |
| | | | | 1.25 | 0.80 | Soft to firm grey brown slightly sandy organic rich clayey SILT | | |
| 1.20-2.50 | B | | | | | | | |
| 1.50 | EN | | | | | | | |
| | | | | | (1.90) | | | |
| 2.50 | EN | | | | | | | |
| 2.70-3.50 | B | | | -0.65 | 2.70 | Spongy dark brown slightly silty slightly sandy PEAT | | |
| | | | | | (0.90) | | | |
| 3.50-4.50 | B | | | -1.55 | 3.60 | Spongy dark brown slightly silty PEAT | | |
| | | | | | (0.70) | | | |

**Plan**

**Remarks**

Shear vane at 1.5m - 35 kPa

Logged in accordance BS5930:2015

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|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Trial Pit Number** TP23 |
| **Machine :** 13 Tonne excavator<br>**Method :** | **Dimensions** 1.0m W X 4.5m D X 3.0m L | **Ground Level (mOD)** 2.05 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722845.3 E 674843.2 N | **Dates** 09/12/2019 | **Project Contractor** GII | **Sheet** 2/2 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|
| | | | | -2.25 | 4.30 | Soft blue grey slightly sitly CLAY | | |
| | | | | | (0.20) | | | |
| | | | | -2.45 | 4.50 | Complete at 4.50m | | |

**Plan**

**Remarks**

Pit stable
No water encountered in pit

Logged in accordance BS5930:2015

| Scale (approx) | Logged By | Figure No. |
|---|---|---|
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|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Trial Pit Number** TP24 |
| **Machine :** 13 Tonne excavator<br>**Method :** | **Dimensions** 1.0m W X 3.0m L X 2.5m D | **Ground Level (mOD)** 1.74 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722894.4 E 674854.7 N | **Dates** 09/12/2019 | **Project Contractor** GII | **Sheet** 1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|
| | | | | 1.64 | (0.10) 0.10 | TOPSOIL | | |
| | | | | 1.54 | (0.10) 0.20 | TARMACADAM | | |
| 0.20-0.60 | B | | | | (0.40) | MADE GROUND: Red brown clayey sandy gravel with wood, bitumen, plastic and concrete fragments.(Moderate hydrocarbon odor) | | |
| 0.50 | EN | | | 1.14 | 0.60 | Firm to stiff grey brown peaty CLAY | | |
| 0.80-1.50 | B | | | | (0.60) | | | |
| | | | Very fast (1) at 1.20m. | 0.54 | 1.20 | Firm dark brown amorphous PEAT | | ▽1 |
| 1.50 | EN | | | | (0.40) | | | |
| 1.50-2.50 | B | | | 0.14 | 1.60 | Soft to firm grey brown peaty SILT | | |
| | | | | | (0.60) | | | |
| | | | | -0.46 | 2.20 | Soft grey brown sandy peaty SILT | | |
| | | | | | (0.30) | | | |
| 2.50 | EN | | | -0.76 | 2.50 | Complete at 2.50m | | |

**Plan**

**Remarks**

Moderate hydrocarbon odour at 0.6m
Shear vane at 1.0m - 120 kPa - residual - 65 kPa
Heavy water ingress at 1.2m
Pit terminated due to obstruction (large tree) at 2.5m

Logged in accordance BS5930:2015

| Scale (approx) | Logged By | Figure No. |
|---|---|---|
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|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Trial Pit Number** TP25 |
| **Machine :** 13 Tonne excavator<br>**Method :** | **Dimensions** 1.0m W X 4.3m D X 3.0m L | **Ground Level (mOD)** 1.81 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722901.8 E 674876.9 N | **Dates** 10/12/2019 | **Project Contractor** GII | **Sheet** 1/2 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|
| | | | | 1.71 | (0.10) 0.10 | CONCRETE | | |
| | | | | 1.66 | 0.15 | MADE GROUND: Blue grey sandy gravel (804) | | |
| | | | | 1.56 | (0.10) 0.25 | TARMACADAM | | |
| 0.30-0.80 | B | | | | | MADE GROUND: Red brown clayey sandy gravel with large angular cobbles and boulders, cables and plastic | | |
| 0.50 | EN | | | | (0.55) | | | |
| 0.80-1.70 | B | | Moderate (1) at 0.80m. | 1.01 | 0.80 | Soft dark grey black peaty SILT becoming sandy with depth | | ▽1 |
| | | | | | (0.90) | | | |
| 1.50 | EN | | | | | | | |
| 1.70-2.50 | B | | | 0.11 | 1.70 | Soft blue grey slightly silty CLAY | | |
| | | | | | (1.20) | | | |
| 2.50 | EN | | | | | | | |
| | | | | -1.09 | 2.90 | Soft grey brown peaty CLAY | | |
| | | | | | (0.20) | | | |
| 3.10-4.30 | B | | | -1.29 | 3.10 | Spongy dark brown fibrous PEAT large decaying tree fragmnnts also present | | |
| | | | | | (0.50) | | | |
| | | | | -1.79 | 3.60 | Spongy dark brown clayey pseudo fibrous PEAT with large decaying tree fragments | | |
| | | | | | (0.70) | | | |

**Plan**

**Remarks**

Perched water at 0.8m and 4.3m
TP Backfilled on completion
Moderate water ingress at 0.8m

Logged in accordance BS5930:2015

| Scale (approx) | Logged By | Figure No. |
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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Trial Pit Number** TP25 |
| **Machine :** 13 Tonne excavator<br>**Method :** | **Dimensions** 1.0m W X 4.3m D X 3.0m L | **Ground Level (mOD)** 1.81 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722901.8 E 674876.9 N | **Dates** 10/12/2019 | **Project Contractor** GII | **Sheet** 2/2 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|
| | | | Moderate (2) at 4.30m. | -2.49 | 4.30 | Complete at 4.30m | | ▽2 |

**Plan**

**Remarks**

Perched water at 0.8m and 4.3m
TP Backfilled on completion
Pit terminated due to side wall collapse

Logged in accordance BS5930:2015

| Scale (approx) | Logged By | Figure No. |
|---|---|---|
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|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Trial Pit Number** TP26 |
| **Machine :** 13 Tonne excavator<br>**Method :** | **Dimensions** 1.0m W X 1.8m D X 3.0m L | **Ground Level (mOD)** 1.76 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722924.4 E 674904.6 N | **Dates** 12/12/2019 | **Project Contractor** GII | **Sheet** 1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|
| | | | | 1.69 | (0.07) 0.07 | TARMACADAM | | |
| 0.10-0.90 | B | | | | | MADE GROUND: Blue grey sandy gravel (804) | | |
| 0.50 | EN | | | | (0.93) | | | |
| | | | Heavy (1) at 0.90m. | | | | | ▽1 |
| | | | | 0.76 | 1.00 | Soft to firm black organic rich clayey SILT | | |
| | | | | | (0.20) | | | |
| 1.10-1.50 | B | | | 0.56 | 1.20 | Soft red brown grey mottled clayey SILT | | |
| | | | | | (0.40) | | | |
| 1.50 | EN | | | | | | | |
| 1.50-1.80 | B | | | 0.16 | 1.60 | Soft grey brown organic rich peaty clayey SILT | | |
| | | | | | (0.20) | | | |
| 1.80 | EN | | | -0.04 | 1.80 | Complete at 1.80m | | |

**Plan**

**Remarks**

TP Backfilled on completion
Perched water at 0.9m
Pit unstable due to water -terminated at 1.8m

Logged in accordance BS5930:2015

| Scale (approx) | Logged By | Figure No. |
|---|---|---|
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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Trial Pit Number** TP27 |
| **Machine :** 13 Tonne excavator<br>**Method :** | **Dimensions** 1.0m W X 4.5m D X 3.0m L | **Ground Level (mOD)** 1.75 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722924.5 E 674943.4 N | **Dates** 10/12/2019 | **Project Contractor** GII | **Sheet** 1/2 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|
| | | | | 1.68 | (0.07) 0.07 | TARMACADAM | | |
| | | | | 1.60 | (0.08) 0.15 | MADE GROUND: Blue grey sandy gravel with concrete, plastic, red brick, steel. | | |
| 0.20-1.00 | B | | Moderate(1) at 0.20m. | | | MADE GROUND: Red brown clayey sandy gravel with large angular cobbles and boulders, concrete and plastic. | | ▽1 |
| 0.50 | EN | | | | (0.85) | | | |
| | | | | 0.75 | 1.00 | Soft to firm grey brown clayey SILT | | |
| 1.50<br>1.50-2.50 | EN<br>B | | | | (1.50) | | | |
| | | | | -0.75 | 2.50 | Soft red brown grey mottled clayey SILT | | |
| 2.50<br>2.50-3.50 | EN<br>B | | | | (1.10) | | | |
| 3.50-4.50 | B | | | -1.85 | 3.60 | Soft peaty CLAY | | |

**Plan**

**Remarks**

TP stable
TP backfilled on completion
Perched water at 0.2m
Shear vane at 3.0m - 42kPa

Logged in accordance BS5930:2015

| Scale (approx) | Logged By | Figure No. |
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|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Trial Pit Number** TP27 |
| **Machine :** 13 Tonne excavator<br>**Method :** | **Dimensions** 1.0m W X 4.5m D X 3.0m L | **Ground Level (mOD)** 1.75 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722924.5 E 674943.4 N | **Dates** 10/12/2019 | **Project Contractor** GII | **Sheet** 2/2 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|
| | | | | | (0.90) | | | |
| | | | | -2.75 | 4.50 | Complete at 4.50m | | |

**Plan**

**Remarks**

TP stable
TP backfilled on completion
Perched water at 0.2m

Logged in accordance BS5930:2015

| Scale (approx) | Logged By | Figure No. |
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|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Trial Pit Number** TP28 |
| **Machine :** 13 Tonne excavator<br>**Method :** | **Dimensions** 1.0m W X 4.5m D X 3.0m L | **Ground Level (mOD)** 1.76 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722878.3 E 674965.4 N | **Dates** 10/12/2019 | **Project Contractor** GII | **Sheet** 1/2 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|
| | | | | 1.69 | (0.07) 0.07 | TARMACADAM | | |
| 0.10-1.00 | B | | Moderate (1) at 0.15m. | 1.61 | (0.08) 0.15 | MADE GROUND: Blue grey sandy gravel with wood, plastic and concrete fragments | | ▽1 |
| 0.50 | EN | | | | (0.85) | MADE GROUND: Red brown sandy gravel with red brick, plastic and steel | | |
| 1.00-2.00 | B | | | 0.76 | 1.00 | Soft to firm grey brown organic rich clayey SILT | | |
| 1.50 | EN | | | | (1.30) | | | |
| 2.30-3.50 | B | | | -0.54 | 2.30 | Soft black slightly silty pseudo fibrous PEAT | | |
| 2.50 | EN | | | | (1.20) | | | |
| 3.50-4.50 | B | | | -1.74 | 3.50 | Grey brown peaty silty SAND | | |

**Plan**

**Remarks**

Water ingress - moderate at 0.15m
Shear vein at 2.0m - 55 kPa , residual shear strength - 22 kPa

Logged in accordance BS5930:2015

| Scale (approx) | Logged By | Figure No. |
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|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Trial Pit Number** TP28 |
| **Machine :** 13 Tonne excavator<br>**Method :** | **Dimensions** 1.0m W X 4.5m D X 3.0m L | **Ground Level (mOD)** 1.76 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722878.3 E 674965.4 N | **Dates** 10/12/2019 | **Project Contractor** GII | **Sheet** 2/2 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|
| | | | | | (1.00) | | | |
| | | | | -2.74 | 4.50 | Complete at 4.50m | | |

**Plan**

**Remarks**

Pit unstable
TP Backfilled on completion

Logged in accordance BS5930:2015

| Scale (approx) | Logged By | Figure No. |
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|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Trial Pit Number** TP29 |
| **Machine :** 13 Tonne excavator<br>**Method :** | **Dimensions** 1.0m W X 4.5m D X 3.0mm L | **Ground Level (mOD)** 2.43 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722837.6 E 6674901 N | **Dates** 12/12/2019 | **Project Contractor** GII | **Sheet** 1/2 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|
| | | | | 2.36 | (0.07) 0.07 | TARMACADAM | | |
| | | | | | (0.23) | MADE GROUND: Blue grey gravelly sand | | |
| | | | | 2.13 | 0.30 | | | |
| 0.30-1.20 | B | | | | (0.20) | MADE GROUND: Red brown sandy gravel with large angular cobbles and boulders | | |
| 0.50 | EN | | Heavy (1) at 0.50m. | 1.93 | 0.50 | MADE GROUND: Large angular cobbles and boulders | | ▽1 |
| | | | | | (0.30) | | | |
| | | | | 1.63 | 0.80 | MADE GROUND: Sandy gravel - creosote odour noted | | |
| | | | | | (0.40) | | | |
| 1.20-2.10 | B | | | 1.23 | 1.20 | Firm brown grey organic clayey SILT | | |
| | | | | | (0.20) | | | |
| 1.50 | EN | | | 1.03 | 1.40 | Soft grey brown organic rich slightly sandy silty CLAY | | |
| | | | | | (0.70) | | | |
| | | | | 0.33 | 2.10 | Soft red brown grey mottled slightly sandy clayey SILT | | |
| 2.50 | EN | | | | | | | |
| 2.50-3.50 | B | | | | (1.40) | | | |
| | | | | -1.07 | 3.50 | Soft brown slightly silty peaty CLAY | | |
| | | | | | (0.80) | | | |
| 4.00-4.50 | B | | | | | | | |

**Plan**

**Remarks**

Shear vein failed at 3.5m
Perched water at 0.5m

Logged in accordance BS5930:2015

| Scale (approx) | Logged By | Figure No. |
|---|---|---|
| 1:25 | EOC | 9230-11-19.TP29 |

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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Trial Pit Number** TP29 |
| **Machine :** 13 Tonne excavator<br>**Method :** | **Dimensions** 1.0m W X 4.5m D X 3.0mm L | **Ground Level (mOD)** 2.43 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722837.6 E 6674901 N | **Dates** 12/12/2019 | **Project Contractor** GII | **Sheet** 2/2 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|
| | | | | -1.87 | 4.30 | Soft black fibrous PEAT | | |
| | | | | | (0.20) | | | |
| | | | | -2.07 | 4.50 | Complete at 4.50m | | |

**Plan**

**Remarks**

Shear vein failed at 3.5m
Pit stable
Iirridescent sheen noted on water in pit
Strong creosote odoUr noted at 0.8m

Logged in accordance BS5930:2015

| Scale (approx) | Logged By | Figure No. |
|---|---|---|
| 1:25 | EOC | 9230-11-19.TP29 |

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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Trial Pit Number** TP30 |
| **Machine :** 13 Tonne excavator<br>**Method :** | **Dimensions** 1.0m W X 4.5m D X 3.0mm L | **Ground Level (mOD)** 2.30 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722763.6 E 674927.1 N | **Dates** 12/12/2019 | **Project Contractor** GII | **Sheet** 1/2 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|
| 0.10-1.10 | B | | TP backfilled on compleetion<br>Pit stable | | | MADE GROUND: Grey brown sandy gravelly with large angular cobbles and boulders, occasional plastic, concrete and wood | | |
| 0.50 | EN | | | | (0.90) | | | |
| | | | | 1.40 | 0.90 | | | |
| | | | | | (0.20) | MADE GROUND: Firm to stiff Grey brown clayey silt (hydrocarbon odor) | | |
| | | | | 1.20 | 1.10 | | | |
| 1.10-2.00 | B | | | | | Soft grey brown organic SILT | | |
| 1.50 | EN | | | | (0.80) | | | |
| | | | | 0.40 | 1.90 | | | |
| 2.00-2.90 | B | | | | | Soft grey brown silty fibrous PEAT | | |
| | | | | | (0.50) | | | |
| | | | | -0.10 | 2.40 | | | |
| 2.50 | EN | | | | | Soft blue grey silty CLAY | | |
| | | | | | (0.50) | | | |
| | | | | -0.60 | 2.90 | | | |
| | | | | | | Soft blue grey sandy silty CLAY | | |
| | | | | | (0.60) | | | |
| 3.50-4.50 | B | | Slow(1) at 3.50m. | -1.20 | 3.50 | Soft to firm silty peaty CLAY | | ▽1 |
| | | | | | (0.80) | | | |

**Plan**

**Remarks**

Perched water at 3.5m
TP backfilled on completion
Shear vein at 1.2m - 60 kPa - residual 28 kPa

Logged in accordance BS5930:2015

| Scale (approx) | Logged By | Figure No. |
|---|---|---|
| 1:25 | EOC | 9230-11-19.TP29 |

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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Trial Pit Number** TP30 |
| **Machine :** 13 Tonne excavator<br>**Method :** | **Dimensions** 1.0m W X 4.5m D X 3.0mm L | **Ground Level (mOD)** 2.30 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722763.6 E 674927.1 N | **Dates** 12/12/2019 | **Project Contractor** GII | **Sheet** 2/2 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|
| | | | | -2.00 | 4.30 | Soft fibrous PEAT | | |
| | | | | | (0.20) | | | |
| | | | | -2.20 | 4.50 | Complete at 4.50m | | |

**Plan**

**Remarks**

Perched water at 3.5m
TP backfilled on completion
Pit stable
Strong hydrocarbon odour noted at 0.9m

Logged in accordance BS5930:2015

| Scale (approx) | Logged By | Figure No. |
|---|---|---|
| 1:25 | EOC | 9230-11-19.TP29 |

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# **APPENDIX 8** – Cable Percussion and Rotary Borehole Records

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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Borehole Number** BH01 |
| **Machine :** Dando 2000<br>**Method :** Cable Percussion | **Casing Diameter** 200mm cased to 7.50m | **Ground Level (mOD)** 2.40 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** (dGPS) 722653.9 E 675153.9 N | **Dates** 05/02/2020 | **Project Contractor** GII | **Sheet** 1/1 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | (0.60) | MADE GROUND: Grey angular fine to coarse gravel (804 fill) | | |
| | | | | | 1.80 | 0.60 | MADE GROUND: Dark grey slightly sandy gravelly clay with plastic fragments. Gravel is angular to subangular, fine to coarse. Sand is fine to coarse | | |
| 1.00-1.45<br>1.00 | SPT(C) N=6<br>B | | | 4,2/1,3,1,1 | | (1.10) | | | |
| | | | | | 0.70 | 1.70 | Very soft grey slightly sandy SILT with rootlets and decaying organic matter. Sand is fine to coarse | | |
| 2.00-2.45<br>2.00 | SPT(C) N=1<br>B | | | 0,0/0,1,0,0 | | | | | |
| | | | | | | (2.10) | | | ▼1 |
| 3.00-3.45<br>3.00<br>3.00 | SPT(C) N=1<br>B<br>UT Failed | | | 1,0/1,0,0,0 | | | | | |
| | | | | | -1.40 | 3.80 | Medium dense grey slightly silty slightly gravelly fine to coarse SAND with occasional rootlets. Gravel is angular to subangular, fine to coarse. | | |
| 4.00-4.45<br>4.00 | SPT(C) N=15<br>B | | | 2,1/1,13,1,0 | | (0.70) | | | |
| | | | | | -2.10 | 4.50 | Soft black slightly sandy slightly silty fibrous PEAT with large wood fragments. Sand is fine to coarse | | |
| 5.00-5.45<br>5.00 | SPT(C) N=1<br>B | | | 1,1/0,0,1,0 | | (0.90) | | | |
| | | | | | -3.00 | 5.40 | Firm grey mottled black slightly sandy slightly gravelly peaty SILT. Gravel is angular to subangular, fine to coarse. Sand is fine to coarse. Peat is fibrous. | | |
| 6.00-6.45<br>6.00 | SPT(C) N=40<br>B | | | 2,2/11,9,10,10<br>Water strike(1) at 6.20m, rose to 2.70m in 20 mins. | | (0.80) | | | |
| | | | | | -3.80 | 6.20 | Medium dense grey brown slightly sandy subangular to subrounded fine to coarse GRAVEL of various lithologies with some subangular to subrounded cobbles. Sand is medium to coarse | | ▽1 |
| 7.00-7.45<br>7.00 | SPT(C) N=50<br>B | | | 13,17/17,25,8 | | (1.30) | | | |
| | | | | | -5.10 | 7.50 | Complete at 7.50m | | |

**Remarks**
Borehole terminated at 7.50m BGL due to obstruction.
150mm wavin installed from 7.50m BGL to GL for possible rotary core follow-on.
UT100 - Failed at 3.0m
Chiselling from 7.50m to 7.50m for 1 hour.

| Scale (approx) | Logged By |
|---|---|
| 1:50 | D. Potter |

**Figure No.** 9230-11-19.BH01

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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Borehole Number** BH02 |
| **Machine :** Dando 2000 & Comacchio GEO305<br>**Method :** Cable Percussion | **Casing Diameter** 200mm cased to 7.00m<br>68mm cased to 19.30m | **Ground Level (mOD)** 2.01 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** (dGPS) 722749.8 E 675176.9 N | **Dates** 04/02/2020 | **Project Contractor** GII | **Sheet** 1/2 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water | Instr |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | (1.00) | MADE GROUND: Black mottled brown slightly sandy gravelly Clay. Gravel is angular to subangular, fine to coarse. Sand is fine to coarse | | | |
| 1.00<br>1.00-1.45 | B<br>SPT(C) N=9 | | | 3,2/2,2,2,3 | 1.01 | 1.00 | Soft to firm grey slightly sandy SILT. Sand is fine to medium. | | ▼1 | |
| | | | | | | (1.50) | | | | |
| 2.00<br>2.00-2.45 | B<br>SPT(C) N=6 | | | 1,2/2,2,1,1 | | | | | | |
| | | | | Water strike(1) at 2.50m, rose to 1.30m in 20 mins. | -0.49 | 2.50 | Soft dark grey slightly silty gravelly fine to coarse SAND. Gravel is angular to subangular, fine to medium. | | ▽1 | |
| 3.00<br>3.00-3.45<br>3.00 | B<br>SPT(C) N=5<br>UT Failed | | | 1,2/1,2,1,1 | | (1.20) | | | | |
| | | | | | -1.69 | 3.70 | Soft to firm light greyish brown slightly sandy SILT. Sand is fine to medium. | | | |
| 4.00<br>4.00-4.45 | B<br>SPT(C) N=7 | | | 2,2/2,2,2,1 | | (1.10) | | | | |
| | | | | | -2.79 | 4.80 | Dense grey brown sandy GRAVEL. Gravel is fine to very coarse. Occasional subangular to sub-rounded cobbles and boulders | | | |
| 5.00<br>5.00-5.44 | B<br>SPT(C) 50/285 | | | 10,10/11,39 | | | | | | |
| 6.00<br>6.00-6.41 | B<br>SPT(C) 50/255 | | | 15,16/17,21,12 | | (2.20) | | | | |
| 7.00<br>7.00-7.13 | B<br>SPT(C) 45*/125<br>50/0 | | | 21,24/50 | -4.99 | 7.00 | Driller notes cobbles aqnd sand and gravel. Recovery consists of grey brown slightly sandy subangular to subrounded fine to coarse GRAVEL and COBBLES of various lithologies with many subangular to subrounded cobbles. Dense. | | | |
| 7.00<br>8.60-9.05 | TCR: 5<br>SCR: 0<br>RQD: 0<br>FI: NI | | | 5,6/7,7,6,9<br>SPT(C) N=29 | | | | | | |
| 9.60 | | | | | | | | | | |

**Remarks**
CP Borehole terminated at 7.00m BGL due to obstruction.
UT100 Failed at 3.0m
Rotary follow on from 7.00m BGL
Complete at 19.30m BGL
50mm Standpipe installed in borehole upon completion, sloted from 19.30m BGL to 2.00m BGL, plain from 2.00m BGL to ground level, with bentonite seal and raised cover
Chiselling from 4.80m to 7.00m for 3 hours. Chiselling from 7.00m to 7.00m for 1 hour.

| Scale (approx) | Logged By |
|---|---|
| 1:50 | D. Potter |

**Figure No.** 9230-11-19.BH02

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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Borehole Number** BH02 |
| **Machine :** Dando 2000 & Comacchio GEO305<br>**Flush :** water<br>**Core Dia :** 68 mm<br>**Method :** Cable Percussion | **Casing Diameter** 200mm cased to 7.00m<br>68mm cased to 19.30m | **Ground Level (mOD)** 2.01 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** (dGPS) 722749.8 E 675176.9 N | **Dates** 04/02/2020 | **Project Contractor** GII | **Sheet** 2/2 |

| Depth (m) | TCR | SCR | RQD | FI | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water | Instr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3 | 0 | 0 | NI | | | (6.90) | | | | |
| 11.10-11.55<br>11.10 | | | | | 4,7/7,8,9,10<br>SPT(C) N=34 | | | | | | |
| | 3 | 0 | 0 | NI | | | | | | | |
| 12.70-13.15<br>12.70 | | | | | 4,4/6,7,9,10<br>SPT(C) N=32 | | | | | | |
| | 5 | 0 | 0 | NI | | | | | | | |
| 13.90 | | | | | | -11.89 | 13.90 | | | | |
| | 100 | 0 | 0 | NI | | | | Weak thinly bedded grey to dark grey very fine grained SLATE. | | | |
| 14.30 | | | | | | | (1.10) | | | | |
| | 100 | 0 | 0 | NI | | | | Sequence predominantly non intact. Recovery indicates 1 set of fractures. F1 - very closely spaced, dipping 70-90 degrees, planar smooth fracture surface with abundant Fe staining | | | |
| | | | | | | -12.99 | 15.00 | | | | |
| | | | | | | | | Weak to medium strong thinly bedded grey to dark grey very fine grained SLATE. | | | |
| 15.80 | | | | | | | | | | | |
| | 64 | 0 | 0 | NI | | | (2.90) | | | | |
| 17.20 | | | | | | | | Sequence predominantly non intact. Recovery indicates 1 set of fractures. F1 - very closely spaced, dipping 70-90 degrees, planar smooth fracture surface with abundant Fe staining | | | |
| | 67 | 0 | 0 | NI | | -15.89 | 17.90 | Weak to medium strong thinly bedded grey to dark grey very fine grained SLATE. | | | |
| | | | | | | | (0.80) | | | | |
| | | | | | | | | Sequence predominantly non intact. Recovery indicates 1 set of fractures. F1 - very closely spaced, dipping 70-90 degrees, planar smooth fracture surface | | | |
| 18.70 | | | | | | -16.69 | 18.70 | | | | |
| | 100 | 0 | 0 | NI | | | (0.60) | | | | |
| 19.30 | | | | | | | | Weak to medium strong thinly bedded grey to dark grey very fine grained SLATE. | | | |
| | | | | | | -17.29 | 19.30 | Sequence predominantly non intact. Recovery indicates 1 set of fractures. F1 - very closely spaced, dipping 70-90 degrees, planar smooth foliated fracture surface | | | |
| | | | | | | | | Complete at 19.30m | | | |

**Remarks**

| Scale (approx) | Logged By |
|---|---|
| 1:50 | D. Potter |

**Figure No.** 9230-11-19.BH02

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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Borehole Number** BH03 |
| **Machine :** Dando 2000 & Comacchio GEO305<br>**Method :** Cable Percussion | **Casing Diameter** 200mm cased to 9.20m 68mm cased to 25.50m | **Ground Level (mOD)** 2.06 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** (dGPS) 722719.3 E 675071.4 N | **Dates** 07/02/2020-12/02/2020 | **Project Contractor** GII | **Sheet** 1/3 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water | Instr |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | (1.20) | MADE GROUND: Grey slightly gravelly sandy Clay with occasional angular cobbles and brick fragments. Gravel is angular to subangular, fine to coarse. Sand is fine to coarse. | | | |
| 1.00<br>1.00-1.45 | B<br>SPT(C) N=2 | | | 0,1/1,1,0,0 | 0.86 | 1.20 | | | ▼1 | |
| | | | | | | | Very soft brown mottled grey slightly sandy slightly peaty SILT. Sand is fine to medium. | | | |
| 2.00<br>2.00-2.45 | B<br>SPT(C) N=1 | | | 1,0/1,0,0,0 | | | | | | |
| | | | | Water strike(1) at 2.50m, rose to 1.00m in 20 mins. | | (2.70) | | | ▽1 | |
| 3.00<br>3.00-3.45 | B<br>SPT(C) N=1 | | | 1,0/1,0,0,0 | | | | | | |
| 4.00<br>4.00-4.45 | B<br>SPT(C) N=2 | | | 1,0/1,0,0,1 | -1.84 | 3.90 | Very soft grey slightly sandy SILT. Sand is fine to medium. | | | |
| | | | | | | (1.10) | | | | |
| 5.00<br>5.00-5.45<br>5.00 | B<br>SPT(C) N=1<br>P Failed | | | 1,0/1,0,0,0 | -2.94 | 5.00 | Very soft grey slightly gravelly sandy SILT. Gravel is angular to subangular, fine to coarse. Sand is fine to coarse. | | | |
| 6.00<br>6.00-6.45 | B<br>SPT(C) N=1 | | | 1,0/1,0,0,0 | | (1.90) | | | | |
| 7.00<br>7.00-7.45 | B<br>SPT(C) N=4 | | | 0,0/1,1,1,1 | -4.84 | 6.90 | | | | |
| | | | | | | (0.40) | Soft black slightly silty fibrous PEAT with wood and rootlets. | | | |
| | | | | | -5.24 | 7.30 | | | | |
| | | | | | | (0.30) | Soft brown slightly sandy SILT. Sand is fine to medium. | | | |
| | | | | | -5.54 | 7.60 | | | | |
| 8.00<br>8.00-8.36 | B<br>SPT(C) 50/210 | | | 14,12/37,13 | | | Dense grey sandy subangular to subrounded fine to coarse GRAVEL of various lithologies with some subangular cobbles. Sand is medium to coarse. | | | |
| | | | | | | (1.60) | | | | |
| 9.00-9.14 | 50/0<br>SPT(C) 28*/135 | | | 28/50 | | | | | | |
| 9.20<br>9.20 | **TCR** **SCR** | **RQD** | **FI** | B | -7.14 | 9.20 | Recovery consists of grey and brown slightly sandy subangular to subrounded medium to coarse GRAVEL with occasional cobbles of various lithologies. Driller notes: Cobbles, sand and gravel. Dense. | | | |

**Remarks**
Borehole terminated at 9.20m BGL due to obstruction.
Piston sample attempted at 5.0m - No recovery
Rotary follow on from 9.20m BGL
Complete at 25.50m BGL
50mm Standpipe installed in borehole upon completino, slotted from 25.50m BGL to 2.00m BGL, plain from 2.00m BGL to ground level, with bentonite seal and raised cover.
Chiselling from 9.20m to 9.20m for 1 hour.

| Scale (approx) | Logged By |
|---|---|
| 1:50 | D. Potter |

**Figure No.** 9230-11-19.BH03

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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Borehole Number** BH03 |
| **Machine :** Dando 2000 & Comacchio GEO305<br>**Flush :** water<br>**Core Dia :** 68 mm<br>**Method :** Cable Percussion | **Casing Diameter** 200mm cased to 9.20m<br>68mm cased to 25.50m | **Ground Level (mOD)** 2.06 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** (dGPS) 722719.3 E 675071.4 N | **Dates** 07/02/2020-12/02/2020 | **Project Contractor** GII | **Sheet** 2/3 |

| Depth (m) | TCR | SCR | RQD | FI | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water | Instr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 8 | 0 | NI | | | | | | | | |
| 11.20-11.65<br>11.20 | | | | | 10,10/15,16,15,4<br>SPT(C) N=50 | | | | | | |
| | 9 | 0 | NI | | | | (5.00) | | | | |
| 12.80-13.25<br>12.80 | | | | | 11,11/9,14,16,11<br>SPT(C) N=50 | | | | | | |
| | 7 | 0 | NI | | | | | | | | |
| 14.20-14.43<br>14.20 | | | | | 13,22/50<br>SPT(C) 50/75 | -12.14 | 14.20 | Recovery consists of: Dense brown slightly gravelly fine to medium SAND. Driller notes cobbles, sand and gravel. Dense. | | | |
| | 13 | 0 | NI | | | | (1.20) | | | | |
| 15.40-15.85<br>15.40 | | | | | 4,3/3,4,8,7<br>SPT(C) N=22 | -13.34 | 15.40 | Recovery consists of: Dense grey and brown slightly sandy subangular to subrounded GRAVEL with occasional cobbles of various lithologies. Driller notes cobbles, sand and gravel | | | |
| | 6 | 0 | NI | | | | | | | | |
| 17.20-17.65<br>17.20 | | | | | 5,7/8,8,12,15<br>SPT(C) N=43 | | | | | | |
| | 6 | 0 | NI | | | | | | | | |
| 18.80-19.73<br>18.80 | | | | | 9,9/12,13,25<br>SPT(C) 50/775 | | (6.70) | | | | |
| | 7 | 0 | NI | | | | | | | | |

**Remarks**

| Scale (approx) | Logged By |
|---|---|
| 1:50 | D. Potter |

**Figure No.** 9230-11-19.BH03

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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Borehole Number** BH03 |
| **Machine :** Dando 2000 & Comacchio GEO305<br>**Flush :** water<br>**Core Dia :** 68 mm<br>**Method :** Cable Percussion | **Casing Diameter** 200mm cased to 9.20m 68mm cased to 25.50m | **Ground Level (mOD)** 2.06 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** (dGPS) 722719.3 E 675071.4 N | **Dates** 07/02/2020-12/02/2020 | **Project Contractor** GII | **Sheet** 3/3 |

| Depth (m) | TCR | SCR | RQD | FI | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water | Instr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 50/50 | | | | | | |
| 20.20-20.20<br>20.20 | 52 | 0 | 0 | | SPT(C) 50*/0<br>50/0 | | | | | | |
| 22.10 | 100 | 70 | 7 | | | -20.04 | 22.10 | Medium strong to strong fine grained thinly laminated grey SANDSTONE with quartz veins. Partially to distinctly weathered | | | |
| 23.00 | 100 | 0 | 0 | NI | | | | 22.10-23.80m BGL: Non Intact | | | |
| 23.80 | 100 | 41 | 41 | 10 | | | (3.40) | 23.80-25.50m BGL: Two fracture sets: F1: Very close to close spaced, 0-30 degree, undulating rough with clay smearing. F2: Close to medium spaced, 60-80 degree, undulating rough with clay smearing. | | | |
| 25.50 | | | | | | -23.44 | 25.50 | Complete at 25.50m | | | |

**Remarks**

| Scale (approx) | Logged By |
|---|---|
| 1:50 | D. Potter |

**Figure No.** 9230-11-19.BH03

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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Borehole Number** BH04 |
| **Machine :** Dando 2000<br>**Method :** Cable Percussion | **Casing Diameter** 200mm cased to 8.00m | **Ground Level (mOD)** 1.95 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722789.1 E 722789.1 N | **Dates** 30/01/2020 | **Project Contractor** GII | **Sheet** 1/1 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1.85 | 0.10 | TARMACADAM. | | |
| | | | | | | (0.50) | MADE GROUND: Grey angular fine to coarse Gravel. | | |
| | | | | | 1.35 | 0.60 | MADE GROUND: Light red slightly sandy slightly gravelly SILT. Gravel is angular to subangular, fine to coarse. Sand is fine to coarse | | |
| 1.00-1.45<br>1.00 | SPT(C) N=5<br>B | | | 1,2/2,1,1,1 | | (1.10) | | | ▼1 |
| | | | | | 0.25 | 1.70 | Very soft grey slightly sandy SILT with rootlets. Sand is fine to medium. | | |
| 2.00-2.45<br>2.00 | SPT(C) N=1<br>B | | | 1,0/1,0,0,0 | | | | | |
| 2.50 | UT Failed | | | | | (2.40) | | | |
| 3.00-3.45<br>3.00 | SPT(C) N=1<br>B | | | 1,0/1,0,0,0 | | | | | |
| 4.00-4.45<br>4.00 | SPT(C) N=1<br>B | | | 1,0/1,0,0,0 | -2.15 | 4.10 | Very soft dark brown mottled grey slightly sandy slightly peaty SILT. Sand is fine to coarse. | | |
| 4.50 | UT | | | | | (0.70) | | | |
| | | | | | -2.85 | 4.80 | Very soft black slightly silty slightly sandy slightly gravelly fibrous PEAT with wood and rootlets. Gravel is angular to subangular, fine to coarse. Sand is fine to coarse | | |
| 5.00-5.45<br>5.00 | SPT(C) N=0<br>B Failed | | | 1,0/0,0,0,0 | | (1.20) | | | |
| 6.00-6.45<br>6.00 | SPT(C) N=9<br>B | | | 2,2/1,1,7,0 | -4.05 | 6.00 | Firm black mottled grey slightly sandy slightly gravelly peaty SILT. Gravel is angular to subangular, fine to coarse. Sand is fine to coarse. Peat is fibrous. | | |
| | | | | | | (1.20) | | | |
| 7.00-7.45<br>7.00 | SPT(C) N=20<br>B | | | 2,1/1,4,9,6<br>Water strike(1) at 7.20m, rose to 1.60m in 20 mins. | -5.25 | 7.20 | Dense grey sandy subangular to rounded fine to coarse GRAVEL with some subangular to subrounded cobbles. Sand is fine to coarse. | | ▽1 |
| | | | | | | (0.80) | | | |
| 8.00-8.42<br>8.00 | SPT(C) 50/265<br>B | | | 9,11/15,15,20 | -6.05 | 8.00 | Complete at 8.00m | | |

**Remarks**
Borehole terminated at 8.00m BGL due to obstruction.
150mm wavin installed from 8.00m to GL for possible rotary core follow-on.
UT100 at 2.5m - no recovery
UT100 at 4.5m- no recovery
Chiselling from 8.00m to 8.00m for 1 hour.

| Scale (approx) | Logged By |
|---|---|
| 1:50 | D. Potter |

**Figure No.** 9230-11-19.BH04

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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Borehole Number** BH05 |
| **Machine :** Dando 2000<br>**Method :** Cable Percussion | **Casing Diameter** 200mm cased to 7.00m | **Ground Level (mOD)** 1.57 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** (dGPS) 722837.9 E 675136.4 N | **Dates** 22/01/2020-23/01/2020 | **Project Contractor** GII | **Sheet** 1/1 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1.47 | 0.10 | TARMADCADAM. | | |
| | | | | | | (0.70) | MADE GROUND: Grey angular fine to coarse Gravel. | | |
| | | | | | 0.77 | 0.80 | Soft grey slightly peaty slightly sandy slightly gravelly CLAY with rootlets. Gravel is angular to subangular, fine to coarse. Sand is fine to coarse. Possible Made Ground. | | |
| 1.00-1.45<br>1.00 | SPT(C) N=3<br>B | | | 1,1/1,0,1,1 | | (0.50) | | | |
| | | | | | 0.27 | 1.30 | Very soft grey slightly sandy SILT with rootlets. Sand is fine to medium. | | ▼1 |
| 2.00-2.45<br>2.00 | SPT(C) N=1<br>B | | | 1,0/1,0,0,0 | | (1.70) | | | |
| 2.50-3.00 | UT Failed | | | | | | | | |
| 3.00-3.45<br>3.00 | SPT(C) N=1<br>B | | | 1,0/1,0,0,0 | -1.43 | 3.00 | Very soft dark grey slightly sandy slightly peaty SILT. Sand is fine to coarse. | | |
| | | | | | | (1.00) | | | |
| 4.00-4.45<br>4.00 | SPT(C) N=1<br>B | | | 1,0/1,0,0,0 | -2.43 | 4.00 | Very soft black slightly silty slightly sandy slightly gravelly fibrous PEAT with wood and rootlets. Gravel is angular to subangular, fine to coarse. Sand is fine to coarse. | | |
| 4.50-5.00 | UT 100% Recovery | | | | | (1.80) | | | |
| 5.00-5.45<br>5.00<br>5.00-5.50 | SPT(C) N=1<br>B<br>UT 60% Recovery | | | 1,0/1,0,0,0 | | | | | |
| | | | | | -4.23 | 5.80 | Soft grey slightly gravelly sandy SILT. Gravel is angular to subangular, fine to coarse. Sand is fine to coarse. | | ▽1 |
| 6.00 | B | | | Water strike(1) at 6.00m, rose to 1.70m in 20 mins. | | (0.50) | | | |
| | | | | | -4.73 | 6.30 | Dense grey sandy subangular to rounded fine to coarse GRAVEL with some subangular to subrounded cobbles. Sand is fine to coarse. | | |
| | | | | | | (0.70) | | | |
| 7.00-7.45<br>7.00 | SPT(C) 50/295<br>B | | | 25/50 | -5.43 | 7.00 | Complete at 7.00m | | |

**Remarks**
Borehole terminated at 7.00m BGL due to obstruction.
150mm wavin installed from 7.00m BGL to GL for possible rotary core follow-on.
Chiselling from 6.30m to 7.00m for 1.5 hours. Chiselling from 7.00m to 7.00m for 1 hour.

| Scale (approx) | Logged By |
|---|---|
| 1:50 | D. Potter |

**Figure No.** 9230-11-19.BH05

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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Borehole Number** BH06 |
| **Machine :** Dando 2000 & Comacchio GEO305<br>**Method :** Cable Percussion | **Casing Diameter** 200mm cased to 8.00m 25.2mm cased to 68.00m | **Ground Level (mOD)** 1.62 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** (dGPS) 722877.9 E 675036.4 N | **Dates** 31/01/2020-14/02/2020 | **Project Contractor** GII | **Sheet** 1/3 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water | Instr |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1.52 | 0.10 | TARMACADAM. | | | |
| | | | | | | (0.40) | MADE GROUND: Grey angular fine to coarse Gravel (804) | | | |
| | | | | | 1.12 | 0.50 | MADE GROUND: Soft grey mottled orange slightly gravelly sandy Clay. Gravel is angular to subangular, fine to coarse. Sand is fine to coarse. | | | |
| 1.00<br>1.00-1.45 | B<br>SPT(C) N=4 | | | 0,0/1,1,1,1 | | (1.40) | | | | |
| 2.00<br>2.00-2.45 | B<br>SPT(C) N=3 | | | 1,0/0,1,1,1 | -0.28 | 1.90 | Soft grey slightly sandy SILT with rootlets. Sand is fine to medium. | | ▼2 | |
| | | | | | | (1.30) | | | ▼1 | |
| 3.00 | B | | | Water strike(1) at 3.00m, rose to 2.90m in 20 mins, sealed at 4.30m. | -1.58 | 3.20 | Soft grey silty CLAY. | | | |
| 3.00-3.45 | SPT(C) N=4 | | | 0,0/1,1,1,1 | | (1.10) | | | | |
| 4.00<br>4.00-4.45 | B<br>SPT(C) N=7 | | | 1,1/2,1,2,2 | -2.68 | 4.30 | Soft grey mottled reddish brown slightly sandy slightly peaty slightly gravelly SILT. Gravel is angular to subangular, fine to coarse. Sand is fine to coarse. Peat is fibrous. | | | |
| 5.00<br>5.00-5.45 | B<br>SPT(C) N=1 | | | 1,0/1,0,0,0 | | (1.70) | | | | |
| 6.00 | B | | | Water strike(2) at 6.00m, rose to 2.00m in 20 mins. | -4.38 | 6.00 | Loose grey slightly silty fine to coarse SAND. | | ▽2 | |
| 6.00-6.45 | SPT(C) N=6 | | | 0,1/1,2,1,2 | | (0.90) | | | | |
| 7.00<br>7.00-7.45 | B<br>SPT(C) 50/295 | | | 2,5/10,11,15,14 | -5.28 | 6.90 | Dense grey sandy subangular to subrounded fine to coarse GRAVEL of various lithologies with some subangular cobbles. Sand is fine to coarse. | | | |
| | | | | 25/50 | | (1.10) | | | | |
| 8.00<br>8.00-8.00<br>8.00 | B<br>SPT(C) 25*/0<br>50/0 | | | | -6.38 | 8.00 | Recovery consists of: grey and brown slightly sandy subangular to subrounded fine to coarse GRAVEL with occasional subrounded cobbles. Driller notes cobbles, sand and gravel. Dense. | | | |
| 9.00-9.45 | | | | 9,10/10,12,11,11<br>SPT(C) N=44 | | | | | | |

| TCR | SCR | RQD | FI |
|---|---|---|---|
| 3 | 0 | 0 | 0 |

**Remarks**
Borehole terminated at 8.00m BGL due to obstruction, possible boulder.
Rotary follow on from 8.00m BGL
Complete at 25.20m BGL
50mm Standpipe installed in borehole upon completion, slotted from 25.20m BGL to 2.50m BGL, plain from 2.50m BGL to ground level, with bentonite seal and raised cover
Chiselling from 8.00m to 8.00m for 1 hour.

| Scale (approx) | Logged By |
|---|---|
| 1:50 | D. Potter |

**Figure No.** 9230-11-19.BH06

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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Borehole Number** BH06 |
| **Machine :** Dando 2000 & Comacchio GEO305<br>**Flush :** water<br>**Core Dia :** 68 mm<br>**Method :** Cable Percussion | **Casing Diameter** 200mm cased to 8.00m 25.2mm cased to 68.00m | **Ground Level (mOD)** 1.62 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** (dGPS) 722877.9 E 675036.4 N | **Dates** 31/01/2020-14/02/2020 | **Project Contractor** GII | **Sheet** 2/3 |

| Depth (m) | TCR | SCR | RQD | FI | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water | Instr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10.60-11.05 | | | | | 7,6/8,9,9,11 SPT(C) N=37 | | | | | | |
| 10.60 | 3 | 0 | 0 | 0 | | | | | | | |
| 11.90 | | | | | | | | | | | |
| 12.40-12.85 | 20 | 0 | 0 | 0 | 10,8/10,11,11,13 SPT(C) N=45 | | | | | | |
| 12.40 | 11 | 0 | 0 | 0 | | | (9.20) | | | | |
| 14.20-14.65 | | | | | 10,19/20,14,15,1 SPT(C) N=50 | | | | | | |
| 14.20 | 9 | 0 | 0 | 0 | | | | | | | |
| 15.40-15.85 | | | | | 13,14/16,16,15,3 SPT(C) N=50 | | | | | | |
| 15.40 | 11 | 0 | 0 | 0 | | | | | | | |
| 17.20-17.58 | | | | | 10,19/20,21,9 SPT(C) 50/225 | -15.58 | 17.20 | Recovery consists of: brown slightly sandy gravelly CLAY. Driller notes boulder Clay. Very stiff | | | |
| 17.20 | 41 | 0 | 0 | 0 | | | | | | | |
| 18.80-19.10 | | | | | 19,21/24,26 SPT(C) 50/150 | | (2.80) | | | | |
| 18.80 | 83 | 0 | 0 | 0 | | | | | | | |
| 20.00 | | | | | | | | | | | |

**Remarks**

| Scale (approx) | Logged By |
|---|---|
| 1:50 | D. Potter |

**Figure No.** 9230-11-19.BH06

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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Borehole Number** BH06 |
| **Machine :** Dando 2000 & Comacchio GEO305<br>**Flush :** water<br>**Core Dia :** 68 mm<br>**Method :** Cable Percussion | **Casing Diameter** 200mm cased to 8.00m 25.2mm cased to 68.00m | **Ground Level (mOD)** 1.62 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** (dGPS) 722877.9 E 675036.4 N | **Dates** 31/01/2020-14/02/2020 | **Project Contractor** GII | **Sheet** 3/3 |

| Depth (m) | TCR | SCR | RQD | FI | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water | Instr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 100 | 0 | 0 | 0 | | -18.38 | 20.00 | Medium strong to strong fine grained thinly laminated grey SLATE with occasional quartz veins and brown staining. Partially to dinstinctly weathered | | | |
| 21.30 | 30 | 0 | 0 | 0 | | | | 20.00-24.60m BGL: Non Intact | | | |
| 22.30 | 70 | 15 | 15 | 0 | | | (5.20) | | | | |
| 23.30 | 85 | 23 | 23 | 0 | | | | | | | |
| 24.60 | 100 | 67 | 33 | 0 | | | | | | | |
| 25.20 | | | | | | -23.58 | 25.20 | 24.60-25.20m BGL: Two Fracture Sets. F1: Very close to close spaced, 40-60 degree, undulating rough with clay smearing. F2: Single fracture, 35 degrees, undulating rough with clay smearing | | | |
| | | | | | | | | Complete at 25.20m | | | |

**Remarks**

| Scale (approx) | Logged By |
|---|---|
| 1:50 | D. Potter |

**Figure No.** 9230-11-19.BH06

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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Borehole Number** BH07 |
| **Machine :** Dando 2000 & Comacchio GEO305<br>**Method :** Cable Percussion | **Casing Diameter** 200mm cased to 8.50m<br>68mm cased to 15.00m | **Ground Level (mOD)** 1.47 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** (dGPS) 722980.2 E 675047.6 N | **Dates** 28/01/2020-17/02/2020 | **Project Contractor** GII | **Sheet** 1/2 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1.27 | (0.20) 0.20 | TARMACADAM. | | |
| | | | | Water strike(1) at 0.40m, no rise after 20 mins, sealed at 2.20m. | | | MADE GROUND: Grey mottled orange slightly gravelly sandy Clay. Gravel is angular to subangular, fine to coarse. Sand is fine to coarse. | | ▼1 ▼2 |
| 1.00<br>1.00-1.45 | B<br>SPT(C) N=0 | | | 1,1/0,0,0,0 | | (1.20) | | | |
| | | | | | 0.07 | 1.40 | Very soft dark grey slightly sandy slightly gravelly SILT with rootlets. Gravel is angular to subangular, fine to coarse. Sand is fine to coarse. | | |
| 2.00<br>2.00-2.45 | B<br>SPT(C) N=2 | | | 0,0/0,1,1,0 | | (0.80) | | | |
| | | | | | -0.73 | 2.20 | Very soft grey slightly sandy SILT. Sand is fine to medium. | | |
| 2.50-3.00 | UT | | | | | (1.10) | | | |
| 3.00<br>3.00-3.45 | B<br>SPT(C) N=1 | | | 1,0/1,0,0,0 | | | | | |
| | | | | | -1.83 | 3.30 | Very soft black slightly silty slightly sandy fibrous PEAT with rootlets and wood fragments. Sand is fine to medium. | | |
| 3.50-4.00 | UT | | | | | | | | |
| 4.00<br>4.00-4.45 | B<br>SPT(C) N=1 | | | 1,0/1,0,0,0 | | | | | |
| 5.00<br>5.00-5.45 | B<br>SPT(C) N=1 | | | 1,0/1,0,0,0 | | (3.20) | | | |
| 6.00 | B | | | | | | Pushing large tree fragment from 5.80m BGL to 6.30m BGL - No SPT taken. | | |
| | | | | Water strike(2) at 6.50m, rose to 0.50m in 20 mins. | -5.03 | 6.50 | Medium dense grey slightly sandy subangular to rounded fine to coarse GRAVEL of various lithologies with some subangular to subrounded cobbles. Sand is fine to coarse. | | ▽2 |
| 7.00<br>7.00-7.45 | B<br>SPT(C) N=32 | | | 2,1/8,8,7,9 | | (2.00) | | | |
| 8.00<br>8.00-8.00<br>8.20-8.65 | SPT(C) N=46<br>B<br>SPT(C) 25*/0<br>50/0 | | | 25/50<br>10,9/11,11,11,13 | | | | | |
| | **TCR** / **SCR** / **RQD** / **FI** | | | | | | | | |
| 8.50 | | | | | -7.03 | 8.50 | Recovery consists of: Brown slightly sandy slightly clayey angular to subangular fine to coarse GRAVEL. Driller notes cobbly Clay | | |
| 9.80-9.80 | 100 / 0 / 0 / NI | | | 50/50<br>SPT(C) 50*/0<br>50/0 | | (1.30) | | | |
| | | | | | -8.33 | 9.80 | Weak to medium strong fine grained thinly laminated dark | | |

**Remarks**
Borehole terminated at 8.50m BGL due to obstruction.
150mm wavin installed from 7.50m BGL to GL for possible rotary follow-on.
Rotary follow on from 8.50m BGL
Complete at 15.0m BGL
Borehole backfilled upon completion
Chiselling from 7.20m to 8.50m for 2 hours. Chiselling from 8.50m to 8.50m for 1 hour.

| Scale (approx) | Logged By |
|---|---|
| 1:50 | D. Potter |

**Figure No.** 9230-11-19.BH07

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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Borehole Number** BH07 |
| **Machine :** Dando 2000 & Comacchio GEO305<br>**Flush :** water<br>**Core Dia :** 68 mm<br>**Method :** Cable Percussion | **Casing Diameter** 200mm cased to 8.50m 68mm cased to 15.00m | **Ground Level (mOD)** 1.47 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** (dGPS) 722980.2 E 675047.6 N | **Dates** 28/01/2020-17/02/2020 | **Project Contractor** GII | **Sheet** 2/2 |

| Depth (m) | TCR | SCR | RQD | FI | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | grey SLATE with occasional quartz veins and brown staining. Partially weathered to destructured | | |
| 10.70 | 100 | 8 | 8 | NI | | | | | | |
| 12.00 | 100 | 29 | 8 | 9 | | | (5.20) | 9.80-13.20m BGL: Non Intact | | |
| 13.20 | 100 | 25 | 6 | NI | | | | 13.20-14.30m BGL: 1 Fracture Set. Very close to close spaced, 45-60 degree, undulating rough with clay staining. | | |
| | | | | | | | | 14.30-15.00m BGL: Non Intact | | |
| 15.00 | | | | | | -13.53 | 15.00 | Complete at 15.00m | | |

**Remarks**

| Scale (approx) | Logged By |
|---|---|
| 1:50 | D. Potter |

**Figure No.** 9230-11-19.BH07

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| Site | Borehole Number |
|---|---|
| Avoca River Park, Arklow | BH08 |

| Machine : Dando 2000<br>Method : Cable Percussion | Casing Diameter<br>200mm cased to 13.00m | Ground Level (mOD)<br>1.95 | Client<br>FT Squared | Job Number<br>9230-11-19 |
|---|---|---|---|---|
| | Location<br>722683.8 E 674961.9 N | Dates<br>22/01/2020-23/01/2020 | Project Contractor<br>GII | Sheet<br>1/2 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | MADE GROUND: Grey angular fine to coarse Gravel with concrete. | | |
| 0.50 | B | | | Water strike(1) at 0.50m, rose to 0.40m in 20 mins. | | (0.90) | | | ▼1 ▽1 |
| | | | | | 1.05 | 0.90 | | | |
| 1.00-1.45<br>1.00 | SPT(C) N=2<br>B | | | 1,0/0,1,1,0 | | | Very soft grey brown slightly sandy SILT | | ▼2 |
| | | | | | | (0.70) | | | |
| | | | | | 0.35 | 1.60 | | | |
| | | | | | | | Very soft brown mottled grey slightly sandy slightly gravelly slightly peaty SILT. Gravel is angular to subangular, fine to coarse. Sand is fine to coarse | | ▼3 |
| 2.00-2.45<br>2.00 | SPT(C) N=1<br>B | | | 1,0/1,0,0,0 | | | | | |
| | | | | | | (1.90) | | | |
| 3.00-3.45<br>3.00 | SPT(C) N=1<br>B | | | 1,0/1,0,0,0 | | | | | |
| 3.50-4.00 | UT Failed | | | | -1.55 | 3.50 | Very soft blue grey silty CLAY | | |
| 4.00-4.45<br>4.00 | SPT(C) N=1<br>B | | | 1,0/1,0,0,0 | | | | | |
| | | | | | | (2.60) | | | |
| 5.00-5.45<br>5.00 | SPT(C) N=1<br>B | | | 1,0/1,0,0,0 | | | | | ▽2 |
| 6.00 | B | | | Water strike(2) at 5.70m, rose to 1.00m in 20 mins. | -4.15 | 6.10 | | | |
| 6.00-6.45 | SPT(C) N=39 | | | 0,2/6,10,11,12 | | | Medium dense to dense grey sandy subangular to rounded fine to coarse GRAVEL with occasional subangular cobbles. Sand is fine to coarse. | | |
| 7.00-7.45<br>7.00 | SPT(C) N=48<br>B | | | 6,9/11,11,12,14 | | | | | |
| | | | | | | (2.30) | | | |
| 8.00-8.45<br>8.00 | SPT(C) N=50<br>B | | | 7,12/14,17,19 | | | | | |
| | | | | | -6.45 | 8.40 | Stiff brown slightly sandy SILT. Sand is fine to medium. | | |
| 9.00-9.40<br>9.00 | SPT(C) 15/250<br>B | | | 1,2/3,4,4,4 | | | | | |
| | | | | | | (1.40) | | | |
| | | | | Water strike(3) at 9.80m, rose to 2.00m in 20 mins. | | | | | |
| 10.00-10.45 | SPT(C) N=30 | | | 3,5/7,8,7,8 | -7.85 | 9.80 | Medium dense grey gravelly fine to coarse SAND. Gravel is | | ▽3 |

**Remarks**
Borehole terminated at 13.00m BGL due to obstruction.
UT 100 failed at 3.5m - no recovery
150mm wavin installed from 13.00m BGL to GL for possible rotary core follow-on.

| Scale (approx) | Logged By |
|---|---|
| 1:50 | D. Potter |

**Figure No.**
9230-11-19.BH08

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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Borehole Number** BH08 |
| **Machine :** Dando 2000<br>**Method :** Cable Percussion | **Casing Diameter** 200mm cased to 13.00m | **Ground Level (mOD)** 1.95 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722683.8 E 674961.9 N | **Dates** 22/01/2020-23/01/2020 | **Project Contractor** GII | **Sheet** 2/2 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|---|
| 10.00 | B | | | | | (0.80) | subangular to subrounded, fine to coarse. | | |
| | | | | | -8.65 | 10.60 | Dense grey sandy subangular to rounded fine to coarse GRAVEL. Sand is medium to coarse. | | |
| 11.00-11.40<br>11.00 | SPT(C) 50/250<br>B | | | 2,5/7,10,16,17 | | (2.40) | | | |
| 12.00-12.38<br>12.00 | SPT(C) 50/230<br>B | | | 2,5/7,11,17,15 | | | | | |
| 13.00-13.00<br>13.00 | SPT(C) 25*/0<br>50/0<br>B | | | 25/50 | -11.05 | 13.00 | Complete at 13.00m | | |

**Remarks**
UT 100 failed at 3.5m - no recovery
Chiselling from 10.80m to 10.90m for 1 hour. Chiselling from 13.00m to 13.00m for 1 hour.

| Scale (approx) | Logged By |
|---|---|
| 1:50 | D. Potter |

**Figure No.** 9230-11-19.BH08

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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Borehole Number** BH09 |
| **Machine :** Dando 2000<br>**Method :** Cable Percussion | **Casing Diameter** 200mm cased to 7.00m | **Ground Level (mOD)** 1.56 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** (dGPS) 722836.2 E 674981.9 N | **Dates** 06/02/2020 | **Project Contractor** GII | **Sheet** 1/1 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1.46 | 0.10 | TARMACADAM. | | |
| | | | | | | (1.00) | MADE GROUND: Grey slightly clayey sandy angular to subangular Gravel. Sand is fine to coarse | | |
| 1.00 | B | | | Water strike(1) at 1.00m, no rise after 20 mins, sealed at 2.50m. | 0.46 | 1.10 | | | ▼* |
| 1.00-1.45 | SPT(C) N=5 | | | 6,9/2,1,1,1 | | | Soft grey slightly gravelly sandy SILT. Gravel is angular to subangular, fine to coarse. Sand is fine to coarse. | | |
| 2.00-2.45 | SPT(C) N=7 | | | 1,1/2,2,2,1 | | (1.80) | | | |
| 2.00 | B | | | | | | | | |
| | | | | | -1.34 | 2.90 | Loose grey slightly silty fine to coarse SAND. | | |
| 3.00-3.45 | SPT(C) N=2 | | | 0,0/0,1,1,0 | | | | | |
| 3.00 | B | | | | | (0.80) | | | |
| | | | | | -2.14 | 3.70 | Very soft grey slightly sandy SILT. Sand is fine to medium. | | |
| 4.00 | B | | | | | | | | |
| 4.00-5.00 | P 70% Recovery | | | | | | | | |
| | | | | | | (2.20) | | | |
| 5.00-5.45 | SPT(C) N=1 | | | 1,0/1,0,0,0 | | | | | |
| 5.00 | B | | | | | | | | |
| 5.00-6.00 | P Failed | | | | | | | | ▽2 |
| | | | | Water strike(2) at 5.50m, rose to 1.00m in 20 mins. | | | | | |
| | | | | | -4.34 | 5.90 | Dense grey brown sandy subangular to rounded fine to coarse GRAVEL of various lithologies with some subangular to subrounded cobbles. Sand is medium to coarse. | | |
| 6.00-6.45 | SPT(C) N=41 | | | 6,8/8,9,11,13 | | | | | |
| 6.00 | B | | | | | (1.10) | | | |
| 7.00-7.15 | SPT(C) 25*/145 50/0 | | | 25/50 | -5.44 | 7.00 | Complete at 7.00m | | |
| 7.00 | B | | | | | | | | |

**Remarks**
Borehole terminated at 7.00m BGL due to obstruction.
Piston at 4.0m - 70% recovery, piston at 5.0m - fail
150mm wavin installed from 7.00m BGL to GL for possible rotary core follow-on.
Chiselling from 7.00m to 7.00m for 1 hour.

| Scale (approx) | Logged By |
|---|---|
| 1:50 | D. Potter |

**Figure No.** 9230-11-19.BH09

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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Borehole Number** BH10 |
| **Machine :** Dando 2000 & Comacchio GEO305<br>**Flush :** water<br>**Core Dia :** 68 mm<br>**Method :** Cable Percussion | **Casing Diameter** 200mm cased to 11.00m<br>68mm cased to 29.00m | **Ground Level (mOD)** 1.60 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** (dGPS) 722868.4 E 674925.6 N | **Dates** 09/01/2020-06/02/2020 | **Project Contractor** GII | **Sheet** 1/3 |

| Depth (m) | TCR | SCR | RQD | FI | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water | Instr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | | | | | | 1.50 | 0.10 (0.20) | TARMACADAM. | | | |
| | | | | | | 1.30 | 0.30 | MADE GROUND: Black angular fine to coarse Gravel. | | | |
| 1.00-1.45<br>1.00 | | | | | 3,3/3,6,2,3<br>SPT(C) N=14<br>B | | (1.40) | POSSIBLE MADE GROUND: Firm to stiff greyish brown slightly sandy gravelly CLAY. Gravel is angular to subangular, fine to coarse. Sand is fine to coarse. | | ▼1 | |
| | | | | | 1,1/0,0,0,1<br>SPT(C) N=1<br>Water strike(1) at 1.70m, rose to 0.90m in 20 mins. | -0.10 | 1.70 | Very soft dark grey mottled light brown sandy SILT. Sand is fine to medium. | | ▽1 | |
| 2.00-2.45<br>2.00 | | | | | B | | | | | | |
| 2.50-3.00 | | | | | UT Failed | | | | | | |
| 3.00-3.45<br>3.00 | | | | | 1,0/1,0,0,0<br>SPT(C) N=1<br>B | | (3.20) | | | | |
| 4.00-4.45<br>4.00 | 7 | 0 | 0 | NI | 0,0/0,0,0,4<br>SPT(C) N=4<br>B | | | | | | |
| 5.00-5.45<br>5.00 | | | | | 1,0/0,0,0,1<br>SPT(C) N=1<br>B | -3.30 | 4.90 | Obstruction from 4.30 m BGL to 4.90m BGL, presumed wood. | | | |
| | | | | | | -3.70 | (0.40)<br>5.30 | Very soft dark grey slightly sandy slightly gravelly slightly peaty SILT with rootlets and wood pieces. Gravel is angular to subangular, fine to coarse. Sand is fine to coarse. Peat is fibrous. | | | |
| 5.50-6.00 | | | | | UT Failed | | | | | | |
| 6.00-6.45<br>6.00 | | | | | 2,3/1,0,0,1<br>SPT(C) N=2<br>B | | (1.70) | Soft black slightly sandy slightly gravelly peaty SILT with rootlets, wood pieces and occasional subangular cobbles. Gravel is angular to subangular, fine to coarse. Sand is fine to coarse. Peat is fibrous. | | | |
| 7.00-7.45<br>7.00 | | | | | 7,10/9,9,9,11<br>SPT(C) N=38<br>B | -5.40 | 7.00 | Dense grey slightly sandy subangular to subrounded GRAVEL of varied lithology with occasional subangular to subrounded cobbles. Sand is medium to coarse. | | | |
| 8.00-8.20<br>8.00 | | | | | 12,12/19,31<br>SPT(C) 50/50<br>B | | | | | | |
| 8.50 | | | | | | | (3.00) | | | | |
| 9.00-9.21<br>9.00 | | | | | 16,23/50<br>SPT(C) 50/60<br>B | | | | | | |
| 10.00-10.07<br>10.00 | | | 0 | NI | 25/50<br>SPT(C) 25*/70<br>50/0<br>B | | | | | | |

**Remarks**
Borehole terminated at 10.00m BGL due to jammed casing.
Rotary follow on from 10.0m BGL
Complete at 29.0m BGL
50mm Standpipe installed in borehole upon completion, slotted from 11.0m BGL to 2.50m BGL, plain from 2.50m BGL to ground level, with bentonite seal and raised cover
Chiselling from 4.30m to 4.90m for 1.5 hours. Chiselling from 10.00m to 10.00m for 1 hour.

| Scale (approx) | Logged By |
|---|---|
| 1:50 | D. Potter |

**Figure No.** 9230-11-19.BH10

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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Borehole Number** BH10 |
| **Machine :** Dando 2000 & Comacchio GEO305<br>**Flush :** water<br>**Core Dia :** 68 mm<br>**Method :** Cable Percussion | **Casing Diameter** 200mm cased to 11.00m<br>68mm cased to 29.00m | **Ground Level (mOD)** 1.60 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** (dGPS) 722868.4 E 674925.6 N | **Dates** 09/01/2020-06/02/2020 | **Project Contractor** GII | **Sheet** 2/3 |

| Depth (m) | TCR | SCR | RQD | FI | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water | Instr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | -8.40 | 10.00 | Recovery consists of: light grey/brown subangular to subrounded medium to coarse GRAVEL with many subangular cobbles. Driller notes GRAVEL with cobbles. Dense. | | | |
| 11.00-11.38<br>11.00 | 16 | 0 | 0 | NI | 13,13/17,19,14<br>SPT(C) 50/225 | | | | | | |
| 12.60-12.98<br>12.60 | 19 | 0 | 0 | NI | 21,2/5,28,17<br>SPT(C) 50/225 | | | | | | |
| 14.20-14.58<br>14.20 | 7 | 0 | 0 | NI | 14,17/17,22,11<br>SPT(C) 50/225 | | | | | | |
| 15.70-16.15<br>15.70 | 3 | 0 | 0 | NI | 9,2/1,7,3,5<br>SPT(C) N=16 | | | | | | |
| 17.20 | 2 | 0 | 0 | NI | | | (14.50) | | | | |

**Remarks**
Chiselling from 10.00m to 10.00m for 1 hour.

| Scale (approx) | Logged By |
|---|---|
| 1:50 | D. Potter |

**Figure No.** 9230-11-19.BH10

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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Borehole Number** BH10 |
| **Machine :** Dando 2000 & Comacchio GEO305<br>**Flush :** water<br>**Core Dia :** 68 mm<br>**Method :** Cable Percussion | **Casing Diameter** 200mm cased to 11.00m<br>68mm cased to 29.00m | **Ground Level (mOD)** 1.60 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** (dGPS) 722868.4 E 674925.6 N | **Dates** 09/01/2020-06/02/2020 | **Project Contractor** GII | **Sheet** 3/3 |

| Depth (m) | TCR | SCR | RQD | FI | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water | Instr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 20.20 | 3 | 0 | 0 | NI | | | | | | | |
| 23.20 | 19 | 0 | 0 | NI | | | | | | | |
| 24.50 | 50 | 0 | 0 | NI | | -22.90 | 24.50 | Weak to medium strong fine grained thinly laminated grey SLATE with occasional brown staining, partially to distinctly weathered | | | |
| 25.50 | 67 | 0 | 0 | NI | | | | 24.50-26.10m BGL: Non Intact | | | |
| 26.10 | 100 | 18 | 18 | NI | | | (4.50) | | | | |
| 27.80 | 100 | 50 | 50 | 15 | | | | 26.10-29.00m BGL: Two Fracture Sets: F1: Very close to close spaced, 0-20 degree, undulating rough with clay staining. F2: Very close to close, 70-90 degree, undulating rough with clay staining. | | | |
| 29.00 | | | | | | -27.40 | 29.00 | Complete at 29.00m | | | |

**Remarks**

| Scale (approx) | Logged By |
|---|---|
| 1:50 | D. Potter |

**Figure No.** 9230-11-19.BH10

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| Site | Borehole Number |
|---|---|
| Avoca River Park, Arklow | BH11 |

| Machine : Dando 2000<br>Method : Cable Percussion | Casing Diameter<br>200mm cased to 12.30m | Ground Level (mOD)<br>1.30 | Client<br>FT Squared | Job Number<br>9230-11-19 |
|---|---|---|---|---|
| | Location<br>722892.1 E 674856.1 N | Dates<br>06/01/2020-07/01/2020 | Project Contractor<br>GII | Sheet<br>1/2 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | (1.10) | MADE GROUND: Black angular fine to coarse Gravel with occasional boulders. | | |
| 1.00-1.45<br>1.00 | SPT(C) N=0<br>B | | | 1,1/0,0,0,0 | 0.20 | 1.10 | | | |
| | | | | | | (0.70) | Very soft dark reddish grey slightly sandy SILT. Sand is fine to medium. | | ▼1 |
| | | | | | -0.50 | 1.80 | | | |
| | | | | | -0.70 | (0.20) 2.00 | Very soft grey slightly sandy SILT. Sand is fine to medium. | | |
| 2.00-2.45<br>2.00 | SPT(C) N=1<br>B | | | 1,0/1,0,0,0 | | | Very soft grey mottled light brown sandy SILT. Sand is fine to medium. | | |
| | | | | | | (1.00) | | | |
| 3.00-3.45<br>3.00 | SPT(C) N=0<br>B | | | 1,0/0,0,0,0 | -1.70 | 3.00 | Very soft grey mottled reddish brown sightly sandy slightly gravelly SILT with rootlets.Gravel is angular to subangular, fine to coarse. Sand is fine to coarse. | | |
| | | | | | | (1.00) | | | |
| 4.00-4.45<br>4.00 | SPT(C) N=2<br>B | | | 1,1/1,0,0,1 | -2.70 | 4.00 | Very soft grey mottled reddish brown slightly sandy slightly peaty SILT with rootlets. Gravel is angular to subangular, fine to coarse. Sand is fine to coarse. | | |
| | | | | | | (1.80) | | | |
| 5.00-5.45<br>5.00 | SPT(C) N=1<br>B | | | 1,0/1,0,0,0 | | | | | |
| | | | | | -4.50 | 5.80 | Very soft dark grey slightly sandy slightly gravelly peaty SILT with rootlets and wood pieces. Gravel is angular to subangular, fine to coarse. Sand is fine to coarse. Peat is fibrous. | | |
| 6.00-6.45<br>6.00 | SPT(C) N=1<br>B | | | 1,0/1,0,0,0 | | (0.70) | | | |
| | | | | | -5.20 | 6.50 | Soft grey slightly sandy slightly gravelly SILT with occasional rootlets. Gravel is angular to subangular, fine to coarse. Sand is fine to coarse. | | |
| | | | | | | (1.00) | | | |
| 7.00-7.45<br>7.00 | SPT(C) N=7<br>B | | | 0,0/0,0,3,4<br>Water strike(1) at 7.20m, rose to 1.70m in 20 mins. | | | | | ▽1 |
| | | | | | -6.20 | 7.50 | Dense grey slightly sandy angular to subrounded fine to coarse GRAVEL with some subangular to subrounded cobbles. Sand is fine to coarse | | |
| 8.00-8.22<br>8.00 | SPT(C) 50/70<br>B | | | 13,24/50 | | | | | |
| 9.00-9.20<br>9.00 | SPT(C) 50/50<br>B | | | 11,25/50 | | | | | |
| 10.00-10.20 | SPT(C) 50/50 | | | 11,22/50 | | | | | |

**Remarks**
Borehole terminated at 12.30m BGL due to obstruction.
Borehole backfilled upon completion.
Chiselling from 1.10m to 1.10m for 1 hour. Chiselling from 7.20m to 12.30m for 5 hours.

| Scale (approx) | Logged By |
|---|---|
| 1:50 | D. Potter |

Figure No.
9230-11-19.BH11

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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Borehole Number** BH11 |
| **Machine :** Dando 2000<br>**Method :** Cable Percussion | **Casing Diameter** 200mm cased to 12.30m | **Ground Level (mOD)** 1.30 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722892.1 E 674856.1 N | **Dates** 06/01/2020-07/01/2020 | **Project Contractor** GII | **Sheet** 2/2 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | (4.80) | | | |
| 10.00 | B | | | | | | | | |
| 11.00-11.15 | SPT(C) 24*/145 50/0 | | | 24/50 | | | | | |
| 11.00 | B | | | | | | | | |
| 12.00-12.00 | SPT(C) 25*/0 50/0 | | | 25/50 | | | | | |
| 12.00 | B | | | | -11.00 | 12.30 | Complete at 12.30m | | |

**Remarks**
Chiselling from 12.30m to 12.30m for 1 hour.

| Scale (approx) | Logged By |
|---|---|
| 1:50 | D. Potter |

**Figure No.** 9230-11-19.BH11

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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Borehole Number** BH11A |
| **Machine :** Dando 2000<br>**Method :** Cable Percussion | **Casing Diameter** 200mm cased to 8.00m | **Ground Level (mOD)** 1.38 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** (dGPS) 722922.6 E 674940 N | **Dates** 08/01/2020-09/01/2020 | **Project Contractor** GII | **Sheet** 1/1 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1.28 | 0.10 (0.30) | TARMACADAM. | | |
| | | | | | 0.98 | 0.40 | MADE GROUND: Dark grey angular fine to coarse Gravel. | | |
| | | | | | | (0.90) | MADE GROUND: Brownish grey angular to subangular fine to coarse Gravel with occasional boulders. | | |
| 1.00-1.45<br>1.00 | SPT(C) N=8<br>B | | | 3,11/2,2,2,2 | 0.08 | 1.30 | Very soft grey slightly sandy SILT. Sand is fine to medium. | | ▼1 |
| | | | | | | (0.60) | | | |
| 2.00 | B | | | UT-100: Test Failed. | -0.52 | 1.90 | Very soft grey mottled reddish brown sandy SILT. Sand is fine to coarse. | | |
| 2.00-2.45<br>2.30-2.80 | SPT(C) N=1<br>UT Failed | | | 1,0/1,0,0,0 | | (0.90) | | | |
| 3.00 | B | | | UT-100: Test Failed. | -1.42 | 2.80 | Soft grey slightly sandy SILT. Sand is fine to medium. | | |
| 3.00-3.45 | SPT(C) N=1 | | | 1,0/1,0,0,0 | | (1.40) | | | |
| 4.00 | B | | | | -2.82 | 4.20 | Firm black slightly sandy sandy gravelly silty fibrous PEAT with rootlets and wood fragments. Gravel is angular to subangular, fine to coarse. Sand is fine to coarse. | | |
| 4.20-4.70 | UT Failed | | | UT-100: 100% Recovery. | | | | | |
| 4.70-5.15 | SPT(C) N=7 | | | 1,1/1,2,3,1 | | | | | |
| 5.00 | B | | | | | | | | |
| 5.20-5.70 | UT 100% Recovery | | | UT-100: 100% Recovery. | | (2.30) | | | |
| 5.70-6.15 | SPT(C) N=14 | | | 2,2/5,5,3,1 | | | | | |
| 6.00 | B | | | | | | | | |
| 6.20-7.20 | UT Failed | | | UT-100: Test Failed. Water strike(1) at 6.50m, rose to 1.50m in 20 mins. | -5.12 | 6.50 | Dense grey slightly sandy subangular to rounded fine to coarse GRAVEL of varied lithologies.Sand is medium to coarse. | | ▽1 |
| 7.00-7.45<br>7.00 | SPT(C) N=39<br>B | | | 6,9/8,9,10,10,12 | | (1.50) | | | |
| 8.00-8.04 | SPT(C) 25*/40 50/0 | | | 25/50 | -6.62 | 8.00 | Complete at 8.00m | | |

**Remarks**
Borehole terminated at 8.00m BGL due to obstruction.
UT100 Failed at 2.3m, 4.2m and 6.2m - UT100 at 5.2m -100% recovery
Borehole backfilled upon completion.
Chiselling from 7.00m to 8.00m for 1 hour. Chiselling from 8.00m to 8.00m for 1 hour.

| Scale (approx) | Logged By |
|---|---|
| 1:50 | D. Potter |

**Figure No.** 9230-11-19.BH11A

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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Borehole Number** BH12 |
| **Machine :** Dando 2000 & Comacchio GEO305<br>**Flush :** water<br>**Core Dia :** 68 mm<br>**Method :** Cable Percussion with Rotary Core Follow on | **Casing Diameter** 200mm cased to 7.70m 68mm cased to 27.60m<br>**Location** (dGPS) 722609.5 E 674984.5 N | **Ground Level (mOD)** 2.08<br>**Dates** 27/01/2020-28/01/2020 | **Client** FT Squared<br>**Project Contractor** GII | **Job Number** 9230-11-19<br>**Sheet** 1/3 |

| Depth (m) | TCR | SCR | RQD | FI | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water | Instr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | | | | | | | | MADE GROUND: Grey angular fine to coarse Gravel. | | ▼1 | |
| | | | | | 4,9/5,5,7,4<br>Water strike(1) at 0.80m, rose to 0.30m in 20 mins. | 1.28 | 0.80 (0.80) | | | ▽1 | |
| | | | | | | 1.08 | 1.00 (0.20) | MADE GROUND: Light red slightly clayey angular to subangular fine to coarse Gravel with occasional subangular cobbles. | | | |
| 1.00-1.45<br>1.00 | | | | | SPT(C) N=21<br>B | | | Stiff light brown slightly sandy SILT. Sand is fine to medium. | | | |
| | | | | | 2,5/5,5,6,7<br>SPT(C) N=23<br>B | | (1.90) | | | | |
| 2.00-2.45<br>2.00 | | | | | | | | | | | |
| | | | | | 2,2/4,5,6,7<br>SPT(C) N=22<br>B | -0.82 | 2.90 | Medium dense grey sandy angular to subrounded fine to coarse GRAVEL of various lithologies with occasional subangular to subrounded cobbles. Sand is fine to coarse. | | | |
| 3.00-3.45<br>3.00 | | | | | | | | | | | |
| | 0 | 0 | 0 | NI | 3,5/5,8,7,8<br>SPT(C) N=28<br>B | | | | | | |
| 4.00-4.45<br>4.00 | | | | | | | (3.10) | | | | |
| | | | | | 4,3/3,6,9,9<br>SPT(C) N=27<br>B | | | | | | |
| 5.00-5.45<br>5.00 | | | | | | | | | | | |
| | | | | | 11,7/9,9,12,11<br>SPT(C) N=41<br>B | -3.92 | 6.00 | Dense grey sandy angular to subrounded fine to coarse GRAVEL of various lithologies with occasional subangular to subrounded cobbles. Sand is fine to coarse. | | | |
| 6.00-6.45<br>6.00 | | | | | | | | | | | |
| | | | | | 21,24/50<br>SPT(C) 50/105<br>B | | (1.70) | | | | |
| 7.00-7.26<br>7.00 | | | | | | | | | | | |
| 7.70 | | | | | | -5.62 | 7.70 | No Recovery | | | |
| | | | | | 12,15/16,11,15,8<br>SPT(C) N=50 | | (0.90) | | | | |
| 8.20-8.65 | | | | | | | | | | | |
| | | | | | | -6.52 | 8.60 | Recovery consists of gravel and COBBLES.Driller notes: gravelly COBBLES. Clasts are subangular to subrounded. Litholigies comprise limestone, granite, quartzite. Dense. | | | |
| | | | | | | | (1.40) | | | | |
| 10.00-10.45 | | | | | 15,15/14,18,16,2<br>SPT(C) N=50 | | | | | | |

**Remarks**
No UT100 or Piston sample taken due to gravels
Borehole terminated at 7.70m BGL due to obstruction.
Rotary follow on from 7.70m BGL
Complete at 27.60m BGL
50mm Standpipe installed in borehole upon completion, slotted from 27.60m BGL to 2.00m BGL, plain from 2.00m BGL to ground level, with bentonite seal and raised cover.
Chiselling from 7.70m to 7.70m for 1 hour.

| Scale (approx) | Logged By |
|---|---|
| 1:50 | D. Potter |

**Figure No.** 9230-11-19.BH12

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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Borehole Number** BH12 |
| **Machine :** Dando 2000 & Comacchio GEO305<br>**Flush :** water<br>**Core Dia :** 68 mm<br>**Method :** Cable Percussion with Rotary Core Follow on | **Casing Diameter** 200mm cased to 7.70m 68mm cased to 27.60m | **Ground Level (mOD)** 2.08 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** (dGPS) 722609.5 E 674984.5 N | **Dates** 27/01/2020-28/01/2020 | **Project Contractor** GII | **Sheet** 2/3 |

| Depth (m) | TCR | SCR | RQD | FI | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water | Instr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | -7.92 | 10.00 | Grey brown gravelly COBBLES. Clasts are subangular to subrounded. Litholigies comprise limestone, granite, quartzite. Driller notes sand washed out . Dense. | | | |
| 11.60-12.05 | | | | | 10,9/9,11,12,14<br>SPT(C) N=46 | | | | | | |
| 13.20-13.50 | | | | | 9,12/28,22<br>SPT(C) 50/150 | | | | | | |
| 14.70-15.15 | | | | | 1,2/1,10,11,10<br>SPT(C) N=32 | | | | | | |
| | 0 | 0 | 0 | | | | | | | | |
| 16.20-16.65 | | | | | 8,9/9,10,10,12<br>SPT(C) N=41 | | | | | | |
| | | | | NI | | | (13.60) | | | | |
| 17.80-18.25 | | | | | 5,5/4,4,8,6<br>SPT(C) N=22 | | | | | | |
| 19.40-19.85 | | | | | 2,2/3,2,10,5<br>SPT(C) N=20 | | | | | | |

**Remarks**

| Scale (approx) | Logged By |
|---|---|
| 1:50 | D. Potter |

**Figure No.** 9230-11-19.BH12

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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Borehole Number** BH12 |
| **Machine :** Dando 2000 & Comacchio GEO305<br>**Flush :** water<br>**Core Dia :** 68 mm<br>**Method :** Cable Percussion with Rotary Core Follow on | **Casing Diameter** 200mm cased to 7.70m 68mm cased to 27.60m | **Ground Level (mOD)** 2.08 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** (dGPS) 722609.5 E 674984.5 N | **Dates** 27/01/2020-28/01/2020 | **Project Contractor** GII | **Sheet** 3/3 |

| Depth (m) | TCR | SCR | RQD | FI | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water | Instr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 21.90-22.35 | | | | | 6,7/6,9,11,9<br>SPT(C) N=35 | | | | | | |
| 23.60 | | | | | | -21.52 | 23.60 | Weak folliated very fine to fine grained dark grey SHALE. Non intact, Fe staining present on fracture surfaces. Quartz veining present between 24.5m and 24.8 | | | |
| | 88 | 13 | 9 | | | | (1.20) | | | | |
| | | | | | | -22.72 | 24.80 | Very weak folliated very fine to fine grained dark grey SHALE. Non intact | | | |
| 26.00 | 63 | 50 | 44 | NI | | | (2.80) | | | | |
| 26.90 | 100 | 54 | 36 | NI | | | | | | | |
| 27.60 | | | | | | -25.52 | 27.60 | Complete at 27.60m | | | |

**Remarks**

| Scale (approx) | Logged By |
|---|---|
| 1:50 | D. Potter |

**Figure No.** 9230-11-19.BH12

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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Borehole Number** BH13 |
| **Machine :** Dando 2000<br>**Method :** Cable Percussion | **Casing Diameter** 200mm cased to 7.00m | **Ground Level (mOD)** 1.71 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** (dGPS) 722661.3 E 674927.7 N | **Dates** 24/01/2020 | **Project Contractor** GII | **Sheet** 1/1 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | (0.60) | MADE GROUND: Dark grey slightly sandy gravelly Clay. Gravel is angular to subangular, fine to coarse. Sand is fine to coarse. | | ▽1 ▼1 |
| 0.50 | B | | | Water strike(1) at 0.30m, fell to 0.40m in 20 mins, sealed at 1.20m. | 1.11 | 0.60 | | | |
| | | | | | | (0.60) | MADE GROUND: Firm multicoloured slightly sandy subangular to subrounded fine to coarse GRAVEL. Sand is medium to coarse. | | |
| 1.00-1.45<br>1.00 | SPT(C) N=8<br>B | | | 1,2/2,2,3,1 | 0.51 | 1.20 | Very soft grey sandy SILT. Sand is fine to medium. | | |
| 2.00-2.45<br>2.00 | SPT(C) N=2<br>B | | | 0,1/1,1,0,0 | | (1.80) | | | ▼3 |
| 2.50 | UT 100% Recovery | | | | | | | | |
| 3.00-3.45<br>3.00 | SPT(C) N=1<br>B | | | 1,0/1,0,0,0 | -1.29 | 3.00<br>(0.20) | Very soft dark brown slightly sandy gravelly fibrous PEAT with many wood pieces and rootlets. Gravel is angular to subangular, fine to coarse. Sand is fine to coarse. | | ▼2 ▽2 |
| | | | | Water strike(2) at 3.20m, rose to 3.00m in 20 mins, sealed at 3.50m. | -1.49 | 3.20<br>(0.30) | | | |
| | | | | | -1.79 | 3.50<br>(0.40) | Very loose grey slightly sandy subangular to subrounded fine to coarse GRAVEL. Sand is fine to coarse | | |
| 4.00-4.45<br>4.00 | SPT(C) N=1<br>B | | | 1,0/1,0,0,0 | -2.19 | 3.90 | Very soft grey slightly sandy slightly gravelly SILT with rootlets. Gravel is angular to subangular, fine to coarse. Sand is fine to coarse | | |
| | | | | | | | Very soft dark grey slightly sandy slightly peaty SILT with some rootlets. Sand is fine to coarse. Peat is fibrous. | | |
| 5.00-5.45<br>5.00 | SPT(C) N=1<br>B | | | 1,0/1,0,0,0 | | (2.20) | | | |
| 6.00 | B | | | Water strike(3) at 6.00m, rose to 2.00m in 20 mins. | -4.39 | 6.10 | | | ▽3 |
| 6.00-6.45 | SPT(C) N=43 | | | 2,6/10,10,11,12 | | (0.90) | Dense grey slightly sandy slightly gravelly angular to subangular COBBLES. Gravel is angular to subangular, fine to coarse. Sand is medium to coarse. | | |
| 7.00-7.00<br>7.00 | SPT(C) 25*/0<br>50/0<br>B | | | 25/50 | -5.29 | 7.00 | Complete at 7.00m | | |

**Remarks**
Borehole terminated at 7.00m BGL due to obstruction.
UT100 at 2.5m - 100% recovery
150mm wavin installed from 7.00m BGL to GL for possible rotary follow-on.
Chiselling from 7.00m to 7.00m for 1 hour.

| Scale (approx) | Logged By |
|---|---|
| 1:50 | D. Potter |

**Figure No.** 9230-11-19.BH13

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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Borehole Number** BH14 |
| **Machine :** Dando 2000 & Comacchio GEO305<br>**Method :** Cable Percussion | **Casing Diameter** 200mm cased to 7.00m<br>68mm cased to 29.60m | **Ground Level (mOD)** 1.96 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722712.6 E 674860.4 N | **Dates** 10/01/2020-11/02/2020 | **Project Contractor** GII | **Sheet** 1/3 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water | Instr |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Water strike(1) at 0.40m, no rise after 20 mins. | | (0.90) | MADE GROUND: Grey angular fine to coarse Gravel with occasional angular cobbles. | | ▼1 | |
| | | | | | 1.06 | 0.90 | NO RECOVERY. Driller's Notes; Pushing large piece of wood from 0.90m to 4.20m. | | | |
| | | | | | | (3.30) | | | | |
| | | | | | -2.24 | 4.20 | Grey slightly sandy SILT. Sand is fine to medium. | | | |
| | | | | | | (0.30) | | | | |
| | | | | | -2.54 | 4.50 | NO RECOVERY. Driller's Notes; Pushing large obstruction from 4.50m to 7.00m. | | | |
| | | | | | | (2.50) | | | | |
| | TCR / SCR / RQD / FI | | | | | | | | | |
| 7.00 | | | | | -5.04 | 7.00 | Stiff brown slightly sandy gravelly CLAY with occasional boulders. Gravel is subangular to subrounded, fine to coarse. Driller notes sandy gravelly CLAY | | | |
| | | | | | | (1.20) | | | | |
| 8.20-8.65 | 7 / 0 / 0 / NI | | | 12,11/13,10,15,12 SPT(C) N=50 | -6.24 | 8.20 | Recovery consists of: Grey slightly sandy subangular coarse GRAVEL with many subangular cobbles. Driller notes BOULDERS. Dense. | | | |
| 9.60-10.05 | | | | 15,18/1,2,12,18 SPT(C) N=33 | | | | | | |
| 9.70 | | | | | | (3.00) | | | | |

**Remarks**
Borehole terminated at 7.00m BGL due to obstruction.
Rotary follow on from 7.00m BGL
Complete at 29.60m BGL
50mm Standpipe installed in borehole upon completion, slotted from 10.0m BGL to 2.0m BGL, plain from 2.0m BGL to ground level, with bentonite seal and raised cover
Chiselling from 6.30m to 6.30m for 1.5 hours.

| Scale (approx) | Logged By |
|---|---|
| 1:50 | D. Potter |

**Figure No.** 9230-11-19.BH14

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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Borehole Number** BH14 |
| **Machine :** Dando 2000 & Comacchio GEO305<br>**Flush :** water<br>**Core Dia :** 68 mm<br>**Method :** Cable Percussion | **Casing Diameter** 200mm cased to 7.00m<br>68mm cased to 29.60m | **Ground Level (mOD)** 1.96 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722712.6 E 674860.4 N | **Dates** 10/01/2020-11/02/2020 | **Project Contractor** GII | **Sheet** 2/3 |

| Depth (m) | TCR | SCR | RQD | FI | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water | Instr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 10 | 0 | 0 | NI | | | | | | | |
| 11.20-11.65 | | | | | 10,7/8,7,7,9 SPT(C) N=31 | -9.24 | 11.20 | | | | |
| 11.20 | 73 | 0 | 0 | NI | | | (2.10) | Recovery consists of:Brown gravelly fine to coarse SAND with occasional cobbles. Gravel is fine to coarse, subangular to subrounded. Driller notes gravelly SAND with boulders. Dense. | | | |
| 12.70-13.15 | | | | | 15,6/6,8,12,1 SPT(C) N=27 | | | | | | |
| 12.70 | 100 | 0 | 0 | NI | | -11.34 | 13.30 | | | | |
| | | | | | | | (0.30) | Medium dense grey subrounded coarse GRAVEL with occasional cobbles. Driller notes boulders. | | | |
| 13.60 | | | | | | -11.64 | 13.60 | | | | |
| | 12 | 0 | 0 | NI | | | | Recovery consists of: Brown gravelly fine to coarse SAND with some cobbles. Gravel is fine to coarse, subangular to subrounded. Driller notes gravelly SAND. Dense. | | | |
| 16.60-17.05 | | | | | 2,3/3,4,5,6 SPT(C) N=18 | | | | | | |
| 16.60 | 4 | 0 | 0 | NI | | | (11.00) | | | | |

**Remarks**

| Scale (approx) | Logged By |
|---|---|
| 1:50 | D. Potter |

**Figure No.** 9230-11-19.BH14

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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Borehole Number** BH14 |
| **Machine :** Dando 2000 & Comacchio GEO305<br>**Flush :** water<br>**Core Dia :** 68 mm<br>**Method :** Cable Percussion | **Casing Diameter** 200mm cased to 7.00m 68mm cased to 29.60m | **Ground Level (mOD)** 1.96 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722712.6 E 674860.4 N | **Dates** 10/01/2020-11/02/2020 | **Project Contractor** GII | **Sheet** 3/3 |

| Depth (m) | TCR | SCR | RQD | FI | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water | Instr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1,5/3,4,6,7 | | | | | | |
| 20.20-20.65 | | | | | SPT(C) N=20 | | | | | | |
| 20.20 | 9 | 0 | 0 | NI | | | | | | | |
| 21.80-22.25 | | | | | 5,3/3,3,5,6 SPT(C) N=17 | | | | | | |
| 21.80 | 4 | 0 | 0 | NI | | | | | | | |
| 24.60 | 100 | 77 | 9 | NI | | -22.64 | 24.60 | Weak to medium strong fine grained thinly laminated grey SLATE with occasional quartzite veins, interbed with medium strong fine grained thinly laminated light grey SANDSTONE, partially to distinctly weathered.<br>24.60-29.60m BGL: F1: Very close to close, 40-60 degree, planar smooth with clay staining. F2: Very close yto medium spaced, 20-30 degree, undulating rough with clay staining. | | | |
| 25.70 | 100 | 50 | 25 | | | | | | | | |
| 26.40 | | | | 9 | | | (4.10) | 26.40-26.70m BGL: Non Intact | | | |
| 26.70 | 100 | 38 | 25 | 9 | | | | | | | |
| 27.50 | | | | NI | | | | 27.50-27.60m BGL: Non Intact | | | |
| 27.60 | | | | | | | | | | | |
| 27.90 | 100 | 71 | 42 | 9 | | -26.74 | 28.70 | Medium strong fine grained light grey SANDSTONE with occasional quartzite veins. | | | |
| 29.10 | 100 | 100 | 60 | | | | (0.90) | | | | |
| 29.60 | | | | | | -27.64 | 29.60 | Complete at 29.60m | | | |

**Remarks**

| Scale (approx) | Logged By |
|---|---|
| 1:50 | D. Potter |

**Figure No.** 9230-11-19.BH14

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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Borehole Number** BH14A |
| **Machine :** Dando 2000<br>**Method :** Cable Percussion | **Casing Diameter** 200mm cased to 8.50m | **Ground Level (mOD)** 1.91 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** (dGPS) 722714.3 E 674858.3 N | **Dates** 13/01/2020 | **Project Contractor** GII | **Sheet** 1/1 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | (0.70) | MADE GROUND: Grey angular fine to coarse Gravel with occasional angular cobbles. | | ▼1 ▽1 |
| | | | | Water strike(1) at 0.70m, rose to 0.40m in 20 mins. | 1.21 | 0.70 | NO RECOVERY. Driller's Notes; Pushing large piece of wood from 0.70m to 4.50m. | | |
| | | | | | | (3.80) | | | |
| | | | | | -2.59 | 4.50 | Grey slightly sandy gravelly SILT. Gravel is angular to subangular, fine to medium. Sand is fine to coarse | | |
| | | | | | | (0.50) | | | |
| 5.00 | B | | | | -3.09 | 5.00 | Soft black slightly sandy slightly silty fibrous PEAT with wood and rootlets. Sand is fine to coarse | | |
| | | | | | | (0.30) | | | |
| 5.50-6.00 | UT Failed | | | | -3.39 | 5.30 | Soft dark brown mottled grey slightly sandy peaty SILT with rootlets and wood pieces. Sand is fine to coarse. Peat is fibrous. | | |
| | | | | | | (1.20) | | | |
| 6.00-6.45<br>6.00 | SPT(C) N=5<br>B | | | 1,0/1,1,1,2 | | | | | |
| | | | | | -4.59 | 6.50 | Dense grey slightly sandy slightly gravelly subangular to subrounded COBBLES. Gravel is angular to subangular, fine to coarse. Sand is medium to coarse. | | |
| 7.00-7.40<br>7.00 | SPT(C) 50/245<br>B | | | 9,11/17,12,21 | | | | | |
| | | | | | | (2.00) | | | |
| 8.00-8.35<br>8.00 | SPT(C) 50/195<br>B | | | 14,19/31,19 | | | | | |
| | | | | | -6.59 | 8.50 | Complete at 8.50m | | |

**Remarks**
Borehole terminated at 8.50m BGL due to obstruction.
UT100 failed at 5.5m
150mm wavin installed from 7.50m BGL to GL for possible rotary follow-on.
Chiselling from 6.50m to 8.50m for 2.5 hours. Chiselling from 8.50m to 8.50m for 1 hour.

| Scale (approx) | Logged By |
|---|---|
| 1:50 | D. Potter |

**Figure No.** 9230-11-19.BH14A

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| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Borehole Number** BH15 |
| **Machine :** Dando 2000<br>**Method :** Cable Percussion | **Casing Diameter** 200mm cased to 13.20m | **Ground Level (mOD)** 1.90 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722777.7 E 674859.8 N | **Dates** 11/12/2019-16/12/2019 | **Project Contractor** GII | **Sheet** 1/2 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | MADE GROUND: Greyish brown slightly sandy gravelly Clay. Gravel is angular to subangular, fine to coarse. Sand is fine to coarse. | | ▽1 |
| 0.50 | B | | | Water strike(1) at 0.20m, rose to 0.00m in 20 mins. | | (1.20) | | | |
| 1.00-1.45<br>1.00 | SPT(C) N=2<br>B | | | 1,0/0,0,1,1 | 0.70 | 1.20 | Very soft grey slightly sandy SILT. Gravel is angular to subangular, fine to coarse. Sand is fine to medium. | | |
| 2.00-2.45<br>2.00 | SPT(C) N=2<br>B | | | 0,1/1,0,0,1 | | (2.70) | | | |
| 3.00<br>3.00 | B<br>UT Failed | | | | | | | | |
| 4.00-4.45<br>4.00 | SPT(C) N=1<br>B | | | 0,1/0,0,0,1 | -2.00 | 3.90 | Very soft dark grey mottled reddish brown slightly sandy slightly gravelly slightly peaty SILT with rootlets. Gravel is angular to subangular, fine to coarse. Sand is fine to medium. Peat is fibrous. | | |
| 5.00<br>5.00 | B<br>UT Failed | | | | | (1.70) | | | ▼2 |
| 6.00-6.45<br>6.00 | SPT(C) N=5<br>B | | | 1,2/1,2,1,1 | -3.70 | 5.60 | Soft grey slightly sandy SILT. Sand is fine to medium. | | |
| | | | | Water strike(2) at 6.30m, rose to 5.10m in 20 mins. | | (0.80) | | | ▽2 |
| 7.00-7.45<br>7.00 | SPT(C) N=16<br>B | | | 2,3/4,5,4,3 | -4.50 | 6.40 | Medium dense grey slightly sandy subangular to subrounded GRAVEL with occasional subangular cobbles. Sand is medium to coarse. | | |
| 8.00-8.45<br>8.00 | SPT(C) N=17<br>B | | | 3,2/3,4,5,5 | | (2.60) | | | |
| 9.00-9.45<br>9.00 | SPT(C) N=13<br>B | | | 4,4/2,2,4,5 | -7.10 | 9.00 | Stiff dark reddish brown slightly sandy SILT. Sand is fine to medium. | | |
| 10.00-10.45 | SPT(C) N=27 | | | 3,5/5,7,8,7 | | | | | |

**Remarks**
Borehole terminated at 13.20m BGL due to obstruction.
UT100 Failed at 3.0m and 5.0m
Borehole backfilled upon completion.

| Scale (approx) | Logged By |
|---|---|
| 1:50 | D. Potter |

**Figure No.** 9230-11-19.BH15

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www.gii.ie

| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Borehole Number** BH15 |
| **Machine :** Dando 2000<br>**Method :** Cable Percussion | **Casing Diameter** 200mm cased to 13.20m | **Ground Level (mOD)** 1.90 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722777.7 E 674859.8 N | **Dates** 11/12/2019-16/12/2019 | **Project Contractor** GII | **Sheet** 2/2 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|---|
| 10.00 | B | | | | | (2.60) | | | |
| 11.00-11.45<br>11.00 | SPT(C) N=33<br>B | | | 4,6/7,8,8,10 | | | | | |
| | | | | | -9.70 | 11.60 | Dense grey sandy subangular to rounded GRAVEL with occasional subangular to subrounded cobbles. Sand is medium to coarse. | | |
| 12.00-12.45<br>12.00 | SPT(C) N=25<br>B | | | 5,11/5,8,5,7 | | (1.60) | | | |
| 13.00-13.00<br>13.00 | SPT(C) 25*/0 50/0<br>B | | | 25/50 | -11.30 | 13.20 | Complete at 13.20m | | |

**Remarks**
UT100 Failed at 3.0m and 5.0m
Chiselling from 11.50m to 12.00m for 0.5 hours. Chiselling from 13.00m to 13.20m for 1 hour.

| Scale (approx) | Logged By |
|---|---|
| 1:50 | D. Potter |

**Figure No.** 9230-11-19.BH15

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| Site | Borehole Number |
|---|---|
| Avoca River Park, Arklow | BH16 |

| Machine : Dando 2000<br>Method : Cable Percussion | Casing Diameter<br>200mm cased to 12.00m | Ground Level (mOD)<br>1.79 | Client<br>FT Squared | Job Number<br>9230-11-19 |
|---|---|---|---|---|
| | Location<br>722821.5 E 674794.3 N | Dates<br>17/12/2019-20/12/2019 | Project Contractor<br>GII | Sheet<br>1/2 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | (0.80) | MADE GROUND: Grey sandy angular to subangular fine to coarse Gravel. Sand is medium to coarse. | | |
| 0.50 | B | | | | 0.99 | 0.80 | | | |
| 1.00-1.45<br>1.00 | SPT(C) N=2<br>B | | | 1,0/0,0,1,1 | | (0.80) | Very soft light greyish brown slightly sandy slightly gravelly CLAY. | | |
| | | | | | 0.19 | 1.60 | | | |
| | | | | | | (0.40) | Very soft grey slightly sandy SILT. Sand is fine to coarse. | | |
| 2.00<br>2.00-3.00 | B<br>UT | | | | -0.21 | 2.00 | Very soft dark grey mottled dark reddish brown slightly sandy SILT with occasional rootlets. Sand is fine to medium. | | ▼1 |
| 3.00 | B | | | Water strike(1) at 3.00m, rose to 2.30m in 20 mins. | | (2.00) | | | ▽1 |
| 3.00-3.45 | SPT(C) N=1 | | | 1,0/0,0,1,0 | | | | | |
| 4.00-4.45<br>4.00 | SPT(C) N=3<br>B | | | 1,1/0,1,1,1 | -2.21 | 4.00 | Very soft grey slightly sandy SILT. Sand is fine to medium. | | |
| | | | | | | (1.00) | | | |
| 5.00-5.45<br>5.00 | SPT(C) N=3<br>B | | | 1,2/1,0,1,1 | -3.21 | 5.00 | Soft dark grey mottled dark brown slightly sandy peaty SILT with rootlets and wood pieces. Sand is fine to medium. Peat is fibrous. | | |
| | | | | | | (1.10) | | | |
| 6.00-6.45<br>6.00 | SPT(C) N=4<br>B | | | 1,1/1,1,1,1 | -4.31 | 6.10 | Soft grey slightly sandy SILT. Sand is fine to medium. | | |
| | | | | | | (1.40) | | | |
| 7.00-7.45<br>7.00 | SPT(C) N=5<br>B | | | 1,2/1,2,1,1 | | | | | |
| | | | | | -5.71 | 7.50 | Medium dense grey slightly sandy subangular to subrounded fine to coarse GRAVEL of varied lithologies. Sand is medium to coarse. | | |
| 8.00-8.45<br>8.00 | SPT(C) N=26<br>B | | | 3,5/7,5,7,7 | | | | | |
| | | | | | | (1.70) | | | |
| 9.00-9.45<br>9.00 | SPT(C) N=20<br>B | | | 3,5/4,5,5,6 | -7.41 | 9.20 | Stiff dark reddish brown slightly sandy slightly gravelly SILT. Gravel is angular to subangular, fine to coarse. Sand is fine to medium. | | |
| 10.00-10.45 | SPT(C) N=24 | | | 4,5/6,5,7,6 | | | | | |

**Remarks**
Borehole terminated at 12.00m BGL due to obstruction.
Borehole backfilled upon completion.

| Scale (approx) | Logged By |
|---|---|
| 1:50 | D. Potter |

**Figure No.**
9230-11-19.BH16

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# Ground Investigations Ireland Ltd
www.gii.ie

| | | | |
|---|---|---|---|
| **Site** Avoca River Park, Arklow | | | **Borehole Number** BH16 |
| **Machine :** Dando 2000<br>**Method :** Cable Percussion | **Casing Diameter** 200mm cased to 12.00m | **Ground Level (mOD)** 1.79 | **Client** FT Squared | **Job Number** 9230-11-19 |
| | **Location** 722821.5 E 674794.3 N | **Dates** 17/12/2019-20/12/2019 | **Project Contractor** GII | **Sheet** 2/2 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|---|
| 10.00 | B | | | | | (1.60) | | | |
| | | | | | -9.01 | 10.80 | Dense grey slightly silty gravelly fine to coarse SAND. Gravel is subangular to subrounded, fine to coarse. | | |
| 11.00-11.45<br>11.00 | SPT(C) N=26<br>B | | | 5,3/6,6,7,7 | | (1.20) | | | |
| 12.00-12.00<br>12.00 | SPT(C) 25*/0 50/0<br>B | | | 25/50 | -10.21 | 12.00 | Complete at 12.00m | | |

**Remarks**
Chiselling from 12.00m to 12.00m for 1 hour.

| Scale (approx) | Logged By |
|---|---|
| 1:50 | D. Potter |

**Figure No.** 9230-11-19.BH16

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# **APPENDIX 9** – Laboratory Testing

Element Materials Technology
Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

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W: www.element.com

Ground Investigations Ireland
Catherinestown House
Hazelhatch Road
Newcastle
Co. Dublin
Ireland

| | |
|---|---|
| **Attention :** | Emer O'Connor |
| **Date :** | 28th January, 2020 |
| **Your reference :** | 19/11/9230 |
| **Our reference :** | Test Report 19/20618 Batch 1 |
| **Location :** | Avoca River Park |
| **Date samples received :** | 16th December, 2019 |
| **Status :** | Final report |
| **Issue :** | 2 |

Sixty nine samples were received for analysis on 16th December, 2019 of which forty five were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

**Authorised By:**

**Phil Sommerton BSc**
**Senior Project Manager**

Please include all sections of this report if it is reproduced

**Client Name:** Ground Investigations Ireland
**Reference:** 19/11/9230
**Location:** Avoca River Park
**Contact:** Emer O'Connor
**EMT Job No:** 19/20618

**Report : Solid**

**Solids:** V=60g VOC jar, J=250g glass jar, T=plastic tub

| EMT Sample No. | 4-6 | 7-9 | 13-15 | 16-18 | 19-21 | 34-36 | 40-42 | 46-48 | 52-54 | 55-57 | LOD/LOR | Units | Method No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | TP01 | TP02 | TP02 | TP03 | TP03 | TP05 | TP06 | TP07 | TP08 | TP08 | | | |
| Depth | 1.80 | 0.50 | 2.50 | 0.50 | 1.50 | 1.20 | 1.50 | 1.50 | 1.50 | 2.50 | | | |
| COC No / misc | | | | | | | | | | | | | |
| Containers | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | | | |
| Sample Date | 04/12/2019 | 05/12/2019 | 05/12/2019 | 04/12/2019 | 04/12/2019 | 04/12/2019 | 06/12/2019 | 06/12/2019 | 05/12/2019 | 05/12/2019 | | | |
| Sample Type | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | | | |
| Batch Number | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | |
| Date of Receipt | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | | | |
| Antimony | - | 1 | - | 2 | - | 2 | 2 | - | 104$_{AC}$ | 2 | <1 | mg/kg | TM30/PM15 |
| Arsenic # | - | 4.5 | - | 19.6 | - | 54.5 | 58.0 | - | 1658.0$_{AE}$ | 61.5 | <0.5 | mg/kg | TM30/PM15 |
| Barium # | - | 114 | - | 42 | - | 50 | 55 | - | 50 | 67 | <1 | mg/kg | TM30/PM15 |
| Cadmium # | - | 1.0 | - | <0.1 | - | <0.1 | 4.8 | - | 11.3 | 0.9 | <0.1 | mg/kg | TM30/PM15 |
| Chromium # | - | 86.1 | - | 41.0 | - | 46.8 | 35.8 | - | <0.5 | 34.8 | <0.5 | mg/kg | TM30/PM15 |
| Copper # | - | 47 | - | 49 | - | 34 | 1508$_{AE}$ | - | 4010$_{AF}$ | 236 | <1 | mg/kg | TM30/PM15 |
| Lead # | - | 41 | - | 24 | - | 51 | 74 | - | 1617 | 45 | <5 | mg/kg | TM30/PM15 |
| Mercury # | - | <0.1 | - | <0.1 | - | <0.1 | <0.1 | - | <0.1 | <0.1 | <0.1 | mg/kg | TM30/PM15 |
| Molybdenum # | - | 3.0 | - | 0.1 | - | 0.9 | 1.0 | - | 83.9$_{AC}$ | 0.4 | <0.1 | mg/kg | TM30/PM15 |
| Nickel # | - | 2.0 | - | 41.3 | - | 21.9 | 21.8 | - | <0.7 | 17.5 | <0.7 | mg/kg | TM30/PM15 |
| Selenium # | - | 2 | - | 1 | - | 3 | 3 | - | <1 | 5 | <1 | mg/kg | TM30/PM15 |
| Zinc # | - | 6 | - | 125 | - | 114 | 1141 | - | 4572$_{AC}$ | 892 | <5 | mg/kg | TM30/PM15 |
| Antimony | - | - | - | - | - | - | - | - | - | - | <1 | mg/kg | TM30/PM62 |
| Arsenic | - | - | - | - | - | - | - | - | - | - | <0.5 | mg/kg | TM30/PM62 |
| Barium | - | - | - | - | - | - | - | - | - | - | <1 | mg/kg | TM30/PM62 |
| Cadmium | - | - | - | - | - | - | - | - | - | - | <0.1 | mg/kg | TM30/PM62 |
| Chromium | - | - | - | - | - | - | - | - | - | - | <0.5 | mg/kg | TM30/PM62 |
| Copper | - | - | - | - | - | - | - | - | - | - | <1 | mg/kg | TM30/PM62 |
| Lead | - | - | - | - | - | - | - | - | - | - | <5 | mg/kg | TM30/PM62 |
| Mercury | - | - | - | - | - | - | - | - | - | - | <0.1 | mg/kg | TM30/PM62 |
| Molybdenum | - | - | - | - | - | - | - | - | - | - | <0.1 | mg/kg | TM30/PM62 |
| Nickel | - | - | - | - | - | - | - | - | - | - | <0.7 | mg/kg | TM30/PM62 |
| Selenium | - | - | - | - | - | - | - | - | - | - | <1 | mg/kg | TM30/PM62 |
| Zinc | - | - | - | - | - | - | - | - | - | - | <5 | mg/kg | TM30/PM62 |

Please see attached notes for all abbreviations and acronyms

**Client Name:** Ground Investigations Ireland
**Reference:** 19/11/9230
**Location:** Avoca River Park
**Contact:** Emer O'Connor
**EMT Job No:** 19/20618

**Report : Solid**

**Solids:** V=60g VOC jar, J=250g glass jar, T=plastic tub

| EMT Sample No. | 4-6 | 7-9 | 13-15 | 16-18 | 19-21 | 34-36 | 40-42 | 46-48 | 52-54 | 55-57 | LOD/LOR | Units | Method No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | TP01 | TP02 | TP02 | TP03 | TP03 | TP05 | TP06 | TP07 | TP08 | TP08 | | | |
| Depth | 1.80 | 0.50 | 2.50 | 0.50 | 1.50 | 1.20 | 1.50 | 1.50 | 1.50 | 2.50 | | | |
| COC No / misc | | | | | | | | | | | | | |
| Containers | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | | | |
| Sample Date | 04/12/2019 | 05/12/2019 | 05/12/2019 | 04/12/2019 | 04/12/2019 | 04/12/2019 | 06/12/2019 | 06/12/2019 | 05/12/2019 | 05/12/2019 | | | |
| Sample Type | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | | | |
| Batch Number | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | |
| Date of Receipt | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | | | |
| PAH MS | | | | | | | | | | | | | |
| Naphthalene # | - | <0.04 | - | <0.04 | - | <0.04 | <0.04 | - | <0.04 | <0.04 | <0.04 | mg/kg | TM4/PM8 |
| Acenaphthylene | - | <0.03 | - | <0.03 | - | <0.03 | <0.03 | - | <0.03 | <0.03 | <0.03 | mg/kg | TM4/PM8 |
| Acenaphthene # | - | <0.05 | - | <0.05 | - | <0.05 | <0.05 | - | <0.05 | <0.05 | <0.05 | mg/kg | TM4/PM8 |
| Fluorene # | - | <0.04 | - | <0.04 | - | <0.04 | <0.04 | - | <0.04 | <0.04 | <0.04 | mg/kg | TM4/PM8 |
| Phenanthrene # | - | <0.03 | - | <0.03 | - | <0.03 | <0.03 | - | <0.03 | <0.03 | <0.03 | mg/kg | TM4/PM8 |
| Anthracene # | - | <0.04 | - | <0.04 | - | <0.04 | <0.04 | - | <0.04 | <0.04 | <0.04 | mg/kg | TM4/PM8 |
| Fluoranthene # | - | <0.03 | - | <0.03 | - | <0.03 | <0.03 | - | <0.03 | <0.03 | <0.03 | mg/kg | TM4/PM8 |
| Pyrene # | - | <0.03 | - | <0.03 | - | <0.03 | <0.03 | - | <0.03 | <0.03 | <0.03 | mg/kg | TM4/PM8 |
| Benzo(a)anthracene # | - | <0.06 | - | <0.06 | - | <0.06 | <0.06 | - | <0.06 | <0.06 | <0.06 | mg/kg | TM4/PM8 |
| Chrysene # | - | <0.02 | - | <0.02 | - | <0.02 | <0.02 | - | <0.02 | <0.02 | <0.02 | mg/kg | TM4/PM8 |
| Benzo(bk)fluoranthene # | - | <0.07 | - | <0.07 | - | <0.07 | <0.07 | - | <0.07 | <0.07 | <0.07 | mg/kg | TM4/PM8 |
| Benzo(a)pyrene # | - | <0.04 | - | <0.04 | - | <0.04 | <0.04 | - | <0.04 | <0.04 | <0.04 | mg/kg | TM4/PM8 |
| Indeno(123cd)pyrene | - | <0.04 | - | <0.04 | - | <0.04 | <0.04 | - | <0.04 | <0.04 | <0.04 | mg/kg | TM4/PM8 |
| Dibenzo(ah)anthracene # | - | <0.04 | - | <0.04 | - | <0.04 | <0.04 | - | <0.04 | <0.04 | <0.04 | mg/kg | TM4/PM8 |
| Benzo(ghi)perylene # | - | <0.04 | - | <0.04 | - | <0.04 | <0.04 | - | <0.04 | <0.04 | <0.04 | mg/kg | TM4/PM8 |
| Coronene | - | <0.04 | - | <0.04 | - | <0.04 | <0.04 | - | <0.04 | <0.04 | <0.04 | mg/kg | TM4/PM8 |
| PAH 6 Total # | - | <0.22 | - | <0.22 | - | <0.22 | <0.22 | - | <0.22 | <0.22 | <0.22 | mg/kg | TM4/PM8 |
| PAH 17 Total | - | <0.64 | - | <0.64 | - | <0.64 | <0.64 | - | <0.64 | <0.64 | <0.64 | mg/kg | TM4/PM8 |
| Benzo(b)fluoranthene | - | <0.05 | - | <0.05 | - | <0.05 | <0.05 | - | <0.05 | <0.05 | <0.05 | mg/kg | TM4/PM8 |
| Benzo(k)fluoranthene | - | <0.02 | - | <0.02 | - | <0.02 | <0.02 | - | <0.02 | <0.02 | <0.02 | mg/kg | TM4/PM8 |
| Benzo(j)fluoranthene | - | <1 | - | <1 | - | <1 | <1 | - | <1 | <1 | <1 | mg/kg | TM4/PM8 |
| PAH Surrogate % Recovery | - | 93 | - | 92 | - | 88 | 95 | - | 92 | 77 | <0 | % | TM4/PM8 |
| Mineral Oil (C10-C40) | - | 136 | - | <30 | - | <30 | <30 | - | <30 | <30 | <30 | mg/kg | TM5/PM8/PM16 |
| TPH CWG | | | | | | | | | | | | | |
| **Aliphatics** | | | | | | | | | | | | | |
| >C5-C6 # | - | <0.1 | - | <0.1 | - | <0.1 | <0.1 | - | <0.1 | <0.1 | <0.1 | mg/kg | TM36/PM12 |
| >C6-C8 # | - | <0.1 | - | <0.1 | - | <0.1 | <0.1 | - | <0.1 | <0.1 | <0.1 | mg/kg | TM36/PM12 |
| >C8-C10 | - | <0.1 | - | <0.1 | - | <0.1 | <0.1 | - | <0.1 | <0.1 | <0.1 | mg/kg | TM36/PM12 |
| >C10-C12 # | - | <0.2 | - | <0.2 | - | <0.2 | <0.2 | - | <0.2 | <0.2 | <0.2 | mg/kg | TM5/PM8/PM16 |
| >C12-C16 # | - | 9 | - | <4 | - | <4 | <4 | - | <4 | <4 | <4 | mg/kg | TM5/PM8/PM16 |
| >C16-C21 # | - | 23 | - | <7 | - | <7 | <7 | - | <7 | <7 | <7 | mg/kg | TM5/PM8/PM16 |
| >C21-C35 # | - | 86 | - | 22 | - | <7 | <7 | - | <7 | <7 | <7 | mg/kg | TM5/PM8/PM16 |
| >C35-C40 | - | 18 | - | <7 | - | <7 | <7 | - | <7 | <7 | <7 | mg/kg | TM5/PM8/PM16 |
| Total aliphatics C5-40 | - | 136 | - | <26 | - | <26 | <26 | - | <26 | <26 | <26 | mg/kg | TM5/TM36/PM8/PM12/PM16 |
| >C6-C10 | - | <0.1 | - | <0.1 | - | <0.1 | <0.1 | - | <0.1 | <0.1 | <0.1 | mg/kg | TM36/PM12 |
| >C10-C25 | - | 54 | - | <10 | - | <10 | <10 | - | <10 | <10 | <10 | mg/kg | TM5/PM8/PM16 |
| >C25-C35 | - | 63 | - | 24 | - | <10 | <10 | - | <10 | <10 | <10 | mg/kg | TM5/PM8/PM16 |

Please see attached notes for all abbreviations and acronyms

## Element Materials Technology

**Client Name:** Ground Investigations Ireland
**Reference:** 19/11/9230
**Location:** Avoca River Park
**Contact:** Emer O'Connor
**EMT Job No:** 19/20618

**Report : Solid**

**Solids:** V=60g VOC jar, J=250g glass jar, T=plastic tub

| EMT Sample No. | 4-6 | 7-9 | 13-15 | 16-18 | 19-21 | 34-36 | 40-42 | 46-48 | 52-54 | 55-57 | LOD/LOR | Units | Method No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | TP01 | TP02 | TP02 | TP03 | TP03 | TP05 | TP06 | TP07 | TP08 | TP08 | | | |
| Depth | 1.80 | 0.50 | 2.50 | 0.50 | 1.50 | 1.20 | 1.50 | 1.50 | 1.50 | 2.50 | | | |
| COC No / misc | | | | | | | | | | | | | |
| Containers | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | | | |
| Sample Date | 04/12/2019 | 05/12/2019 | 05/12/2019 | 04/12/2019 | 04/12/2019 | 04/12/2019 | 06/12/2019 | 06/12/2019 | 05/12/2019 | 05/12/2019 | | | |
| Sample Type | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | | | |
| Batch Number | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | |
| Date of Receipt | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | | | |
| TPH CWG | | | | | | | | | | | | | |
| **Aromatics** | | | | | | | | | | | | | |
| >C5-EC7 # | - | <0.1 | - | <0.1 | - | <0.1 | <0.1 | - | <0.1 | <0.1 | <0.1 | mg/kg | TM36/PM12 |
| >EC7-EC8 # | - | <0.1 | - | <0.1 | - | <0.1 | <0.1 | - | <0.1 | <0.1 | <0.1 | mg/kg | TM36/PM12 |
| >EC8-EC10 # | - | <0.1 | - | <0.1 | - | <0.1 | <0.1 | - | <0.1 | <0.1 | <0.1 | mg/kg | TM36/PM12 |
| >EC10-EC12 # | - | <0.2 | - | <0.2 | - | <0.2 | <0.2 | - | <0.2 | <0.2 | <0.2 | mg/kg | TM5/PM8/PM16 |
| >EC12-EC16 # | - | <4 | - | <4 | - | <4 | <4 | - | <4 | <4 | <4 | mg/kg | TM5/PM8/PM16 |
| >EC16-EC21 # | - | <7 | - | <7 | - | <7 | <7 | - | <7 | <7 | <7 | mg/kg | TM5/PM8/PM16 |
| >EC21-EC35 # | - | 50 | - | 31 | - | <7 | <7 | - | <7 | <7 | <7 | mg/kg | TM5/PM8/PM16 |
| >EC35-EC40 | - | 15 | - | 32 | - | <7 | <7 | - | <7 | <7 | <7 | mg/kg | TM5/PM8/PM16 |
| Total aromatics C5-40 | - | 65 | - | 63 | - | <26 | <26 | - | <26 | <26 | <26 | mg/kg | TM5/TM36/PM8/PM12/PM16 |
| Total aliphatics and aromatics(C5-40) | - | 201 | - | 63 | - | <52 | <52 | - | <52 | <52 | <52 | mg/kg | TM5/TM36/PM8/PM12/PM16 |
| >EC6-EC10 # | - | <0.1 | - | <0.1 | - | <0.1 | <0.1 | - | <0.1 | <0.1 | <0.1 | mg/kg | TM36/PM12 |
| >EC10-EC25 | - | <10 | - | <10 | - | <10 | <10 | - | <10 | <10 | <10 | mg/kg | TM5/PM8/PM16 |
| >EC25-EC35 | - | 53 | - | 31 | - | <10 | <10 | - | <10 | <10 | <10 | mg/kg | TM5/PM8/PM16 |
| MTBE # | - | <5 | - | <5 | - | <5 | <5 | - | <5 | <5 | <5 | ug/kg | TM31/PM12 |
| Benzene # | - | <5 | - | <5 | - | <5 | <5 | - | <5 | <5 | <5 | ug/kg | TM31/PM12 |
| Toluene # | - | <5 | - | <5 | - | <5 | <5 | - | <5 | <5 | <5 | ug/kg | TM31/PM12 |
| Ethylbenzene # | - | <5 | - | <5 | - | <5 | <5 | - | <5 | <5 | <5 | ug/kg | TM31/PM12 |
| m/p-Xylene # | - | <5 | - | <5 | - | <5 | <5 | - | <5 | <5 | <5 | ug/kg | TM31/PM12 |
| o-Xylene # | - | <5 | - | <5 | - | <5 | <5 | - | <5 | <5 | <5 | ug/kg | TM31/PM12 |
| PCB 28 # | - | <5 | - | <5 | - | <5 | <5 | - | <5 | <5 | <5 | ug/kg | TM17/PM8 |
| PCB 52 # | - | <5 | - | <5 | - | <5 | <5 | - | <5 | <5 | <5 | ug/kg | TM17/PM8 |
| PCB 101 # | - | <5 | - | <5 | - | <5 | <5 | - | <5 | <5 | <5 | ug/kg | TM17/PM8 |
| PCB 118 # | - | <5 | - | <5 | - | <5 | <5 | - | <5 | <5 | <5 | ug/kg | TM17/PM8 |
| PCB 138 # | - | <5 | - | <5 | - | <5 | <5 | - | <5 | <5 | <5 | ug/kg | TM17/PM8 |
| PCB 153 # | - | <5 | - | <5 | - | <5 | <5 | - | <5 | <5 | <5 | ug/kg | TM17/PM8 |
| PCB 180 # | - | <5 | - | <5 | - | <5 | <5 | - | <5 | <5 | <5 | ug/kg | TM17/PM8 |
| Total 7 PCBs # | - | <35 | - | <35 | - | <35 | <35 | - | <35 | <35 | <35 | ug/kg | TM17/PM8 |
| Natural Moisture Content | - | 50.7 | - | 9.9 | - | 44.1 | 47.5 | - | 63.1 | 47.2 | <0.1 | % | PM4/PM0 |
| Moisture Content (% Wet Weight) | - | 33.6 | - | 9.0 | - | 30.6 | 32.2 | - | 38.7 | 32.0 | <0.1 | % | PM4/PM0 |
| Hexavalent Chromium # | - | <0.3 | - | <0.3 | - | <0.3 | <0.3 | - | <0.3 | <0.3 | <0.3 | mg/kg | TM38/PM20 |
| Sulphate as SO4 (2:1 Ext) # | 0.0637 | 1.4368 | 0.3995 | - | 0.8708 | - | 0.0390 | 0.5428 | - | - | <0.0015 | g/l | TM38/PM20 |
| Sulphate as SO4 (2:1 Ext) | - | - | - | - | - | - | - | - | - | - | <0.0015 | g/l | TM38/PM60 |
| Chromium III | - | 86.1 | - | 41.0 | - | 46.8 | 35.8 | - | <0.5 | 34.8 | <0.5 | mg/kg | NONE/NONE |
| Chromium III | - | - | - | - | - | - | - | - | - | - | <0.5 | mg/kg | NONE/NONE |
| Total Organic Carbon # | - | 0.40 | - | 0.33 | - | 0.61 | 1.38 | - | 0.38 | 0.28 | <0.02 | % | TM21/PM24 |
| Organic Matter | - | - | 1.9 | - | 6.8 | - | - | - | - | - | <0.2 | % | TM21/PM24 |

Please see attached notes for all abbreviations and acronyms

## Element Materials Technology

**Client Name:** Ground Investigations Ireland
**Reference:** 19/11/9230
**Location:** Avoca River Park
**Contact:** Emer O'Connor
**EMT Job No:** 19/20618

**Report : Solid**

**Solids:** V=60g VOC jar, J=250g glass jar, T=plastic tub

| EMT Sample No. | 4-6 | 7-9 | 13-15 | 16-18 | 19-21 | 34-36 | 40-42 | 46-48 | 52-54 | 55-57 | LOD/LOR | Units | Method No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | TP01 | TP02 | TP02 | TP03 | TP03 | TP05 | TP06 | TP07 | TP08 | TP08 | | | |
| Depth | 1.80 | 0.50 | 2.50 | 0.50 | 1.50 | 1.20 | 1.50 | 1.50 | 1.50 | 2.50 | | | |
| COC No / misc | | | | | | | | | | | | | |
| Containers | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | | | |
| Sample Date | 04/12/2019 | 05/12/2019 | 05/12/2019 | 04/12/2019 | 04/12/2019 | 04/12/2019 | 06/12/2019 | 06/12/2019 | 05/12/2019 | 05/12/2019 | | | |
| Sample Type | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | | | |
| Batch Number | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | |
| Date of Receipt | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | | | |
| pH # | 8.34 | 4.64 | 6.37 | 8.16 | 4.96 | 7.08 | 7.03 | 6.53 | 6.74 | 5.82 | <0.01 | pH units | TM73/PM11 |
| Mass of raw test portion | - | 0.151 | - | 0.1003 | - | 0.1395 | 0.1219 | - | 0.1316 | 0.1232 | | kg | NONE/PM17 |
| Mass of dried test portion | - | 0.09 | - | 0.09 | - | 0.09 | 0.09 | - | 0.09 | 0.09 | | kg | NONE/PM17 |

Please see attached notes for all abbreviations and acronyms

## Element Materials Technology

**Client Name:** Ground Investigations Ireland
**Reference:** 19/11/9230
**Location:** Avoca River Park
**Contact:** Emer O'Connor
**EMT Job No:** 19/20618

**Report : Solid**

**Solids:** V=60g VOC jar, J=250g glass jar, T=plastic tub

| EMT Sample No. | 58-60 | 61-63 | 76-78 | 79-81 | 82-84 | 88-90 | 91-93 | 94-96 | 100-102 | 106-108 | LOD/LOR | Units | Method No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | TP09 | TP09 | TP11 | TP11 | TP11 | TP12 | TP13 | TP13 | TP14 | TP16 | | | |
| Depth | 0.50 | 1.50 | 0.50 | 1.50 | 2.50 | 1.50 | 0.50 | 1.50 | 1.50 | 0.50 | | | |
| COC No / misc | | | | | | | | | | | | | |
| Containers | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | | | |
| Sample Date | 05/12/2019 | 05/12/2019 | 05/12/2019 | 05/12/2019 | 05/12/2019 | 06/12/2019 | 11/12/2019 | 11/12/2019 | 11/12/2019 | 09/12/2019 | | | |
| Sample Type | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | | | |
| Batch Number | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | |
| Date of Receipt | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | | | |
| Antimony | 15 | 3 | 1 | 3 | - | - | 2 | $102_{AC}$ | - | 3 | <1 | mg/kg | TM30/PM15 |
| Arsenic # | $414.2_{AC}$ | 78.4 | 2.6 | 31.6 | - | - | 25.2 | $1603.0_{AE}$ | - | 7.6 | <0.5 | mg/kg | TM30/PM15 |
| Barium # | 32 | 80 | 24 | 49 | - | - | 27 | 20 | - | 23 | <1 | mg/kg | TM30/PM15 |
| Cadmium # | 2.7 | <0.1 | <0.1 | 0.4 | - | - | 0.1 | 4.6 | - | 0.2 | <0.1 | mg/kg | TM30/PM15 |
| Chromium # | 16.2 | 44.3 | 17.5 | 50.6 | - | - | 31.5 | <0.5 | - | 205.3 | <0.5 | mg/kg | TM30/PM15 |
| Copper # | $762_{AC}$ | 172 | 18 | 65 | - | - | 42 | $6327_{AG}$ | - | 56 | <1 | mg/kg | TM30/PM15 |
| Lead # | 532 | 113 | 39 | 63 | - | - | 19 | 1633 | - | 40 | <5 | mg/kg | TM30/PM15 |
| Mercury # | <0.1 | <0.1 | <0.1 | <0.1 | - | - | <0.1 | 0.8 | - | <0.1 | <0.1 | mg/kg | TM30/PM15 |
| Molybdenum # | 15.5 | 0.5 | 0.5 | 0.8 | - | - | 0.4 | $110.8_{AC}$ | - | 1.4 | <0.1 | mg/kg | TM30/PM15 |
| Nickel # | 16.9 | 32.3 | 10.0 | 32.8 | - | - | 29.3 | <0.7 | - | 20.4 | <0.7 | mg/kg | TM30/PM15 |
| Selenium # | 2 | 3 | <1 | 2 | - | - | 1 | <1 | - | 1 | <1 | mg/kg | TM30/PM15 |
| Zinc # | 927 | $4693_{AC}$ | 109 | 191 | - | - | 217 | 1830 | - | 258 | <5 | mg/kg | TM30/PM15 |
| Antimony | - | - | - | - | - | - | - | - | - | - | <1 | mg/kg | TM30/PM62 |
| Arsenic | - | - | - | - | - | - | - | - | - | - | <0.5 | mg/kg | TM30/PM62 |
| Barium | - | - | - | - | - | - | - | - | - | - | <1 | mg/kg | TM30/PM62 |
| Cadmium | - | - | - | - | - | - | - | - | - | - | <0.1 | mg/kg | TM30/PM62 |
| Chromium | - | - | - | - | - | - | - | - | - | - | <0.5 | mg/kg | TM30/PM62 |
| Copper | - | - | - | - | - | - | - | - | - | - | <1 | mg/kg | TM30/PM62 |
| Lead | - | - | - | - | - | - | - | - | - | - | <5 | mg/kg | TM30/PM62 |
| Mercury | - | - | - | - | - | - | - | - | - | - | <0.1 | mg/kg | TM30/PM62 |
| Molybdenum | - | - | - | - | - | - | - | - | - | - | <0.1 | mg/kg | TM30/PM62 |
| Nickel | - | - | - | - | - | - | - | - | - | - | <0.7 | mg/kg | TM30/PM62 |
| Selenium | - | - | - | - | - | - | - | - | - | - | <1 | mg/kg | TM30/PM62 |
| Zinc | - | - | - | - | - | - | - | - | - | - | <5 | mg/kg | TM30/PM62 |

Please see attached notes for all abbreviations and acronyms

**Client Name:** Ground Investigations Ireland
**Reference:** 19/11/9230
**Location:** Avoca River Park
**Contact:** Emer O'Connor
**EMT Job No:** 19/20618

**Report : Solid**

**Solids:** V=60g VOC jar, J=250g glass jar, T=plastic tub

| EMT Sample No. | 58-60 | 61-63 | 76-78 | 79-81 | 82-84 | 88-90 | 91-93 | 94-96 | 100-102 | 106-108 | LOD/LOR | Units | Method No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | TP09 | TP09 | TP11 | TP11 | TP11 | TP12 | TP13 | TP13 | TP14 | TP16 | | | |
| Depth | 0.50 | 1.50 | 0.50 | 1.50 | 2.50 | 1.50 | 0.50 | 1.50 | 1.50 | 0.50 | | | |
| COC No / misc | | | | | | | | | | | | | |
| Containers | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | | | |
| Sample Date | 05/12/2019 | 05/12/2019 | 05/12/2019 | 05/12/2019 | 05/12/2019 | 06/12/2019 | 11/12/2019 | 11/12/2019 | 11/12/2019 | 09/12/2019 | | | |
| Sample Type | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | | | |
| Batch Number | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | |
| Date of Receipt | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | | | |
| PAH MS | | | | | | | | | | | | | |
| Naphthalene # | <0.04 | <0.04 | <0.04 | <0.04 | - | - | <0.04 | <0.04 | - | <0.04 | <0.04 | mg/kg | TM4/PM8 |
| Acenaphthylene | <0.03 | <0.03 | <0.03 | <0.03 | - | - | <0.03 | <0.03 | - | <0.03 | <0.03 | mg/kg | TM4/PM8 |
| Acenaphthene # | <0.05 | <0.05 | <0.05 | 0.14 | - | - | <0.05 | <0.05 | - | <0.05 | <0.05 | mg/kg | TM4/PM8 |
| Fluorene # | <0.04 | <0.04 | <0.04 | 0.08 | - | - | <0.04 | <0.04 | - | <0.04 | <0.04 | mg/kg | TM4/PM8 |
| Phenanthrene # | <0.03 | <0.03 | <0.03 | 0.15 | - | - | <0.03 | <0.03 | - | <0.03 | <0.03 | mg/kg | TM4/PM8 |
| Anthracene # | <0.04 | <0.04 | <0.04 | <0.04 | - | - | <0.04 | <0.04 | - | <0.04 | <0.04 | mg/kg | TM4/PM8 |
| Fluoranthene # | <0.03 | <0.03 | <0.03 | 0.06 | - | - | <0.03 | <0.03 | - | <0.03 | <0.03 | mg/kg | TM4/PM8 |
| Pyrene # | <0.03 | <0.03 | <0.03 | 0.06 | - | - | <0.03 | <0.03 | - | <0.03 | <0.03 | mg/kg | TM4/PM8 |
| Benzo(a)anthracene # | <0.06 | <0.06 | <0.06 | <0.06 | - | - | <0.06 | <0.06 | - | <0.06 | <0.06 | mg/kg | TM4/PM8 |
| Chrysene # | <0.02 | <0.02 | <0.02 | <0.02 | - | - | <0.02 | <0.02 | - | <0.02 | <0.02 | mg/kg | TM4/PM8 |
| Benzo(bk)fluoranthene # | <0.07 | <0.07 | <0.07 | <0.07 | - | - | <0.07 | <0.07 | - | <0.07 | <0.07 | mg/kg | TM4/PM8 |
| Benzo(a)pyrene # | <0.04 | <0.04 | <0.04 | <0.04 | - | - | <0.04 | <0.04 | - | <0.04 | <0.04 | mg/kg | TM4/PM8 |
| Indeno(123cd)pyrene | <0.04 | <0.04 | <0.04 | <0.04 | - | - | <0.04 | <0.04 | - | <0.04 | <0.04 | mg/kg | TM4/PM8 |
| Dibenzo(ah)anthracene # | <0.04 | <0.04 | <0.04 | <0.04 | - | - | <0.04 | <0.04 | - | <0.04 | <0.04 | mg/kg | TM4/PM8 |
| Benzo(ghi)perylene # | <0.04 | <0.04 | <0.04 | <0.04 | - | - | <0.04 | <0.04 | - | <0.04 | <0.04 | mg/kg | TM4/PM8 |
| Coronene | <0.04 | <0.04 | <0.04 | <0.04 | - | - | <0.04 | <0.04 | - | <0.04 | <0.04 | mg/kg | TM4/PM8 |
| PAH 6 Total # | <0.22 | <0.22 | <0.22 | <0.22 | - | - | <0.22 | <0.22 | - | <0.22 | <0.22 | mg/kg | TM4/PM8 |
| PAH 17 Total | <0.64 | <0.64 | <0.64 | <0.64 | - | - | <0.64 | <0.64 | - | <0.64 | <0.64 | mg/kg | TM4/PM8 |
| Benzo(b)fluoranthene | <0.05 | <0.05 | <0.05 | <0.05 | - | - | <0.05 | <0.05 | - | <0.05 | <0.05 | mg/kg | TM4/PM8 |
| Benzo(k)fluoranthene | <0.02 | <0.02 | <0.02 | <0.02 | - | - | <0.02 | <0.02 | - | <0.02 | <0.02 | mg/kg | TM4/PM8 |
| Benzo(j)fluoranthene | <1 | <1 | <1 | <1 | - | - | <1 | <1 | - | <1 | <1 | mg/kg | TM4/PM8 |
| PAH Surrogate % Recovery | 97 | 96 | 91 | 94 | - | - | 92 | 94 | - | 94 | <0 | % | TM4/PM8 |
| Mineral Oil (C10-C40) | <30 | <30 | <30 | 249$_{AA}$ | - | - | 31 | <30 | - | 61$_{AA}$ | <30 | mg/kg | TM5/PM8/PM16 |
| TPH CWG | | | | | | | | | | | | | |
| **Aliphatics** | | | | | | | | | | | | | |
| >C5-C6 # | <0.1 | <0.1 | <0.1 | <0.1$^{SV}$ | - | - | <0.1 | <0.1 | - | <0.1 | <0.1 | mg/kg | TM36/PM12 |
| >C6-C8 # | <0.1 | <0.1 | <0.1 | <0.1$^{SV}$ | - | - | <0.1 | <0.1 | - | <0.1 | <0.1 | mg/kg | TM36/PM12 |
| >C8-C10 | <0.1 | <0.1 | <0.1 | <0.1$^{SV}$ | - | - | <0.1 | <0.1 | - | <0.1 | <0.1 | mg/kg | TM36/PM12 |
| >C10-C12 # | <0.2 | <0.2 | <0.2 | <0.4$_{AA}$ | - | - | <0.2 | <0.2 | - | <0.4$_{AA}$ | <0.2 | mg/kg | TM5/PM8/PM16 |
| >C12-C16 # | <4 | <4 | <4 | 47$_{AA}$ | - | - | <4 | <4 | - | <8$_{AA}$ | <4 | mg/kg | TM5/PM8/PM16 |
| >C16-C21 # | <7 | <7 | <7 | 53$_{AA}$ | - | - | <7 | <7 | - | <14$_{AA}$ | <7 | mg/kg | TM5/PM8/PM16 |
| >C21-C35 # | <7 | <7 | <7 | 120$_{AA}$ | - | - | 31 | <7 | - | 61$_{AA}$ | <7 | mg/kg | TM5/PM8/PM16 |
| >C35-C40 | <7 | <7 | <7 | 29$_{AA}$ | - | - | <7 | <7 | - | <14$_{AA}$ | <7 | mg/kg | TM5/PM8/PM16 |
| Total aliphatics C5-40 | <26 | <26 | <26 | 249$_{AA}$ | - | - | 31 | <26 | - | 61$_{AA}$ | <26 | mg/kg | TM5/TM36/PM8/PM12/PM16 |
| >C6-C10 | <0.1 | <0.1 | <0.1 | <0.1$^{SV}$ | - | - | <0.1 | <0.1 | - | <0.1 | <0.1 | mg/kg | TM36/PM12 |
| >C10-C25 | <10 | <10 | <10 | 140$_{AA}$ | - | - | <10 | <10 | - | <20$_{AA}$ | <10 | mg/kg | TM5/PM8/PM16 |
| >C25-C35 | <10 | <10 | <10 | 90$_{AA}$ | - | - | 32 | <10 | - | 60$_{AA}$ | <10 | mg/kg | TM5/PM8/PM16 |

Please see attached notes for all abbreviations and acronyms

**Client Name:** Ground Investigations Ireland
**Reference:** 19/11/9230
**Location:** Avoca River Park
**Contact:** Emer O'Connor
**EMT Job No:** 19/20618

**Report : Solid**

**Solids:** V=60g VOC jar, J=250g glass jar, T=plastic tub

| EMT Sample No. | 58-60 | 61-63 | 76-78 | 79-81 | 82-84 | 88-90 | 91-93 | 94-96 | 100-102 | 106-108 | LOD/LOR | Units | Method No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | TP09 | TP09 | TP11 | TP11 | TP11 | TP12 | TP13 | TP13 | TP14 | TP16 | | | |
| Depth | 0.50 | 1.50 | 0.50 | 1.50 | 2.50 | 1.50 | 0.50 | 1.50 | 1.50 | 0.50 | | | |
| COC No / misc | | | | | | | | | | | | | |
| Containers | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | | | |
| Sample Date | 05/12/2019 | 05/12/2019 | 05/12/2019 | 05/12/2019 | 05/12/2019 | 06/12/2019 | 11/12/2019 | 11/12/2019 | 11/12/2019 | 09/12/2019 | | | |
| Sample Type | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | | | |
| Batch Number | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | |
| Date of Receipt | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | | | |
| TPH CWG | | | | | | | | | | | | | |
| **Aromatics** | | | | | | | | | | | | | |
| >C5-EC7 # | <0.1 | <0.1 | <0.1 | <0.1 SV | - | - | <0.1 | <0.1 | - | <0.1 | <0.1 | mg/kg | TM36/PM12 |
| >EC7-EC8 # | <0.1 | <0.1 | <0.1 | <0.1 SV | - | - | <0.1 | <0.1 | - | <0.1 | <0.1 | mg/kg | TM36/PM12 |
| >EC8-EC10 # | <0.1 | <0.1 | <0.1 | <0.1 SV | - | - | <0.1 | <0.1 | - | <0.1 | <0.1 | mg/kg | TM36/PM12 |
| >EC10-EC12 # | <0.2 | <0.2 | <0.2 | <0.4 AA | - | - | <0.2 | <0.2 | - | <0.4 AA | <0.2 | mg/kg | TM5/PM8/PM16 |
| >EC12-EC16 # | <4 | <4 | <4 | 93 AA | - | - | <4 | <4 | - | <8 AA | <4 | mg/kg | TM5/PM8/PM16 |
| >EC16-EC21 # | <7 | <7 | <7 | 55 AA | - | - | <7 | <7 | - | <14 AA | <7 | mg/kg | TM5/PM8/PM16 |
| >EC21-EC35 # | <7 | <7 | <7 | 196 AA | - | - | <7 | <7 | - | 30 AA | <7 | mg/kg | TM5/PM8/PM16 |
| >EC35-EC40 | <7 | <7 | <7 | 65 AA | - | - | <7 | <7 | - | 36 AA | <7 | mg/kg | TM5/PM8/PM16 |
| Total aromatics C5-40 | <26 | <26 | <26 | 409 AA | - | - | <26 | <26 | - | 66 AA | <26 | mg/kg | TM5/TM36/PM8/PM12/PM16 |
| Total aliphatics and aromatics(C5-40) | <52 | <52 | <52 | 658 AA | - | - | <52 | <52 | - | 127 AA | <52 | mg/kg | TM5/TM36/PM8/PM12/PM16 |
| >EC6-EC10 # | <0.1 | <0.1 | <0.1 | <0.1 SV | - | - | <0.1 | <0.1 | - | <0.1 | <0.1 | mg/kg | TM36/PM12 |
| >EC10-EC25 | <10 | <10 | <10 | 143 AA | - | - | <10 | <10 | - | <20 AA | <10 | mg/kg | TM5/PM8/PM16 |
| >EC25-EC35 | <10 | <10 | <10 | 173 AA | - | - | <10 | <10 | - | 33 AA | <10 | mg/kg | TM5/PM8/PM16 |
| MTBE # | <5 | <5 | <5 | <5 SV | - | - | <5 | <5 | - | <5 | <5 | ug/kg | TM31/PM12 |
| Benzene # | <5 | <5 | <5 | <5 SV | - | - | <5 | <5 | - | <5 | <5 | ug/kg | TM31/PM12 |
| Toluene # | <5 | <5 | <5 | <5 SV | - | - | <5 | <5 | - | <5 | <5 | ug/kg | TM31/PM12 |
| Ethylbenzene # | <5 | <5 | <5 | <5 SV | - | - | <5 | <5 | - | <5 | <5 | ug/kg | TM31/PM12 |
| m/p-Xylene # | <5 | <5 | <5 | <5 SV | - | - | <5 | <5 | - | <5 | <5 | ug/kg | TM31/PM12 |
| o-Xylene # | <5 | <5 | <5 | <5 SV | - | - | <5 | <5 | - | <5 | <5 | ug/kg | TM31/PM12 |
| PCB 28 # | <5 | <5 | <5 | <5 | - | - | <5 | <5 | - | <5 | <5 | ug/kg | TM17/PM8 |
| PCB 52 # | <5 | <5 | <5 | <5 | - | - | 37 | <5 | - | <5 | <5 | ug/kg | TM17/PM8 |
| PCB 101 # | <5 | <5 | <5 | <5 | - | - | 110 | <5 | - | 17 | <5 | ug/kg | TM17/PM8 |
| PCB 118 # | <5 | <5 | <5 | <5 | - | - | 101 | <5 | - | 8 | <5 | ug/kg | TM17/PM8 |
| PCB 138 # | <5 | <5 | <5 | <5 | - | - | 115 | <5 | - | 29 | <5 | ug/kg | TM17/PM8 |
| PCB 153 # | <5 | <5 | <5 | <5 | - | - | 85 | <5 | - | 26 | <5 | ug/kg | TM17/PM8 |
| PCB 180 # | <5 | <5 | <5 | <5 | - | - | 16 | <5 | - | 13 | <5 | ug/kg | TM17/PM8 |
| Total 7 PCBs # | <35 | <35 | <35 | <35 | - | - | 464 | <35 | - | 93 | <35 | ug/kg | TM17/PM8 |
| Natural Moisture Content | 22.7 | 66.1 | 7.5 | 51.9 | - | - | 7.1 | 46.4 | - | 7.7 | <0.1 | % | PM4/PM0 |
| Moisture Content (% Wet Weight) | 18.5 | 39.8 | 7.0 | 34.2 | - | - | 6.6 | 31.7 | - | 7.1 | <0.1 | % | PM4/PM0 |
| Hexavalent Chromium # | <0.3 | <0.3 | <0.3 | <0.3 | - | - | <0.3 | <0.3 | - | <0.3 | <0.3 | mg/kg | TM38/PM20 |
| Sulphate as SO4 (2:1 Ext) # | 0.3013 | - | - | 0.2096 | - | - | - | - | 0.0914 | 0.0049 | <0.0015 | g/l | TM38/PM20 |
| Sulphate as SO4 (2:1 Ext) | - | - | - | - | - | - | - | - | - | - | <0.0015 | g/l | TM38/PM60 |
| Chromium III | 16.2 | 44.3 | 17.5 | 50.6 | - | - | 31.5 | <0.5 | - | 205.3 | <0.5 | mg/kg | NONE/NONE |
| Chromium III | - | - | - | - | - | - | - | - | - | - | <0.5 | mg/kg | NONE/NONE |
| Total Organic Carbon # | 0.24 | 2.47 | 0.10 | 2.30 | - | - | 0.32 | 0.11 | - | 0.70 | <0.02 | % | TM21/PM24 |
| Organic Matter | - | - | - | - | 1.1 | 9.9 | - | - | 0.3 | - | <0.2 | % | TM21/PM24 |

Please see attached notes for all abbreviations and acronyms

## Element Materials Technology

**Client Name:** Ground Investigations Ireland
**Reference:** 19/11/9230
**Location:** Avoca River Park
**Contact:** Emer O'Connor
**EMT Job No:** 19/20618

**Report : Solid**

**Solids:** V=60g VOC jar, J=250g glass jar, T=plastic tub

| EMT Sample No. | 58-60 | 61-63 | 76-78 | 79-81 | 82-84 | 88-90 | 91-93 | 94-96 | 100-102 | 106-108 | LOD/LOR | Units | Method No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | TP09 | TP09 | TP11 | TP11 | TP11 | TP12 | TP13 | TP13 | TP14 | TP16 | | | |
| Depth | 0.50 | 1.50 | 0.50 | 1.50 | 2.50 | 1.50 | 0.50 | 1.50 | 1.50 | 0.50 | | | |
| COC No / misc | | | | | | | | | | | | | |
| Containers | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | | | |
| Sample Date | 05/12/2019 | 05/12/2019 | 05/12/2019 | 05/12/2019 | 05/12/2019 | 06/12/2019 | 11/12/2019 | 11/12/2019 | 11/12/2019 | 09/12/2019 | | | |
| Sample Type | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | | | |
| Batch Number | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | |
| Date of Receipt | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | | | |
| pH # | 6.21 | 7.12 | 8.56 | 7.17 | - | - | 7.19 | 4.55 | 7.28 | 8.33 | <0.01 | pH units | TM73/PM11 |
| Mass of raw test portion | 0.1157 | 0.1496 | 0.0997 | 0.1189 | - | - | 0.0981 | 0.1313 | - | 0.1002 | | kg | NONE/PM17 |
| Mass of dried test portion | 0.09 | 0.09 | 0.09 | 0.09 | - | - | 0.09 | 0.09 | - | 0.09 | | kg | NONE/PM17 |

Please see attached notes for all abbreviations and acronyms

**Client Name:** Ground Investigations Ireland
**Reference:** 19/11/9230
**Location:** Avoca River Park
**Contact:** Emer O'Connor
**EMT Job No:** 19/20618

**Report : Solid**

**Solids:** V=60g VOC jar, J=250g glass jar, T=plastic tub

| EMT Sample No. | 109-111 | 115-117 | 118-119 | 123-125 | 126-128 | 129-131 | 135-137 | 138-140 | 144-146 | 147-149 | LOD/LOR | Units | Method No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | TP16 | TP17 | TP17 | TP18 | TP19 | TP19 | TP20 | TP20 | TP21 | TP21 | | | |
| Depth | 1.20 | 1.50 | 1.80 | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | | | |
| COC No / misc | | | | | | | | | | | | | |
| Containers | V J T | V J T | J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | | | |
| Sample Date | 09/12/2019 | 12/12/2019 | 12/12/2019 | 12/12/2019 | 11/12/2019 | 11/12/2019 | 09/12/2019 | 09/12/2019 | 09/12/2019 | 09/12/2019 | | | |
| Sample Type | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | | | |
| Batch Number | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | |
| Date of Receipt | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | | | |
| Antimony | - | 2 | - | - | 2 | 2 | - | - | 1 | 1 | <1 | mg/kg | TM30/PM15 |
| Arsenic # | - | 55.2 | - | - | 18.6 | 28.3 | - | - | 14.6 | 48.8 | <0.5 | mg/kg | TM30/PM15 |
| Barium # | - | 178 | - | - | 60 | 52 | - | - | 21 | 52 | <1 | mg/kg | TM30/PM15 |
| Cadmium # | - | 0.4 | - | - | <0.1 | 0.2 | - | - | 0.1 | <0.1 | <0.1 | mg/kg | TM30/PM15 |
| Chromium # | - | 39.3 | - | - | 36.9 | 48.3 | - | - | 46.3 | 40.4 | <0.5 | mg/kg | TM30/PM15 |
| Copper # | - | 98 | - | - | 37 | 93 | - | - | 86 | 28 | <1 | mg/kg | TM30/PM15 |
| Lead # | - | 100 | - | - | 17 | 145 | - | - | 53 | 46 | <5 | mg/kg | TM30/PM15 |
| Mercury # | - | <0.1 | - | - | <0.1 | <0.1 | - | - | <0.1 | <0.1 | <0.1 | mg/kg | TM30/PM15 |
| Molybdenum # | - | 0.9 | - | - | 1.2 | 1.8 | - | - | 1.4 | 0.8 | <0.1 | mg/kg | TM30/PM15 |
| Nickel # | - | 23.4 | - | - | 25.0 | 29.0 | - | - | 22.1 | 21.0 | <0.7 | mg/kg | TM30/PM15 |
| Selenium # | - | 2 | - | - | 1 | 2 | - | - | <1 | 5 | <1 | mg/kg | TM30/PM15 |
| Zinc # | - | 428 | - | - | 134 | 162 | - | - | 357 | 103 | <5 | mg/kg | TM30/PM15 |
| Antimony | - | - | - | - | - | - | 2 | 13 | - | - | <1 | mg/kg | TM30/PM62 |
| Arsenic | - | - | - | - | - | - | 18.1 | 18.7 | - | - | <0.5 | mg/kg | TM30/PM62 |
| Barium | - | - | - | - | - | - | 45 | 35 | - | - | <1 | mg/kg | TM30/PM62 |
| Cadmium | - | - | - | - | - | - | 0.7 | 0.4 | - | - | <0.1 | mg/kg | TM30/PM62 |
| Chromium | - | - | - | - | - | - | 90.6 | DR | - | - | <0.5 | mg/kg | TM30/PM62 |
| Copper | - | - | - | - | - | - | 129 | 124 | - | - | <1 | mg/kg | TM30/PM62 |
| Lead | - | - | - | - | - | - | 77 | 71 | - | - | <5 | mg/kg | TM30/PM62 |
| Mercury | - | - | - | - | - | - | <0.1 | <0.1 | - | - | <0.1 | mg/kg | TM30/PM62 |
| Molybdenum | - | - | - | - | - | - | 2.7 | 1.3 | - | - | <0.1 | mg/kg | TM30/PM62 |
| Nickel | - | - | - | - | - | - | 25.4 | 104.9 | - | - | <0.7 | mg/kg | TM30/PM62 |
| Selenium | - | - | - | - | - | - | <1 | <1 | - | - | <1 | mg/kg | TM30/PM62 |
| Zinc | - | - | - | - | - | - | 331 | 182 | - | - | <5 | mg/kg | TM30/PM62 |

Please see attached notes for all abbreviations and acronyms

**Client Name:** Ground Investigations Ireland
**Reference:** 19/11/9230
**Location:** Avoca River Park
**Contact:** Emer O'Connor
**EMT Job No:** 19/20618

**Report : Solid**

**Solids:** V=60g VOC jar, J=250g glass jar, T=plastic tub

| EMT Sample No. | 109-111 | 115-117 | 118-119 | 123-125 | 126-128 | 129-131 | 135-137 | 138-140 | 144-146 | 147-149 | LOD/LOR | Units | Method No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | TP16 | TP17 | TP17 | TP18 | TP19 | TP19 | TP20 | TP20 | TP21 | TP21 | | | |
| Depth | 1.20 | 1.50 | 1.80 | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | | | |
| COC No / misc | | | | | | | | | | | | | |
| Containers | V J T | V J T | J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | | | |
| Sample Date | 09/12/2019 | 12/12/2019 | 12/12/2019 | 12/12/2019 | 11/12/2019 | 11/12/2019 | 09/12/2019 | 09/12/2019 | 09/12/2019 | 09/12/2019 | | | |
| Sample Type | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | | | |
| Batch Number | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | |
| Date of Receipt | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | | | |
| PAH MS | | | | | | | | | | | | | |
| Naphthalene # | - | 0.18 | - | - | <0.04 | 0.84 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | mg/kg | TM4/PM8 |
| Acenaphthylene | - | <0.03 | - | - | <0.03 | 0.08 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | mg/kg | TM4/PM8 |
| Acenaphthene # | - | <0.05 | - | - | <0.05 | 0.09 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | mg/kg | TM4/PM8 |
| Fluorene # | - | <0.04 | - | - | <0.04 | 0.32 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | mg/kg | TM4/PM8 |
| Phenanthrene # | - | <0.03 | - | - | <0.03 | 1.50 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | mg/kg | TM4/PM8 |
| Anthracene # | - | <0.04 | - | - | <0.04 | 0.11 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | mg/kg | TM4/PM8 |
| Fluoranthene # | - | <0.03 | - | - | <0.03 | 0.09 | 0.05 | <0.03 | <0.03 | <0.03 | <0.03 | mg/kg | TM4/PM8 |
| Pyrene # | - | <0.03 | - | - | <0.03 | 0.81 | 0.05 | <0.03 | <0.03 | <0.03 | <0.03 | mg/kg | TM4/PM8 |
| Benzo(a)anthracene # | - | <0.06 | - | - | <0.06 | 0.18 | <0.06 | <0.06 | <0.06 | <0.06 | <0.06 | mg/kg | TM4/PM8 |
| Chrysene # | - | <0.02 | - | - | <0.02 | 0.88 | 0.02 | <0.02 | <0.02 | <0.02 | <0.02 | mg/kg | TM4/PM8 |
| Benzo(bk)fluoranthene # | - | <0.07 | - | - | <0.07 | 0.15 | <0.07 | <0.07 | <0.07 | <0.07 | <0.07 | mg/kg | TM4/PM8 |
| Benzo(a)pyrene # | - | <0.04 | - | - | <0.04 | 0.23 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | mg/kg | TM4/PM8 |
| Indeno(123cd)pyrene | - | <0.04 | - | - | <0.04 | <0.40 AE | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | mg/kg | TM4/PM8 |
| Dibenzo(ah)anthracene # | - | <0.04 | - | - | <0.04 | <0.40 AE | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | mg/kg | TM4/PM8 |
| Benzo(ghi)perylene # | - | <0.04 | - | - | <0.04 | <0.40 AE | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | mg/kg | TM4/PM8 |
| Coronene | - | <0.04 | - | - | <0.04 | <0.40 AE | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | mg/kg | TM4/PM8 |
| PAH 6 Total # | - | <0.22 | - | - | <0.22 | 0.47 | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | mg/kg | TM4/PM8 |
| PAH 17 Total | - | <0.64 | - | - | <0.64 | 5.28 | <0.64 | <0.64 | <0.64 | <0.64 | <0.64 | mg/kg | TM4/PM8 |
| Benzo(b)fluoranthene | - | <0.05 | - | - | <0.05 | 0.11 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | mg/kg | TM4/PM8 |
| Benzo(k)fluoranthene | - | <0.02 | - | - | <0.02 | 0.04 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | mg/kg | TM4/PM8 |
| Benzo(j)fluoranthene | - | <1 | - | - | <1 | <1 | <1 | <1 | <1 | <1 | <1 | mg/kg | TM4/PM8 |
| PAH Surrogate % Recovery | - | 95 | - | - | 83 | 92 | 97 | 95 | 100 | 95 | <0 | % | TM4/PM8 |
| Mineral Oil (C10-C40) | - | <30 | - | - | 82 | 576 AD | 60 | 93 | 168 | <30 | <30 | mg/kg | TM5/PM8/PM16 |
| TPH CWG | | | | | | | | | | | | | |
| **Aliphatics** | | | | | | | | | | | | | |
| >C5-C6 # | - | <0.1 | - | - | <0.1 | <0.1 SV | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | mg/kg | TM36/PM12 |
| >C6-C8 # | - | <0.1 | - | - | <0.1 | <0.1 SV | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | mg/kg | TM36/PM12 |
| >C8-C10 | - | <0.1 | - | - | <0.1 | 0.5 SV | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | mg/kg | TM36/PM12 |
| >C10-C12 # | - | <0.2 | - | - | <0.2 | 3.4 AD | <0.2 | 1.6 | 1.9 | <0.2 | <0.2 | mg/kg | TM5/PM8/PM16 |
| >C12-C16 # | - | <4 | - | - | <4 | <36 AD | <4 | 12 | 13 | <4 | <4 | mg/kg | TM5/PM8/PM16 |
| >C16-C21 # | - | <7 | - | - | <7 | <63 AD | 8 | 17 | 23 | <7 | <7 | mg/kg | TM5/PM8/PM16 |
| >C21-C35 # | - | <7 | - | - | 73 | 573 AD | 42 | 49 | 103 | <7 | <7 | mg/kg | TM5/PM8/PM16 |
| >C35-C40 | - | <7 | - | - | 9 | <63 AD | 10 | 13 | 27 | <7 | <7 | mg/kg | TM5/PM8/PM16 |
| Total aliphatics C5-40 | - | <26 | - | - | 82 | 577 AD | 60 | 93 | 168 | <26 | <26 | mg/kg | TM5/TM36/PM8/PM12/PM16 |
| >C6-C10 | - | <0.1 | - | - | <0.1 | 0.5 SV | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | mg/kg | TM36/PM12 |
| >C10-C25 | - | <10 | - | - | 17 | 250 AD | <10 | 33 | 58 | <10 | <10 | mg/kg | TM5/PM8/PM16 |
| >C25-C35 | - | <10 | - | - | 60 | 414 AD | 24 | 36 | 79 | <10 | <10 | mg/kg | TM5/PM8/PM16 |

Please see attached notes for all abbreviations and acronyms



Please include all sections of this report if it is reproduced

All solid results are expressed on a dry weight basis unless stated otherwise.

**Client Name:** Ground Investigations Ireland
**Reference:** 19/11/9230
**Location:** Avoca River Park
**Contact:** Emer O'Connor
**EMT Job No:** 19/20618

**Report : Solid**

**Solids:** V=60g VOC jar, J=250g glass jar, T=plastic tub

| EMT Sample No. | 109-111 | 115-117 | 118-119 | 123-125 | 126-128 | 129-131 | 135-137 | 138-140 | 144-146 | 147-149 | LOD/LOR | Units | Method No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | TP16 | TP17 | TP17 | TP18 | TP19 | TP19 | TP20 | TP20 | TP21 | TP21 | | | |
| Depth | 1.20 | 1.50 | 1.80 | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | | | |
| COC No / misc | | | | | | | | | | | | | |
| Containers | V J T | V J T | J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | | | |
| Sample Date | 09/12/2019 | 12/12/2019 | 12/12/2019 | 12/12/2019 | 11/12/2019 | 11/12/2019 | 09/12/2019 | 09/12/2019 | 09/12/2019 | 09/12/2019 | | | |
| Sample Type | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | | | |
| Batch Number | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | |
| Date of Receipt | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | | | |
| TPH CWG | | | | | | | | | | | | | |
| **Aromatics** | | | | | | | | | | | | | |
| >C5-EC7 # | - | <0.1 | - | - | <0.1 | <0.1 SV | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | mg/kg | TM36/PM12 |
| >EC7-EC8 # | - | <0.1 | - | - | <0.1 | <0.1 SV | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | mg/kg | TM36/PM12 |
| >EC8-EC10 # | - | <0.1 | - | - | <0.1 | <0.1 SV | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | mg/kg | TM36/PM12 |
| >EC10-EC12 # | - | <0.2 | - | - | <0.2 | <1.8 SV AD | <0.2 SV | <0.2 | <0.2 | <0.2 | <0.2 | mg/kg | TM5/PM8/PM16 |
| >EC12-EC16 # | - | <4 | - | - | <4 | <36 SV AD | <4 SV | <4 | <4 | <4 | <4 | mg/kg | TM5/PM8/PM16 |
| >EC16-EC21 # | - | <7 | - | - | <7 | 98 SV AD | <7 SV | 12 | 11 | <7 | <7 | mg/kg | TM5/PM8/PM16 |
| >EC21-EC35 # | - | <7 | - | - | 70 | 724 SV AD | 63 SV | 68 | 59 | <7 | <7 | mg/kg | TM5/PM8/PM16 |
| >EC35-EC40 | - | <7 | - | - | 17 | 125 SV AD | 28 SV | 24 | 25 | <7 | <7 | mg/kg | TM5/PM8/PM16 |
| Total aromatics C5-40 | - | <26 | - | - | 87 | 947 SV AD | 91 SV | 104 | 95 | <26 | <26 | mg/kg | TM5/TM36/PM8/PM12/PM16 |
| Total aliphatics and aromatics(C5-40) | - | <52 | - | - | 169 | 1524 SV AD | 151 SV | 197 | 263 | <52 | <52 | mg/kg | TM5/TM36/PM8/PM12/PM16 |
| >EC6-EC10 # | - | <0.1 | - | - | <0.1 | <0.1 SV | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | mg/kg | TM36/PM12 |
| >EC10-EC25 | - | <10 | - | - | 12 | 289 SV AD | 19 SV | 24 | 16 | <10 | <10 | mg/kg | TM5/PM8/PM16 |
| >EC25-EC35 | - | <10 | - | - | 58 | 526 SV AD | 46 SV | 57 | 46 | <10 | <10 | mg/kg | TM5/PM8/PM16 |
| MTBE # | - | <5 | - | - | <5 | <5 SV | <5 | <5 | <5 | <5 | <5 | ug/kg | TM31/PM12 |
| Benzene # | - | <5 | - | - | <5 | <5 SV | <5 | <5 | <5 | <5 | <5 | ug/kg | TM31/PM12 |
| Toluene # | - | <5 | - | - | <5 | <5 SV | <5 | <5 | <5 | <5 | <5 | ug/kg | TM31/PM12 |
| Ethylbenzene # | - | <5 | - | - | <5 | <5 SV | <5 | <5 | <5 | <5 | <5 | ug/kg | TM31/PM12 |
| m/p-Xylene # | - | <5 | - | - | <5 | 26 SV | <5 | <5 | <5 | <5 | <5 | ug/kg | TM31/PM12 |
| o-Xylene # | - | <5 | - | - | <5 | 22 SV | <5 | <5 | <5 | <5 | <5 | ug/kg | TM31/PM12 |
| PCB 28 # | - | <5 | - | - | <5 | <25 AC | 13 | <5 | <5 | <5 | <5 | ug/kg | TM17/PM8 |
| PCB 52 # | - | <5 | - | - | 7 | <25 AC | 396 | <5 | <5 | <5 | <5 | ug/kg | TM17/PM8 |
| PCB 101 # | - | <5 | - | - | 15 | <25 AC | 812 | <5 | <5 | <5 | <5 | ug/kg | TM17/PM8 |
| PCB 118 # | - | <5 | - | - | 10 | <25 AC | 638 | <5 | <5 | <5 | <5 | ug/kg | TM17/PM8 |
| PCB 138 # | - | <5 | - | - | 16 | 61 AC | 806 | 7 | <5 | <5 | <5 | ug/kg | TM17/PM8 |
| PCB 153 # | - | <5 | - | - | 14 | 80 AC | 723 | 6 | <5 | <5 | <5 | ug/kg | TM17/PM8 |
| PCB 180 # | - | <5 | - | - | 7 | 65 AC | 327 | <5 | <5 | <5 | <5 | ug/kg | TM17/PM8 |
| Total 7 PCBs # | - | <35 | - | - | 69 | 206 AC | 3715 | <35 | <35 | <35 | <35 | ug/kg | TM17/PM8 |
| Natural Moisture Content | - | 64.9 | - | - | 6.3 | 34.9 | 16.2 | 20.6 | 7.3 | 51.4 | <0.1 | % | PM4/PM0 |
| Moisture Content (% Wet Weight) | - | 39.4 | - | - | 6.0 | 25.9 | 14.0 | 17.1 | 6.8 | 33.9 | <0.1 | % | PM4/PM0 |
| Hexavalent Chromium # | - | <0.3 | - | - | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | mg/kg | TM38/PM20 |
| Sulphate as SO4 (2:1 Ext) # | - | - | - | - | - | - | - | - | 0.0170 | - | <0.0015 | g/l | TM38/PM20 |
| Sulphate as SO4 (2:1 Ext) | - | - | - | - | - | - | 0.0178 | - | - | - | <0.0015 | g/l | TM38/PM60 |
| Chromium III | - | 39.3 | - | - | 36.9 | 48.3 | - | - | 46.3 | 40.4 | <0.5 | mg/kg | NONE/NONE |
| Chromium III | - | - | - | - | - | - | 90.6 | 1194.5 AC | - | - | <0.5 | mg/kg | NONE/NONE |
| Total Organic Carbon # | - | 7.23 | - | - | 0.42 | 3.94 | NDP | NDP | 0.22 | 0.40 | <0.02 | % | TM21/PM24 |
| Organic Matter | 0.8 | 12.5 | 0.3 | 2.0 | - | - | - | - | - | - | <0.2 | % | TM21/PM24 |

Please see attached notes for all abbreviations and acronyms



Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

## Element Materials Technology

**Client Name:** Ground Investigations Ireland
**Reference:** 19/11/9230
**Location:** Avoca River Park
**Contact:** Emer O'Connor
**EMT Job No:** 19/20618

**Report : Solid**

**Solids:** V=60g VOC jar, J=250g glass jar, T=plastic tub

| EMT Sample No. | 109-111 | 115-117 | 118-119 | 123-125 | 126-128 | 129-131 | 135-137 | 138-140 | 144-146 | 147-149 | LOD/LOR | Units | Method No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | TP16 | TP17 | TP17 | TP18 | TP19 | TP19 | TP20 | TP20 | TP21 | TP21 | | | |
| Depth | 1.20 | 1.50 | 1.80 | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | | | |
| COC No / misc | | | | | | | | | | | | | |
| Containers | V J T | V J T | J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | | | |
| Sample Date | 09/12/2019 | 12/12/2019 | 12/12/2019 | 12/12/2019 | 11/12/2019 | 11/12/2019 | 09/12/2019 | 09/12/2019 | 09/12/2019 | 09/12/2019 | | | |
| Sample Type | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | | | |
| Batch Number | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | |
| Date of Receipt | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | | | |
| pH # | - | 7.56 | - | - | 8.33 | 8.04 | 8.34 | 7.82 | 8.34 | 7.12 | <0.01 | pH units | TM73/PM11 |
| Mass of raw test portion | - | 0.1696 | - | - | 0.0969 | 0.1173 | 0.1109 | 0.1087 | 0.0986 | 0.1278 | | kg | NONE/PM17 |
| Mass of dried test portion | - | 0.09 | - | - | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | | kg | NONE/PM17 |

Please see attached notes for all abbreviations and acronyms

**Client Name:** Ground Investigations Ireland
**Reference:** 19/11/9230
**Location:** Avoca River Park
**Contact:** Emer O'Connor
**EMT Job No:** 19/20618

**Report : Solid**

**Solids:** V=60g VOC jar, J=250g glass jar, T=plastic tub

| EMT Sample No. | 153-155 | 156-158 | 162-164 | 165-167 | 168-170 | 171-173 | 174-176 | 177-179 | 180-182 | 183-185 | LOD/LOR | Units | Method No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | TP22 | TP22 | TP23 | TP24 | TP24 | TP25 | TP25 | TP26 | TP26 | TP27 | | | |
| Depth | 0.50 | 1.50 | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | | | |
| COC No / misc | | | | | | | | | | | | | |
| Containers | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | | | |
| Sample Date | 09/12/2019 | 09/12/2019 | 09/12/2019 | 09/12/2019 | 09/12/2019 | 10/12/2019 | 10/12/2019 | 12/12/2019 | 12/12/2019 | 10/12/2019 | | | |
| Sample Type | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | | | |
| Batch Number | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | |
| Date of Receipt | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | | | |
| Antimony | 4 | - | - | - | 3 | 2 | - | 2 | - | 3 | <1 | mg/kg | TM30/PM15 |
| Arsenic # | 30.4 | - | - | - | 55.8 | 8.3 | - | 16.7 | - | 19.6 | <0.5 | mg/kg | TM30/PM15 |
| Barium # | 34 | - | - | - | 92 | 38 | - | 38 | - | 70 | <1 | mg/kg | TM30/PM15 |
| Cadmium # | 0.3 | - | - | - | 0.7 | <0.1 | - | <0.1 | - | <0.1 | <0.1 | mg/kg | TM30/PM15 |
| Chromium # | 23.6 | - | - | - | 75.8 | 49.7 | - | 38.4 | - | 46.2 | <0.5 | mg/kg | TM30/PM15 |
| Copper # | 99 | - | - | - | 118 | 44 | - | 34 | - | 48 | <1 | mg/kg | TM30/PM15 |
| Lead # | 244 | - | - | - | 364 | 17 | - | 19 | - | 42 | <5 | mg/kg | TM30/PM15 |
| Mercury # | <0.1 | - | - | - | <0.1 | <0.1 | - | <0.1 | - | <0.1 | <0.1 | mg/kg | TM30/PM15 |
| Molybdenum # | 1.2 | - | - | - | 4.8 | 0.5 | - | <0.1 | - | <0.1 | <0.1 | mg/kg | TM30/PM15 |
| Nickel # | 14.0 | - | - | - | 27.6 | 28.1 | - | 37.0 | - | 58.5 | <0.7 | mg/kg | TM30/PM15 |
| Selenium # | 1 | - | - | - | 2 | 1 | - | 1 | - | 2 | <1 | mg/kg | TM30/PM15 |
| Zinc # | 132 | - | - | - | 260 | 119 | - | 122 | - | 149 | <5 | mg/kg | TM30/PM15 |
| Antimony | - | - | - | 1 | - | - | - | - | - | - | <1 | mg/kg | TM30/PM62 |
| Arsenic | - | - | - | 20.9 | - | - | - | - | - | - | <0.5 | mg/kg | TM30/PM62 |
| Barium | - | - | - | 36 | - | - | - | - | - | - | <1 | mg/kg | TM30/PM62 |
| Cadmium | - | - | - | 0.2 | - | - | - | - | - | - | <0.1 | mg/kg | TM30/PM62 |
| Chromium | - | - | - | 28.2 | - | - | - | - | - | - | <0.5 | mg/kg | TM30/PM62 |
| Copper | - | - | - | 75 | - | - | - | - | - | - | <1 | mg/kg | TM30/PM62 |
| Lead | - | - | - | 98 | - | - | - | - | - | - | <5 | mg/kg | TM30/PM62 |
| Mercury | - | - | - | <0.1 | - | - | - | - | - | - | <0.1 | mg/kg | TM30/PM62 |
| Molybdenum | - | - | - | 0.9 | - | - | - | - | - | - | <0.1 | mg/kg | TM30/PM62 |
| Nickel | - | - | - | 20.7 | - | - | - | - | - | - | <0.7 | mg/kg | TM30/PM62 |
| Selenium | - | - | - | <1 | - | - | - | - | - | - | <1 | mg/kg | TM30/PM62 |
| Zinc | - | - | - | 235 | - | - | - | - | - | - | <5 | mg/kg | TM30/PM62 |

Please see attached notes for all abbreviations and acronyms

**Client Name:** Ground Investigations Ireland
**Reference:** 19/11/9230
**Location:** Avoca River Park
**Contact:** Emer O'Connor
**EMT Job No:** 19/20618

**Report : Solid**

**Solids:** V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

| EMT Sample No. | 153-155 | 156-158 | 162-164 | 165-167 | 168-170 | 171-173 | 174-176 | 177-179 | 180-182 | 183-185 | LOD/LOR | Units | Method No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | TP22 | TP22 | TP23 | TP24 | TP24 | TP25 | TP25 | TP26 | TP26 | TP27 | | | |
| Depth | 0.50 | 1.50 | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | | | |
| COC No / misc | | | | | | | | | | | | | |
| Containers | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | | | |
| Sample Date | 09/12/2019 | 09/12/2019 | 09/12/2019 | 09/12/2019 | 09/12/2019 | 10/12/2019 | 10/12/2019 | 12/12/2019 | 12/12/2019 | 10/12/2019 | | | |
| Sample Type | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | | | |
| Batch Number | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | |
| Date of Receipt | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | | | |
| PAH MS | | | | | | | | | | | | | |
| Naphthalene # | <0.04 | - | - | <0.04 | <0.04 | <0.04 | - | <0.04 | - | <0.04 | <0.04 | mg/kg | TM4/PM8 |
| Acenaphthylene | <0.03 | - | - | <0.03 | <0.03 | <0.03 | - | <0.03 | - | <0.03 | <0.03 | mg/kg | TM4/PM8 |
| Acenaphthene # | <0.05 | - | - | <0.05 | <0.05 | <0.05 | - | <0.05 | - | <0.05 | <0.05 | mg/kg | TM4/PM8 |
| Fluorene # | <0.04 | - | - | <0.04 | <0.04 | <0.04 | - | <0.04 | - | <0.04 | <0.04 | mg/kg | TM4/PM8 |
| Phenanthrene # | <0.03 | - | - | <0.03 | <0.03 | <0.03 | - | <0.03 | - | <0.03 | <0.03 | mg/kg | TM4/PM8 |
| Anthracene # | <0.04 | - | - | <0.04 | <0.04 | <0.04 | - | <0.04 | - | <0.04 | <0.04 | mg/kg | TM4/PM8 |
| Fluoranthene # | <0.03 | - | - | <0.03 | <0.03 | <0.03 | - | <0.03 | - | <0.03 | <0.03 | mg/kg | TM4/PM8 |
| Pyrene # | <0.03 | - | - | <0.03 | <0.03 | <0.03 | - | <0.03 | - | <0.03 | <0.03 | mg/kg | TM4/PM8 |
| Benzo(a)anthracene # | <0.06 | - | - | <0.06 | <0.06 | <0.06 | - | <0.06 | - | <0.06 | <0.06 | mg/kg | TM4/PM8 |
| Chrysene # | <0.02 | - | - | <0.02 | <0.02 | <0.02 | - | <0.02 | - | <0.02 | <0.02 | mg/kg | TM4/PM8 |
| Benzo(bk)fluoranthene # | <0.07 | - | - | <0.07 | <0.07 | <0.07 | - | <0.07 | - | <0.07 | <0.07 | mg/kg | TM4/PM8 |
| Benzo(a)pyrene # | <0.04 | - | - | <0.04 | <0.04 | <0.04 | - | <0.04 | - | <0.04 | <0.04 | mg/kg | TM4/PM8 |
| Indeno(123cd)pyrene | <0.04 | - | - | <0.04 | <0.04 | <0.04 | - | <0.04 | - | <0.04 | <0.04 | mg/kg | TM4/PM8 |
| Dibenzo(ah)anthracene # | <0.04 | - | - | <0.04 | <0.04 | <0.04 | - | <0.04 | - | <0.04 | <0.04 | mg/kg | TM4/PM8 |
| Benzo(ghi)perylene # | <0.04 | - | - | <0.04 | <0.04 | <0.04 | - | <0.04 | - | <0.04 | <0.04 | mg/kg | TM4/PM8 |
| Coronene | <0.04 | - | - | <0.04 | <0.04 | <0.04 | - | <0.04 | - | <0.04 | <0.04 | mg/kg | TM4/PM8 |
| PAH 6 Total # | <0.22 | - | - | <0.22 | <0.22 | <0.22 | - | <0.22 | - | <0.22 | <0.22 | mg/kg | TM4/PM8 |
| PAH 17 Total | <0.64 | - | - | <0.64 | <0.64 | <0.64 | - | <0.64 | - | <0.64 | <0.64 | mg/kg | TM4/PM8 |
| Benzo(b)fluoranthene | <0.05 | - | - | <0.05 | <0.05 | <0.05 | - | <0.05 | - | <0.05 | <0.05 | mg/kg | TM4/PM8 |
| Benzo(k)fluoranthene | <0.02 | - | - | <0.02 | <0.02 | <0.02 | - | <0.02 | - | <0.02 | <0.02 | mg/kg | TM4/PM8 |
| Benzo(j)fluoranthene | <1 | - | - | <1 | <1 | <1 | - | <1 | - | <1 | <1 | mg/kg | TM4/PM8 |
| PAH Surrogate % Recovery | 89 | - | - | 93 | 96 | 96 | - | 95 | - | 102 | <0 | % | TM4/PM8 |
| Mineral Oil (C10-C40) | 90 | - | - | 67 | <30 | <30 | - | <30 | - | <30 | <30 | mg/kg | TM5/PM8/PM16 |
| TPH CWG | | | | | | | | | | | | | |
| **Aliphatics** | | | | | | | | | | | | | |
| >C5-C6 # | <0.1 | - | - | <0.1 | <0.1 SV | <0.1 SV | - | <0.1 | - | <0.1 | <0.1 | mg/kg | TM36/PM12 |
| >C6-C8 # | <0.1 | - | - | <0.1 | <0.1 SV | <0.1 SV | - | <0.1 | - | <0.1 | <0.1 | mg/kg | TM36/PM12 |
| >C8-C10 | <0.1 | - | - | <0.1 | <0.1 SV | <0.1 SV | - | <0.1 | - | <0.1 | <0.1 | mg/kg | TM36/PM12 |
| >C10-C12 # | 1.2 | - | - | 4.3 | <0.2 | <0.2 | - | <0.2 | - | <0.2 | <0.2 | mg/kg | TM5/PM8/PM16 |
| >C12-C16 # | 10 | - | - | 16 | <4 | <4 | - | <4 | - | <4 | <4 | mg/kg | TM5/PM8/PM16 |
| >C16-C21 # | 15 | - | - | 20 | <7 | <7 | - | <7 | - | <7 | <7 | mg/kg | TM5/PM8/PM16 |
| >C21-C35 # | 55 | - | - | 27 | <7 | <7 | - | 15 | - | <7 | <7 | mg/kg | TM5/PM8/PM16 |
| >C35-C40 | 9 | - | - | <7 | <7 | <7 | - | <7 | - | <7 | <7 | mg/kg | TM5/PM8/PM16 |
| Total aliphatics C5-40 | 90 | - | - | 67 | <26 | <26 | - | <26 | - | <26 | <26 | mg/kg | TM5/TM36/PM8/PM12/PM16 |
| >C6-C10 | <0.1 | - | - | <0.1 | <0.1 SV | <0.1 SV | - | <0.1 | - | <0.1 | <0.1 | mg/kg | TM36/PM12 |
| >C10-C25 | 35 | - | - | 45 | <10 | <10 | - | <10 | - | <10 | <10 | mg/kg | TM5/PM8/PM16 |
| >C25-C35 | 36 | - | - | 18 | <10 | 13 | - | 15 | - | <10 | <10 | mg/kg | TM5/PM8/PM16 |

## Element Materials Technology

**Client Name:** Ground Investigations Ireland
**Reference:** 19/11/9230
**Location:** Avoca River Park
**Contact:** Emer O'Connor
**EMT Job No:** 19/20618

**Report : Solid**

**Solids:** V=60g VOC jar, J=250g glass jar, T=plastic tub

| EMT Sample No. | 153-155 | 156-158 | 162-164 | 165-167 | 168-170 | 171-173 | 174-176 | 177-179 | 180-182 | 183-185 | LOD/LOR | Units | Method No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | TP22 | TP22 | TP23 | TP24 | TP24 | TP25 | TP25 | TP26 | TP26 | TP27 | | | |
| Depth | 0.50 | 1.50 | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | | | |
| COC No / misc | | | | | | | | | | | | | |
| Containers | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | | | |
| Sample Date | 09/12/2019 | 09/12/2019 | 09/12/2019 | 09/12/2019 | 09/12/2019 | 10/12/2019 | 10/12/2019 | 12/12/2019 | 12/12/2019 | 10/12/2019 | | | |
| Sample Type | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | | | |
| Batch Number | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | |
| Date of Receipt | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | | | |
| TPH CWG | | | | | | | | | | | | | |
| **Aromatics** | | | | | | | | | | | | | |
| >C5-EC7 # | <0.1 | - | - | <0.1 | <0.1 SV | <0.1 SV | - | <0.1 | - | <0.1 | <0.1 | mg/kg | TM36/PM12 |
| >EC7-EC8 # | <0.1 | - | - | <0.1 | <0.1 SV | <0.1 SV | - | <0.1 | - | <0.1 | <0.1 | mg/kg | TM36/PM12 |
| >EC8-EC10 # | <0.1 | - | - | <0.1 | <0.1 SV | <0.1 SV | - | <0.1 | - | <0.1 | <0.1 | mg/kg | TM36/PM12 |
| >EC10-EC12 # | <0.2 SV | - | - | <0.2 SV | <0.2 SV | <0.2 | - | <0.2 | - | <0.2 | <0.2 | mg/kg | TM5/PM8/PM16 |
| >EC12-EC16 # | <4 SV | - | - | 7 SV | <4 SV | <4 | - | <4 | - | <4 | <4 | mg/kg | TM5/PM8/PM16 |
| >EC16-EC21 # | <7 SV | - | - | 14 SV | <7 SV | <7 | - | <7 | - | <7 | <7 | mg/kg | TM5/PM8/PM16 |
| >EC21-EC35 # | 40 SV | - | - | 49 SV | 55 SV | <7 | - | 43 | - | <7 | <7 | mg/kg | TM5/PM8/PM16 |
| >EC35-EC40 | 13 SV | - | - | 12 SV | 15 SV | <7 | - | 12 | - | <7 | <7 | mg/kg | TM5/PM8/PM16 |
| Total aromatics C5-40 | 53 SV | - | - | 82 SV | 70 SV | <26 | - | 55 | - | <26 | <26 | mg/kg | TM5/TM36/PM8/PM12/PM16 |
| Total aliphatics and aromatics(C5-40) | 143 SV | - | - | 149 SV | 70 SV | <52 | - | 55 | - | <52 | <52 | mg/kg | TM5/TM36/PM8/PM12/PM16 |
| >EC6-EC10 # | <0.1 | - | - | <0.1 | <0.1 SV | <0.1 SV | - | <0.1 | - | <0.1 | <0.1 | mg/kg | TM36/PM12 |
| >EC10-EC25 | <10 SV | - | - | 28 SV | <10 SV | <10 | - | <10 | - | <10 | <10 | mg/kg | TM5/PM8/PM16 |
| >EC25-EC35 | 33 SV | - | - | 30 SV | 46 SV | <10 | - | 43 | - | <10 | <10 | mg/kg | TM5/PM8/PM16 |
| MTBE # | <5 | - | - | <5 | <5 SV | <5 SV | - | <5 | - | <5 | <5 | ug/kg | TM31/PM12 |
| Benzene # | <5 | - | - | <5 | <5 SV | <5 SV | - | <5 | - | <5 | <5 | ug/kg | TM31/PM12 |
| Toluene # | <5 | - | - | <5 | <5 SV | 18 SV | - | <5 | - | <5 | <5 | ug/kg | TM31/PM12 |
| Ethylbenzene # | <5 | - | - | <5 | <5 SV | <5 SV | - | <5 | - | <5 | <5 | ug/kg | TM31/PM12 |
| m/p-Xylene # | <5 | - | - | <5 | <5 SV | <5 SV | - | <5 | - | <5 | <5 | ug/kg | TM31/PM12 |
| o-Xylene # | <5 | - | - | <5 | <5 SV | <5 SV | - | <5 | - | <5 | <5 | ug/kg | TM31/PM12 |
| PCB 28 # | <5 | - | - | <5 | <5 | <5 | - | <5 | - | <5 | <5 | ug/kg | TM17/PM8 |
| PCB 52 # | <5 | - | - | <5 | <5 | <5 | - | <5 | - | <5 | <5 | ug/kg | TM17/PM8 |
| PCB 101 # | <5 | - | - | <5 | <5 | <5 | - | <5 | - | <5 | <5 | ug/kg | TM17/PM8 |
| PCB 118 # | <5 | - | - | <5 | <5 | <5 | - | <5 | - | <5 | <5 | ug/kg | TM17/PM8 |
| PCB 138 # | <5 | - | - | <5 | <5 | <5 | - | <5 | - | <5 | <5 | ug/kg | TM17/PM8 |
| PCB 153 # | <5 | - | - | <5 | <5 | <5 | - | <5 | - | <5 | <5 | ug/kg | TM17/PM8 |
| PCB 180 # | <5 | - | - | <5 | <5 | <5 | - | <5 | - | <5 | <5 | ug/kg | TM17/PM8 |
| Total 7 PCBs # | <35 | - | - | <35 | <35 | <35 | - | <35 | - | <35 | <35 | ug/kg | TM17/PM8 |
| Natural Moisture Content | 28.5 | - | - | 9.4 | 84.2 | 12.4 | - | 17.2 | - | 14.2 | <0.1 | % | PM4/PM0 |
| Moisture Content (% Wet Weight) | 22.2 | - | - | 8.6 | 45.7 | 11.1 | - | 14.6 | - | 12.4 | <0.1 | % | PM4/PM0 |
| Hexavalent Chromium # | <0.3 | - | - | <0.3 | <0.3 | <0.3 | - | <0.3 | - | <0.3 | <0.3 | mg/kg | TM38/PM20 |
| Sulphate as SO4 (2:1 Ext) # | - | - | - | - | - | - | - | 0.0059 | - | - | <0.0015 | g/l | TM38/PM20 |
| Sulphate as SO4 (2:1 Ext) | - | - | - | 0.0130 | - | - | - | - | - | - | <0.0015 | g/l | TM38/PM60 |
| Chromium III | 23.6 | - | - | - | 75.8 | 49.7 | - | 38.4 | - | 46.2 | <0.5 | mg/kg | NONE/NONE |
| Chromium III | - | - | - | 28.2 | - | - | - | - | - | - | <0.5 | mg/kg | NONE/NONE |
| Total Organic Carbon # | 1.65 | - | - | NDP | 3.43 | 0.14 | - | 0.45 | - | 0.21 | <0.02 | % | TM21/PM24 |
| Organic Matter | - | 1.2 | 1.7 | - | - | - | 4.4 | - | 0.6 | - | <0.2 | % | TM21/PM24 |

Please see attached notes for all abbreviations and acronyms



Please include all sections of this report if it is reproduced

All solid results are expressed on a dry weight basis unless stated otherwise.

## Element Materials Technology

**Client Name:** Ground Investigations Ireland
**Reference:** 19/11/9230
**Location:** Avoca River Park
**Contact:** Emer O'Connor
**EMT Job No:** 19/20618

**Report : Solid**

**Solids:** V=60g VOC jar, J=250g glass jar, T=plastic tub

| EMT Sample No. | 153-155 | 156-158 | 162-164 | 165-167 | 168-170 | 171-173 | 174-176 | 177-179 | 180-182 | 183-185 | LOD/LOR | Units | Method No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | TP22 | TP22 | TP23 | TP24 | TP24 | TP25 | TP25 | TP26 | TP26 | TP27 | | | |
| Depth | 0.50 | 1.50 | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | | | |
| COC No / misc | | | | | | | | | | | | | |
| Containers | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | | | |
| Sample Date | 09/12/2019 | 09/12/2019 | 09/12/2019 | 09/12/2019 | 09/12/2019 | 10/12/2019 | 10/12/2019 | 12/12/2019 | 12/12/2019 | 10/12/2019 | | | |
| Sample Type | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | | | |
| Batch Number | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | |
| Date of Receipt | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | | | |
| pH # | 9.59 | - | - | 8.04 | 6.69 | 7.08 | - | 7.17 | - | 7.12 | <0.01 | pH units | TM73/PM11 |
| Mass of raw test portion | 0.1161 | - | - | 0.0985 | 0.1339 | 0.1075 | - | 0.1165 | - | 0.1012 | | kg | NONE/PM17 |
| Mass of dried test portion | 0.09 | - | - | 0.09 | 0.09 | 0.09 | - | 0.09 | - | 0.09 | | kg | NONE/PM17 |

Please see attached notes for all abbreviations and acronyms



Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

## Element Materials Technology

**Client Name:** Ground Investigations Ireland
**Reference:** 19/11/9230
**Location:** Avoca River Park
**Contact:** Emer O'Connor
**EMT Job No:** 19/20618

**Report : Solid**

**Solids:** V=60g VOC jar, J=250g glass jar, T=plastic tub

| EMT Sample No. | 189-191 | 192-194 | 195-197 | 198-200 | 204-206 | | | | | | LOD/LOR | Units | Method No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | TP28 | TP28 | TP29 | TP29 | TP30 | | | | | | | | |
| Depth | 0.50 | 1.50 | 0.50 | 1.50 | 1.50 | | | | | | | | |
| COC No / misc | | | | | | | | | | | | | |
| Containers | V J T | V J T | V J T | V J T | V J T | | | | | | | | |
| Sample Date | 10/12/2019 | 10/12/2019 | 12/12/2019 | 12/12/2019 | 11/12/2019 | | | | | | | | |
| Sample Type | Soil | Soil | Soil | Soil | Soil | | | | | | | | |
| Batch Number | 1 | 1 | 1 | 1 | 1 | | | | | | | | |
| Date of Receipt | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | | | | | | | | |
| Antimony | 3 | 1 | 1 | - | - | | | | | | <1 | mg/kg | TM30/PM15 |
| Arsenic # | 12.0 | 50.3 | <0.5 | - | - | | | | | | <0.5 | mg/kg | TM30/PM15 |
| Barium # | 54 | 67 | 15 | - | - | | | | | | <1 | mg/kg | TM30/PM15 |
| Cadmium # | <0.1 | 1.7 | <0.1 | - | - | | | | | | <0.1 | mg/kg | TM30/PM15 |
| Chromium # | 38.1 | 37.4 | 41.4 | - | - | | | | | | <0.5 | mg/kg | TM30/PM15 |
| Copper # | 35 | 132 | 35 | - | - | | | | | | <1 | mg/kg | TM30/PM15 |
| Lead # | 20 | 210 | 10 | - | - | | | | | | <5 | mg/kg | TM30/PM15 |
| Mercury # | <0.1 | <0.1 | <0.1 | - | - | | | | | | <0.1 | mg/kg | TM30/PM15 |
| Molybdenum # | <0.1 | 1.1 | 0.8 | - | - | | | | | | <0.1 | mg/kg | TM30/PM15 |
| Nickel # | 41.8 | 26.8 | 10.1 | - | - | | | | | | <0.7 | mg/kg | TM30/PM15 |
| Selenium # | 2 | 2 | <1 | - | - | | | | | | <1 | mg/kg | TM30/PM15 |
| Zinc # | 133 | 263 | 169 | - | - | | | | | | <5 | mg/kg | TM30/PM15 |
| Antimony | - | - | - | 6 | - | | | | | | <1 | mg/kg | TM30/PM62 |
| Arsenic | - | - | - | 24.1 | - | | | | | | <0.5 | mg/kg | TM30/PM62 |
| Barium | - | - | - | 40 | - | | | | | | <1 | mg/kg | TM30/PM62 |
| Cadmium | - | - | - | 0.6 | - | | | | | | <0.1 | mg/kg | TM30/PM62 |
| Chromium | - | - | - | DR | - | | | | | | <0.5 | mg/kg | TM30/PM62 |
| Copper | - | - | - | 98 | - | | | | | | <1 | mg/kg | TM30/PM62 |
| Lead | - | - | - | 67 | - | | | | | | <5 | mg/kg | TM30/PM62 |
| Mercury | - | - | - | <0.1 | - | | | | | | <0.1 | mg/kg | TM30/PM62 |
| Molybdenum | - | - | - | 1.7 | - | | | | | | <0.1 | mg/kg | TM30/PM62 |
| Nickel | - | - | - | 31.7 | - | | | | | | <0.7 | mg/kg | TM30/PM62 |
| Selenium | - | - | - | 1 | - | | | | | | <1 | mg/kg | TM30/PM62 |
| Zinc | - | - | - | 134 | - | | | | | | <5 | mg/kg | TM30/PM62 |

Please see attached notes for all abbreviations and acronyms

**Client Name:** Ground Investigations Ireland
**Reference:** 19/11/9230
**Location:** Avoca River Park
**Contact:** Emer O'Connor
**EMT Job No:** 19/20618

**Report : Solid**

**Solids:** V=60g VOC jar, J=250g glass jar, T=plastic tub

| EMT Sample No. | 189-191 | 192-194 | 195-197 | 198-200 | 204-206 | | | | | | LOD/LOR | Units | Method No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | TP28 | TP28 | TP29 | TP29 | TP30 | | | | | | | | |
| Depth | 0.50 | 1.50 | 0.50 | 1.50 | 1.50 | | | | | | | | |
| COC No / misc | | | | | | | | | | | | | |
| Containers | V J T | V J T | V J T | V J T | V J T | | | | | | | | |
| Sample Date | 10/12/2019 | 10/12/2019 | 12/12/2019 | 12/12/2019 | 11/12/2019 | | | | | | | | |
| Sample Type | Soil | Soil | Soil | Soil | Soil | | | | | | | | |
| Batch Number | 1 | 1 | 1 | 1 | 1 | | | | | | | | |
| Date of Receipt | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | | | | | | | | |
| PAH MS | | | | | | | | | | | | | |
| Naphthalene # | <0.04 | <0.04 | <0.04 | 0.12 | - | | | | | | <0.04 | mg/kg | TM4/PM8 |
| Acenaphthylene | <0.03 | <0.03 | <0.03 | <0.03 | - | | | | | | <0.03 | mg/kg | TM4/PM8 |
| Acenaphthene # | <0.05 | <0.05 | <0.05 | <0.05 | - | | | | | | <0.05 | mg/kg | TM4/PM8 |
| Fluorene # | <0.04 | <0.04 | <0.04 | <0.04 | - | | | | | | <0.04 | mg/kg | TM4/PM8 |
| Phenanthrene # | <0.03 | <0.03 | <0.03 | 0.13 | - | | | | | | <0.03 | mg/kg | TM4/PM8 |
| Anthracene # | <0.04 | <0.04 | <0.04 | <0.04 | - | | | | | | <0.04 | mg/kg | TM4/PM8 |
| Fluoranthene # | <0.03 | <0.03 | <0.03 | 0.09 | - | | | | | | <0.03 | mg/kg | TM4/PM8 |
| Pyrene # | <0.03 | <0.03 | <0.03 | 0.14 | - | | | | | | <0.03 | mg/kg | TM4/PM8 |
| Benzo(a)anthracene # | <0.06 | <0.06 | <0.06 | <0.06 | - | | | | | | <0.06 | mg/kg | TM4/PM8 |
| Chrysene # | <0.02 | <0.02 | <0.02 | 0.13 | - | | | | | | <0.02 | mg/kg | TM4/PM8 |
| Benzo(bk)fluoranthene # | <0.07 | <0.07 | <0.07 | <0.07 | - | | | | | | <0.07 | mg/kg | TM4/PM8 |
| Benzo(a)pyrene # | <0.04 | <0.04 | <0.04 | <0.04 | - | | | | | | <0.04 | mg/kg | TM4/PM8 |
| Indeno(123cd)pyrene | <0.04 | <0.04 | <0.04 | <0.04 | - | | | | | | <0.04 | mg/kg | TM4/PM8 |
| Dibenzo(ah)anthracene # | <0.04 | <0.04 | <0.04 | <0.04 | - | | | | | | <0.04 | mg/kg | TM4/PM8 |
| Benzo(ghi)perylene # | <0.04 | <0.04 | <0.04 | <0.04 | - | | | | | | <0.04 | mg/kg | TM4/PM8 |
| Coronene | <0.04 | <0.04 | <0.04 | <0.04 | - | | | | | | <0.04 | mg/kg | TM4/PM8 |
| PAH 6 Total # | <0.22 | <0.22 | <0.22 | <0.22 | - | | | | | | <0.22 | mg/kg | TM4/PM8 |
| PAH 17 Total | <0.64 | <0.64 | <0.64 | <0.64 | - | | | | | | <0.64 | mg/kg | TM4/PM8 |
| Benzo(b)fluoranthene | <0.05 | <0.05 | <0.05 | <0.05 | - | | | | | | <0.05 | mg/kg | TM4/PM8 |
| Benzo(k)fluoranthene | <0.02 | <0.02 | <0.02 | <0.02 | - | | | | | | <0.02 | mg/kg | TM4/PM8 |
| Benzo(j)fluoranthene | <1 | <1 | <1 | <1 | - | | | | | | <1 | mg/kg | TM4/PM8 |
| PAH Surrogate % Recovery | 96 | 97 | 96 | 95 | - | | | | | | <0 | % | TM4/PM8 |
| Mineral Oil (C10-C40) | 44 | - | - | 542 AB | - | | | | | | <30 | mg/kg | TM5/PM8/PM16 |
| TPH CWG | | | | | | | | | | | | | |
| **Aliphatics** | | | | | | | | | | | | | |
| >C5-C6 # | <0.1 | <0.1 | <0.1 | <0.1 | - | | | | | | <0.1 | mg/kg | TM36/PM12 |
| >C6-C8 # | <0.1 | <0.1 | <0.1 | <0.1 | - | | | | | | <0.1 | mg/kg | TM36/PM12 |
| >C8-C10 | <0.1 | <0.1 | <0.1 | 1.2 | - | | | | | | <0.1 | mg/kg | TM36/PM12 |
| >C10-C12 # | <0.2 | <0.2 | <0.2 | <0.6 AB | - | | | | | | <0.2 | mg/kg | TM5/PM8/PM16 |
| >C12-C16 # | <4 | <4 | <4 | <12 AB | - | | | | | | <4 | mg/kg | TM5/PM8/PM16 |
| >C16-C21 # | <7 | <7 | <7 | <21 AB | - | | | | | | <7 | mg/kg | TM5/PM8/PM16 |
| >C21-C35 # | 44 | <7 | 83 | 438 AB | - | | | | | | <7 | mg/kg | TM5/PM8/PM16 |
| >C35-C40 | <7 | <7 | 12 | 104 AB | - | | | | | | <7 | mg/kg | TM5/PM8/PM16 |
| Total aliphatics C5-40 | 44 | <26 | 95 | 543 AB | - | | | | | | <26 | mg/kg | TM5/TM36/PM8/PM12/PM16 |
| >C6-C10 | <0.1 | <0.1 | <0.1 | 1.2 | - | | | | | | <0.1 | mg/kg | TM36/PM12 |
| >C10-C25 | <10 | <10 | 21 | 91 AB | - | | | | | | <10 | mg/kg | TM5/PM8/PM16 |
| >C25-C35 | 44 | <10 | 72 | 355 AB | - | | | | | | <10 | mg/kg | TM5/PM8/PM16 |

Please see attached notes for all abbreviations and acronyms

**Client Name:** Ground Investigations Ireland
**Reference:** 19/11/9230
**Location:** Avoca River Park
**Contact:** Emer O'Connor
**EMT Job No:** 19/20618

**Report : Solid**

**Solids:** V=60g VOC jar, J=250g glass jar, T=plastic tub

| EMT Sample No. | 189-191 | 192-194 | 195-197 | 198-200 | 204-206 | | | | | | LOD/LOR | Units | Method No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | TP28 | TP28 | TP29 | TP29 | TP30 | | | | | | | | |
| Depth | 0.50 | 1.50 | 0.50 | 1.50 | 1.50 | | | | | | | | |
| COC No / misc | | | | | | | | | | | | | |
| Containers | V J T | V J T | V J T | V J T | V J T | | | | | | | | |
| Sample Date | 10/12/2019 | 10/12/2019 | 12/12/2019 | 12/12/2019 | 11/12/2019 | | | | | | | | |
| Sample Type | Soil | Soil | Soil | Soil | Soil | | | | | | | | |
| Batch Number | 1 | 1 | 1 | 1 | 1 | | | | | | | | |
| Date of Receipt | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | | | | | | | | |
| TPH CWG | | | | | | | | | | | | | |
| **Aromatics** | | | | | | | | | | | | | |
| >C5-EC7 # | <0.1 | <0.1 | <0.1 | <0.1 | - | | | | | | <0.1 | mg/kg | TM36/PM12 |
| >EC7-EC8 # | <0.1 | <0.1 | <0.1 | <0.1 | - | | | | | | <0.1 | mg/kg | TM36/PM12 |
| >EC8-EC10 # | <0.1 | <0.1 | <0.1 | 1.2 | - | | | | | | <0.1 | mg/kg | TM36/PM12 |
| >EC10-EC12 # | <0.2 | <0.2 | <0.2 | <0.6 AB | - | | | | | | <0.2 | mg/kg | TM5/PM8/PM16 |
| >EC12-EC16 # | <4 | <4 | <4 | <12 AB | - | | | | | | <4 | mg/kg | TM5/PM8/PM16 |
| >EC16-EC21 # | <7 | <7 | <7 | 52 AB | - | | | | | | <7 | mg/kg | TM5/PM8/PM16 |
| >EC21-EC35 # | 41 | <7 | 63 | 777 AB | - | | | | | | <7 | mg/kg | TM5/PM8/PM16 |
| >EC35-EC40 | <7 | <7 | 18 | 214 AB | - | | | | | | <7 | mg/kg | TM5/PM8/PM16 |
| Total aromatics C5-40 | 41 | <26 | 81 | 1044 AB | - | | | | | | <26 | mg/kg | TM5/TM36/PM8/PM12/PM16 |
| Total aliphatics and aromatics(C5-40) | 85 | <52 | 176 | 1587 AB | - | | | | | | <52 | mg/kg | TM5/TM36/PM8/PM12/PM16 |
| >EC6-EC10 # | <0.1 | <0.1 | <0.1 | 1.2 | - | | | | | | <0.1 | mg/kg | TM36/PM12 |
| >EC10-EC25 | <10 | <10 | <10 | 207 AB | - | | | | | | <10 | mg/kg | TM5/PM8/PM16 |
| >EC25-EC35 | 41 | <10 | 64 | 627 AB | - | | | | | | <10 | mg/kg | TM5/PM8/PM16 |
| MTBE # | <5 | <5 | <5 | <5 | - | | | | | | <5 | ug/kg | TM31/PM12 |
| Benzene # | <5 | <5 | <5 | <5 | - | | | | | | <5 | ug/kg | TM31/PM12 |
| Toluene # | <5 | <5 | <5 | <5 | - | | | | | | <5 | ug/kg | TM31/PM12 |
| Ethylbenzene # | <5 | <5 | <5 | 108 | - | | | | | | <5 | ug/kg | TM31/PM12 |
| m/p-Xylene # | <5 | <5 | <5 | 859 | - | | | | | | <5 | ug/kg | TM31/PM12 |
| o-Xylene # | <5 | <5 | <5 | 148 | - | | | | | | <5 | ug/kg | TM31/PM12 |
| PCB 28 # | <5 | <5 | <5 | <25 AC | - | | | | | | <5 | ug/kg | TM17/PM8 |
| PCB 52 # | <5 | <5 | 17 | <25 AC | - | | | | | | <5 | ug/kg | TM17/PM8 |
| PCB 101 # | 6 | <5 | 66 | <25 AC | - | | | | | | <5 | ug/kg | TM17/PM8 |
| PCB 118 # | <5 | <5 | 37 | <25 AC | - | | | | | | <5 | ug/kg | TM17/PM8 |
| PCB 138 # | 7 | <5 | 105 | <25 AC | - | | | | | | <5 | ug/kg | TM17/PM8 |
| PCB 153 # | 6 | <5 | 90 | <25 AC | - | | | | | | <5 | ug/kg | TM17/PM8 |
| PCB 180 # | <5 | <5 | 45 | <25 AC | - | | | | | | <5 | ug/kg | TM17/PM8 |
| Total 7 PCBs # | <35 | <35 | 360 | <175 AC | - | | | | | | <35 | ug/kg | TM17/PM8 |
| Natural Moisture Content | 15.2 | 65.3 | 8.2 | 28.8 | - | | | | | | <0.1 | % | PM4/PM0 |
| Moisture Content (% Wet Weight) | 13.2 | 39.5 | 7.6 | 22.3 | - | | | | | | <0.1 | % | PM4/PM0 |
| Hexavalent Chromium # | <0.3 | <0.3 | <0.3 | <0.3 | - | | | | | | <0.3 | mg/kg | TM38/PM20 |
| Sulphate as SO4 (2:1 Ext) # | - | 0.0246 | - | - | - | | | | | | <0.0015 | g/l | TM38/PM20 |
| Sulphate as SO4 (2:1 Ext) | - | - | - | - | - | | | | | | <0.0015 | g/l | TM38/PM60 |
| Chromium III | 38.1 | 37.4 | 41.4 | - | - | | | | | | <0.5 | mg/kg | NONE/NONE |
| Chromium III | - | - | - | 530.3 AC | - | | | | | | <0.5 | mg/kg | NONE/NONE |
| Total Organic Carbon # | 0.14 | 2.15 | 0.07 | NDP | - | | | | | | <0.02 | % | TM21/PM24 |
| Organic Matter | - | - | - | - | 1.9 | | | | | | <0.2 | % | TM21/PM24 |

Please see attached notes for all abbreviations and acronyms



Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

## Element Materials Technology

**Client Name:** Ground Investigations Ireland
**Reference:** 19/11/9230
**Location:** Avoca River Park
**Contact:** Emer O'Connor
**EMT Job No:** 19/20618

**Report : Solid**

**Solids:** V=60g VOC jar, J=250g glass jar, T=plastic tub

| EMT Sample No. | 189-191 | 192-194 | 195-197 | 198-200 | 204-206 | | | | | | LOD/LOR | Units | Method No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | TP28 | TP28 | TP29 | TP29 | TP30 | | | | | | | | |
| Depth | 0.50 | 1.50 | 0.50 | 1.50 | 1.50 | | | | | | | | |
| COC No / misc | | | | | | | | | | | | | |
| Containers | V J T | V J T | V J T | V J T | V J T | | | | | | | | |
| Sample Date | 10/12/2019 | 10/12/2019 | 12/12/2019 | 12/12/2019 | 11/12/2019 | | | | | | | | |
| Sample Type | Soil | Soil | Soil | Soil | Soil | | | | | | | | |
| Batch Number | 1 | 1 | 1 | 1 | 1 | | | | | | | | |
| Date of Receipt | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | | | | | | | | |
| pH # | 6.28 | 7.40 | 8.43 | 7.44 | - | | | | | | <0.01 | pH units | TM73/PM11 |
| Mass of raw test portion | 0.101 | 0.1199 | 0.0964 | 0.1273 | - | | | | | | | kg | NONE/PM17 |
| Mass of dried test portion | 0.09 | 0.09 | 0.09 | 0.09 | - | | | | | | | kg | NONE/PM17 |

Please see attached notes for all abbreviations and acronyms

**Client Name:** Ground Investigations Ireland
**Reference:** 19/11/9230
**Location:** Avoca River Park
**Contact:** Emer O'Connor
**EMT Job No:** 19/20618

**Report : CEN 10:1 1 Batch**

**Solids:** V=60g VOC jar, J=250g glass jar, T=plastic tub

| EMT Sample No. | 7-9 | 16-18 | 34-36 | 40-42 | 52-54 | 55-57 | 58-60 | 61-63 | 76-78 | 79-81 | LOD/LOR | Units | Method No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | TP02 | TP03 | TP05 | TP06 | TP08 | TP08 | TP09 | TP09 | TP11 | TP11 | | | |
| Depth | 0.50 | 0.50 | 1.20 | 1.50 | 1.50 | 2.50 | 0.50 | 1.50 | 0.50 | 1.50 | | | |
| COC No / misc | | | | | | | | | | | | | |
| Containers | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | | | |
| Sample Date | 05/12/2019 | 04/12/2019 | 04/12/2019 | 06/12/2019 | 05/12/2019 | 05/12/2019 | 05/12/2019 | 05/12/2019 | 05/12/2019 | 05/12/2019 | | | |
| Sample Type | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | | | |
| Batch Number | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | |
| Date of Receipt | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | | | |
| Dissolved Antimony # | 0.007 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | 0.005 | <0.002 | <0.002 | <0.002 | mg/l | TM30/PM17 |
| Dissolved Antimony (A10) # | 0.07 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | 0.05 | <0.02 | <0.02 | <0.02 | mg/kg | TM30/PM17 |
| Dissolved Arsenic # | 0.1130 | <0.0025 | 0.0165 | 0.0165 | 0.0995 | <0.0025 | 0.0580 | 0.0773 | <0.0025 | <0.0025 | <0.0025 | mg/l | TM30/PM17 |
| Dissolved Arsenic (A10) # | 1.129 | <0.025 | 0.165 | 0.165 | 0.995 | <0.025 | 0.580 | 0.773 | <0.025 | <0.025 | <0.025 | mg/kg | TM30/PM17 |
| Dissolved Barium # | 0.018 | <0.003 | 0.007 | 0.007 | 0.010 | 0.016 | <0.003 | 0.006 | <0.003 | <0.003 | <0.003 | mg/l | TM30/PM17 |
| Dissolved Barium (A10) # | 0.18 | <0.03 | 0.07 | 0.07 | 0.10 | 0.16 | <0.03 | 0.06 | <0.03 | <0.03 | <0.03 | mg/kg | TM30/PM17 |
| Dissolved Cadmium # | 0.0039 | <0.0005 | <0.0005 | 0.0007 | 0.0020 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | mg/l | TM30/PM17 |
| Dissolved Cadmium (A10) # | 0.039 | <0.005 | <0.005 | 0.007 | 0.020 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | mg/kg | TM30/PM17 |
| Dissolved Chromium # | 0.0059 | <0.0015 | <0.0015 | <0.0015 | <0.0015 | 0.0100 | <0.0015 | <0.0015 | <0.0015 | <0.0015 | <0.0015 | mg/l | TM30/PM17 |
| Dissolved Chromium (A10) # | 0.059 | <0.015 | <0.015 | <0.015 | <0.015 | 0.100 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | mg/kg | TM30/PM17 |
| Dissolved Copper # | 0.009 | <0.007 | <0.007 | 0.043 | 0.060 | <0.007 | <0.007 | 0.014 | <0.007 | <0.007 | <0.007 | mg/l | TM30/PM17 |
| Dissolved Copper (A10) # | 0.09 | <0.07 | <0.07 | 0.43 | 0.60 | <0.07 | <0.07 | 0.14 | <0.07 | <0.07 | <0.07 | mg/kg | TM30/PM17 |
| Dissolved Lead # | 0.013 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | 0.014 | <0.005 | <0.005 | <0.005 | mg/l | TM30/PM17 |
| Dissolved Lead (A10) # | 0.13 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | 0.14 | <0.05 | <0.05 | <0.05 | mg/kg | TM30/PM17 |
| Dissolved Molybdenum # | 0.004 | 0.006 | <0.002 | <0.002 | 0.043 | <0.002 | 0.084 | 0.007 | 0.003 | <0.002 | <0.002 | mg/l | TM30/PM17 |
| Dissolved Molybdenum (A10) # | 0.04 | 0.06 | <0.02 | <0.02 | 0.43 | <0.02 | 0.84 | 0.07 | 0.03 | <0.02 | <0.02 | mg/kg | TM30/PM17 |
| Dissolved Nickel # | 0.009 | <0.002 | <0.002 | <0.002 | 0.002 | 0.005 | <0.002 | 0.004 | <0.002 | <0.002 | <0.002 | mg/l | TM30/PM17 |
| Dissolved Nickel (A10) # | 0.09 | <0.02 | <0.02 | <0.02 | <0.02 | 0.05 | <0.02 | 0.04 | <0.02 | <0.02 | <0.02 | mg/kg | TM30/PM17 |
| Dissolved Selenium # | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | 0.028 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | mg/l | TM30/PM17 |
| Dissolved Selenium (A10) # | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | 0.28 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | mg/kg | TM30/PM17 |
| Dissolved Zinc # | 0.070 | 0.004 | 0.007 | 0.044 | 0.504 | 0.465 | 0.018 | 0.420 | 0.004 | 0.006 | <0.003 | mg/l | TM30/PM17 |
| Dissolved Zinc (A10) # | 0.70 | 0.04 | 0.07 | 0.44 | 5.04 | 4.65 | 0.18 | 4.20 | 0.04 | 0.06 | <0.03 | mg/kg | TM30/PM17 |
| Mercury Dissolved by CVAF # | <0.00001 | <0.00001 | <0.00001 | 0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | mg/l | TM61/PM0 |
| Mercury Dissolved by CVAF # | <0.0001 | <0.0001 | <0.0001 | 0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | mg/kg | TM61/PM0 |
| Phenol | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | mg/l | TM26/PM0 |
| Phenol | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | mg/kg | TM26/PM0 |
| Fluoride | 47.0 AC | <1.5 AC | <1.5 AC | <0.3 | <0.3 | <0.3 | <0.3 | 1.7 | <1.5 AC | 8.4 AC | <0.3 | mg/l | TM173/PM0 |
| Fluoride | 470 AC | <15 AC | <15 AC | <3 | <3 | <3 | <3 | 17 | <15 AC | 84 AC | <3 | mg/kg | TM173/PM0 |
| Sulphate as SO4 # | 1333.7 | 1.9 | 13.6 | <0.5 | 72.4 | 188.5 | 74.3 | <0.5 | 10.4 | 40.5 | <0.5 | mg/l | TM38/PM0 |
| Sulphate as SO4 # | 13331 | 19 | 136 | <5 | 724 | 1885 | 743 | <5 | 104 | 405 | <5 | mg/kg | TM38/PM0 |
| Chloride # | <0.3 | <0.3 | 0.6 | <0.3 | 1.6 | 1.8 | 0.6 | 7.9 | 1.2 | 0.6 | <0.3 | mg/l | TM38/PM0 |
| Chloride # | <3 | <3 | 6 | <3 | 16 | 18 | 6 | 79 | 12 | 6 | <3 | mg/kg | TM38/PM0 |
| Dissolved Organic Carbon | 6 | <2 | 11 | 16 | 5 | <2 | 3 | 25 | <2 | 4 | <2 | mg/l | TM60/PM0 |
| Dissolved Organic Carbon | 60 | <20 | 110 | 160 | 50 | <20 | 30 | 250 | <20 | 40 | <20 | mg/kg | TM60/PM0 |
| pH | 4.62 | 7.44 | 7.52 | 7.24 | 6.66 | 6.49 | 7.75 | 7.43 | 7.92 | 7.54 | <0.01 | pH units | TM73/PM0 |
| Total Dissolved Solids # | 2357 | 48 | 104 | 65 | 119 | 331 | 168 | 99 | 62 | 88 | <35 | mg/l | TM20/PM0 |
| Total Dissolved Solids # | 23559 | 480 | 1040 | 650 | 1190 | 3311 | 1680 | 990 | 620 | 880 | <350 | mg/kg | TM20/PM0 |

Please see attached notes for all abbreviations and acronyms

**Client Name:** Ground Investigations Ireland
**Reference:** 19/11/9230
**Location:** Avoca River Park
**Contact:** Emer O'Connor
**EMT Job No:** 19/20618

**Report : CEN 10:1 1 Batch**

**Solids:** V=60g VOC jar, J=250g glass jar, T=plastic tub

| EMT Sample No. | 91-93 | 94-96 | 106-108 | 115-117 | 126-128 | 129-131 | 135-137 | 138-140 | 144-146 | 147-149 | LOD/LOR | Units | Method No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | TP13 | TP13 | TP16 | TP17 | TP19 | TP19 | TP20 | TP20 | TP21 | TP21 | | | |
| Depth | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | | | |
| COC No / misc | | | | | | | | | | | | | |
| Containers | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | | | |
| Sample Date | 11/12/2019 | 11/12/2019 | 09/12/2019 | 12/12/2019 | 11/12/2019 | 11/12/2019 | 09/12/2019 | 09/12/2019 | 09/12/2019 | 09/12/2019 | | | |
| Sample Type | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | | | |
| Batch Number | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | |
| Date of Receipt | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | | | |
| Dissolved Antimony # | <0.002 | <0.002 | <0.002 | 0.002 | <0.002 | 0.006 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | mg/l | TM30/PM17 |
| Dissolved Antimony (A10) # | <0.02 | <0.02 | <0.02 | 0.02 | <0.02 | 0.06 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | mg/kg | TM30/PM17 |
| Dissolved Arsenic # | <0.0025 | 0.0265 | <0.0025 | 0.0267 | <0.0025 | 0.0203 | 0.0038 | 0.0035 | 0.0078 | 0.0294 | <0.0025 | mg/l | TM30/PM17 |
| Dissolved Arsenic (A10) # | <0.025 | 0.265 | <0.025 | 0.267 | <0.025 | 0.203 | 0.038 | 0.035 | 0.078 | 0.294 | <0.025 | mg/kg | TM30/PM17 |
| Dissolved Barium # | <0.003 | <0.003 | <0.003 | 0.023 | <0.003 | 0.006 | 0.003 | 0.004 | <0.003 | <0.003 | <0.003 | mg/l | TM30/PM17 |
| Dissolved Barium (A10) # | <0.03 | <0.03 | <0.03 | 0.23 | <0.03 | 0.06 | 0.03 | 0.04 | <0.03 | <0.03 | <0.03 | mg/kg | TM30/PM17 |
| Dissolved Cadmium # | <0.0005 | 0.0021 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | mg/l | TM30/PM17 |
| Dissolved Cadmium (A10) # | <0.005 | 0.021 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | mg/kg | TM30/PM17 |
| Dissolved Chromium # | <0.0015 | <0.0015 | <0.0015 | <0.0015 | <0.0015 | 0.0033 | 0.0024 | <0.0015 | <0.0015 | <0.0015 | <0.0015 | mg/l | TM30/PM17 |
| Dissolved Chromium (A10) # | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | 0.033 | 0.024 | <0.015 | <0.015 | <0.015 | <0.015 | mg/kg | TM30/PM17 |
| Dissolved Copper # | <0.007 | 0.028 | <0.007 | <0.007 | <0.007 | <0.007 | <0.007 | <0.007 | 0.008 | <0.007 | <0.007 | mg/l | TM30/PM17 |
| Dissolved Copper (A10) # | <0.07 | 0.28 | <0.07 | <0.07 | <0.07 | <0.07 | <0.07 | <0.07 | 0.08 | <0.07 | <0.07 | mg/kg | TM30/PM17 |
| Dissolved Lead # | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | mg/l | TM30/PM17 |
| Dissolved Lead (A10) # | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | mg/kg | TM30/PM17 |
| Dissolved Molybdenum # | <0.002 | 0.013 | 0.006 | 0.015 | 0.003 | 0.026 | 0.013 | 0.014 | 0.006 | 0.004 | <0.002 | mg/l | TM30/PM17 |
| Dissolved Molybdenum (A10) # | <0.02 | 0.13 | 0.06 | 0.15 | 0.03 | 0.26 | 0.13 | 0.14 | 0.06 | 0.04 | <0.02 | mg/kg | TM30/PM17 |
| Dissolved Nickel # | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | 0.003 | <0.002 | <0.002 | <0.002 | mg/l | TM30/PM17 |
| Dissolved Nickel (A10) # | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | 0.03 | <0.02 | <0.02 | <0.02 | mg/kg | TM30/PM17 |
| Dissolved Selenium # | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | mg/l | TM30/PM17 |
| Dissolved Selenium (A10) # | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | mg/kg | TM30/PM17 |
| Dissolved Zinc # | 0.018 | 0.381 | 0.004 | 0.004 | 0.005 | 0.007 | 0.003 | 0.005 | 0.006 | 0.007 | <0.003 | mg/l | TM30/PM17 |
| Dissolved Zinc (A10) # | 0.18 | 3.81 | 0.04 | 0.04 | 0.05 | 0.07 | 0.03 | 0.05 | 0.06 | 0.07 | <0.03 | mg/kg | TM30/PM17 |
| Mercury Dissolved by CVAF # | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | 0.00001 | <0.00001 | mg/l | TM61/PM0 |
| Mercury Dissolved by CVAF # | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | mg/kg | TM61/PM0 |
| Phenol | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | mg/l | TM26/PM0 |
| Phenol | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | mg/kg | TM26/PM0 |
| Fluoride | <0.3 | <1.5 AC | <1.5 AC | <1.5 AC | <1.5 AC | <1.5 AC | 0.6 | 0.5 | <0.3 | <0.3 | <0.3 | mg/l | TM173/PM0 |
| Fluoride | <3 | <15 AC | <15 AC | <15 AC | <15 AC | <15 AC | 6 | 5 | <3 | <3 | <3 | mg/kg | TM173/PM0 |
| Sulphate as SO4 # | 42.5 | 121.6 | <0.5 | 190.4 | 1.1 | 24.0 | 8.9 | 15.5 | 5.1 | <0.5 | <0.5 | mg/l | TM38/PM0 |
| Sulphate as SO4 # | 425 | 1216 | <5 | 1904 | 11 | 240 | 89 | 155 | 51 | <5 | <5 | mg/kg | TM38/PM0 |
| Chloride # | <0.3 | 0.7 | <0.3 | 2.1 | <0.3 | 9.5 | <0.3 | <0.3 | 2.4 | 2.3 | <0.3 | mg/l | TM38/PM0 |
| Chloride # | <3 | 7 | <3 | 21 | <3 | 95 | <3 | <3 | 24 | 23 | <3 | mg/kg | TM38/PM0 |
| Dissolved Organic Carbon | 3 | <2 | <2 | 17 | <2 | 30 | <2 | 5 | 6 | 15 | <2 | mg/l | TM60/PM0 |
| Dissolved Organic Carbon | 30 | <20 | <20 | 170 | <20 | 300 | <20 | 50 | 60 | 150 | <20 | mg/kg | TM60/PM0 |
| pH | 7.32 | 6.97 | 7.85 | 8.00 | 8.18 | 8.80 | 8.23 | 8.24 | 8.61 | 7.70 | <0.01 | pH units | TM73/PM0 |
| Total Dissolved Solids # | 139 | 282 | <35 | 456 | 43 | 133 | 77 | 131 | 84 | 62 | <35 | mg/l | TM20/PM0 |
| Total Dissolved Solids # | 1390 | 2820 | <350 | 4561 | 430 | 1330 | 770 | 1310 | 840 | 620 | <350 | mg/kg | TM20/PM0 |

Please see attached notes for all abbreviations and acronyms



Please include all sections of this report if it is reproduced

All solid results are expressed on a dry weight basis unless stated otherwise.

**Client Name:** Ground Investigations Ireland
**Reference:** 19/11/9230
**Location:** Avoca River Park
**Contact:** Emer O'Connor
**EMT Job No:** 19/20618

**Report : CEN 10:1 1 Batch**

**Solids:** V=60g VOC jar, J=250g glass jar, T=plastic tub

| EMT Sample No. | 153-155 | 165-167 | 168-170 | 171-173 | 177-179 | 183-185 | 189-191 | 192-194 | 195-197 | 198-200 | LOD/LOR | Units | Method No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | TP22 | TP24 | TP24 | TP25 | TP26 | TP27 | TP28 | TP28 | TP29 | TP29 | | | |
| Depth | 0.50 | 0.50 | 1.50 | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 0.50 | 1.50 | | | |
| COC No / misc | | | | | | | | | | | | | |
| Containers | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | | | |
| Sample Date | 09/12/2019 | 09/12/2019 | 09/12/2019 | 10/12/2019 | 12/12/2019 | 10/12/2019 | 10/12/2019 | 10/12/2019 | 12/12/2019 | 12/12/2019 | | | |
| Sample Type | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | | | |
| Batch Number | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | |
| Date of Receipt | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | | | |
| Dissolved Antimony # | 0.009 | <0.002 | 0.002 | <0.002 | <0.002 | <0.002 | <0.002 | 0.004 | <0.002 | 0.003 | <0.002 | mg/l | TM30/PM17 |
| Dissolved Antimony (A10) # | 0.09 | <0.02 | 0.02 | <0.02 | <0.02 | <0.02 | <0.02 | 0.04 | <0.02 | 0.03 | <0.02 | mg/kg | TM30/PM17 |
| Dissolved Arsenic # | 0.0148 | 0.0058 | 0.0477 | <0.0025 | <0.0025 | <0.0025 | 0.0028 | 0.0882 | 0.0073 | 0.0115 | <0.0025 | mg/l | TM30/PM17 |
| Dissolved Arsenic (A10) # | 0.148 | 0.058 | 0.477 | <0.025 | <0.025 | <0.025 | 0.028 | 0.882 | 0.073 | 0.115 | <0.025 | mg/kg | TM30/PM17 |
| Dissolved Barium # | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | 0.012 | <0.003 | 0.006 | <0.003 | mg/l | TM30/PM17 |
| Dissolved Barium (A10) # | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | 0.12 | <0.03 | 0.06 | <0.03 | mg/kg | TM30/PM17 |
| Dissolved Cadmium # | <0.0005 | <0.0005 | 0.0006 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | mg/l | TM30/PM17 |
| Dissolved Cadmium (A10) # | <0.005 | <0.005 | 0.006 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | mg/kg | TM30/PM17 |
| Dissolved Chromium # | 0.0043 | <0.0015 | 0.0017 | <0.0015 | <0.0015 | <0.0015 | <0.0015 | 0.0051 | <0.0015 | <0.0015 | <0.0015 | mg/l | TM30/PM17 |
| Dissolved Chromium (A10) # | 0.043 | <0.015 | 0.017 | <0.015 | <0.015 | <0.015 | <0.015 | 0.051 | <0.015 | <0.015 | <0.015 | mg/kg | TM30/PM17 |
| Dissolved Copper # | 0.104 | <0.007 | 0.101 | <0.007 | <0.007 | <0.007 | <0.007 | 0.027 | <0.007 | <0.007 | <0.007 | mg/l | TM30/PM17 |
| Dissolved Copper (A10) # | 1.04 | <0.07 | 1.01 | <0.07 | <0.07 | <0.07 | <0.07 | 0.27 | <0.07 | <0.07 | <0.07 | mg/kg | TM30/PM17 |
| Dissolved Lead # | <0.005 | <0.005 | 0.097 | <0.005 | <0.005 | <0.005 | <0.005 | 0.042 | <0.005 | <0.005 | <0.005 | mg/l | TM30/PM17 |
| Dissolved Lead (A10) # | <0.05 | <0.05 | 0.97 | <0.05 | <0.05 | <0.05 | <0.05 | 0.42 | <0.05 | <0.05 | <0.05 | mg/kg | TM30/PM17 |
| Dissolved Molybdenum # | 0.010 | 0.006 | 0.006 | 0.005 | 0.003 | <0.002 | <0.002 | 0.009 | 0.003 | 0.021 | <0.002 | mg/l | TM30/PM17 |
| Dissolved Molybdenum (A10) # | 0.10 | 0.06 | 0.06 | 0.05 | 0.03 | <0.02 | <0.02 | 0.09 | 0.03 | 0.21 | <0.02 | mg/kg | TM30/PM17 |
| Dissolved Nickel # | 0.005 | <0.002 | 0.004 | <0.002 | <0.002 | <0.002 | <0.002 | 0.007 | <0.002 | 0.007 | <0.002 | mg/l | TM30/PM17 |
| Dissolved Nickel (A10) # | 0.05 | <0.02 | 0.04 | <0.02 | <0.02 | <0.02 | <0.02 | 0.07 | <0.02 | 0.07 | <0.02 | mg/kg | TM30/PM17 |
| Dissolved Selenium # | 0.007 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | mg/l | TM30/PM17 |
| Dissolved Selenium (A10) # | 0.07 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | mg/kg | TM30/PM17 |
| Dissolved Zinc # | 0.003 | 0.003 | 0.024 | 0.003 | 0.003 | 0.003 | 0.004 | 0.022 | 0.003 | 0.004 | <0.003 | mg/l | TM30/PM17 |
| Dissolved Zinc (A10) # | <0.03 | <0.03 | 0.24 | <0.03 | <0.03 | 0.03 | 0.04 | 0.22 | 0.03 | 0.04 | <0.03 | mg/kg | TM30/PM17 |
| Mercury Dissolved by CVAF # | <0.00001 | <0.00001 | 0.00002 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | 0.00001 | <0.00001 | <0.00001 | <0.00001 | mg/l | TM61/PM0 |
| Mercury Dissolved by CVAF # | <0.0001 | <0.0001 | 0.0002 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | mg/kg | TM61/PM0 |
| Phenol | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | mg/l | TM26/PM0 |
| Phenol | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | mg/kg | TM26/PM0 |
| Fluoride | 0.4 | 1.2 | <0.3 | 0.5 | 0.6 | 0.4 | <0.3 | <0.3 | 0.4 | 2.4 | <0.3 | mg/l | TM173/PM0 |
| Fluoride | 4 | 12 | <3 | 5 | 6 | 4 | <3 | <3 | 4 | 24 | <3 | mg/kg | TM173/PM0 |
| Sulphate as SO4 # | 21.7 | 3.7 | <0.5 | 4.3 | 3.7 | 3.2 | 7.4 | <0.5 | 0.8 | 229.5 | <0.5 | mg/l | TM38/PM0 |
| Sulphate as SO4 # | 217 | 37 | <5 | 43 | 37 | 32 | 74 | <5 | 8 | 2294 | <5 | mg/kg | TM38/PM0 |
| Chloride # | 4.8 | <0.3 | 8.4 | <0.3 | 0.4 | <0.3 | <0.3 | 10.1 | <0.3 | 5.6 | <0.3 | mg/l | TM38/PM0 |
| Chloride # | 48 | <3 | 84 | <3 | 4 | <3 | <3 | 101 | <3 | 56 | <3 | mg/kg | TM38/PM0 |
| Dissolved Organic Carbon | 27 | 2 | 36 | <2 | 3 | <2 | <2 | 48 | <2 | 14 | <2 | mg/l | TM60/PM0 |
| Dissolved Organic Carbon | 270 | <20 | 360 | <20 | 30 | <20 | <20 | 480 | <20 | 140 | <20 | mg/kg | TM60/PM0 |
| pH | 11.69 | 7.87 | 7.44 | 7.60 | 7.90 | 7.60 | 7.28 | 7.63 | 8.19 | 7.99 | <0.01 | pH units | TM73/PM0 |
| Total Dissolved Solids # | 357 | <35 | <35 | 42 | 67 | <35 | 42 | 74 | 45 | 373 | <35 | mg/l | TM20/PM0 |
| Total Dissolved Solids # | 3570 | <350 | <350 | 420 | 670 | <350 | 420 | 740 | 450 | 3728 | <350 | mg/kg | TM20/PM0 |

Please see attached notes for all abbreviations and acronyms



Please include all sections of this report if it is reproduced

All solid results are expressed on a dry weight basis unless stated otherwise.

## Element Materials Technology

**Client Name:** Ground Investigations Ireland
**Reference:** 19/11/9230
**Location:** Avoca River Park
**Contact:** Emer O'Connor
**EMT Job No:** 19/20618

**Report : EN12457_2**

**Solids:** V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

| EMT Sample No. | 7-9 | 16-18 | 34-36 | 40-42 | 52-54 | 55-57 | 58-60 | 61-63 | 76-78 | 79-81 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | TP02 | TP03 | TP05 | TP06 | TP08 | TP08 | TP09 | TP09 | TP11 | TP11 | | | | | | |
| Depth | 0.50 | 0.50 | 1.20 | 1.50 | 1.50 | 2.50 | 0.50 | 1.50 | 0.50 | 1.50 | | | | | | |
| COC No / misc | | | | | | | | | | | | | | | | |
| Containers | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | | | | | | |
| Sample Date | 05/12/2019 | 04/12/2019 | 04/12/2019 | 06/12/2019 | 05/12/2019 | 05/12/2019 | 05/12/2019 | 05/12/2019 | 05/12/2019 | 05/12/2019 | | | | | | |
| Sample Type | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | | | | | | |
| Batch Number | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | | | | |
| Date of Receipt | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | Inert | Stable Non-reactive | Hazardous | LOD LOR | Units | Method No. |
| **Solid Waste Analysis** | | | | | | | | | | | | | | | | |
| Total Organic Carbon # | 0.40 | 0.33 | 0.61 | 1.38 | 0.38 | 0.28 | 0.24 | 2.47 | 0.10 | 2.30 | 3 | 5 | 6 | <0.02 | % | TM21/PM24 |
| Sum of BTEX | <0.025 | <0.025 | <0.025 | <0.025 | <0.025 | <0.025 | <0.025 | <0.025 | <0.025 | <0.025 [SV] | 6 | - | - | <0.025 | mg/kg | TM31/PM12 |
| Sum of 7 PCBs # | <0.035 | <0.035 | <0.035 | <0.035 | <0.035 | <0.035 | <0.035 | <0.035 | <0.035 | <0.035 | 1 | - | - | <0.035 | mg/kg | TM17/PM8 |
| Mineral Oil | 136 | <30 | <30 | <30 | <30 | <30 | <30 | <30 | <30 | 249 [BA] | 500 | - | - | <30 | mg/kg | TM5/PM8/PM16 |
| PAH Sum of 6 # | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | - | - | - | <0.22 | mg/kg | TM4/PM8 |
| PAH Sum of 17 | <0.64 | <0.64 | <0.64 | <0.64 | <0.64 | <0.64 | <0.64 | <0.64 | <0.64 | <0.64 | 100 | - | - | <0.64 | mg/kg | TM4/PM8 |
| **CEN 10:1 Leachate** | | | | | | | | | | | | | | | | |
| Arsenic # | 1.129 | <0.025 | 0.165 | 0.165 | 0.995 | <0.025 | 0.580 | 0.773 | <0.025 | <0.025 | 0.5 | 2 | 25 | <0.025 | mg/kg | TM30/PM17 |
| Barium # | 0.18 | <0.03 | 0.07 | 0.07 | 0.10 | 0.16 | <0.03 | 0.06 | <0.03 | <0.03 | 20 | 100 | 300 | <0.03 | mg/kg | TM30/PM17 |
| Cadmium # | 0.039 | <0.005 | <0.005 | 0.007 | 0.020 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | 0.04 | 1 | 5 | <0.005 | mg/kg | TM30/PM17 |
| Chromium # | 0.059 | <0.015 | <0.015 | <0.015 | <0.015 | 0.100 | <0.015 | <0.015 | <0.015 | <0.015 | 0.5 | 10 | 70 | <0.015 | mg/kg | TM30/PM17 |
| Copper # | 0.09 | <0.07 | <0.07 | 0.43 | 0.60 | <0.07 | <0.07 | 0.14 | <0.07 | <0.07 | 2 | 50 | 100 | <0.07 | mg/kg | TM30/PM17 |
| Mercury # | <0.0001 | <0.0001 | <0.0001 | 0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | 0.01 | 0.2 | 2 | <0.0001 | mg/kg | TM61/PM0 |
| Molybdenum # | 0.04 | 0.06 | <0.02 | <0.02 | 0.43 | <0.02 | 0.84 | 0.07 | 0.03 | <0.02 | 0.5 | 10 | 30 | <0.02 | mg/kg | TM30/PM17 |
| Nickel # | 0.09 | <0.02 | <0.02 | <0.02 | <0.02 | 0.05 | <0.02 | 0.04 | <0.02 | <0.02 | 0.4 | 10 | 40 | <0.02 | mg/kg | TM30/PM17 |
| Lead # | 0.13 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | 0.14 | <0.05 | <0.05 | 0.5 | 10 | 50 | <0.05 | mg/kg | TM30/PM17 |
| Antimony # | 0.07 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | 0.05 | <0.02 | <0.02 | 0.06 | 0.7 | 5 | <0.02 | mg/kg | TM30/PM17 |
| Selenium # | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | 0.28 | <0.03 | <0.03 | <0.03 | <0.03 | 0.1 | 0.5 | 7 | <0.03 | mg/kg | TM30/PM17 |
| Zinc # | 0.70 | 0.04 | 0.07 | 0.44 | 5.04 | 4.65 | 0.18 | 4.20 | 0.04 | 0.06 | 4 | 50 | 200 | <0.03 | mg/kg | TM30/PM17 |
| Total Dissolved Solids # | 23559 | 480 | 1040 | 650 | 1190 | 3311 | 1680 | 990 | 620 | 880 | 4000 | 60000 | 100000 | <350 | mg/kg | TM20/PM0 |
| Dissolved Organic Carbon | 60 | <20 | 110 | 160 | 50 | <20 | 30 | 250 | <20 | 40 | 500 | 800 | 1000 | <20 | mg/kg | TM60/PM0 |
| Mass of raw test portion | 0.151 | 0.1003 | 0.1395 | 0.1219 | 0.1316 | 0.1232 | 0.1157 | 0.1496 | 0.0997 | 0.1189 | - | - | - | | kg | NONE/PM17 |
| Dry Matter Content Ratio | 59.8 | 89.6 | 64.4 | 73.8 | 68.2 | 73.1 | 77.8 | 60.1 | 89.9 | 76.0 | - | - | - | <0.1 | % | NONE/PM4 |
| Leachant Volume | 0.839 | 0.89 | 0.85 | 0.868 | 0.858 | 0.867 | 0.874 | 0.84 | 0.89 | 0.871 | - | - | - | | l | NONE/PM17 |
| Eluate Volume | 0.8 | 0.6 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | - | - | - | | l | NONE/PM17 |
| pH # | 4.64 | 8.16 | 7.08 | 7.03 | 6.74 | 5.82 | 6.21 | 7.12 | 8.56 | 7.17 | - | - | - | <0.01 | pH units | TM73/PM11 |
| Phenol | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 1 | - | - | <0.1 | mg/kg | TM26/PM0 |
| Fluoride | 470 [BC] | <15 [BC] | <15 [BC] | <3 | <3 | <3 | <3 | 17 | <15 [BC] | 84 [BC] | - | - | - | <3 | mg/kg | TM173/PM0 |
| Sulphate as SO4 # | 13331 | 19 | 136 | <5 | 724 | 1885 | 743 | <5 | 104 | 405 | 1000 | 20000 | 50000 | <5 | mg/kg | TM38/PM0 |
| Chloride # | <3 | <3 | 6 | <3 | 16 | 18 | 6 | 79 | 12 | 6 | 800 | 15000 | 25000 | <3 | mg/kg | TM38/PM0 |

## Element Materials Technology

**Client Name:** Ground Investigations Ireland
**Reference:** 19/11/9230
**Location:** Avoca River Park
**Contact:** Emer O'Connor
**EMT Job No:** 19/20618

**Report : EN12457_2**

**Solids:** V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

| EMT Sample No. | 91-93 | 94-96 | 106-108 | 115-117 | 126-128 | 129-131 | 135-137 | 138-140 | 144-146 | 147-149 | Inert | Stable Non-reactive | Hazardous | LOD LOR | Units | Method No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID** | TP13 | TP13 | TP16 | TP17 | TP19 | TP19 | TP20 | TP20 | TP21 | TP21 | | | | | | |
| **Depth** | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | | | | | | |
| **COC No / misc** | | | | | | | | | | | | | | | | |
| **Containers** | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | | | | | | |
| **Sample Date** | 11/12/2019 | 11/12/2019 | 09/12/2019 | 12/12/2019 | 11/12/2019 | 11/12/2019 | 09/12/2019 | 09/12/2019 | 09/12/2019 | 09/12/2019 | | | | | | |
| **Sample Type** | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | | | | | | |
| **Batch Number** | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | | | | |
| **Date of Receipt** | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | | | | | | |
| **Solid Waste Analysis** | | | | | | | | | | | | | | | | |
| Total Organic Carbon # | 0.32 | 0.11 | 0.70 | 7.23 | 0.42 | 3.94 | NDP | NDP | 0.22 | 0.40 | 3 | 5 | 6 | <0.02 | % | TM21/PM24 |
| Sum of BTEX | <0.025 | <0.025 | <0.025 | <0.025 | <0.025 | 0.048$^{SV}$ | <0.025 | <0.025 | <0.025 | <0.025 | 6 | - | - | <0.025 | mg/kg | TM31/PM12 |
| Sum of 7 PCBs # | 0.464 | <0.035 | 0.093 | <0.035 | 0.069 | 0.206$_{BC}$ | 3.715 | <0.035 | <0.035 | <0.035 | 1 | - | - | <0.035 | mg/kg | TM17/PM8 |
| Mineral Oil | 31 | <30 | 61$_{BA}$ | <30 | 82 | 576$_{BD}$ | 60 | 93 | 168 | <30 | 500 | - | - | <30 | mg/kg | TM5/PM8/PM16 |
| PAH Sum of 6 # | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | 0.47 | <0.22 | <0.22 | <0.22 | <0.22 | - | - | - | <0.22 | mg/kg | TM4/PM8 |
| PAH Sum of 17 | <0.64 | <0.64 | <0.64 | <0.64 | <0.64 | 5.28 | <0.64 | <0.64 | <0.64 | <0.64 | 100 | - | - | <0.64 | mg/kg | TM4/PM8 |
| **CEN 10:1 Leachate** | | | | | | | | | | | | | | | | |
| Arsenic # | <0.025 | 0.265 | <0.025 | 0.267 | <0.025 | 0.203 | 0.038 | 0.035 | 0.078 | 0.294 | 0.5 | 2 | 25 | <0.025 | mg/kg | TM30/PM17 |
| Barium # | <0.03 | <0.03 | <0.03 | 0.23 | <0.03 | 0.06 | 0.03 | 0.04 | <0.03 | <0.03 | 20 | 100 | 300 | <0.03 | mg/kg | TM30/PM17 |
| Cadmium # | <0.005 | 0.021 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | 0.04 | 1 | 5 | <0.005 | mg/kg | TM30/PM17 |
| Chromium # | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | 0.033 | 0.024 | <0.015 | <0.015 | <0.015 | 0.5 | 10 | 70 | <0.015 | mg/kg | TM30/PM17 |
| Copper # | <0.07 | 0.28 | <0.07 | <0.07 | <0.07 | <0.07 | <0.07 | <0.07 | 0.08 | <0.07 | 2 | 50 | 100 | <0.07 | mg/kg | TM30/PM17 |
| Mercury # | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | 0.01 | 0.2 | 2 | <0.0001 | mg/kg | TM61/PM0 |
| Molybdenum # | <0.02 | 0.13 | 0.06 | 0.15 | 0.03 | 0.26 | 0.13 | 0.14 | 0.06 | 0.04 | 0.5 | 10 | 30 | <0.02 | mg/kg | TM30/PM17 |
| Nickel # | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | 0.03 | <0.02 | <0.02 | 0.4 | 10 | 40 | <0.02 | mg/kg | TM30/PM17 |
| Lead # | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | 0.5 | 10 | 50 | <0.05 | mg/kg | TM30/PM17 |
| Antimony # | <0.02 | <0.02 | <0.02 | 0.02 | <0.02 | 0.06 | <0.02 | <0.02 | <0.02 | <0.02 | 0.06 | 0.7 | 5 | <0.02 | mg/kg | TM30/PM17 |
| Selenium # | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | 0.1 | 0.5 | 7 | <0.03 | mg/kg | TM30/PM17 |
| Zinc # | 0.18 | 3.81 | 0.04 | 0.04 | 0.05 | 0.07 | 0.03 | 0.05 | 0.06 | 0.07 | 4 | 50 | 200 | <0.03 | mg/kg | TM30/PM17 |
| Total Dissolved Solids # | 1390 | 2820 | <350 | 4561 | 430 | 1330 | 770 | 1310 | 840 | 620 | 4000 | 60000 | 100000 | <350 | mg/kg | TM20/PM0 |
| Dissolved Organic Carbon | 30 | <20 | <20 | 170 | <20 | 300 | <20 | 50 | 60 | 150 | 500 | 800 | 1000 | <20 | mg/kg | TM60/PM0 |
| Mass of raw test portion | 0.0981 | 0.1313 | 0.1002 | 0.1696 | 0.0969 | 0.1173 | 0.1109 | 0.1087 | 0.0986 | 0.1278 | - | - | - | | kg | NONE/PM17 |
| Dry Matter Content Ratio | 92.0 | 68.7 | 90.2 | 52.9 | 92.4 | 76.9 | 81.0 | 82.5 | 91.0 | 70.6 | - | - | - | <0.1 | % | NONE/PM4 |
| Leachant Volume | 0.892 | 0.859 | 0.89 | 0.82 | 0.893 | 0.873 | 0.879 | 0.881 | 0.891 | 0.862 | - | - | - | | l | NONE/PM17 |
| Eluate Volume | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 0.08 | - | - | - | | l | NONE/PM17 |
| pH # | 7.19 | 4.55 | 8.33 | 7.56 | 8.33 | 8.04 | 8.34 | 7.82 | 8.34 | 7.12 | - | - | - | <0.01 | pH units | TM73/PM11 |
| Phenol | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 1 | - | - | <0.1 | mg/kg | TM26/PM0 |
| Fluoride | <3 | <15$_{BC}$ | <15$_{BC}$ | <15$_{BC}$ | <15$_{BC}$ | <15$_{BC}$ | 6 | 5 | <3 | <3 | - | - | - | <3 | mg/kg | TM173/PM0 |
| Sulphate as SO4 # | 425 | 1216 | <5 | 1904 | 11 | 240 | 89 | 155 | 51 | <5 | 1000 | 20000 | 50000 | <5 | mg/kg | TM38/PM0 |
| Chloride # | <3 | 7 | <3 | 21 | <3 | 95 | <3 | <3 | 24 | 23 | 800 | 15000 | 25000 | <3 | mg/kg | TM38/PM0 |



Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

**Client Name:** Ground Investigations Ireland
**Reference:** 19/11/9230
**Location:** Avoca River Park
**Contact:** Emer O'Connor
**EMT Job No:** 19/20618

**Report : EN12457_2**

**Solids:** V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

| EMT Sample No. | 153-155 | 165-167 | 168-170 | 171-173 | 177-179 | 183-185 | 189-191 | 192-194 | 195-197 | 198-200 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | TP22 | TP24 | TP24 | TP25 | TP26 | TP27 | TP28 | TP28 | TP29 | TP29 | | | | | | |
| Depth | 0.50 | 0.50 | 1.50 | 0.50 | 0.50 | 0.50 | 0.50 | 1.50 | 0.50 | 1.50 | | | | | | |
| COC No / misc | | | | | | | | | | | | | | | | |
| Containers | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | V J T | | | | | | |
| Sample Date | 09/12/2019 | 09/12/2019 | 09/12/2019 | 10/12/2019 | 12/12/2019 | 10/12/2019 | 10/12/2019 | 10/12/2019 | 12/12/2019 | 12/12/2019 | | | | | | |
| Sample Type | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | | | | | | |
| Batch Number | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | | | | |
| Date of Receipt | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | 16/12/2019 | Inert | Stable Non-reactive | Hazardous | LOD LOR | Units | Method No. |
| **Solid Waste Analysis** | | | | | | | | | | | | | | | | |
| Total Organic Carbon # | 1.65 | NDP | 3.43 | 0.14 | 0.45 | 0.21 | 0.14 | 2.15 | 0.07 | NDP | 3 | 5 | 6 | <0.02 | % | TM21/PM24 |
| Sum of BTEX | <0.025 | <0.025 | <0.025 SV | <0.025 SV | <0.025 | <0.025 | <0.025 | <0.025 | <0.025 | 1.115 | 6 | - | - | <0.025 | mg/kg | TM31/PM12 |
| Sum of 7 PCBs # | <0.035 | <0.035 | <0.035 | <0.035 | <0.035 | <0.035 | <0.035 | <0.035 | 0.360 | <0.175 BC | 1 | - | - | <0.035 | mg/kg | TM17/PM8 |
| Mineral Oil | 90 | 67 | <30 | <30 | <30 | <30 | 44 | - | - | 542 BB | 500 | - | - | <30 | mg/kg | TM5/PM8/PM16 |
| PAH Sum of 6 # | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | - | - | - | <0.22 | mg/kg | TM4/PM8 |
| PAH Sum of 17 | <0.64 | <0.64 | <0.64 | <0.64 | <0.64 | <0.64 | <0.64 | <0.64 | <0.64 | <0.64 | 100 | - | - | <0.64 | mg/kg | TM4/PM8 |
| **CEN 10:1 Leachate** | | | | | | | | | | | | | | | | |
| Arsenic # | 0.148 | 0.058 | 0.477 | <0.025 | <0.025 | <0.025 | 0.028 | 0.882 | 0.073 | 0.115 | 0.5 | 2 | 25 | <0.025 | mg/kg | TM30/PM17 |
| Barium # | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | 0.12 | <0.03 | 0.06 | 20 | 100 | 300 | <0.03 | mg/kg | TM30/PM17 |
| Cadmium # | <0.005 | <0.005 | 0.006 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | 0.04 | 1 | 5 | <0.005 | mg/kg | TM30/PM17 |
| Chromium # | 0.043 | <0.015 | 0.017 | <0.015 | <0.015 | <0.015 | <0.015 | 0.051 | <0.015 | <0.015 | 0.5 | 10 | 70 | <0.015 | mg/kg | TM30/PM17 |
| Copper # | 1.04 | <0.07 | 1.01 | <0.07 | <0.07 | <0.07 | <0.07 | 0.27 | <0.07 | <0.07 | 2 | 50 | 100 | <0.07 | mg/kg | TM30/PM17 |
| Mercury # | <0.0001 | <0.0001 | 0.0002 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | 0.01 | 0.2 | 2 | <0.0001 | mg/kg | TM61/PM0 |
| Molybdenum # | 0.10 | 0.06 | 0.06 | 0.05 | 0.03 | <0.02 | <0.02 | 0.09 | 0.03 | 0.21 | 0.5 | 10 | 30 | <0.02 | mg/kg | TM30/PM17 |
| Nickel # | 0.05 | <0.02 | 0.04 | <0.02 | <0.02 | <0.02 | <0.02 | 0.07 | <0.02 | 0.07 | 0.4 | 10 | 40 | <0.02 | mg/kg | TM30/PM17 |
| Lead # | <0.05 | <0.05 | 0.97 | <0.05 | <0.05 | <0.05 | <0.05 | 0.42 | <0.05 | <0.05 | 0.5 | 10 | 50 | <0.05 | mg/kg | TM30/PM17 |
| Antimony # | 0.09 | <0.02 | 0.02 | <0.02 | <0.02 | <0.02 | <0.02 | 0.04 | <0.02 | 0.03 | 0.06 | 0.7 | 5 | <0.02 | mg/kg | TM30/PM17 |
| Selenium # | 0.07 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | 0.1 | 0.5 | 7 | <0.03 | mg/kg | TM30/PM17 |
| Zinc # | <0.03 | <0.03 | 0.24 | <0.03 | <0.03 | 0.03 | 0.04 | 0.22 | 0.03 | 0.04 | 4 | 50 | 200 | <0.03 | mg/kg | TM30/PM17 |
| Total Dissolved Solids # | 3570 | <350 | <350 | 420 | 670 | <350 | 420 | 740 | 450 | 3728 | 4000 | 60000 | 100000 | <350 | mg/kg | TM20/PM0 |
| Dissolved Organic Carbon | 270 | <20 | 360 | <20 | 30 | <20 | <20 | 480 | <20 | 140 | 500 | 800 | 1000 | <20 | mg/kg | TM60/PM0 |
| Mass of raw test portion | 0.1161 | 0.0985 | 0.1339 | 0.1075 | 0.1165 | 0.1012 | 0.101 | 0.1199 | 0.0964 | 0.1273 | - | - | - | | kg | NONE/PM17 |
| Dry Matter Content Ratio | 77.6 | 91.2 | 67.0 | 83.5 | 77.2 | 89.0 | 89.0 | 75.2 | 93.8 | 70.5 | - | - | - | <0.1 | % | NONE/PM4 |
| Leachant Volume | 0.874 | 0.891 | 0.856 | 0.882 | 0.873 | 0.889 | 0.889 | 0.87 | 0.894 | 0.862 | - | - | - | | l | NONE/PM17 |
| Eluate Volume | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | - | - | - | | l | NONE/PM17 |
| pH # | 9.59 | 8.04 | 6.69 | 7.08 | 7.17 | 7.12 | 6.28 | 7.40 | 8.43 | 7.44 | - | - | - | <0.01 | pH units | TM73/PM11 |
| Phenol | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 1 | - | - | <0.1 | mg/kg | TM26/PM0 |
| Fluoride | 4 | 12 | <3 | 5 | 6 | 4 | <3 | <3 | 4 | 24 | - | - | - | <3 | mg/kg | TM173/PM0 |
| Sulphate as SO4 # | 217 | 37 | <5 | 43 | 37 | 32 | 74 | <5 | 8 | 2294 | 1000 | 20000 | 50000 | <5 | mg/kg | TM38/PM0 |
| Chloride # | 48 | <3 | 84 | <3 | 4 | <3 | <3 | 101 | <3 | 56 | 800 | 15000 | 25000 | <3 | mg/kg | TM38/PM0 |



Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

**Client Name:** Ground Investigations Ireland

**Reference:** 19/11/9230

**Location:** Avoca River Park

**Contact:** Emer O'Connor

**Matrix : Solid**

| EMT Job No. | Batch | Sample ID | Depth | EMT Sample No. | EPH Interpretation |
|---|---|---|---|---|---|
| 19/20618 | 1 | TP02 | 0.50 | 7-9 | Naturally occurring compounds |
| 19/20618 | 1 | TP03 | 0.50 | 16-18 | Trace of lubricating oil & Possible tarmac/bitumen |
| 19/20618 | 1 | TP05 | 1.20 | 34-36 | No interpretation possible |
| 19/20618 | 1 | TP06 | 1.50 | 40-42 | No interpretation possible |
| 19/20618 | 1 | TP08 | 1.50 | 52-54 | No interpretation possible |
| 19/20618 | 1 | TP08 | 2.50 | 55-57 | No interpretation possible |
| 19/20618 | 1 | TP09 | 0.50 | 58-60 | No interpretation possible |
| 19/20618 | 1 | TP09 | 1.50 | 61-63 | No interpretation possible |
| 19/20618 | 1 | TP11 | 0.50 | 76-78 | No interpretation possible |
| 19/20618 | 1 | TP11 | 1.50 | 79-81 | Degraded diesel & Naturally occurring compounds |
| 19/20618 | 1 | TP13 | 0.50 | 91-93 | No interpretation possible |
| 19/20618 | 1 | TP13 | 1.50 | 94-96 | No interpretation possible |
| 19/20618 | 1 | TP16 | 0.50 | 106-108 | Lubricatign ol & Possible tarmac/bitumen |
| 19/20618 | 1 | TP17 | 1.50 | 115-117 | No interpretation possible |
| 19/20618 | 1 | TP19 | 0.50 | 126-128 | Lubricating oil |
| 19/20618 | 1 | TP19 | 1.50 | 129-131 | lubricating oil & Possible tarmac/bitumen |
| 19/20618 | 1 | TP20 | 0.50 | 135-137 | Trace of lubricating oil |
| 19/20618 | 1 | TP20 | 1.50 | 138-140 | Trace of lubricating oil & Possible trace of degraded diesel |
| 19/20618 | 1 | TP21 | 0.50 | 144-146 | Lubricating oil & Degraded diesel |
| 19/20618 | 1 | TP21 | 1.50 | 147-149 | No interpretation possible |
| 19/20618 | 1 | TP22 | 0.50 | 153-155 | Trace of degraded diesel |
| 19/20618 | 1 | TP24 | 0.50 | 165-167 | Degraded diesel |
| 19/20618 | 1 | TP24 | 1.50 | 168-170 | Naturally occurring compounds |
| 19/20618 | 1 | TP25 | 0.50 | 171-173 | No interpretation possible |
| 19/20618 | 1 | TP26 | 0.50 | 177-179 | Lubricating oil |
| 19/20618 | 1 | TP27 | 0.50 | 183-185 | No interpretation possible |
| 19/20618 | 1 | TP28 | 0.50 | 189-191 | Lubricating oil |
| 19/20618 | 1 | TP28 | 1.50 | 192-194 | No interpretation possible |
| 19/20618 | 1 | TP29 | 0.50 | 195-197 | Trace of lubricating oil |
| 19/20618 | 1 | TP29 | 1.50 | 198-200 | Lubricating oil & Naturally occuring compounds |
| | | | | | |
| | | | | | |

**Client Name:** Ground Investigations Ireland
**Reference:** 19/11/9230
**Location:** Avoca River Park
**Contact:** Emer O'Connor

**Note:**

Asbestos Screen analysis is carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Detailed Gravimetric Quantification and PCOM Fibre Analysis is carried out in accordance with our documented in-house methods PM042 and TM131 and HSG 248 using Stereo and Polarised Light Microscopy and Phase Contrast Optical Microscopy (PCOM). Samples are retained for not less than 6 months from the date of analysis unless specifically requested.

Opinions, including ACM type and Asbestos level less than 0.1%, lie outside the scope of our UKAS accreditation.

Where the sample is not taken by a Element Materials Technology consultant, Element Materials Technology cannot be responsible for inaccurate or unrepresentative sampling.

| EMT Job No. | Batch | Sample ID | Depth | EMT Sample No. | Date Of Analysis | Analysis | Result |
|---|---|---|---|---|---|---|---|
| 19/20618 | 1 | TP02 | 0.50 | 8 | 19/12/2019 | **General Description (Bulk Analysis)** | soil.stones |
| | | | | | 19/12/2019 | **Asbestos Fibres** | NAD |
| | | | | | 19/12/2019 | **Asbestos ACM** | NAD |
| | | | | | 19/12/2019 | **Asbestos Type** | NAD |
| | | | | | 19/12/2019 | **Asbestos Level Screen** | NAD |
| 19/20618 | 1 | TP03 | 0.50 | 17 | 19/12/2019 | **General Description (Bulk Analysis)** | soil.stones |
| | | | | | 19/12/2019 | **Asbestos Fibres** | NAD |
| | | | | | 19/12/2019 | **Asbestos ACM** | NAD |
| | | | | | 19/12/2019 | **Asbestos Type** | NAD |
| | | | | | 19/12/2019 | **Asbestos Level Screen** | NAD |
| 19/20618 | 1 | TP05 | 1.20 | 35 | 19/12/2019 | **General Description (Bulk Analysis)** | soil.stones |
| | | | | | 19/12/2019 | **Asbestos Fibres** | NAD |
| | | | | | 19/12/2019 | **Asbestos ACM** | NAD |
| | | | | | 19/12/2019 | **Asbestos Type** | NAD |
| | | | | | 19/12/2019 | **Asbestos Level Screen** | NAD |
| 19/20618 | 1 | TP06 | 1.50 | 41 | 19/12/2019 | **General Description (Bulk Analysis)** | soil/stones |
| | | | | | 19/12/2019 | **Asbestos Fibres** | NAD |
| | | | | | 19/12/2019 | **Asbestos ACM** | NAD |
| | | | | | 19/12/2019 | **Asbestos Type** | NAD |
| | | | | | 19/12/2019 | **Asbestos Level Screen** | NAD |
| 19/20618 | 1 | TP08 | 1.50 | 53 | 19/12/2019 | **General Description (Bulk Analysis)** | soil/stones |
| | | | | | 19/12/2019 | **Asbestos Fibres** | NAD |
| | | | | | 19/12/2019 | **Asbestos ACM** | NAD |
| | | | | | 19/12/2019 | **Asbestos Type** | NAD |
| | | | | | 19/12/2019 | **Asbestos Level Screen** | NAD |
| 19/20618 | 1 | TP08 | 2.50 | 56 | 19/12/2019 | **General Description (Bulk Analysis)** | soil/stones |
| | | | | | 19/12/2019 | **Asbestos Fibres** | NAD |
| | | | | | 19/12/2019 | **Asbestos ACM** | NAD |
| | | | | | 19/12/2019 | **Asbestos Type** | NAD |
| | | | | | 19/12/2019 | **Asbestos Level Screen** | NAD |
| 19/20618 | 1 | TP09 | 0.50 | 59 | 19/12/2019 | **General Description (Bulk Analysis)** | Soil/Stones |
| | | | | | 19/12/2019 | **Asbestos Fibres** | NAD |
| | | | | | 19/12/2019 | **Asbestos ACM** | NAD |

**Client Name:** Ground Investigations Ireland
**Reference:** 19/11/9230
**Location:** Avoca River Park
**Contact:** Emer O'Connor

| EMT Job No. | Batch | Sample ID | Depth | EMT Sample No. | Date Of Analysis | Analysis | Result |
|---|---|---|---|---|---|---|---|
| 19/20618 | 1 | TP09 | 0.50 | 59 | 19/12/2019 | **Asbestos Type** | NAD |
| | | | | | 19/12/2019 | **Asbestos Level Screen** | NAD |
| 19/20618 | 1 | TP09 | 1.50 | 62 | 19/12/2019 | **General Description (Bulk Analysis)** | soil-stones |
| | | | | | 19/12/2019 | **Asbestos Fibres** | NAD |
| | | | | | 19/12/2019 | **Asbestos ACM** | NAD |
| | | | | | 19/12/2019 | **Asbestos Type** | NAD |
| | | | | | 19/12/2019 | **Asbestos Level Screen** | NAD |
| 19/20618 | 1 | TP11 | 0.50 | 77 | 19/12/2019 | **General Description (Bulk Analysis)** | soil-stones |
| | | | | | 19/12/2019 | **Asbestos Fibres** | NAD |
| | | | | | 19/12/2019 | **Asbestos ACM** | NAD |
| | | | | | 19/12/2019 | **Asbestos Type** | NAD |
| | | | | | 19/12/2019 | **Asbestos Level Screen** | NAD |
| 19/20618 | 1 | TP11 | 1.50 | 80 | 19/12/2019 | **General Description (Bulk Analysis)** | soil-stones |
| | | | | | 19/12/2019 | **Asbestos Fibres** | NAD |
| | | | | | 19/12/2019 | **Asbestos ACM** | NAD |
| | | | | | 19/12/2019 | **Asbestos Type** | NAD |
| | | | | | 19/12/2019 | **Asbestos Level Screen** | NAD |
| 19/20618 | 1 | TP13 | 0.50 | 92 | 19/12/2019 | **General Description (Bulk Analysis)** | Soil/Stones |
| | | | | | 19/12/2019 | **Asbestos Fibres** | NAD |
| | | | | | 19/12/2019 | **Asbestos ACM** | NAD |
| | | | | | 19/12/2019 | **Asbestos Type** | NAD |
| | | | | | 19/12/2019 | **Asbestos Level Screen** | NAD |
| 19/20618 | 1 | TP13 | 1.50 | 95 | 19/12/2019 | **General Description (Bulk Analysis)** | Soil/Stones |
| | | | | | 19/12/2019 | **Asbestos Fibres** | NAD |
| | | | | | 19/12/2019 | **Asbestos ACM** | NAD |
| | | | | | 19/12/2019 | **Asbestos Type** | NAD |
| | | | | | 19/12/2019 | **Asbestos Level Screen** | NAD |
| 19/20618 | 1 | TP16 | 0.50 | 107 | 19/12/2019 | **General Description (Bulk Analysis)** | Soil/Stones |
| | | | | | 19/12/2019 | **Asbestos Fibres** | NAD |
| | | | | | 19/12/2019 | **Asbestos ACM** | NAD |
| | | | | | 19/12/2019 | **Asbestos Type** | NAD |
| | | | | | 19/12/2019 | **Asbestos Level Screen** | NAD |
| 19/20618 | 1 | TP17 | 1.50 | 116 | 19/12/2019 | **General Description (Bulk Analysis)** | soil.stones |
| | | | | | 19/12/2019 | **Asbestos Fibres** | NAD |
| | | | | | 19/12/2019 | **Asbestos ACM** | NAD |
| | | | | | 19/12/2019 | **Asbestos Type** | NAD |
| | | | | | 19/12/2019 | **Asbestos Level Screen** | NAD |
| 19/20618 | 1 | TP19 | 0.50 | 127 | 19/12/2019 | **General Description (Bulk Analysis)** | Soil/Stone |
| | | | | | 19/12/2019 | **Asbestos Fibres** | NAD |
| | | | | | 19/12/2019 | **Asbestos ACM** | NAD |
| | | | | | 19/12/2019 | **Asbestos Type** | NAD |
| | | | | | 19/12/2019 | **Asbestos Level Screen** | NAD |
| 19/20618 | 1 | TP19 | 1.50 | 130 | 19/12/2019 | **General Description (Bulk Analysis)** | soil-stones |
| | | | | | 19/12/2019 | **Asbestos Fibres** | NAD |

**Client Name:** Ground Investigations Ireland
**Reference:** 19/11/9230
**Location:** Avoca River Park
**Contact:** Emer O'Connor

| EMT Job No. | Batch | Sample ID | Depth | EMT Sample No. | Date Of Analysis | Analysis | Result |
|---|---|---|---|---|---|---|---|
| 19/20618 | 1 | TP19 | 1.50 | 130 | 19/12/2019 | **Asbestos ACM** | NAD |
| | | | | | 19/12/2019 | **Asbestos Type** | NAD |
| | | | | | 19/12/2019 | **Asbestos Level Screen** | NAD |
| 19/20618 | 1 | TP20 | 0.50 | 136 | 19/12/2019 | **General Description (Bulk Analysis)** | soil/stones |
| | | | | | 19/12/2019 | **Asbestos Fibres** | Fibre Bundles |
| | | | | | 19/12/2019 | **Asbestos ACM** | NAD |
| | | | | | 19/12/2019 | **Asbestos Type** | Chrysotile |
| | | | | | 19/12/2019 | **Asbestos Level Screen** | less than 0.1% |
| | | | | | 30/12/2019 | **Total ACM Gravimetric Quantification (% Asb)** | <0.001 (mass %) |
| | | | | | 30/12/2019 | **Total Detailed Gravimetric Quantification (% Asb)** | <0.001 (mass %) |
| | | | | | 30/12/2019 | **Total Gravimetric Quantification (ACM + Detailed) (% Asb)** | <0.001 (mass %) |
| 19/20618 | 1 | TP20 | 1.50 | 139 | 19/12/2019 | **General Description (Bulk Analysis)** | soil/stones |
| | | | | | 19/12/2019 | **Asbestos Fibres** | Fibre Bundles |
| | | | | | 19/12/2019 | **Asbestos ACM** | NAD |
| | | | | | 19/12/2019 | **Asbestos Type** | Chrysotile |
| | | | | | 19/12/2019 | **Asbestos Level Screen** | less than 0.1% |
| | | | | | 30/12/2019 | **Total ACM Gravimetric Quantification (% Asb)** | <0.001 (mass %) |
| | | | | | 30/12/2019 | **Total Detailed Gravimetric Quantification (% Asb)** | <0.001 (mass %) |
| | | | | | 30/12/2019 | **Total Gravimetric Quantification (ACM + Detailed) (% Asb)** | <0.001 (mass %) |
| 19/20618 | 1 | TP21 | 0.50 | 145 | 19/12/2019 | **General Description (Bulk Analysis)** | soil-stones |
| | | | | | 19/12/2019 | **Asbestos Fibres** | NAD |
| | | | | | 19/12/2019 | **Asbestos ACM** | NAD |
| | | | | | 19/12/2019 | **Asbestos Type** | NAD |
| | | | | | 19/12/2019 | **Asbestos Level Screen** | NAD |
| 19/20618 | 1 | TP21 | 1.50 | 148 | 19/12/2019 | **General Description (Bulk Analysis)** | soil/stones |
| | | | | | 19/12/2019 | **Asbestos Fibres** | NAD |
| | | | | | 19/12/2019 | **Asbestos ACM** | NAD |
| | | | | | 19/12/2019 | **Asbestos Type** | NAD |
| | | | | | 19/12/2019 | **Asbestos Level Screen** | NAD |
| 19/20618 | 1 | TP22 | 0.50 | 154 | 19/12/2019 | **General Description (Bulk Analysis)** | soil.stones |
| | | | | | 19/12/2019 | **Asbestos Fibres** | NAD |
| | | | | | 19/12/2019 | **Asbestos ACM** | NAD |
| | | | | | 19/12/2019 | **Asbestos Type** | NAD |
| | | | | | 19/12/2019 | **Asbestos Level Screen** | NAD |
| 19/20618 | 1 | TP24 | 0.50 | 166 | 19/12/2019 | **General Description (Bulk Analysis)** | Soil/Stones |
| | | | | | 19/12/2019 | **Asbestos Fibres** | Fibre Bundles |
| | | | | | 19/12/2019 | **Asbestos ACM** | NAD |
| | | | | | 19/12/2019 | **Asbestos Type** | Chrysotile |
| | | | | | 19/12/2019 | **Asbestos Level Screen** | less than 0.1% |
| | | | | | 30/12/2019 | **Total ACM Gravimetric Quantification (% Asb)** | <0.001 (mass %) |
| | | | | | 30/12/2019 | **Total Detailed Gravimetric Quantification (% Asb)** | <0.001 (mass %) |
| | | | | | 30/12/2019 | **Total Gravimetric Quantification (ACM + Detailed) (% Asb)** | <0.001 (mass %) |
| 19/20618 | 1 | TP24 | 1.50 | 169 | 23/12/2019 | **General Description (Bulk Analysis)** | soil-stones |
| | | | | | 23/12/2019 | **Asbestos Fibres** | NAD |
| | | | | | 23/12/2019 | **Asbestos ACM** | NAD |
| | | | | | 23/12/2019 | **Asbestos Type** | NAD |

**Client Name:** Ground Investigations Ireland
**Reference:** 19/11/9230
**Location:** Avoca River Park
**Contact:** Emer O'Connor

| EMT Job No. | Batch | Sample ID | Depth | EMT Sample No. | Date Of Analysis | Analysis | Result |
|---|---|---|---|---|---|---|---|
| 19/20618 | 1 | TP24 | 1.50 | 169 | 23/12/2019 | **Asbestos Level Screen** | NAD |
| 19/20618 | 1 | TP25 | 0.50 | 172 | 19/12/2019 | **General Description (Bulk Analysis)** | Soil/Stone |
| | | | | | 19/12/2019 | **Asbestos Fibres** | NAD |
| | | | | | 19/12/2019 | **Asbestos ACM** | NAD |
| | | | | | 19/12/2019 | **Asbestos Type** | NAD |
| | | | | | 19/12/2019 | **Asbestos Level Screen** | NAD |
| 19/20618 | 1 | TP26 | 0.50 | 178 | 19/12/2019 | **General Description (Bulk Analysis)** | soil/stones |
| | | | | | 19/12/2019 | **Asbestos Fibres** | NAD |
| | | | | | 19/12/2019 | **Asbestos ACM** | NAD |
| | | | | | 19/12/2019 | **Asbestos Type** | NAD |
| | | | | | 19/12/2019 | **Asbestos Level Screen** | NAD |
| 19/20618 | 1 | TP27 | 0.50 | 184 | 19/12/2019 | **General Description (Bulk Analysis)** | Soil/Stone |
| | | | | | 19/12/2019 | **Asbestos Fibres** | NAD |
| | | | | | 19/12/2019 | **Asbestos ACM** | NAD |
| | | | | | 19/12/2019 | **Asbestos Type** | NAD |
| | | | | | 19/12/2019 | **Asbestos Level Screen** | NAD |
| 19/20618 | 1 | TP28 | 0.50 | 190 | 19/12/2019 | **General Description (Bulk Analysis)** | soil/stones |
| | | | | | 19/12/2019 | **Asbestos Fibres** | NAD |
| | | | | | 19/12/2019 | **Asbestos ACM** | NAD |
| | | | | | 19/12/2019 | **Asbestos Type** | NAD |
| | | | | | 19/12/2019 | **Asbestos Level Screen** | NAD |
| 19/20618 | 1 | TP28 | 1.50 | 193 | 19/12/2019 | **General Description (Bulk Analysis)** | soil.stones |
| | | | | | 19/12/2019 | **Asbestos Fibres** | NAD |
| | | | | | 19/12/2019 | **Asbestos ACM** | NAD |
| | | | | | 19/12/2019 | **Asbestos Type** | NAD |
| | | | | | 19/12/2019 | **Asbestos Level Screen** | NAD |
| 19/20618 | 1 | TP29 | 0.50 | 196 | 19/12/2019 | **General Description (Bulk Analysis)** | soil/stones |
| | | | | | 19/12/2019 | **Asbestos Fibres** | NAD |
| | | | | | 19/12/2019 | **Asbestos ACM** | NAD |
| | | | | | 19/12/2019 | **Asbestos Type** | NAD |
| | | | | | 19/12/2019 | **Asbestos Level Screen** | NAD |
| 19/20618 | 1 | TP29 | 1.50 | 199 | 19/12/2019 | **General Description (Bulk Analysis)** | soil/stones |
| | | | | | 19/12/2019 | **Asbestos Fibres** | Fibre Bundles |
| | | | | | 19/12/2019 | **Asbestos ACM** | NAD |
| | | | | | 19/12/2019 | **Asbestos Type** | Chrysotile |
| | | | | | 19/12/2019 | **Asbestos Level Screen** | less than 0.1% |
| | | | | | 30/12/2019 | **Total ACM Gravimetric Quantification (% Asb)** | <0.001 (mass %) |
| | | | | | 30/12/2019 | **Total Detailed Gravimetric Quantification (% Asb)** | <0.001 (mass %) |
| | | | | | 30/12/2019 | **Total Gravimetric Quantification (ACM + Detailed) (% Asb)** | <0.001 (mass %) |

**Client Name:** Ground Investigations Ireland

**Reference:** 19/11/9230

**Location:** Avoca River Park

**Contact:** Emer O'Connor

**Matrix : Solid**

| EMT Job No. | Batch | Sample ID | Depth | EMT Sample No. | Method No. | NDP Reason |
|---|---|---|---|---|---|---|
| 19/20618 | 1 | TP20 | 0.50 | 135-137 | TM21/PM24 | Asbestos detected in sample |
| 19/20618 | 1 | TP20 | 1.50 | 138-140 | TM21/PM24 | Asbestos detected in sample |
| 19/20618 | 1 | TP24 | 0.50 | 165-167 | TM21/PM24 | Asbestos detected in sample |
| 19/20618 | 1 | TP29 | 1.50 | 198-200 | TM21/PM24 | Asbestos detected in sample |

**Client Name:** Ground Investigations Ireland

**Reference:** 19/11/9230

**Location:** Avoca River Park

**Contact:** Emer O'Connor

**Matrix : Solid**

| EMT Job No. | Batch | Sample ID | Depth | EMT Sample No. | Analysis | Reason |
|---|---|---|---|---|---|---|
| 19/20618 | 1 | TP01 | 1.80 | 4-6 | pH, Sulphate | Sample holding time exceeded |
| 19/20618 | 1 | TP02 | 2.50 | 13-15 | pH, Sulphate | Sample holding time exceeded |
| 19/20618 | 1 | TP03 | 1.50 | 19-21 | pH, Sulphate | Sample holding time exceeded |
| 19/20618 | 1 | TP07 | 1.50 | 46-48 | pH, Sulphate | Sample holding time exceeded |
| 19/20618 | 1 | TP14 | 1.50 | 100-102 | pH, Sulphate | Sample holding time exceeded |

**Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.**

**Only analyses which are accredited are recorded as deviating if set criteria are not met.**



Please include all sections of this report if it is reproduced

# NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

***EMT Job No.:*** 19/20618

**SOILS**

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

**WATERS**

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

**DEVIATING SAMPLES**

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

**SURROGATES**

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

**DILUTIONS**

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

**BLANKS**

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

**NOTE**

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

**REPORTS FROM THE SOUTH AFRICA LABORATORY**

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

**Measurement Uncertainty**

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

**ABBREVIATIONS and ACRONYMS USED**

| | |
|---|---|
| # | ISO17025 (UKAS Ref No. 4225) accredited - UK. |
| SA | ISO17025 (SANAS Ref No.T0729) accredited - South Africa |
| B | Indicates analyte found in associated method blank. |
| DR | Dilution required. |
| M | MCERTS accredited. |
| NA | Not applicable |
| NAD | No Asbestos Detected. |
| ND | None Detected (usually refers to VOC and/SVOC TICs). |
| NDP | No Determination Possible |
| SS | Calibrated against a single substance |
| SV | Surrogate recovery outside performance criteria. This may be due to a matrix effect. |
| W | Results expressed on as received basis. |
| + | AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page. |
| >> | Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher, this result is not accredited. |
| * | Analysis subcontracted to an Element Materials Technology approved laboratory. |
| AD | Samples are dried at 35°C ±5°C |
| CO | Suspected carry over |
| LOD/LOR | Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS |
| ME | Matrix Effect |
| NFD | No Fibres Detected |
| BS | AQC Sample |
| LB | Blank Sample |
| N | Client Sample |
| TB | Trip Blank Sample |
| OC | Outside Calibration Range |
| AA | x2 Dilution |

| | |
|---|---|
| AB | x3 Dilution |
| AC | x5 Dilution |
| AD | x9 Dilution |
| AE | x10 Dilution |
| AF | x50 Dilution |
| AG | x100 Dilution |
| BA | x2 Dilution |
| BB | x3 Dilution |
| BC | x5 Dilution |
| BD | x9 Dilution |

**EMT Job No:** 19/20618

| Test Method No. | Description | Prep Method No. (if appropriate) | Description | ISO 17025 (UKAS/SANAS) | MCERTS (UK soils only) | Analysis done on As Received (AR) or Dried (AD) | Reported on dry weight basis |
|---|---|---|---|---|---|---|---|
| PM4 | Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377. | PM0 | No preparation is required. | | | AR | |
| TM4 | Modified USEPA 8270 method for the solvent extraction and determination of PAHs by GC-MS. | PM8 | End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required. | | | AR | Yes |
| TM4 | Modified USEPA 8270 method for the solvent extraction and determination of PAHs by GC-MS. | PM8 | End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required. | Yes | | AR | Yes |
| TM5 | Modified 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present. | PM16 | Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE. | | | AR | |
| TM5 | Modified 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present. | PM8/PM16 | End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE. | | | AR | Yes |
| TM5 | Modified 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present. | PM8/PM16 | End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE. | Yes | | AR | Yes |
| TM5/TM36 | please refer to TM5 and TM36 for method details | PM8/PM12/PM16 | please refer to PM8/PM16 and PM12 for method details | | | AR | Yes |
| TM17 | Modified US EPA method 8270. Determination of specific Polychlorinated Biphenyl congeners by GC-MS. | PM8 | End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required. | Yes | | AR | Yes |
| TM20 | Modified BS 1377-3: 1990/USEPA 160.3 Gravimetric determination of Total Dissolved Solids/Total Solids | PM0 | No preparation is required. | Yes | | AR | Yes |
| TM21 | Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4. | PM24 | Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis. | | | AD | Yes |

**EMT Job No:** 19/20618

| Test Method No. | Description | Prep Method No. (if appropriate) | Description | ISO 17025 (UKAS/SANAS) | MCERTS (UK soils only) | Analysis done on As Received (AR) or Dried (AD) | Reported on dry weight basis |
|---|---|---|---|---|---|---|---|
| TM21 | Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4. | PM24 | Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis. | Yes | | AD | Yes |
| TM26 | Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection. | PM0 | No preparation is required. | | | AR | Yes |
| TM30 | Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009 | PM15 | Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground. | | | AD | Yes |
| TM30 | Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009 | PM15 | Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground. | Yes | | AD | Yes |
| TM30 | Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009 | PM17 | Modified method BS EN12457-2 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio. | Yes | | AR | Yes |
| TM30 | Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009 | PM62 | Acid digestion of as received solid samples using Aqua Regia refluxed at 112.5 °C. | | | AR | Yes |
| TM31 | Modified USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID. | PM12 | Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis. | | | AR | Yes |
| TM31 | Modified USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID. | PM12 | Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis. | Yes | | AR | Yes |
| TM36 | Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results can be confirmed using GCMS. | PM12 | Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis. | | | AR | Yes |
| TM36 | Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results can be confirmed using GCMS. | PM12 | Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis. | Yes | | AR | Yes |

**EMT Job No:** 19/20618

| Test Method No. | Description | Prep Method No. (if appropriate) | Description | ISO 17025 (UKAS/SANAS) | MCERTS (UK soils only) | Analysis done on As Received (AR) or Dried (AD) | Reported on dry weight basis |
|---|---|---|---|---|---|---|---|
| TM38 | Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex Cr) | PM0 | No preparation is required. | Yes | | AR | Yes |
| TM38 | Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex Cr) | PM20 | Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker. | Yes | | AD | Yes |
| TM38 | Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex Cr) | PM20 | Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker. | Yes | | AR | Yes |
| TM38 | Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex Cr) | PM60 | As received solid samples are extracted with deionised water in a 2:1 ratio of water to solid. | | | AR | Yes |
| TM60 | TC/TOC analysis of Waters by High Temperature Combustion followed by NDIR detection. Based on the following modified standard methods: USEPA 9060, APHA Standard Methods for Examination of Water and Wastewater 5310B, ASTM D 7573, and USEPA 415.1. | PM0 | No preparation is required. | | | AR | Yes |
| TM61 | Modified US EPA methods 245.7 and 200.7. Determination of Mercury by Cold Vapour Atomic Fluorescence. | PM0 | No preparation is required. | Yes | | AR | Yes |
| TM65 | Asbestos Bulk Identification method based on HSG 248. | PM42 | Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065. | Yes | | AR | |
| TM73 | Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser. | PM0 | No preparation is required. | | | AR | Yes |
| TM73 | Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser. | PM11 | Extraction of as received solid samples using one part solid to 2.5 parts deionised water. | Yes | | AR | No |
| TM131 | Quantification of Asbestos Fibres and ACM, based on HSG248 and SCA method. | PM42 | Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065. | Yes | | AR | Yes |

**EMT Job No:** 19/20618

| Test Method No. | Description | Prep Method No. (if appropriate) | Description | ISO 17025 (UKAS/SANAS) | MCERTS (UK soils only) | Analysis done on As Received (AR) or Dried (AD) | Reported on dry weight basis |
|---|---|---|---|---|---|---|---|
| TM173 | Analysis of fluoride by ISE (Ion Selective Electrode) using modified ISE method 340.2 | PM0 | No preparation is required. | | | AR | Yes |
| NONE | No Method Code | NONE | No Method Code | | | AD | Yes |
| NONE | No Method Code | NONE | No Method Code | | | AR | Yes |
| NONE | No Method Code | PM17 | Modified method BS EN12457-2 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio. | | | | |
| NONE | No Method Code | PM17 | Modified method BS EN12457-2 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio. | | | AR | |
| NONE | No Method Code | PM4 | Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377. | | | AR | |
| | | | | | | | |
| | | | | | | | |
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| | | | | | | | |

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Ireland

| | |
|---|---|
| **Attention :** | Barry Sexton |
| **Date :** | 9th June, 2020 |
| **Your reference :** | 9230-11-19 |
| **Our reference :** | Test Report 20/6773 Batch 1 |
| **Location :** | Avoca River Park |
| **Date samples received :** | 29th May, 2020 |
| **Status :** | Final report |
| **Issue :** | 1 |

Six samples were received for analysis on 29th May, 2020 of which six were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

**Authorised By:**

**Phil Sommerton BSc**
**Senior Project Manager**

Please include all sections of this report if it is reproduced

## Element Materials Technology

**Client Name:** Ground Investigations Ireland
**Reference:** 9230-11-19
**Location:** Avoca River Park
**Contact:** Barry Sexton
**EMT Job No:** 20/6773

**Report : Liquid**

**Liquids/products:** V=40ml vial, G=glass bottle, P=plastic bottle
H=$H_2SO_4$, Z=ZnAc, N=NaOH, HN=$HN0_3$

| EMT Sample No. | 1-9 | 10-18 | 19-27 | 28-36 | 37-45 | 46-54 | | | | | LOD/LOR | Units | Method No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | BH-02 | BH-03 | BH-06 | BH-10 | BH-12 | RIVER UPSTREAM | | | | | | | |
| Depth | | | | | | 0.00-0.10 | | | | | | | |
| COC No / misc | | | | | | | | | | | | | |
| Containers | V H HN HCL Z P G | V H HN HCL Z BOD G | V H HN HCL Z P G | V H HN HCL Z BOD G | V H HN HCL Z BOD G | V H HN HCL Z BOD G | | | | | | | |
| Sample Date | 26/05/2020 | 26/05/2020 | 26/05/2020 | 26/05/2020 | 26/05/2020 | 26/05/2020 | | | | | | | |
| Sample Type | Ground Water | Ground Water | Ground Water | Ground Water | Ground Water | Ground Water | | | | | | | |
| Batch Number | 1 | 1 | 1 | 1 | 1 | 1 | | | | | | | |
| Date of Receipt | 29/05/2020 | 29/05/2020 | 29/05/2020 | 29/05/2020 | 29/05/2020 | 29/05/2020 | | | | | | | |
| Dissolved Arsenic # | 4.5 | 3.1 | 29.4 | <2.5 | 16.2 | <2.5 | | | | | <2.5 | ug/l | TM30/PM14 |
| Dissolved Boron | 16 | 25 | 13 | 59 | 25 | <12 | | | | | <12 | ug/l | TM30/PM14 |
| Dissolved Cadmium # | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | | | | | <0.5 | ug/l | TM30/PM14 |
| Dissolved Calcium # | 36.4 | 74.6 | 25.3 | 36.6 | 77.8 | 9.1 | | | | | <0.2 | mg/l | TM30/PM14 |
| Total Dissolved Chromium # | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | | | | | <1.5 | ug/l | TM30/PM14 |
| Dissolved Copper # | <7 | <7 | 8 | <7 | <7 | 16 | | | | | <7 | ug/l | TM30/PM14 |
| Dissolved Lead # | <5 | <5 | <5 | <5 | <5 | <5 | | | | | <5 | ug/l | TM30/PM14 |
| Dissolved Manganese # | 7372 | 7291 | 13850$_{AA}$ | 5962 | 14480$_{AA}$ | 118 | | | | | <2 | ug/l | TM30/PM14 |
| Dissolved Mercury # | <1 | <1 | <1 | <1 | <1 | <1 | | | | | <1 | ug/l | TM30/PM14 |
| Dissolved Nickel # | <2 | 15 | 5 | 9 | 9 | <2 | | | | | <2 | ug/l | TM30/PM14 |
| Dissolved Phosphorus # | <5 | <5 | 237 | 13 | 72 | 25 | | | | | <5 | ug/l | TM30/PM14 |
| Dissolved Potassium # | 1.5 | 7.6 | 2.2 | 4.4 | 13.0 | 1.1 | | | | | <0.1 | mg/l | TM30/PM14 |
| Dissolved Zinc # | <3 | 48 | 21 | 5 | 18 | 160 | | | | | <3 | ug/l | TM30/PM14 |
| Total Dissolved Sulphur as S | 5479 | 90403$_{AB}$ | 27023 | 27762 | 168355$_{AB}$ | 6407 | | | | | <10 | ug/l | TM30/PM14 |
| | | | | | | | | | | | | | |
| PAH MS | | | | | | | | | | | | | |
| Naphthalene # | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | | | | | <0.1 | ug/l | TM4/PM30 |
| Acenaphthylene # | <0.013 | <0.013 | <0.013 | <0.013 | <0.013 | <0.013 | | | | | <0.013 | ug/l | TM4/PM30 |
| Acenaphthene # | <0.013 | <0.013 | <0.013 | <0.013 | <0.013 | <0.013 | | | | | <0.013 | ug/l | TM4/PM30 |
| Fluorene # | <0.014 | <0.014 | <0.014 | <0.014 | <0.014 | <0.014 | | | | | <0.014 | ug/l | TM4/PM30 |
| Phenanthrene # | <0.011 | <0.011 | <0.011 | <0.011 | <0.011 | 0.023 | | | | | <0.011 | ug/l | TM4/PM30 |
| Anthracene # | <0.013 | <0.013 | <0.013 | <0.013 | <0.013 | <0.013 | | | | | <0.013 | ug/l | TM4/PM30 |
| Fluoranthene # | <0.012 | <0.012 | <0.012 | <0.012 | <0.012 | 0.025 | | | | | <0.012 | ug/l | TM4/PM30 |
| Pyrene # | <0.013 | <0.013 | <0.013 | <0.013 | <0.013 | 0.017 | | | | | <0.013 | ug/l | TM4/PM30 |
| Benzo(a)anthracene # | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | | | | | <0.015 | ug/l | TM4/PM30 |
| Chrysene # | <0.011 | <0.011 | <0.011 | <0.011 | <0.011 | <0.011 | | | | | <0.011 | ug/l | TM4/PM30 |
| Benzo(bk)fluoranthene # | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 | | | | | <0.018 | ug/l | TM4/PM30 |
| Benzo(a)pyrene # | <0.016 | <0.016 | <0.016 | <0.016 | <0.016 | <0.016 | | | | | <0.016 | ug/l | TM4/PM30 |
| Indeno(123cd)pyrene # | <0.011 | <0.011 | <0.011 | <0.011 | <0.011 | <0.011 | | | | | <0.011 | ug/l | TM4/PM30 |
| Dibenzo(ah)anthracene # | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | | | | | <0.01 | ug/l | TM4/PM30 |
| Benzo(ghi)perylene # | <0.011 | <0.011 | <0.011 | <0.011 | <0.011 | <0.011 | | | | | <0.011 | ug/l | TM4/PM30 |
| PAH 16 Total # | <0.195 | <0.195 | <0.195 | <0.195 | <0.195 | <0.195 | | | | | <0.195 | ug/l | TM4/PM30 |
| Benzo(b)fluoranthene | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | | | | | <0.01 | ug/l | TM4/PM30 |
| Benzo(k)fluoranthene | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | | | | | <0.01 | ug/l | TM4/PM30 |
| PAH Surrogate % Recovery | 80 | 77 | 85 | 81 | 85 | 79 | | | | | <0 | % | TM4/PM30 |
| | | | | | | | | | | | | | |
| Methyl Tertiary Butyl Ether # | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | | | | | <0.1 | ug/l | TM15/PM10 |
| Benzene # | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | | | | | <0.5 | ug/l | TM15/PM10 |
| Toluene # | <5 | <5 | <5 | <5 | <5 | <5 | | | | | <5 | ug/l | TM15/PM10 |
| Ethylbenzene # | <1 | <1 | <1 | <1 | <1 | <1 | | | | | <1 | ug/l | TM15/PM10 |
| m/p-Xylene # | <2 | <2 | <2 | <2 | <2 | <2 | | | | | <2 | ug/l | TM15/PM10 |
| o-Xylene # | <1 | <1 | <1 | <1 | <1 | <1 | | | | | <1 | ug/l | TM15/PM10 |
| Surrogate Recovery Toluene D8 | 89 | 93 | 91 | 79 | 107 | 73 | | | | | <0 | % | TM15/PM10 |
| Surrogate Recovery 4-Bromofluorobenzene | 101 | 107 | 108 | 104 | 113 | 94 | | | | | <0 | % | TM15/PM10 |

Please see attached notes for all abbreviations and acronyms

**Client Name:** Ground Investigations Ireland
**Reference:** 9230-11-19
**Location:** Avoca River Park
**Contact:** Barry Sexton
**EMT Job No:** 20/6773

**Report : Liquid**

**Liquids/products:** V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, HN=$HN0_3$

| EMT Sample No. | 1-9 | 10-18 | 19-27 | 28-36 | 37-45 | 46-54 | | | | | LOD/LOR | Units | Method No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | BH-02 | BH-03 | BH-06 | BH-10 | BH-12 | RIVER UPSTREAM | | | | | | | |
| Depth | | | | | | 0.00-0.10 | | | | | | | |
| COC No / misc | | | | | | | | | | | | | |
| Containers | V H HN HCL Z P G | V H HN HCL Z BOD G | V H HN HCL Z P G | V H HN HCL Z BOD G | V H HN HCL Z BOD G | V H HN HCL Z BOD G | | | | | | | |
| Sample Date | 26/05/2020 | 26/05/2020 | 26/05/2020 | 26/05/2020 | 26/05/2020 | 26/05/2020 | | | | | | | |
| Sample Type | Ground Water | Ground Water | Ground Water | Ground Water | Ground Water | Ground Water | | | | | | | |
| Batch Number | 1 | 1 | 1 | 1 | 1 | 1 | | | | | | | |
| Date of Receipt | 29/05/2020 | 29/05/2020 | 29/05/2020 | 29/05/2020 | 29/05/2020 | 29/05/2020 | | | | | | | |
| Pesticides | | | | | | | | | | | | | |
| **Organochlorine Pesticides** | | | | | | | | | | | | | |
| Aldrin | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | | | | | <0.01 | ug/l | TM149/PM30 |
| Alpha-HCH (BHC) | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | | | | | <0.01 | ug/l | TM149/PM30 |
| Beta-HCH (BHC) | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | | | | | <0.01 | ug/l | TM149/PM30 |
| Delta-HCH (BHC) | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | | | | | <0.01 | ug/l | TM149/PM30 |
| Dieldrin | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | | | | | <0.01 | ug/l | TM149/PM30 |
| Endosulphan I | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | | | | | <0.01 | ug/l | TM149/PM30 |
| Endosulphan II | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | | | | | <0.01 | ug/l | TM149/PM30 |
| Endosulphan sulphate | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | | | | | <0.01 | ug/l | TM149/PM30 |
| Endrin | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | | | | | <0.01 | ug/l | TM149/PM30 |
| Gamma-HCH (BHC) | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | | | | | <0.01 | ug/l | TM149/PM30 |
| Heptachlor | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | | | | | <0.01 | ug/l | TM149/PM30 |
| Heptachlor Epoxide | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | | | | | <0.01 | ug/l | TM149/PM30 |
| o,p'-Methoxychlor | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | | | | | <0.01 | ug/l | TM149/PM30 |
| p,p'-DDE | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | | | | | <0.01 | ug/l | TM149/PM30 |
| p,p'-DDT | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | | | | | <0.01 | ug/l | TM149/PM30 |
| p,p'-Methoxychlor | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | | | | | <0.01 | ug/l | TM149/PM30 |
| p,p'-TDE | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | | | | | <0.01 | ug/l | TM149/PM30 |
| **Organophosphorus Pesticides** | | | | | | | | | | | | | |
| Azinphos methyl | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | | | | | <0.01 | ug/l | TM149/PM30 |
| Diazinon | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | | | | | <0.01 | ug/l | TM149/PM30 |
| Dichlorvos | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | | | | | <0.01 | ug/l | TM149/PM30 |
| Disulfoton | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | | | | | <0.01 | ug/l | TM149/PM30 |
| Ethion | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | | | | | <0.01 | ug/l | TM149/PM30 |
| Ethyl Parathion (Parathion) | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | | | | | <0.01 | ug/l | TM149/PM30 |
| Fenitrothion | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | | | | | <0.01 | ug/l | TM149/PM30 |
| Malathion | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | | | | | <0.01 | ug/l | TM149/PM30 |
| Methyl Parathion | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | | | | | <0.01 | ug/l | TM149/PM30 |
| Mevinphos | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | | | | | <0.01 | ug/l | TM149/PM30 |
| TPH CWG | | | | | | | | | | | | | |
| **Aliphatics** | | | | | | | | | | | | | |
| >C5-C6 # | <10 | <10 | <10 | <10 | <10 | <10 | | | | | <10 | ug/l | TM36/PM12 |
| >C6-C8 # | <10 | <10 | <10 | <10 | <10 | <10 | | | | | <10 | ug/l | TM36/PM12 |
| >C8-C10 # | <10 | <10 | <10 | <10 | <10 | <10 | | | | | <10 | ug/l | TM36/PM12 |
| >C10-C12 # | <5 | <5 | <5 | <5 | <5 | <5 | | | | | <5 | ug/l | TM5/PM16/PM30 |
| >C12-C16 # | <10 | <10 | <10 | <10 | <10 | <10 | | | | | <10 | ug/l | TM5/PM16/PM30 |
| >C16-C21 # | <10 | <10 | <10 | <10 | <10 | <10 | | | | | <10 | ug/l | TM5/PM16/PM30 |
| >C21-C35 # | <10 | <10 | <10 | <10 | <10 | <10 | | | | | <10 | ug/l | TM5/PM16/PM30 |
| Total aliphatics C5-35 # | <10 | <10 | <10 | <10 | <10 | <10 | | | | | <10 | ug/l | TM5/TM36/PM12/PM16/PM30 |

Please see attached notes for all abbreviations and acronyms



Please include all sections of this report if it is reproduced

All solid results are expressed on a dry weight basis unless stated otherwise.

## Element Materials Technology

**Client Name:** Ground Investigations Ireland
**Reference:** 9230-11-19
**Location:** Avoca River Park
**Contact:** Barry Sexton
**EMT Job No:** 20/6773

**Report : Liquid**

**Liquids/products:** V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, HN=$HN0_3$

| EMT Sample No. | 1-9 | 10-18 | 19-27 | 28-36 | 37-45 | 46-54 | | | | | LOD/LOR | Units | Method No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | BH-02 | BH-03 | BH-06 | BH-10 | BH-12 | RIVER UPSTREAM | | | | | | | |
| Depth | | | | | | 0.00-0.10 | | | | | | | |
| COC No / misc | | | | | | | | | | | | | |
| Containers | V H HN HCL Z P G | V H HN HCL Z BOD G | V H HN HCL Z P G | V H HN HCL Z BOD G | V H HN HCL Z BOD G | V H HN HCL Z BOD G | | | | | | | |
| Sample Date | 26/05/2020 | 26/05/2020 | 26/05/2020 | 26/05/2020 | 26/05/2020 | 26/05/2020 | | | | | | | |
| Sample Type | Ground Water | Ground Water | Ground Water | Ground Water | Ground Water | Ground Water | | | | | | | |
| Batch Number | 1 | 1 | 1 | 1 | 1 | 1 | | | | | | | |
| Date of Receipt | 29/05/2020 | 29/05/2020 | 29/05/2020 | 29/05/2020 | 29/05/2020 | 29/05/2020 | | | | | | | |
| TPH CWG | | | | | | | | | | | | | |
| **Aromatics** | | | | | | | | | | | | | |
| >C5-EC7 # | <10 | <10 | <10 | <10 | <10 | <10 | | | | | <10 | ug/l | TM36/PM12 |
| >EC7-EC8 # | <10 | <10 | <10 | <10 | <10 | <10 | | | | | <10 | ug/l | TM36/PM12 |
| >EC8-EC10 # | <10 | <10 | <10 | <10 | <10 | <10 | | | | | <10 | ug/l | TM36/PM12 |
| >EC10-EC12 # | <5 | <5 | <5 | <5 | <5 | <5 | | | | | <5 | ug/l | TM5/PM16/PM30 |
| >EC12-EC16 # | <10 | <10 | <10 | <10 | <10 | <10 | | | | | <10 | ug/l | TM5/PM16/PM30 |
| >EC16-EC21 # | <10 | <10 | <10 | <10 | <10 | <10 | | | | | <10 | ug/l | TM5/PM16/PM30 |
| >EC21-EC35 # | <10 | <10 | <10 | <10 | <10 | <10 | | | | | <10 | ug/l | TM5/PM16/PM30 |
| Total aromatics C5-35 # | <10 | <10 | <10 | <10 | <10 | <10 | | | | | <10 | ug/l | TM5/TM36/PM12/PM16/PM30 |
| Total aliphatics and aromatics(C5-35) # | <10 | <10 | <10 | <10 | <10 | <10 | | | | | <10 | ug/l | TM5/TM36/PM12/PM16/PM30 |
| Phenol # | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | | | | | <0.01 | mg/l | TM26/PM0 |
| Sulphate as SO4 # | 18.8 | 234.2 | 89.5 | 89.5 | 455.7 | 21.1 | | | | | <0.5 | mg/l | TM38/PM0 |
| Chloride # | 25.0 | 22.2 | 25.9 | 26.4 | 30.5 | 12.5 | | | | | <0.3 | mg/l | TM38/PM0 |
| Nitrate as NO3 # | 8.9 | <0.2 | <0.2 | 10.6 | <0.2 | 6.6 | | | | | <0.2 | mg/l | TM38/PM0 |
| Nitrite as NO2 # | 0.13 | <0.02 | <0.02 | 0.04 | <0.02 | 0.02 | | | | | <0.02 | mg/l | TM38/PM0 |
| Total Cyanide # | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | | | | | <0.01 | mg/l | TM89/PM0 |
| Ammoniacal Nitrogen as NH3 # | 1.20 | 8.53 | 6.28 | 5.26 | 98.36 | 0.09 | | | | | <0.03 | mg/l | TM38/PM0 |
| Hexavalent Chromium | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | | | | | <0.006 | mg/l | TM38/PM0 |
| Electrical Conductivity @25C # | 386 | 646 | 390 | 427 | 1353 | 125 | | | | | <2 | uS/cm | TM76/PM0 |
| pH # | 7.38 | 6.47 | 6.64 | 6.98 | 6.67 | 7.59 | | | | | <0.01 | pH units | TM73/PM0 |

Please see attached notes for all abbreviations and acronyms



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All solid results are expressed on a dry weight basis unless stated otherwise.

**Client Name:** Ground Investigations Ireland
**Reference:** 9230-11-19
**Location:** Avoca River Park
**Contact:** Barry Sexton
**EMT Job No:** 20/6773

**VOC Report :** **Liquid**

| EMT Sample No. | 1-9 | 10-18 | 19-27 | 28-36 | 37-45 | 46-54 | | | | | LOD/LOR | Units | Method No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | BH-02 | BH-03 | BH-06 | BH-10 | BH-12 | RIVER UPSTREAM | | | | | | | |
| Depth | | | | | | 0.00-0.10 | | | | | | | |
| COC No / misc | | | | | | | | | | | | | |
| Containers | V H HN HCL Z P G | V H HN HCL Z BOD G | V H HN HCL Z P G | V H HN HCL Z BOD G | V H HN HCL Z BOD G | V H HN HCL Z BOD G | | | | | | | |
| Sample Date | 26/05/2020 | 26/05/2020 | 26/05/2020 | 26/05/2020 | 26/05/2020 | 26/05/2020 | | | | | | | |
| Sample Type | Ground Water | Ground Water | Ground Water | Ground Water | Ground Water | Ground Water | | | | | | | |
| Batch Number | 1 | 1 | 1 | 1 | 1 | 1 | | | | | | | |
| Date of Receipt | 29/05/2020 | 29/05/2020 | 29/05/2020 | 29/05/2020 | 29/05/2020 | 29/05/2020 | | | | | | | |
| VOC MS | | | | | | | | | | | | | |
| Dichlorodifluoromethane | <2 | <2 | <2 | <2 | <2 | <2 | | | | | <2 | ug/l | TM15/PM10 |
| Methyl Tertiary Butyl Ether # | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | | | | | <0.1 | ug/l | TM15/PM10 |
| Chloromethane # | <3 | <3 | <3 | <3 | <3 | <3 | | | | | <3 | ug/l | TM15/PM10 |
| Vinyl Chloride # | <0.1 | <0.1 | <0.1 | <0.1 | 0.8 | <0.1 | | | | | <0.1 | ug/l | TM15/PM10 |
| Bromomethane | <1 | <1 | <1 | <1 | <1 | <1 | | | | | <1 | ug/l | TM15/PM10 |
| Chloroethane # | <3 | <3 | <3 | <3 | <3 | <3 | | | | | <3 | ug/l | TM15/PM10 |
| Trichlorofluoromethane # | <3 | <3 | <3 | <3 | <3 | <3 | | | | | <3 | ug/l | TM15/PM10 |
| 1,1-Dichloroethene (1,1 DCE) # | <3 | <3 | <3 | <3 | 4 | <3 | | | | | <3 | ug/l | TM15/PM10 |
| Dichloromethane (DCM) # | <5 | <5 | <5 | <5 | <5 | <5 | | | | | <5 | ug/l | TM15/PM10 |
| trans-1-2-Dichloroethene # | <3 | <3 | <3 | <3 | <3 | <3 | | | | | <3 | ug/l | TM15/PM10 |
| 1,1-Dichloroethane # | <3 | <3 | <3 | <3 | 28 | <3 | | | | | <3 | ug/l | TM15/PM10 |
| cis-1-2-Dichloroethene # | <3 | <3 | <3 | <3 | 7 | <3 | | | | | <3 | ug/l | TM15/PM10 |
| 2,2-Dichloropropane | <1 | <1 | <1 | <1 | <1 | <1 | | | | | <1 | ug/l | TM15/PM10 |
| Bromochloromethane # | <2 | <2 | <2 | <2 | <2 | <2 | | | | | <2 | ug/l | TM15/PM10 |
| Chloroform # | <2 | <2 | <2 | <2 | <2 | <2 | | | | | <2 | ug/l | TM15/PM10 |
| 1,1,1-Trichloroethane # | <2 | <2 | <2 | <2 | 9 | <2 | | | | | <2 | ug/l | TM15/PM10 |
| 1,1-Dichloropropene # | <3 | <3 | <3 | <3 | <3 | <3 | | | | | <3 | ug/l | TM15/PM10 |
| Carbon tetrachloride # | <2 | <2 | <2 | <2 | <2 | <2 | | | | | <2 | ug/l | TM15/PM10 |
| 1,2-Dichloroethane # | <2 | <2 | <2 | <2 | <2 | <2 | | | | | <2 | ug/l | TM15/PM10 |
| Benzene # | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | | | | | <0.5 | ug/l | TM15/PM10 |
| Trichloroethene (TCE) # | <3 | <3 | <3 | <3 | 4 | <3 | | | | | <3 | ug/l | TM15/PM10 |
| 1,2-Dichloropropane # | <2 | <2 | <2 | <2 | <2 | <2 | | | | | <2 | ug/l | TM15/PM10 |
| Dibromomethane # | <3 | <3 | <3 | <3 | <3 | <3 | | | | | <3 | ug/l | TM15/PM10 |
| Bromodichloromethane # | <2 | <2 | <2 | <2 | <2 | <2 | | | | | <2 | ug/l | TM15/PM10 |
| cis-1-3-Dichloropropene | <2 | <2 | <2 | <2 | <2 | <2 | | | | | <2 | ug/l | TM15/PM10 |
| Toluene # | <5 | <5 | <5 | <5 | <5 | <5 | | | | | <5 | ug/l | TM15/PM10 |
| trans-1-3-Dichloropropene | <2 | <2 | <2 | <2 | <2 | <2 | | | | | <2 | ug/l | TM15/PM10 |
| 1,1,2-Trichloroethane # | <2 | <2 | <2 | <2 | <2 | <2 | | | | | <2 | ug/l | TM15/PM10 |
| Tetrachloroethene (PCE) # | <3 | <3 | <3 | <3 | 5 | <3 | | | | | <3 | ug/l | TM15/PM10 |
| 1,3-Dichloropropane # | <2 | <2 | <2 | <2 | <2 | <2 | | | | | <2 | ug/l | TM15/PM10 |
| Dibromochloromethane # | <2 | <2 | <2 | <2 | <2 | <2 | | | | | <2 | ug/l | TM15/PM10 |
| 1,2-Dibromoethane # | <2 | <2 | <2 | <2 | <2 | <2 | | | | | <2 | ug/l | TM15/PM10 |
| Chlorobenzene # | <2 | <2 | <2 | <2 | <2 | <2 | | | | | <2 | ug/l | TM15/PM10 |
| 1,1,1,2-Tetrachloroethane # | <2 | <2 | <2 | <2 | <2 | <2 | | | | | <2 | ug/l | TM15/PM10 |
| Ethylbenzene # | <1 | <1 | <1 | <1 | <1 | <1 | | | | | <1 | ug/l | TM15/PM10 |
| m/p-Xylene # | <2 | <2 | <2 | <2 | <2 | <2 | | | | | <2 | ug/l | TM15/PM10 |
| o-Xylene # | <1 | <1 | <1 | <1 | <1 | <1 | | | | | <1 | ug/l | TM15/PM10 |
| Styrene | <2 | <2 | <2 | <2 | <2 | <2 | | | | | <2 | ug/l | TM15/PM10 |
| Bromoform # | <2 | <2 | <2 | <2 | <2 | <2 | | | | | <2 | ug/l | TM15/PM10 |
| Isopropylbenzene # | <3 | <3 | <3 | <3 | <3 | <3 | | | | | <3 | ug/l | TM15/PM10 |
| 1,1,2,2-Tetrachloroethane | <4 | <4 | <4 | <4 | <4 | <4 | | | | | <4 | ug/l | TM15/PM10 |
| Bromobenzene # | <2 | <2 | <2 | <2 | <2 | <2 | | | | | <2 | ug/l | TM15/PM10 |
| 1,2,3-Trichloropropane # | <3 | <3 | <3 | <3 | <3 | <3 | | | | | <3 | ug/l | TM15/PM10 |
| Propylbenzene # | <3 | <3 | <3 | <3 | <3 | <3 | | | | | <3 | ug/l | TM15/PM10 |
| 2-Chlorotoluene # | <3 | <3 | <3 | <3 | <3 | <3 | | | | | <3 | ug/l | TM15/PM10 |
| 1,3,5-Trimethylbenzene # | <3 | <3 | <3 | <3 | <3 | <3 | | | | | <3 | ug/l | TM15/PM10 |
| 4-Chlorotoluene # | <3 | <3 | <3 | <3 | <3 | <3 | | | | | <3 | ug/l | TM15/PM10 |
| tert-Butylbenzene # | <3 | <3 | <3 | <3 | <3 | <3 | | | | | <3 | ug/l | TM15/PM10 |
| 1,2,4-Trimethylbenzene # | <3 | <3 | <3 | <3 | <3 | <3 | | | | | <3 | ug/l | TM15/PM10 |
| sec-Butylbenzene # | <3 | <3 | <3 | <3 | <3 | <3 | | | | | <3 | ug/l | TM15/PM10 |
| 4-Isopropyltoluene # | <3 | <3 | <3 | <3 | <3 | <3 | | | | | <3 | ug/l | TM15/PM10 |
| 1,3-Dichlorobenzene # | <3 | <3 | <3 | <3 | <3 | <3 | | | | | <3 | ug/l | TM15/PM10 |
| 1,4-Dichlorobenzene # | <3 | <3 | <3 | <3 | <3 | <3 | | | | | <3 | ug/l | TM15/PM10 |
| n-Butylbenzene # | <3 | <3 | <3 | <3 | <3 | <3 | | | | | <3 | ug/l | TM15/PM10 |
| 1,2-Dichlorobenzene # | <3 | <3 | <3 | <3 | <3 | <3 | | | | | <3 | ug/l | TM15/PM10 |
| 1,2-Dibromo-3-chloropropane | <2 | <2 | <2 | <2 | <2 | <2 | | | | | <2 | ug/l | TM15/PM10 |
| 1,2,4-Trichlorobenzene | <3 | <3 | <3 | <3 | <3 | <3 | | | | | <3 | ug/l | TM15/PM10 |
| Hexachlorobutadiene | <3 | <3 | <3 | <3 | <3 | <3 | | | | | <3 | ug/l | TM15/PM10 |
| Naphthalene | <2 | <2 | <2 | <2 | <2 | <2 | | | | | <2 | ug/l | TM15/PM10 |
| 1,2,3-Trichlorobenzene | <3 | <3 | <3 | <3 | <3 | <3 | | | | | <3 | ug/l | TM15/PM10 |
| Surrogate Recovery Toluene D8 | 89 | 93 | 91 | 79 | 107 | 73 | | | | | <0 | % | TM15/PM10 |
| Surrogate Recovery 4-Bromofluorobenzene | 101 | 107 | 108 | 104 | 113 | 94 | | | | | <0 | % | TM15/PM10 |

Please see attached notes for all abbreviations and acronyms

**Client Name:** Ground Investigations Ireland
**Reference:** 9230-11-19
**Location:** Avoca River Park
**Contact:** Barry Sexton

| EMT Job No. | Batch | Sample ID | Depth | EMT Sample No. | Analysis | Reason |
|---|---|---|---|---|---|---|
| No deviating sample report results for job 20/6773 | | | | | | |

**Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.**
**Only analyses which are accredited are recorded as deviating if set criteria are not met.**

# NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

***EMT Job No.:*** 20/6773

**SOILS**

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

**WATERS**

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

**DEVIATING SAMPLES**

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

**SURROGATES**

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

**DILUTIONS**

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

**BLANKS**

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

**NOTE**

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

**REPORTS FROM THE SOUTH AFRICA LABORATORY**

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

**Measurement Uncertainty**

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

**ABBREVIATIONS and ACRONYMS USED**

| | |
|---|---|
| # | ISO17025 (UKAS Ref No. 4225) accredited - UK. |
| SA | ISO17025 (SANAS Ref No.T0729) accredited - South Africa |
| B | Indicates analyte found in associated method blank. |
| DR | Dilution required. |
| M | MCERTS accredited. |
| NA | Not applicable |
| NAD | No Asbestos Detected. |
| ND | None Detected (usually refers to VOC and/SVOC TICs). |
| NDP | No Determination Possible |
| SS | Calibrated against a single substance |
| SV | Surrogate recovery outside performance criteria. This may be due to a matrix effect. |
| W | Results expressed on as received basis. |
| + | AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page. |
| >> | Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher, this result is not accredited. |
| * | Analysis subcontracted to an Element Materials Technology approved laboratory. |
| AD | Samples are dried at 35°C ±5°C |
| CO | Suspected carry over |
| LOD/LOR | Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS |
| ME | Matrix Effect |
| NFD | No Fibres Detected |
| BS | AQC Sample |
| LB | Blank Sample |
| N | Client Sample |
| TB | Trip Blank Sample |
| OC | Outside Calibration Range |
| AA | x5 Dilution |

| | |
|---|---|
| AB | x10 Dilution |

**EMT Job No:** 20/6773

| Test Method No. | Description | Prep Method No. (if appropriate) | Description | ISO 17025 (UKAS/SANAS) | MCERTS (UK soils only) | Analysis done on As Received (AR) or Dried (AD) | Reported on dry weight basis |
|---|---|---|---|---|---|---|---|
| TM4 | Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS. | PM30 | Water samples are extracted with solvent using a magnetic stirrer to create a vortex. | | | | |
| TM4 | Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS. | PM30 | Water samples are extracted with solvent using a magnetic stirrer to create a vortex. | Yes | | | |
| TM5 | Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present. | PM16/PM30 | Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE/Water samples are extracted with solvent using a magnetic stirrer to create a vortex. | Yes | | | |
| TM5/TM36 | please refer to TM5 and TM36 for method details | PM12/PM16/PM30 | please refer to PM16/PM30 and PM12 for method details | Yes | | | |
| TM15 | Modified USEPA 8260B v2:1996. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS. | PM10 | Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis. | | | | |
| TM15 | Modified USEPA 8260B v2:1996. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS. | PM10 | Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis. | Yes | | | |
| TM26 | Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection. | PM0 | No preparation is required. | Yes | | | |
| TM30 | Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP | PM14 | Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified | | | | |
| TM30 | Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP | PM14 | Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified | Yes | | | |
| TM36 | Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE re | PM12 | Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis. | Yes | | | |

**EMT Job No:** 20/6773

| Test Method No. | Description | Prep Method No. (if appropriate) | Description | ISO 17025 (UKAS/SANAS) | MCERTS (UK soils only) | Analysis done on As Received (AR) or Dried (AD) | Reported on dry weight basis |
|---|---|---|---|---|---|---|---|
| TM38 | Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993 (comparabl | PM0 | No preparation is required. | | | | |
| TM38 | Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993 (comparabl | PM0 | No preparation is required. | Yes | | | |
| TM73 | Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser. | PM0 | No preparation is required. | Yes | | | |
| TM76 | Modified US EPA method 120.1 (1982). Determination of Specific Conductance by Metrohm automated probe analyser. | PM0 | No preparation is required. | Yes | | | |
| TM89 | Modified USEPA method OIA-1667 (1999). Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis. | PM0 | No preparation is required. | Yes | | | |
| TM149 | Determination of Pesticides by Large Volume Injection on GC Triple Quad MS, based upon USEPA method 8270D v5:2014 | PM30 | Water samples are extracted with solvent using a magnetic stirrer to create a vortex. | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

# **APPENDIX 10** – HazWasteOnLine™ Report

# Waste Classification Report

DGJ93-AU2TX-KY8H9

## Job name

Avoca River Park Trial Pit Data 2019

## Description/Comments

Analytical data associated with samples collected from Trial Pits Excavated at Avoca River Business Park in December 2019.

## Project

9230-11-19

## Site

Avoca River Park

## Related Documents

| # | Name | Description |
|---|---|---|
| 1 | Avoca River Park Trial Pit Data 2019.HWOL | .hwol file used to create the Job |

## Waste Stream Template

Example waste stream template for contaminated soils

## Classified by

Name:
**Barry Sexton**
Date:
**12 Feb 2020 07:52 GMT**
Telephone:
**00353876119640**

Company:
**Ground Investigations Ireland**
**Catherinestown House,**
**Hazelhatch Road, Newcastle**
**Co. Dublin**

HazWasteOnline™ Training Record:

| Course | Date |
|---|---|
| Hazardous Waste Classification | 09 Apr 2019 |
| Advanced Hazardous Waste Classification | 10 Apr 2019 |

## Report

Created by: Barry Sexton
Created date: 12 Feb 2020 07:52 GMT

## Job summary

| # | Sample Name | Depth [m] | Classification Result | Hazard properties | Page |
|---|---|---|---|---|---|
| 1 | TP02-05/12/2019-0.50m | | Non Hazardous | | 3 |
| 2 | TP03-04/12/2019-0.50m | | Non Hazardous | | 6 |
| 3 | TP05-04/12/2019-1.20m | | Non Hazardous | | 9 |
| 4 | TP06-06/12/2019-1.50m | | Non Hazardous | | 12 |
| 5 | TP08-05/12/2019-1.50m | | Hazardous | HP 7, HP 14 | 15 |
| 6 | TP08-05/12/2019-2.50m | | Non Hazardous | | 18 |
| 7 | TP09-05/12/2019-0.50m | | Non Hazardous | | 21 |
| 8 | TP09-05/12/2019-1.50m | | Hazardous | HP 14 | 24 |
| 9 | TP11-05/12/2019-0.50m | | Non Hazardous | | 27 |
| 10 | TP11-05/12/2019-1.50m | | Non Hazardous | | 30 |
| 11 | TP13-11/12/2019-0.50m | | Non Hazardous | | 33 |
| 12 | TP13-11/12/2019-1.50m | | Hazardous | HP 7, HP 14 | 36 |

| # | Sample Name | Depth [m] | Classification Result | Hazard properties | Page |
|---|---|---|---|---|---|
| 13 | TP16-09/12/2019-0.50m | | Non Hazardous | | 39 |
| 14 | TP17-12/12/2019-1.50m | | Non Hazardous | | 42 |
| 15 | TP19-11/12/2019-0.50m | | Non Hazardous | | 45 |
| 16 | TP19-11/12/2019-1.50m | | Hazardous | HP 7, HP 11 | 48 |
| 17 | TP20-09/12/2019-0.50m | | Non Hazardous | | 51 |
| 18 | TP20-09/12/2019-1.50m | | Non Hazardous | | 54 |
| 19 | TP21-09/12/2019-0.50m | | Non Hazardous | | 57 |
| 20 | TP21-09/12/2019-1.50m | | Non Hazardous | | 60 |
| 21 | TP22-09/12/2019-0.50m | | Non Hazardous | | 63 |
| 22 | TP24-09/12/2019-0.50m | | Non Hazardous | | 66 |
| 23 | TP24-09/12/2019-1.50m | | Non Hazardous | | 69 |
| 24 | TP25-10/12/2019-0.50m | | Non Hazardous | | 72 |
| 25 | TP26-12/12/2019-0.50m | | Non Hazardous | | 75 |
| 26 | TP27-10/12/2019-0.50m | | Non Hazardous | | 78 |
| 27 | TP28-10/12/2019-0.50m | | Non Hazardous | | 81 |
| 28 | TP28-10/12/2019-1.50m | | Non Hazardous | | 84 |
| 29 | TP29-12/12/2019-0.50m | | Non Hazardous | | 87 |
| 30 | TP29-12/12/2019-1.50m | | Hazardous | HP 7, HP 11 | 90 |

| Appendices | Page |
|---|---|
| Appendix A: Classifier defined and non CLP determinands | 93 |
| Appendix B: Rationale for selection of metal species | 94 |
| Appendix C: Version | 95 |

## Classification of sample: TP02-05/12/2019-0.50m

**Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

## Sample details

Sample Name:
**TP02-05/12/2019-0.50m**
Moisture content:
**33.6%**
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

## Hazard properties

None identified

## Determinands

Moisture content: 33.6% Wet Weight Moisture Correction applied (MC)

| # | Determinand | CLP index number | EC Number | CAS Number | CLP Note | User entered data | Conv. Factor | Compound conc. | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | antimony { antimony trioxide } | 051-005-00-X | 215-175-0 | 1309-64-4 | | 1 mg/kg | 1.197 | 0.795 mg/kg | 0.0000795 % | ✓ | |
| 2 | arsenic { arsenic pentoxide } | 033-004-00-6 | 215-116-9 | 1303-28-2 | | 4.5 mg/kg | 1.534 | 4.583 mg/kg | 0.000458 % | ✓ | |
| 3 | cadmium { cadmium oxide } | 048-002-00-0 | 215-146-2 | 1306-19-0 | | 1 mg/kg | 1.142 | 0.759 mg/kg | 0.0000759 % | ✓ | |
| 4 | chromium in chromium(III) compounds { chromium(III) oxide } | | 215-160-9 | 1308-38-9 | | 86.1 mg/kg | 1.462 | 83.558 mg/kg | 0.00836 % | ✓ | |
| 5 | chromium in chromium(VI) compounds { chromium(VI) oxide } | 024-001-00-0 | 215-607-8 | 1333-82-0 | | <0.3 mg/kg | 1.923 | <0.577 mg/kg | <0.0000577 % | | **<LOD** |
| 6 | copper { dicopper oxide; copper (I) oxide } | 029-002-00-X | 215-270-7 | 1317-39-1 | | 47 mg/kg | 1.126 | 35.137 mg/kg | 0.00351 % | ✓ | |
| 7 | lead { lead compounds with the exception of those specified elsewhere in this Annex } | 082-001-00-6 | | | 1 | 41 mg/kg | | 27.224 mg/kg | 0.00272 % | ✓ | |
| 8 | mercury { mercury dichloride } | 080-010-00-X | 231-299-8 | 7487-94-7 | | <0.1 mg/kg | 1.353 | <0.135 mg/kg | <0.0000135 % | | **<LOD** |
| 9 | molybdenum { molybdenum(VI) oxide } | 042-001-00-9 | 215-204-7 | 1313-27-5 | | 3 mg/kg | 1.5 | 2.988 mg/kg | 0.000299 % | ✓ | |
| 10 | nickel { nickel chromate } | 028-035-00-7 | 238-766-5 | 14721-18-7 | | 2 mg/kg | 2.976 | 3.952 mg/kg | 0.000395 % | ✓ | |
| 11 | selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } | 034-002-00-8 | | | | 2 mg/kg | 2.554 | 3.391 mg/kg | 0.000339 % | ✓ | |
| 12 | zinc { zinc oxide } | 030-013-00-7 | 215-222-5 | 1314-13-2 | | 6 mg/kg | 1.245 | 4.959 mg/kg | 0.000496 % | ✓ | |
| 13 | TPH (C6 to C40) petroleum group | | | TPH | | 201 mg/kg | | 133.464 mg/kg | 0.0133 % | ✓ | |
| 14 | tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane | 603-181-00-X | 216-653-1 | 1634-04-4 | | <0.005 mg/kg | | <0.005 mg/kg | <0.0000005 % | | **<LOD** |

| # | | Determinand | CLP index number | EC Number | CAS Number | CLP Note | User entered data | | Conv. Factor | Compound conc. | | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | | benzene | 601-020-00-8 | 200-753-7 | 71-43-2 | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| 16 | | toluene | 601-021-00-3 | 203-625-9 | 108-88-3 | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| 17 | | ethylbenzene | 601-023-00-4 | 202-849-4 | 100-41-4 | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| 18 | | xylene | 601-022-00-9 | 202-422-2 [1]<br>203-396-5 [2]<br>203-576-3 [3]<br>215-535-7 [4] | 95-47-6 [1]<br>106-42-3 [2]<br>108-38-3 [3]<br>1330-20-7 [4] | | <0.01 | mg/kg | | <0.01 | mg/kg | <0.000001 % | | <LOD |
| 19 | | pH | | | PH | | 4.64 | pH | | 4.64 | pH | 4.64 pH | | |
| 20 | | naphthalene | 601-052-00-2 | 202-049-5 | 91-20-3 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 21 | | acenaphthylene | | 205-917-1 | 208-96-8 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| 22 | | acenaphthene | | 201-469-6 | 83-32-9 | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| 23 | | fluorene | | 201-695-5 | 86-73-7 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 24 | | phenanthrene | | 201-581-5 | 85-01-8 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| 25 | | anthracene | | 204-371-1 | 120-12-7 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 26 | | fluoranthene | | 205-912-4 | 206-44-0 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| 27 | | pyrene | | 204-927-3 | 129-00-0 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| 28 | | benzo[a]anthracene | 601-033-00-9 | 200-280-6 | 56-55-3 | | <0.06 | mg/kg | | <0.06 | mg/kg | <0.000006 % | | <LOD |
| 29 | | chrysene | 601-048-00-0 | 205-923-4 | 218-01-9 | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| 30 | | benzo[b]fluoranthene | 601-034-00-4 | 205-911-9 | 205-99-2 | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| 31 | | benzo[k]fluoranthene | 601-036-00-5 | 205-916-6 | 207-08-9 | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| 32 | | benzo[a]pyrene; benzo[def]chrysene | 601-032-00-3 | 200-028-5 | 50-32-8 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 33 | | indeno[123-cd]pyrene | | 205-893-2 | 193-39-5 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 34 | | dibenz[a,h]anthracene | 601-041-00-2 | 200-181-8 | 53-70-3 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 35 | | benzo[ghi]perylene | | 205-883-8 | 191-24-2 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 36 | | polychlorobiphenyls; PCB | 602-039-00-4 | 215-648-1 | 1336-36-3 | | <0.035 | mg/kg | | <0.035 | mg/kg | <0.0000035 % | | <LOD |
| 37 | | barium { barium oxide } | | 215-127-9 | 1304-28-5 | | 114 | mg/kg | 1.117 | 84.515 | mg/kg | 0.00845 % | ✓ | |
| 38 | | coronene | | 205-881-7 | 191-07-1 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 39 | | benzo[j]fluoranthene | 601-035-00-X | 205-910-3 | 205-82-3 | | <1 | mg/kg | | <1 | mg/kg | <0.0001 % | | <LOD |
| | | | | | | | | | | | Total: | 0.0388 % | | |

| Key | |
|---|---|
| | User supplied data |
| | Determinand values ignored for classification, see column 'Conc. Not Used' for reason |
| | Determinand defined or amended by HazWasteOnline (see Appendix A) |
| | Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration |
| **<LOD** | Below limit of detection |
| **ND** | Not detected |
| CLP: Note 1 | Only the metal concentration has been used for classification |

## Supplementary Hazardous Property Information

**HP 3(i): Flammable** "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Solid waste without liquid phase

Hazard Statements hit:

**Flam. Liq. 3; H226** "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0133%)

## Classification of sample: TP03-04/12/2019-0.50m

**Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

## Sample details

Sample Name:
**TP03-04/12/2019-0.50m**
Moisture content:
**9%**
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

## Hazard properties

None identified

## Determinands

Moisture content: 9% Wet Weight Moisture Correction applied (MC)

| # | Determinand | CLP index number | EC Number | CAS Number | CLP Note | User entered data | Conv. Factor | Compound conc. | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | antimony { antimony trioxide } | 051-005-00-X | 215-175-0 | 1309-64-4 | | 2 mg/kg | 1.197 | 2.179 mg/kg | 0.000218 % | ✓ | |
| 2 | arsenic { arsenic pentoxide } | 033-004-00-6 | 215-116-9 | 1303-28-2 | | 19.6 mg/kg | 1.534 | 27.358 mg/kg | 0.00274 % | ✓ | |
| 3 | cadmium { cadmium oxide } | 048-002-00-0 | 215-146-2 | 1306-19-0 | | <0.1 mg/kg | 1.142 | <0.114 mg/kg | <0.0000114 % | | <**LOD** |
| 4 | chromium in chromium(III) compounds { chromium(III) oxide } | | 215-160-9 | 1308-38-9 | | 41 mg/kg | 1.462 | 54.531 mg/kg | 0.00545 % | ✓ | |
| 5 | chromium in chromium(VI) compounds { chromium(VI) oxide } | 024-001-00-0 | 215-607-8 | 1333-82-0 | | <0.3 mg/kg | 1.923 | <0.577 mg/kg | <0.0000577 % | | <**LOD** |
| 6 | copper { dicopper oxide; copper (I) oxide } | 029-002-00-X | 215-270-7 | 1317-39-1 | | 49 mg/kg | 1.126 | 50.203 mg/kg | 0.00502 % | ✓ | |
| 7 | lead { lead compounds with the exception of those specified elsewhere in this Annex } | 082-001-00-6 | | | 1 | 24 mg/kg | | 21.84 mg/kg | 0.00218 % | ✓ | |
| 8 | mercury { mercury dichloride } | 080-010-00-X | 231-299-8 | 7487-94-7 | | <0.1 mg/kg | 1.353 | <0.135 mg/kg | <0.0000135 % | | <**LOD** |
| 9 | molybdenum { molybdenum(VI) oxide } | 042-001-00-9 | 215-204-7 | 1313-27-5 | | 0.1 mg/kg | 1.5 | 0.137 mg/kg | 0.0000137 % | ✓ | |
| 10 | nickel { nickel chromate } | 028-035-00-7 | 238-766-5 | 14721-18-7 | | 41.3 mg/kg | 2.976 | 111.857 mg/kg | 0.0112 % | ✓ | |
| 11 | selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } | 034-002-00-8 | | | | 1 mg/kg | 2.554 | 2.324 mg/kg | 0.000232 % | ✓ | |
| 12 | zinc { zinc oxide } | 030-013-00-7 | 215-222-5 | 1314-13-2 | | 125 mg/kg | 1.245 | 141.586 mg/kg | 0.0142 % | ✓ | |
| 13 | TPH (C6 to C40) petroleum group | | | TPH | | 63 mg/kg | | 57.33 mg/kg | 0.00573 % | ✓ | |
| 14 | tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane | 603-181-00-X | 216-653-1 | 1634-04-4 | | <0.005 mg/kg | | <0.005 mg/kg | <0.0000005 % | | <**LOD** |

| # | | Determinand | | | CLP Note | User entered data | | Conv. Factor | Compound conc. | | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CLP index number | EC Number | CAS Number | | | | | | | | | |
| 15 | | benzene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-020-00-8 | 200-753-7 | 71-43-2 | | | | | | | | | |
| 16 | | toluene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-021-00-3 | 203-625-9 | 108-88-3 | | | | | | | | | |
| 17 | | ethylbenzene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-023-00-4 | 202-849-4 | 100-41-4 | | | | | | | | | |
| 18 | | xylene | | | | <0.01 | mg/kg | | <0.01 | mg/kg | <0.000001 % | | <LOD |
| | | 601-022-00-9 | 202-422-2 [1]<br>203-396-5 [2]<br>203-576-3 [3]<br>215-535-7 [4] | 95-47-6 [1]<br>106-42-3 [2]<br>108-38-3 [3]<br>1330-20-7 [4] | | | | | | | | | |
| 19 | | pH | | | | 8.16 | pH | | 8.16 | pH | 8.16 pH | | |
| | | | | PH | | | | | | | | | |
| 20 | | naphthalene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-052-00-2 | 202-049-5 | 91-20-3 | | | | | | | | | |
| 21 | | acenaphthylene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 205-917-1 | 208-96-8 | | | | | | | | | |
| 22 | | acenaphthene | | | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| | | | 201-469-6 | 83-32-9 | | | | | | | | | |
| 23 | | fluorene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 201-695-5 | 86-73-7 | | | | | | | | | |
| 24 | | phenanthrene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 201-581-5 | 85-01-8 | | | | | | | | | |
| 25 | | anthracene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 204-371-1 | 120-12-7 | | | | | | | | | |
| 26 | | fluoranthene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 205-912-4 | 206-44-0 | | | | | | | | | |
| 27 | | pyrene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 204-927-3 | 129-00-0 | | | | | | | | | |
| 28 | | benzo[a]anthracene | | | | <0.06 | mg/kg | | <0.06 | mg/kg | <0.000006 % | | <LOD |
| | | 601-033-00-9 | 200-280-6 | 56-55-3 | | | | | | | | | |
| 29 | | chrysene | | | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| | | 601-048-00-0 | 205-923-4 | 218-01-9 | | | | | | | | | |
| 30 | | benzo[b]fluoranthene | | | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| | | 601-034-00-4 | 205-911-9 | 205-99-2 | | | | | | | | | |
| 31 | | benzo[k]fluoranthene | | | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| | | 601-036-00-5 | 205-916-6 | 207-08-9 | | | | | | | | | |
| 32 | | benzo[a]pyrene; benzo[def]chrysene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-032-00-3 | 200-028-5 | 50-32-8 | | | | | | | | | |
| 33 | | indeno[123-cd]pyrene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-893-2 | 193-39-5 | | | | | | | | | |
| 34 | | dibenz[a,h]anthracene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-041-00-2 | 200-181-8 | 53-70-3 | | | | | | | | | |
| 35 | | benzo[ghi]perylene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-883-8 | 191-24-2 | | | | | | | | | |
| 36 | | polychlorobiphenyls; PCB | | | | <0.035 | mg/kg | | <0.035 | mg/kg | <0.0000035 % | | <LOD |
| | | 602-039-00-4 | 215-648-1 | 1336-36-3 | | | | | | | | | |
| 37 | | barium { barium oxide } | | | | 42 | mg/kg | 1.117 | 42.673 | mg/kg | 0.00427 % | ✓ | |
| | | | 215-127-9 | 1304-28-5 | | | | | | | | | |
| 38 | | coronene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-881-7 | 191-07-1 | | | | | | | | | |
| 39 | | benzo[j]fluoranthene | | | | <1 | mg/kg | | <1 | mg/kg | <0.0001 % | | <LOD |
| | | 601-035-00-X | 205-910-3 | 205-82-3 | | | | | | | | | |
| | | | | | | | | | | Total: | 0.0515 % | | |

| Key | |
|---|---|
| | User supplied data |
| | Determinand values ignored for classification, see column 'Conc. Not Used' for reason |
| | Determinand defined or amended by HazWasteOnline (see Appendix A) |
| | Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration |
| **<LOD** | Below limit of detection |
| **ND** | Not detected |
| CLP: Note 1 | Only the metal concentration has been used for classification |

## Supplementary Hazardous Property Information

**HP 3(i): Flammable** "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Solid waste without liquid phase

Hazard Statements hit:

**Flam. Liq. 3; H226** "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.00573%)

## Classification of sample: TP05-04/12/2019-1.20m

**Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

## Sample details

Sample Name:
**TP05-04/12/2019-1.20m**
Moisture content:
**30.6%**
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

## Hazard properties

None identified

## Determinands

Moisture content: 30.6% Wet Weight Moisture Correction applied (MC)

| # | Determinand | CLP index number | EC Number | CAS Number | CLP Note | User entered data | Conv. Factor | Compound conc. | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | antimony { antimony trioxide } | 051-005-00-X | 215-175-0 | 1309-64-4 | | 2 mg/kg | 1.197 | 1.662 mg/kg | 0.000166 % | ✓ | |
| 2 | arsenic { arsenic pentoxide } | 033-004-00-6 | 215-116-9 | 1303-28-2 | | 54.5 mg/kg | 1.534 | 58.016 mg/kg | 0.0058 % | ✓ | |
| 3 | cadmium { cadmium oxide } | 048-002-00-0 | 215-146-2 | 1306-19-0 | | <0.1 mg/kg | 1.142 | <0.114 mg/kg | <0.0000114 % | | <**LOD** |
| 4 | chromium in chromium(III) compounds { chromium(III) oxide } | | 215-160-9 | 1308-38-9 | | 46.8 mg/kg | 1.462 | 47.47 mg/kg | 0.00475 % | ✓ | |
| 5 | chromium in chromium(VI) compounds { chromium(VI) oxide } | 024-001-00-0 | 215-607-8 | 1333-82-0 | | <0.3 mg/kg | 1.923 | <0.577 mg/kg | <0.0000577 % | | <**LOD** |
| 6 | copper { dicopper oxide; copper (I) oxide } | 029-002-00-X | 215-270-7 | 1317-39-1 | | 34 mg/kg | 1.126 | 26.566 mg/kg | 0.00266 % | ✓ | |
| 7 | lead { lead compounds with the exception of those specified elsewhere in this Annex } | 082-001-00-6 | | | 1 | 51 mg/kg | | 35.394 mg/kg | 0.00354 % | ✓ | |
| 8 | mercury { mercury dichloride } | 080-010-00-X | 231-299-8 | 7487-94-7 | | <0.1 mg/kg | 1.353 | <0.135 mg/kg | <0.0000135 % | | <**LOD** |
| 9 | molybdenum { molybdenum(VI) oxide } | 042-001-00-9 | 215-204-7 | 1313-27-5 | | 0.9 mg/kg | 1.5 | 0.937 mg/kg | 0.0000937 % | ✓ | |
| 10 | nickel { nickel chromate } | 028-035-00-7 | 238-766-5 | 14721-18-7 | | 21.9 mg/kg | 2.976 | 45.235 mg/kg | 0.00452 % | ✓ | |
| 11 | selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } | 034-002-00-8 | | | | 3 mg/kg | 2.554 | 5.317 mg/kg | 0.000532 % | ✓ | |
| 12 | zinc { zinc oxide } | 030-013-00-7 | 215-222-5 | 1314-13-2 | | 114 mg/kg | 1.245 | 98.477 mg/kg | 0.00985 % | ✓ | |
| 13 | TPH (C6 to C40) petroleum group | | | TPH | | <52 mg/kg | | <52 mg/kg | <0.0052 % | | <**LOD** |
| 14 | tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane | 603-181-00-X | 216-653-1 | 1634-04-4 | | <0.005 mg/kg | | <0.005 mg/kg | <0.0000005 % | | <**LOD** |

| # | Determinand | CLP index number | EC Number | CAS Number | CLP Note | User entered data | | Conv. Factor | Compound conc. | | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | benzene | 601-020-00-8 | 200-753-7 | 71-43-2 | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| 16 | toluene | 601-021-00-3 | 203-625-9 | 108-88-3 | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| 17 | ethylbenzene | 601-023-00-4 | 202-849-4 | 100-41-4 | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| 18 | xylene | 601-022-00-9 | 202-422-2 [1]<br>203-396-5 [2]<br>203-576-3 [3]<br>215-535-7 [4] | 95-47-6 [1]<br>106-42-3 [2]<br>108-38-3 [3]<br>1330-20-7 [4] | | <0.01 | mg/kg | | <0.01 | mg/kg | <0.000001 % | | <LOD |
| 19 | pH | | | PH | | 7.08 | pH | | 7.08 | pH | 7.08 pH | | |
| 20 | naphthalene | 601-052-00-2 | 202-049-5 | 91-20-3 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 21 | acenaphthylene | | 205-917-1 | 208-96-8 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| 22 | acenaphthene | | 201-469-6 | 83-32-9 | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| 23 | fluorene | | 201-695-5 | 86-73-7 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 24 | phenanthrene | | 201-581-5 | 85-01-8 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| 25 | anthracene | | 204-371-1 | 120-12-7 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 26 | fluoranthene | | 205-912-4 | 206-44-0 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| 27 | pyrene | | 204-927-3 | 129-00-0 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| 28 | benzo[a]anthracene | 601-033-00-9 | 200-280-6 | 56-55-3 | | <0.06 | mg/kg | | <0.06 | mg/kg | <0.000006 % | | <LOD |
| 29 | chrysene | 601-048-00-0 | 205-923-4 | 218-01-9 | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| 30 | benzo[b]fluoranthene | 601-034-00-4 | 205-911-9 | 205-99-2 | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| 31 | benzo[k]fluoranthene | 601-036-00-5 | 205-916-6 | 207-08-9 | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| 32 | benzo[a]pyrene; benzo[def]chrysene | 601-032-00-3 | 200-028-5 | 50-32-8 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 33 | indeno[123-cd]pyrene | | 205-893-2 | 193-39-5 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 34 | dibenz[a,h]anthracene | 601-041-00-2 | 200-181-8 | 53-70-3 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 35 | benzo[ghi]perylene | | 205-883-8 | 191-24-2 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 36 | polychlorobiphenyls; PCB | 602-039-00-4 | 215-648-1 | 1336-36-3 | | <0.035 | mg/kg | | <0.035 | mg/kg | <0.0000035 % | | <LOD |
| 37 | barium { barium oxide } | | 215-127-9 | 1304-28-5 | | 50 | mg/kg | 1.117 | 38.743 | mg/kg | 0.00387 % | ✓ | |
| 38 | coronene | | 205-881-7 | 191-07-1 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 39 | benzo[j]fluoranthene | 601-035-00-X | 205-910-3 | 205-82-3 | | <1 | mg/kg | | <1 | mg/kg | <0.0001 % | | <LOD |
| | | | | | | | | | | Total: | 0.0412 % | | |

Key

| | |
|---|---|
| | User supplied data |
| | Determinand values ignored for classification, see column 'Conc. Not Used' for reason |
| | Determinand defined or amended by HazWasteOnline (see Appendix A) |
| | Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration |
| **<LOD** | Below limit of detection |
| **ND** | Not detected |
| CLP: Note 1 | Only the metal concentration has been used for classification |

## Classification of sample: TP06-06/12/2019-1.50m

**Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

## Sample details

Sample Name:
**TP06-06/12/2019-1.50m**
Moisture content:
**32.2%**
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

## Hazard properties

None identified

## Determinands

Moisture content: 32.2% Wet Weight Moisture Correction applied (MC)

| # | Determinand | CLP index number | EC Number | CAS Number | CLP Note | User entered data | Conv. Factor | Compound conc. | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | antimony { antimony trioxide } | 051-005-00-X | 215-175-0 | 1309-64-4 | | 2 mg/kg | 1.197 | 1.623 mg/kg | 0.000162 % | ✓ | |
| 2 | arsenic { arsenic pentoxide } | 033-004-00-6 | 215-116-9 | 1303-28-2 | | 58 mg/kg | 1.534 | 60.318 mg/kg | 0.00603 % | ✓ | |
| 3 | cadmium { cadmium oxide } | 048-002-00-0 | 215-146-2 | 1306-19-0 | | 4.8 mg/kg | 1.142 | 3.718 mg/kg | 0.000372 % | ✓ | |
| 4 | chromium in chromium(III) compounds { chromium(III) oxide } | | 215-160-9 | 1308-38-9 | | 35.8 mg/kg | 1.462 | 35.475 mg/kg | 0.00355 % | ✓ | |
| 5 | chromium in chromium(VI) compounds { chromium(VI) oxide } | 024-001-00-0 | 215-607-8 | 1333-82-0 | | <0.3 mg/kg | 1.923 | <0.577 mg/kg | <0.0000577 % | | <**LOD** |
| 6 | copper { dicopper oxide; copper (I) oxide } | 029-002-00-X | 215-270-7 | 1317-39-1 | | 1508 mg/kg | 1.126 | 1151.135 mg/kg | 0.115 % | ✓ | |
| 7 | lead { lead compounds with the exception of those specified elsewhere in this Annex } | 082-001-00-6 | | | 1 | 74 mg/kg | | 50.172 mg/kg | 0.00502 % | ✓ | |
| 8 | mercury { mercury dichloride } | 080-010-00-X | 231-299-8 | 7487-94-7 | | <0.1 mg/kg | 1.353 | <0.135 mg/kg | <0.0000135 % | | <**LOD** |
| 9 | molybdenum { molybdenum(VI) oxide } | 042-001-00-9 | 215-204-7 | 1313-27-5 | | 1 mg/kg | 1.5 | 1.017 mg/kg | 0.000102 % | ✓ | |
| 10 | nickel { nickel chromate } | 028-035-00-7 | 238-766-5 | 14721-18-7 | | 21.8 mg/kg | 2.976 | 43.99 mg/kg | 0.0044 % | ✓ | |
| 11 | selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } | 034-002-00-8 | | | | 3 mg/kg | 2.554 | 5.194 mg/kg | 0.000519 % | ✓ | |
| 12 | zinc { zinc oxide } | 030-013-00-7 | 215-222-5 | 1314-13-2 | | 1141 mg/kg | 1.245 | 962.908 mg/kg | 0.0963 % | ✓ | |
| 13 | TPH (C6 to C40) petroleum group | | | TPH | | <52 mg/kg | | <52 mg/kg | <0.0052 % | | <**LOD** |
| 14 | tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane | 603-181-00-X | 216-653-1 | 1634-04-4 | | <0.005 mg/kg | | <0.005 mg/kg | <0.0000005 % | | <**LOD** |

| # | | Determinand | | | CLP Note | User entered data | | Conv. Factor | Compound conc. | | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CLP index number | EC Number | CAS Number | | | | | | | | | |
| 15 | | benzene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-020-00-8 | 200-753-7 | 71-43-2 | | | | | | | | | |
| 16 | | toluene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-021-00-3 | 203-625-9 | 108-88-3 | | | | | | | | | |
| 17 | | ethylbenzene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-023-00-4 | 202-849-4 | 100-41-4 | | | | | | | | | |
| 18 | | xylene | | | | <0.01 | mg/kg | | <0.01 | mg/kg | <0.000001 % | | <LOD |
| | | 601-022-00-9 | 202-422-2 [1]<br>203-396-5 [2]<br>203-576-3 [3]<br>215-535-7 [4] | 95-47-6 [1]<br>106-42-3 [2]<br>108-38-3 [3]<br>1330-20-7 [4] | | | | | | | | | |
| 19 | | pH | | | | 7.03 | pH | | 7.03 | pH | 7.03 pH | | |
| | | | | PH | | | | | | | | | |
| 20 | | naphthalene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-052-00-2 | 202-049-5 | 91-20-3 | | | | | | | | | |
| 21 | | acenaphthylene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 205-917-1 | 208-96-8 | | | | | | | | | |
| 22 | | acenaphthene | | | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| | | | 201-469-6 | 83-32-9 | | | | | | | | | |
| 23 | | fluorene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 201-695-5 | 86-73-7 | | | | | | | | | |
| 24 | | phenanthrene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 201-581-5 | 85-01-8 | | | | | | | | | |
| 25 | | anthracene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 204-371-1 | 120-12-7 | | | | | | | | | |
| 26 | | fluoranthene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 205-912-4 | 206-44-0 | | | | | | | | | |
| 27 | | pyrene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 204-927-3 | 129-00-0 | | | | | | | | | |
| 28 | | benzo[a]anthracene | | | | <0.06 | mg/kg | | <0.06 | mg/kg | <0.000006 % | | <LOD |
| | | 601-033-00-9 | 200-280-6 | 56-55-3 | | | | | | | | | |
| 29 | | chrysene | | | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| | | 601-048-00-0 | 205-923-4 | 218-01-9 | | | | | | | | | |
| 30 | | benzo[b]fluoranthene | | | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| | | 601-034-00-4 | 205-911-9 | 205-99-2 | | | | | | | | | |
| 31 | | benzo[k]fluoranthene | | | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| | | 601-036-00-5 | 205-916-6 | 207-08-9 | | | | | | | | | |
| 32 | | benzo[a]pyrene; benzo[def]chrysene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-032-00-3 | 200-028-5 | 50-32-8 | | | | | | | | | |
| 33 | | indeno[123-cd]pyrene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-893-2 | 193-39-5 | | | | | | | | | |
| 34 | | dibenz[a,h]anthracene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-041-00-2 | 200-181-8 | 53-70-3 | | | | | | | | | |
| 35 | | benzo[ghi]perylene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-883-8 | 191-24-2 | | | | | | | | | |
| 36 | | polychlorobiphenyls; PCB | | | | <0.035 | mg/kg | | <0.035 | mg/kg | <0.0000035 % | | <LOD |
| | | 602-039-00-4 | 215-648-1 | 1336-36-3 | | | | | | | | | |
| 37 | | barium { barium oxide } | | | | 55 | mg/kg | 1.117 | 41.635 | mg/kg | 0.00416 % | ✓ | |
| | | | 215-127-9 | 1304-28-5 | | | | | | | | | |
| 38 | | coronene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-881-7 | 191-07-1 | | | | | | | | | |
| 39 | | benzo[j]fluoranthene | | | | <1 | mg/kg | | <1 | mg/kg | <0.0001 % | | <LOD |
| | | 601-035-00-X | 205-910-3 | 205-82-3 | | | | | | | | | |
| | | | | | | | | | | Total: | 0.241 % | | |

Key

| | |
|---|---|
| | User supplied data |
| | Determinand values ignored for classification, see column 'Conc. Not Used' for reason |
| | Determinand defined or amended by HazWasteOnline (see Appendix A) |
| | Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration |
| **<LOD** | Below limit of detection |
| **ND** | Not detected |
| CLP: Note 1 | Only the metal concentration has been used for classification |

## Classification of sample: TP08-05/12/2019-1.50m

**Hazardous Waste**
Classified as **17 05 03 ***
in the List of Waste

## Sample details

Sample Name:
**TP08-05/12/2019-1.50m**
Moisture content:
**38.7%**
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 03 * (Soil and stones containing hazardous substances)

## Hazard properties

**HP 7: Carcinogenic** "waste which induces cancer or increases its incidence"

Hazard Statements hit:

**Carc. 1A; H350** "May cause cancer [state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard]."

Because of determinand:

arsenic pentoxide: (compound conc.: 0.156%)

**HP 14: Ecotoxic** "waste which presents or may present immediate or delayed risks for one or more sectors of the environment"

Hazard Statements hit:

**Aquatic Chronic 1; H410** "Very toxic to aquatic life with long lasting effects."

Because of determinands:

arsenic pentoxide: (compound conc.: 0.156%)
dicopper oxide; copper (I) oxide: (compound conc.: 0.277%)
zinc oxide: (compound conc.: 0.349%)

## Determinands

Moisture content: 38.7% Wet Weight Moisture Correction applied (MC)

| # | Determinand | CLP index number | EC Number | CAS Number | CLP Note | User entered data | Conv. Factor | Compound conc. | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | antimony { antimony trioxide } | 051-005-00-X | 215-175-0 | 1309-64-4 | | 104 mg/kg | 1.197 | 76.318 mg/kg | 0.00763 % | ✓ | |
| 2 | arsenic { arsenic pentoxide } | 033-004-00-6 | 215-116-9 | 1303-28-2 | | 1658 mg/kg | 1.534 | 1558.961 mg/kg | 0.156 % | ✓ | |
| 3 | cadmium { cadmium oxide } | 048-002-00-0 | 215-146-2 | 1306-19-0 | | 11.3 mg/kg | 1.142 | 7.913 mg/kg | 0.000791 % | ✓ | |
| 4 | chromium in chromium(III) compounds { chromium(III) oxide } | | 215-160-9 | 1308-38-9 | | <0.5 mg/kg | 1.462 | <0.731 mg/kg | <0.0000731 % | | <LOD |
| 5 | chromium in chromium(VI) compounds { chromium(VI) oxide } | 024-001-00-0 | 215-607-8 | 1333-82-0 | | <0.3 mg/kg | 1.923 | <0.577 mg/kg | <0.0000577 % | | <LOD |
| 6 | copper { dicopper oxide; copper (I) oxide } | 029-002-00-X | 215-270-7 | 1317-39-1 | | 4010 mg/kg | 1.126 | 2767.58 mg/kg | 0.277 % | ✓ | |
| 7 | lead { lead compounds with the exception of those specified elsewhere in this Annex } | 082-001-00-6 | | | 1 | 1617 mg/kg | | 991.221 mg/kg | 0.0991 % | ✓ | |

| # | | Determinand | CLP index number | EC Number | CAS Number | CLP Note | User entered data | | Conv. Factor | Compound conc. | | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | | mercury { mercury dichloride } | 080-010-00-X | 231-299-8 | 7487-94-7 | | <0.1 | mg/kg | 1.353 | <0.135 | mg/kg | <0.0000135 % | | <LOD |
| 9 | | molybdenum { molybdenum(VI) oxide } | 042-001-00-9 | 215-204-7 | 1313-27-5 | | 83.9 | mg/kg | 1.5 | 77.156 | mg/kg | 0.00772 % | ✓ | |
| 10 | | nickel { nickel chromate } | 028-035-00-7 | 238-766-5 | 14721-18-7 | | <0.7 | mg/kg | 2.976 | <2.083 | mg/kg | <0.000208 % | | <LOD |
| 11 | | selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } | 034-002-00-8 | | | | <1 | mg/kg | 2.554 | <2.554 | mg/kg | <0.000255 % | | <LOD |
| 12 | | zinc { zinc oxide } | 030-013-00-7 | 215-222-5 | 1314-13-2 | | 4572 | mg/kg | 1.245 | 3488.48 | mg/kg | 0.349 % | ✓ | |
| 13 | | TPH (C6 to C40) petroleum group | | | TPH | | <52 | mg/kg | | <52 | mg/kg | <0.0052 % | | <LOD |
| 14 | | tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane | 603-181-00-X | 216-653-1 | 1634-04-4 | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| 15 | | benzene | 601-020-00-8 | 200-753-7 | 71-43-2 | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| 16 | | toluene | 601-021-00-3 | 203-625-9 | 108-88-3 | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| 17 | | ethylbenzene | 601-023-00-4 | 202-849-4 | 100-41-4 | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| 18 | | xylene | 601-022-00-9 | 202-422-2 [1]<br>203-396-5 [2]<br>203-576-3 [3]<br>215-535-7 [4] | 95-47-6 [1]<br>106-42-3 [2]<br>108-38-3 [3]<br>1330-20-7 [4] | | <0.01 | mg/kg | | <0.01 | mg/kg | <0.000001 % | | <LOD |
| 19 | | pH | | | PH | | 6.74 | pH | | 6.74 | pH | 6.74 pH | | |
| 20 | | naphthalene | 601-052-00-2 | 202-049-5 | 91-20-3 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 21 | | acenaphthylene | | 205-917-1 | 208-96-8 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| 22 | | acenaphthene | | 201-469-6 | 83-32-9 | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| 23 | | fluorene | | 201-695-5 | 86-73-7 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 24 | | phenanthrene | | 201-581-5 | 85-01-8 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| 25 | | anthracene | | 204-371-1 | 120-12-7 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 26 | | fluoranthene | | 205-912-4 | 206-44-0 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| 27 | | pyrene | | 204-927-3 | 129-00-0 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| 28 | | benzo[a]anthracene | 601-033-00-9 | 200-280-6 | 56-55-3 | | <0.06 | mg/kg | | <0.06 | mg/kg | <0.000006 % | | <LOD |
| 29 | | chrysene | 601-048-00-0 | 205-923-4 | 218-01-9 | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| 30 | | benzo[b]fluoranthene | 601-034-00-4 | 205-911-9 | 205-99-2 | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| 31 | | benzo[k]fluoranthene | 601-036-00-5 | 205-916-6 | 207-08-9 | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| 32 | | benzo[a]pyrene; benzo[def]chrysene | 601-032-00-3 | 200-028-5 | 50-32-8 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 33 | | indeno[123-cd]pyrene | | 205-893-2 | 193-39-5 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 34 | | dibenz[a,h]anthracene | 601-041-00-2 | 200-181-8 | 53-70-3 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |

| # | | Determinand | | | CLP Note | User entered data | | Conv. Factor | Compound conc. | | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CLP index number | EC Number | CAS Number | | | | | | | | | |
| 35 | | benzo[ghi]perylene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <**LOD** |
| | | | 205-883-8 | 191-24-2 | | | | | | | | | |
| 36 | | polychlorobiphenyls; PCB | | | | <0.035 | mg/kg | | <0.035 | mg/kg | <0.0000035 % | | <**LOD** |
| | | 602-039-00-4 | 215-648-1 | 1336-36-3 | | | | | | | | | |
| 37 | | barium { barium oxide } | | | | 50 | mg/kg | 1.117 | 34.221 | mg/kg | 0.00342 % | ✓ | |
| | | | 215-127-9 | 1304-28-5 | | | | | | | | | |
| 38 | | coronene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <**LOD** |
| | | | 205-881-7 | 191-07-1 | | | | | | | | | |
| 39 | | benzo[j]fluoranthene | | | | <1 | mg/kg | | <1 | mg/kg | <0.0001 % | | <**LOD** |
| | | 601-035-00-X | 205-910-3 | 205-82-3 | | | | | | | | | |
| | | | | | | | | | | Total: | 0.906 % | | |

Key

| | |
|---|---|
| | User supplied data |
| | Determinand values ignored for classification, see column 'Conc. Not Used' for reason |
| | Hazardous result |
| | Determinand defined or amended by HazWasteOnline (see Appendix A) |
| | Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration |
| **<LOD** | Below limit of detection |
| **ND** | Not detected |
| CLP: Note 1 | Only the metal concentration has been used for classification |

## Classification of sample: TP08-05/12/2019-2.50m

**Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

## Sample details

Sample Name:
**TP08-05/12/2019-2.50m**
Moisture content:
**32%**
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

## Hazard properties

None identified

## Determinands

Moisture content: 32% Wet Weight Moisture Correction applied (MC)

| # | Determinand | CLP index number | EC Number | CAS Number | CLP Note | User entered data | Conv. Factor | Compound conc. | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | antimony { antimony trioxide } | 051-005-00-X | 215-175-0 | 1309-64-4 | | 2 mg/kg | 1.197 | 1.628 mg/kg | 0.000163 % | ✓ | |
| 2 | arsenic { arsenic pentoxide } | 033-004-00-6 | 215-116-9 | 1303-28-2 | | 61.5 mg/kg | 1.534 | 64.147 mg/kg | 0.00641 % | ✓ | |
| 3 | cadmium { cadmium oxide } | 048-002-00-0 | 215-146-2 | 1306-19-0 | | 0.9 mg/kg | 1.142 | 0.699 mg/kg | 0.0000699 % | ✓ | |
| 4 | chromium in chromium(III) compounds { chromium(III) oxide } | | 215-160-9 | 1308-38-9 | | 34.8 mg/kg | 1.462 | 34.586 mg/kg | 0.00346 % | ✓ | |
| 5 | chromium in chromium(VI) compounds { chromium(VI) oxide } | 024-001-00-0 | 215-607-8 | 1333-82-0 | | <0.3 mg/kg | 1.923 | <0.577 mg/kg | <0.0000577 % | | <**LOD** |
| 6 | copper { dicopper oxide; copper (I) oxide } | 029-002-00-X | 215-270-7 | 1317-39-1 | | 236 mg/kg | 1.126 | 180.683 mg/kg | 0.0181 % | ✓ | |
| 7 | lead { lead compounds with the exception of those specified elsewhere in this Annex } | 082-001-00-6 | | | 1 | 45 mg/kg | | 30.6 mg/kg | 0.00306 % | ✓ | |
| 8 | mercury { mercury dichloride } | 080-010-00-X | 231-299-8 | 7487-94-7 | | <0.1 mg/kg | 1.353 | <0.135 mg/kg | <0.0000135 % | | <**LOD** |
| 9 | molybdenum { molybdenum(VI) oxide } | 042-001-00-9 | 215-204-7 | 1313-27-5 | | 0.4 mg/kg | 1.5 | 0.408 mg/kg | 0.0000408 % | ✓ | |
| 10 | nickel { nickel chromate } | 028-035-00-7 | 238-766-5 | 14721-18-7 | | 17.5 mg/kg | 2.976 | 35.418 mg/kg | 0.00354 % | ✓ | |
| 11 | selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } | 034-002-00-8 | | | | 5 mg/kg | 2.554 | 8.682 mg/kg | 0.000868 % | ✓ | |
| 12 | zinc { zinc oxide } | 030-013-00-7 | 215-222-5 | 1314-13-2 | | 892 mg/kg | 1.245 | 754.994 mg/kg | 0.0755 % | ✓ | |
| 13 | TPH (C6 to C40) petroleum group | | | TPH | | <52 mg/kg | | <52 mg/kg | <0.0052 % | | <**LOD** |
| 14 | tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane | 603-181-00-X | 216-653-1 | 1634-04-4 | | <0.005 mg/kg | | <0.005 mg/kg | <0.0000005 % | | <**LOD** |

| # | | Determinand | | | CLP Note | User entered data | | Conv. Factor | Compound conc. | | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CLP index number | EC Number | CAS Number | | | | | | | | | |
| 15 | | benzene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-020-00-8 | 200-753-7 | 71-43-2 | | | | | | | | | |
| 16 | | toluene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-021-00-3 | 203-625-9 | 108-88-3 | | | | | | | | | |
| 17 | | ethylbenzene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-023-00-4 | 202-849-4 | 100-41-4 | | | | | | | | | |
| 18 | | xylene | | | | <0.01 | mg/kg | | <0.01 | mg/kg | <0.000001 % | | <LOD |
| | | 601-022-00-9 | 202-422-2 [1]<br>203-396-5 [2]<br>203-576-3 [3]<br>215-535-7 [4] | 95-47-6 [1]<br>106-42-3 [2]<br>108-38-3 [3]<br>1330-20-7 [4] | | | | | | | | | |
| 19 | | pH | | | | 5.82 | pH | | 5.82 | pH | 5.82 pH | | |
| | | | | PH | | | | | | | | | |
| 20 | | naphthalene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-052-00-2 | 202-049-5 | 91-20-3 | | | | | | | | | |
| 21 | | acenaphthylene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 205-917-1 | 208-96-8 | | | | | | | | | |
| 22 | | acenaphthene | | | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| | | | 201-469-6 | 83-32-9 | | | | | | | | | |
| 23 | | fluorene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 201-695-5 | 86-73-7 | | | | | | | | | |
| 24 | | phenanthrene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 201-581-5 | 85-01-8 | | | | | | | | | |
| 25 | | anthracene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 204-371-1 | 120-12-7 | | | | | | | | | |
| 26 | | fluoranthene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 205-912-4 | 206-44-0 | | | | | | | | | |
| 27 | | pyrene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 204-927-3 | 129-00-0 | | | | | | | | | |
| 28 | | benzo[a]anthracene | | | | <0.06 | mg/kg | | <0.06 | mg/kg | <0.000006 % | | <LOD |
| | | 601-033-00-9 | 200-280-6 | 56-55-3 | | | | | | | | | |
| 29 | | chrysene | | | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| | | 601-048-00-0 | 205-923-4 | 218-01-9 | | | | | | | | | |
| 30 | | benzo[b]fluoranthene | | | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| | | 601-034-00-4 | 205-911-9 | 205-99-2 | | | | | | | | | |
| 31 | | benzo[k]fluoranthene | | | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| | | 601-036-00-5 | 205-916-6 | 207-08-9 | | | | | | | | | |
| 32 | | benzo[a]pyrene; benzo[def]chrysene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-032-00-3 | 200-028-5 | 50-32-8 | | | | | | | | | |
| 33 | | indeno[123-cd]pyrene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-893-2 | 193-39-5 | | | | | | | | | |
| 34 | | dibenz[a,h]anthracene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-041-00-2 | 200-181-8 | 53-70-3 | | | | | | | | | |
| 35 | | benzo[ghi]perylene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-883-8 | 191-24-2 | | | | | | | | | |
| 36 | | polychlorobiphenyls; PCB | | | | <0.035 | mg/kg | | <0.035 | mg/kg | <0.0000035 % | | <LOD |
| | | 602-039-00-4 | 215-648-1 | 1336-36-3 | | | | | | | | | |
| 37 | | barium { barium oxide } | | | | 67 | mg/kg | 1.117 | 50.868 | mg/kg | 0.00509 % | ✓ | |
| | | | 215-127-9 | 1304-28-5 | | | | | | | | | |
| 38 | | coronene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-881-7 | 191-07-1 | | | | | | | | | |
| 39 | | benzo[j]fluoranthene | | | | <1 | mg/kg | | <1 | mg/kg | <0.0001 % | | <LOD |
| | | 601-035-00-X | 205-910-3 | 205-82-3 | | | | | | | | | |
| | | | | | | | | | | Total: | 0.122 % | | |

Key

| | |
|---|---|
| | User supplied data |
| | Determinand values ignored for classification, see column 'Conc. Not Used' for reason |
| | Determinand defined or amended by HazWasteOnline (see Appendix A) |
| | Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration |
| **<LOD** | Below limit of detection |
| **ND** | Not detected |
| CLP: Note 1 | Only the metal concentration has been used for classification |

## Classification of sample: TP09-05/12/2019-0.50m

**Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

## Sample details

Sample Name:
**TP09-05/12/2019-0.50m**
Moisture content:
**18.5%**
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

## Hazard properties

None identified

## Determinands

Moisture content: 18.5% Wet Weight Moisture Correction applied (MC)

| # | Determinand | CLP index number | EC Number | CAS Number | CLP Note | User entered data | Conv. Factor | Compound conc. | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | antimony { antimony trioxide } | 051-005-00-X | 215-175-0 | 1309-64-4 | | 15 mg/kg | 1.197 | 14.635 mg/kg | 0.00146 % | ✓ | |
| 2 | arsenic { arsenic pentoxide } | 033-004-00-6 | 215-116-9 | 1303-28-2 | | 414.2 mg/kg | 1.534 | 517.795 mg/kg | 0.0518 % | ✓ | |
| 3 | cadmium { cadmium oxide } | 048-002-00-0 | 215-146-2 | 1306-19-0 | | 2.7 mg/kg | 1.142 | 2.514 mg/kg | 0.000251 % | ✓ | |
| 4 | chromium in chromium(III) compounds { chromium(III) oxide } | | 215-160-9 | 1308-38-9 | | 16.2 mg/kg | 1.462 | 19.297 mg/kg | 0.00193 % | ✓ | |
| 5 | chromium in chromium(VI) compounds { chromium(VI) oxide } | 024-001-00-0 | 215-607-8 | 1333-82-0 | | <0.3 mg/kg | 1.923 | <0.577 mg/kg | <0.0000577 % | | <**LOD** |
| 6 | copper { dicopper oxide; copper (I) oxide } | 029-002-00-X | 215-270-7 | 1317-39-1 | | 762 mg/kg | 1.126 | 699.21 mg/kg | 0.0699 % | ✓ | |
| 7 | lead { lead compounds with the exception of those specified elsewhere in this Annex } | 082-001-00-6 | | | 1 | 532 mg/kg | | 433.58 mg/kg | 0.0434 % | ✓ | |
| 8 | mercury { mercury dichloride } | 080-010-00-X | 231-299-8 | 7487-94-7 | | <0.1 mg/kg | 1.353 | <0.135 mg/kg | <0.0000135 % | | <**LOD** |
| 9 | molybdenum { molybdenum(VI) oxide } | 042-001-00-9 | 215-204-7 | 1313-27-5 | | 15.5 mg/kg | 1.5 | 18.951 mg/kg | 0.0019 % | ✓ | |
| 10 | nickel { nickel chromate } | 028-035-00-7 | 238-766-5 | 14721-18-7 | | 16.9 mg/kg | 2.976 | 40.994 mg/kg | 0.0041 % | ✓ | |
| 11 | selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } | 034-002-00-8 | | | | 2 mg/kg | 2.554 | 4.162 mg/kg | 0.000416 % | ✓ | |
| 12 | zinc { zinc oxide } | 030-013-00-7 | 215-222-5 | 1314-13-2 | | 927 mg/kg | 1.245 | 940.388 mg/kg | 0.094 % | ✓ | |
| 13 | TPH (C6 to C40) petroleum group | | | TPH | | <52 mg/kg | | <52 mg/kg | <0.0052 % | | <**LOD** |
| 14 | tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane | 603-181-00-X | 216-653-1 | 1634-04-4 | | <0.005 mg/kg | | <0.005 mg/kg | <0.0000005 % | | <**LOD** |

| # | | Determinand | CLP index number | EC Number | CAS Number | CLP Note | User entered data | | Conv. Factor | Compound conc. | | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | | benzene | 601-020-00-8 | 200-753-7 | 71-43-2 | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| 16 | | toluene | 601-021-00-3 | 203-625-9 | 108-88-3 | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| 17 | | ethylbenzene | 601-023-00-4 | 202-849-4 | 100-41-4 | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| 18 | | xylene | 601-022-00-9 | 202-422-2 [1]<br>203-396-5 [2]<br>203-576-3 [3]<br>215-535-7 [4] | 95-47-6 [1]<br>106-42-3 [2]<br>108-38-3 [3]<br>1330-20-7 [4] | | <0.01 | mg/kg | | <0.01 | mg/kg | <0.000001 % | | <LOD |
| 19 | | pH | | | PH | | 6.21 | pH | | 6.21 | pH | 6.21 pH | | |
| 20 | | naphthalene | 601-052-00-2 | 202-049-5 | 91-20-3 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 21 | | acenaphthylene | | 205-917-1 | 208-96-8 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| 22 | | acenaphthene | | 201-469-6 | 83-32-9 | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| 23 | | fluorene | | 201-695-5 | 86-73-7 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 24 | | phenanthrene | | 201-581-5 | 85-01-8 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| 25 | | anthracene | | 204-371-1 | 120-12-7 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 26 | | fluoranthene | | 205-912-4 | 206-44-0 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| 27 | | pyrene | | 204-927-3 | 129-00-0 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| 28 | | benzo[a]anthracene | 601-033-00-9 | 200-280-6 | 56-55-3 | | <0.06 | mg/kg | | <0.06 | mg/kg | <0.000006 % | | <LOD |
| 29 | | chrysene | 601-048-00-0 | 205-923-4 | 218-01-9 | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| 30 | | benzo[b]fluoranthene | 601-034-00-4 | 205-911-9 | 205-99-2 | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| 31 | | benzo[k]fluoranthene | 601-036-00-5 | 205-916-6 | 207-08-9 | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| 32 | | benzo[a]pyrene; benzo[def]chrysene | 601-032-00-3 | 200-028-5 | 50-32-8 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 33 | | indeno[123-cd]pyrene | | 205-893-2 | 193-39-5 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 34 | | dibenz[a,h]anthracene | 601-041-00-2 | 200-181-8 | 53-70-3 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 35 | | benzo[ghi]perylene | | 205-883-8 | 191-24-2 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 36 | | polychlorobiphenyls; PCB | 602-039-00-4 | 215-648-1 | 1336-36-3 | | <0.035 | mg/kg | | <0.035 | mg/kg | <0.0000035 % | | <LOD |
| 37 | | barium { barium oxide } | | 215-127-9 | 1304-28-5 | | 32 | mg/kg | 1.117 | 29.118 | mg/kg | 0.00291 % | ✓ | |
| 38 | | coronene | | 205-881-7 | 191-07-1 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 39 | | benzo[j]fluoranthene | 601-035-00-X | 205-910-3 | 205-82-3 | | <1 | mg/kg | | <1 | mg/kg | <0.0001 % | | <LOD |
| | | | | | | | | | | | Total: | 0.278 % | | |

Key

| | |
|---|---|
| | User supplied data |
| | Determinand values ignored for classification, see column 'Conc. Not Used' for reason |
| | Determinand defined or amended by HazWasteOnline (see Appendix A) |
| | Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration |
| **<LOD** | Below limit of detection |
| **ND** | Not detected |
| CLP: Note 1 | Only the metal concentration has been used for classification |

## Classification of sample: TP09-05/12/2019-1.50m

**Hazardous Waste**
Classified as **17 05 03 ***
in the List of Waste

## Sample details

Sample Name:
**TP09-05/12/2019-1.50m**
Moisture content:
**39.8%**
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 03 * (Soil and stones containing hazardous substances)

## Hazard properties

**HP 14: Ecotoxic** "waste which presents or may present immediate or delayed risks for one or more sectors of the environment"

Hazard Statements hit:

**Aquatic Chronic 1; H410** "Very toxic to aquatic life with long lasting effects."

Because of determinand:

zinc oxide: (compound conc.: 0.352%)

## Determinands

Moisture content: 39.8% Wet Weight Moisture Correction applied (MC)

| # | Determinand | CLP index number | EC Number | CAS Number | CLP Note | User entered data | | Conv. Factor | Compound conc. | | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | antimony { antimony trioxide } | 051-005-00-X | 215-175-0 | 1309-64-4 | | 3 | mg/kg | 1.197 | 2.162 | mg/kg | 0.000216 % | ✓ | |
| 2 | arsenic { arsenic pentoxide } | 033-004-00-6 | 215-116-9 | 1303-28-2 | | 78.4 | mg/kg | 1.534 | 72.394 | mg/kg | 0.00724 % | ✓ | |
| 3 | cadmium { cadmium oxide } | 048-002-00-0 | 215-146-2 | 1306-19-0 | | <0.1 | mg/kg | 1.142 | <0.114 | mg/kg | <0.0000114 % | | <**LOD** |
| 4 | chromium in chromium(III) compounds { chromium(III) oxide } | | 215-160-9 | 1308-38-9 | | 44.3 | mg/kg | 1.462 | 38.978 | mg/kg | 0.0039 % | ✓ | |
| 5 | chromium in chromium(VI) compounds { chromium(VI) oxide } | 024-001-00-0 | 215-607-8 | 1333-82-0 | | <0.3 | mg/kg | 1.923 | <0.577 | mg/kg | <0.0000577 % | | <**LOD** |
| 6 | copper { dicopper oxide; copper (I) oxide } | 029-002-00-X | 215-270-7 | 1317-39-1 | | 172 | mg/kg | 1.126 | 116.579 | mg/kg | 0.0117 % | ✓ | |
| 7 | lead { lead compounds with the exception of those specified elsewhere in this Annex } | 082-001-00-6 | | | 1 | 113 | mg/kg | | 68.026 | mg/kg | 0.0068 % | ✓ | |
| 8 | mercury { mercury dichloride } | 080-010-00-X | 231-299-8 | 7487-94-7 | | <0.1 | mg/kg | 1.353 | <0.135 | mg/kg | <0.0000135 % | | <**LOD** |
| 9 | molybdenum { molybdenum(VI) oxide } | 042-001-00-9 | 215-204-7 | 1313-27-5 | | 0.5 | mg/kg | 1.5 | 0.452 | mg/kg | 0.0000452 % | ✓ | |
| 10 | nickel { nickel chromate } | 028-035-00-7 | 238-766-5 | 14721-18-7 | | 32.3 | mg/kg | 2.976 | 57.872 | mg/kg | 0.00579 % | ✓ | |
| 11 | selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } | 034-002-00-8 | | | | 3 | mg/kg | 2.554 | 4.612 | mg/kg | 0.000461 % | ✓ | |

| # | | Determinand | | | CLP Note | User entered data | | Conv. Factor | Compound conc. | | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CLP index number | EC Number | CAS Number | | | | | | | | | |
| 12 | | zinc { zinc oxide } | | | | 4693 | mg/kg | 1.245 | 3516.549 | mg/kg | 0.352 % | ✓ | |
| | | 030-013-00-7 | 215-222-5 | 1314-13-2 | | | | | | | | | |
| 13 | | TPH (C6 to C40) petroleum group | | | | <52 | mg/kg | | <52 | mg/kg | <0.0052 % | | <LOD |
| | | | | TPH | | | | | | | | | |
| 14 | | tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 603-181-00-X | 216-653-1 | 1634-04-4 | | | | | | | | | |
| 15 | | benzene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-020-00-8 | 200-753-7 | 71-43-2 | | | | | | | | | |
| 16 | | toluene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-021-00-3 | 203-625-9 | 108-88-3 | | | | | | | | | |
| 17 | | ethylbenzene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-023-00-4 | 202-849-4 | 100-41-4 | | | | | | | | | |
| 18 | | xylene | | | | <0.01 | mg/kg | | <0.01 | mg/kg | <0.000001 % | | <LOD |
| | | 601-022-00-9 | 202-422-2 [1]<br>203-396-5 [2]<br>203-576-3 [3]<br>215-535-7 [4] | 95-47-6 [1]<br>106-42-3 [2]<br>108-38-3 [3]<br>1330-20-7 [4] | | | | | | | | | |
| 19 | | pH | | | | 7.12 | pH | | 7.12 | pH | 7.12 pH | | |
| | | | | PH | | | | | | | | | |
| 20 | | naphthalene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-052-00-2 | 202-049-5 | 91-20-3 | | | | | | | | | |
| 21 | | acenaphthylene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 205-917-1 | 208-96-8 | | | | | | | | | |
| 22 | | acenaphthene | | | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| | | | 201-469-6 | 83-32-9 | | | | | | | | | |
| 23 | | fluorene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 201-695-5 | 86-73-7 | | | | | | | | | |
| 24 | | phenanthrene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 201-581-5 | 85-01-8 | | | | | | | | | |
| 25 | | anthracene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 204-371-1 | 120-12-7 | | | | | | | | | |
| 26 | | fluoranthene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 205-912-4 | 206-44-0 | | | | | | | | | |
| 27 | | pyrene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 204-927-3 | 129-00-0 | | | | | | | | | |
| 28 | | benzo[a]anthracene | | | | <0.06 | mg/kg | | <0.06 | mg/kg | <0.000006 % | | <LOD |
| | | 601-033-00-9 | 200-280-6 | 56-55-3 | | | | | | | | | |
| 29 | | chrysene | | | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| | | 601-048-00-0 | 205-923-4 | 218-01-9 | | | | | | | | | |
| 30 | | benzo[b]fluoranthene | | | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| | | 601-034-00-4 | 205-911-9 | 205-99-2 | | | | | | | | | |
| 31 | | benzo[k]fluoranthene | | | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| | | 601-036-00-5 | 205-916-6 | 207-08-9 | | | | | | | | | |
| 32 | | benzo[a]pyrene; benzo[def]chrysene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-032-00-3 | 200-028-5 | 50-32-8 | | | | | | | | | |
| 33 | | indeno[123-cd]pyrene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-893-2 | 193-39-5 | | | | | | | | | |
| 34 | | dibenz[a,h]anthracene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-041-00-2 | 200-181-8 | 53-70-3 | | | | | | | | | |
| 35 | | benzo[ghi]perylene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-883-8 | 191-24-2 | | | | | | | | | |
| 36 | | polychlorobiphenyls; PCB | | | | <0.035 | mg/kg | | <0.035 | mg/kg | <0.0000035 % | | <LOD |
| | | 602-039-00-4 | 215-648-1 | 1336-36-3 | | | | | | | | | |
| 37 | | barium { barium oxide } | | | | 80 | mg/kg | 1.117 | 53.771 | mg/kg | 0.00538 % | ✓ | |
| | | | 215-127-9 | 1304-28-5 | | | | | | | | | |
| 38 | | coronene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-881-7 | 191-07-1 | | | | | | | | | |
| 39 | | benzo[j]fluoranthene | | | | <1 | mg/kg | | <1 | mg/kg | <0.0001 % | | <LOD |
| | | 601-035-00-X | 205-910-3 | 205-82-3 | | | | | | | | | |

| # | | Determinand | | | CLP Note | User entered data | Conv. Factor | Compound conc. | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CLP index number | EC Number | CAS Number | | | | | | | |
| | | | | | | | | Total: | 0.399 % | | |

Key

| | |
|---|---|
| | User supplied data |
| | Determinand values ignored for classification, see column 'Conc. Not Used' for reason |
| | Hazardous result |
| | Determinand defined or amended by HazWasteOnline (see Appendix A) |
| | Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration |
| **<LOD** | Below limit of detection |
| **ND** | Not detected |
| CLP: Note 1 | Only the metal concentration has been used for classification |

## Classification of sample: TP11-05/12/2019-0.50m

**Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

## Sample details

Sample Name:
**TP11-05/12/2019-0.50m**
Moisture content:
**7%**
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

## Hazard properties

None identified

## Determinands

Moisture content: 7% Wet Weight Moisture Correction applied (MC)

| # | Determinand | CLP Note | User entered data | Conv. Factor | Compound conc. | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|
| | CLP index number / EC Number / CAS Number | | | | | | | |
| 1 | antimony { antimony trioxide }<br>051-005-00-X / 215-175-0 / 1309-64-4 | | 1 mg/kg | 1.197 | 1.113 mg/kg | 0.000111 % | ✓ | |
| 2 | arsenic { arsenic pentoxide }<br>033-004-00-6 / 215-116-9 / 1303-28-2 | | 2.6 mg/kg | 1.534 | 3.709 mg/kg | 0.000371 % | ✓ | |
| 3 | cadmium { cadmium oxide }<br>048-002-00-0 / 215-146-2 / 1306-19-0 | | <0.1 mg/kg | 1.142 | <0.114 mg/kg | <0.0000114 % | | <**LOD** |
| 4 | chromium in chromium(III) compounds { chromium(III) oxide }<br>/ 215-160-9 / 1308-38-9 | | 17.5 mg/kg | 1.462 | 23.787 mg/kg | 0.00238 % | ✓ | |
| 5 | chromium in chromium(VI) compounds { chromium(VI) oxide }<br>024-001-00-0 / 215-607-8 / 1333-82-0 | | <0.3 mg/kg | 1.923 | <0.577 mg/kg | <0.0000577 % | | <**LOD** |
| 6 | copper { dicopper oxide; copper (I) oxide }<br>029-002-00-X / 215-270-7 / 1317-39-1 | | 18 mg/kg | 1.126 | 18.847 mg/kg | 0.00188 % | ✓ | |
| 7 | lead { lead compounds with the exception of those specified elsewhere in this Annex }<br>082-001-00-6 | 1 | 39 mg/kg | | 36.27 mg/kg | 0.00363 % | ✓ | |
| 8 | mercury { mercury dichloride }<br>080-010-00-X / 231-299-8 / 7487-94-7 | | <0.1 mg/kg | 1.353 | <0.135 mg/kg | <0.0000135 % | | <**LOD** |
| 9 | molybdenum { molybdenum(VI) oxide }<br>042-001-00-9 / 215-204-7 / 1313-27-5 | | 0.5 mg/kg | 1.5 | 0.698 mg/kg | 0.0000698 % | ✓ | |
| 10 | nickel { nickel chromate }<br>028-035-00-7 / 238-766-5 / 14721-18-7 | | 10 mg/kg | 2.976 | 27.679 mg/kg | 0.00277 % | ✓ | |
| 11 | selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }<br>034-002-00-8 | | <1 mg/kg | 2.554 | <2.554 mg/kg | <0.000255 % | | <**LOD** |
| 12 | zinc { zinc oxide }<br>030-013-00-7 / 215-222-5 / 1314-13-2 | | 109 mg/kg | 1.245 | 126.177 mg/kg | 0.0126 % | ✓ | |
| 13 | TPH (C6 to C40) petroleum group<br>/ / TPH | | <52 mg/kg | | <52 mg/kg | <0.0052 % | | <**LOD** |
| 14 | tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane<br>603-181-00-X / 216-653-1 / 1634-04-4 | | <0.005 mg/kg | | <0.005 mg/kg | <0.0000005 % | | <**LOD** |

| # | | Determinand | CLP index number | EC Number | CAS Number | CLP Note | User entered data | | Conv. Factor | Compound conc. | | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | | benzene | 601-020-00-8 | 200-753-7 | 71-43-2 | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| 16 | | toluene | 601-021-00-3 | 203-625-9 | 108-88-3 | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| 17 | | ethylbenzene | 601-023-00-4 | 202-849-4 | 100-41-4 | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| 18 | | xylene | 601-022-00-9 | 202-422-2 [1]<br>203-396-5 [2]<br>203-576-3 [3]<br>215-535-7 [4] | 95-47-6 [1]<br>106-42-3 [2]<br>108-38-3 [3]<br>1330-20-7 [4] | | <0.01 | mg/kg | | <0.01 | mg/kg | <0.000001 % | | <LOD |
| 19 | | pH | | | PH | | 8.56 | pH | | 8.56 | pH | 8.56 pH | | |
| 20 | | naphthalene | 601-052-00-2 | 202-049-5 | 91-20-3 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 21 | | acenaphthylene | | 205-917-1 | 208-96-8 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| 22 | | acenaphthene | | 201-469-6 | 83-32-9 | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| 23 | | fluorene | | 201-695-5 | 86-73-7 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 24 | | phenanthrene | | 201-581-5 | 85-01-8 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| 25 | | anthracene | | 204-371-1 | 120-12-7 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 26 | | fluoranthene | | 205-912-4 | 206-44-0 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| 27 | | pyrene | | 204-927-3 | 129-00-0 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| 28 | | benzo[a]anthracene | 601-033-00-9 | 200-280-6 | 56-55-3 | | <0.06 | mg/kg | | <0.06 | mg/kg | <0.000006 % | | <LOD |
| 29 | | chrysene | 601-048-00-0 | 205-923-4 | 218-01-9 | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| 30 | | benzo[b]fluoranthene | 601-034-00-4 | 205-911-9 | 205-99-2 | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| 31 | | benzo[k]fluoranthene | 601-036-00-5 | 205-916-6 | 207-08-9 | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| 32 | | benzo[a]pyrene; benzo[def]chrysene | 601-032-00-3 | 200-028-5 | 50-32-8 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 33 | | indeno[123-cd]pyrene | | 205-893-2 | 193-39-5 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 34 | | dibenz[a,h]anthracene | 601-041-00-2 | 200-181-8 | 53-70-3 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 35 | | benzo[ghi]perylene | | 205-883-8 | 191-24-2 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 36 | | polychlorobiphenyls; PCB | 602-039-00-4 | 215-648-1 | 1336-36-3 | | <0.035 | mg/kg | | <0.035 | mg/kg | <0.0000035 % | | <LOD |
| 37 | | barium { barium oxide } | | 215-127-9 | 1304-28-5 | | 24 | mg/kg | 1.117 | 24.92 | mg/kg | 0.00249 % | ✓ | |
| 38 | | coronene | | 205-881-7 | 191-07-1 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 39 | | benzo[j]fluoranthene | 601-035-00-X | 205-910-3 | 205-82-3 | | <1 | mg/kg | | <1 | mg/kg | <0.0001 % | | <LOD |
| | | | | | | | | | | | Total: | 0.032 % | | |

Key

| | |
|---|---|
| | User supplied data |
| | Determinand values ignored for classification, see column 'Conc. Not Used' for reason |
| | Determinand defined or amended by HazWasteOnline (see Appendix A) |
| | Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration |
| **<LOD** | Below limit of detection |
| **ND** | Not detected |
| CLP: Note 1 | Only the metal concentration has been used for classification |

## Classification of sample: TP11-05/12/2019-1.50m

**Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

## Sample details

Sample Name:
**TP11-05/12/2019-1.50m**
Moisture content:
**34.2%**
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

## Hazard properties

None identified

## Determinands

Moisture content: 34.2% Wet Weight Moisture Correction applied (MC)

| # | Determinand | CLP index number | EC Number | CAS Number | CLP Note | User entered data | Conv. Factor | Compound conc. | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | antimony { antimony trioxide } | 051-005-00-X | 215-175-0 | 1309-64-4 | | 3 mg/kg | 1.197 | 2.363 mg/kg | 0.000236 % | ✓ | |
| 2 | arsenic { arsenic pentoxide } | 033-004-00-6 | 215-116-9 | 1303-28-2 | | 31.6 mg/kg | 1.534 | 31.894 mg/kg | 0.00319 % | ✓ | |
| 3 | cadmium { cadmium oxide } | 048-002-00-0 | 215-146-2 | 1306-19-0 | | 0.4 mg/kg | 1.142 | 0.301 mg/kg | 0.0000301 % | ✓ | |
| 4 | chromium in chromium(III) compounds { chromium(III) oxide } | | 215-160-9 | 1308-38-9 | | 50.6 mg/kg | 1.462 | 48.662 mg/kg | 0.00487 % | ✓ | |
| 5 | chromium in chromium(VI) compounds { chromium(VI) oxide } | 024-001-00-0 | 215-607-8 | 1333-82-0 | | <0.3 mg/kg | 1.923 | <0.577 mg/kg | <0.0000577 % | | <**LOD** |
| 6 | copper { dicopper oxide; copper (I) oxide } | 029-002-00-X | 215-270-7 | 1317-39-1 | | 65 mg/kg | 1.126 | 48.154 mg/kg | 0.00482 % | ✓ | |
| 7 | lead { lead compounds with the exception of those specified elsewhere in this Annex } | 082-001-00-6 | | | 1 | 63 mg/kg | | 41.454 mg/kg | 0.00415 % | ✓ | |
| 8 | mercury { mercury dichloride } | 080-010-00-X | 231-299-8 | 7487-94-7 | | <0.1 mg/kg | 1.353 | <0.135 mg/kg | <0.0000135 % | | <**LOD** |
| 9 | molybdenum { molybdenum(VI) oxide } | 042-001-00-9 | 215-204-7 | 1313-27-5 | | 0.8 mg/kg | 1.5 | 0.79 mg/kg | 0.000079 % | ✓ | |
| 10 | nickel { nickel chromate } | 028-035-00-7 | 238-766-5 | 14721-18-7 | | 32.8 mg/kg | 2.976 | 64.235 mg/kg | 0.00642 % | ✓ | |
| 11 | selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } | 034-002-00-8 | | | | 2 mg/kg | 2.554 | 3.361 mg/kg | 0.000336 % | ✓ | |
| 12 | zinc { zinc oxide } | 030-013-00-7 | 215-222-5 | 1314-13-2 | | 191 mg/kg | 1.245 | 156.433 mg/kg | 0.0156 % | ✓ | |
| 13 | TPH (C6 to C40) petroleum group | | | TPH | | 658 mg/kg | | 432.964 mg/kg | 0.0433 % | ✓ | |
| 14 | tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane | 603-181-00-X | 216-653-1 | 1634-04-4 | | <0.005 mg/kg | | <0.005 mg/kg | <0.0000005 % | | <**LOD** |

| # | | Determinand | | | CLP Note | User entered data | | Conv. Factor | Compound conc. | | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CLP index number | EC Number | CAS Number | | | | | | | | | |
| 15 | | benzene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-020-00-8 | 200-753-7 | 71-43-2 | | | | | | | | | |
| 16 | | toluene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-021-00-3 | 203-625-9 | 108-88-3 | | | | | | | | | |
| 17 | | ethylbenzene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-023-00-4 | 202-849-4 | 100-41-4 | | | | | | | | | |
| 18 | | xylene | | | | <0.01 | mg/kg | | <0.01 | mg/kg | <0.000001 % | | <LOD |
| | | 601-022-00-9 | 202-422-2 [1]<br>203-396-5 [2]<br>203-576-3 [3]<br>215-535-7 [4] | 95-47-6 [1]<br>106-42-3 [2]<br>108-38-3 [3]<br>1330-20-7 [4] | | | | | | | | | |
| 19 | | pH | | | | 7.17 | pH | | 7.17 | pH | 7.17 pH | | |
| | | | | PH | | | | | | | | | |
| 20 | | naphthalene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-052-00-2 | 202-049-5 | 91-20-3 | | | | | | | | | |
| 21 | | acenaphthylene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 205-917-1 | 208-96-8 | | | | | | | | | |
| 22 | | acenaphthene | | | | 0.14 | mg/kg | | 0.0921 | mg/kg | 0.00000921 % | ✓ | |
| | | | 201-469-6 | 83-32-9 | | | | | | | | | |
| 23 | | fluorene | | | | 0.08 | mg/kg | | 0.0526 | mg/kg | 0.00000526 % | ✓ | |
| | | | 201-695-5 | 86-73-7 | | | | | | | | | |
| 24 | | phenanthrene | | | | 0.15 | mg/kg | | 0.0987 | mg/kg | 0.00000987 % | ✓ | |
| | | | 201-581-5 | 85-01-8 | | | | | | | | | |
| 25 | | anthracene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 204-371-1 | 120-12-7 | | | | | | | | | |
| 26 | | fluoranthene | | | | 0.06 | mg/kg | | 0.0395 | mg/kg | 0.00000395 % | ✓ | |
| | | | 205-912-4 | 206-44-0 | | | | | | | | | |
| 27 | | pyrene | | | | 0.06 | mg/kg | | 0.0395 | mg/kg | 0.00000395 % | ✓ | |
| | | | 204-927-3 | 129-00-0 | | | | | | | | | |
| 28 | | benzo[a]anthracene | | | | <0.06 | mg/kg | | <0.06 | mg/kg | <0.000006 % | | <LOD |
| | | 601-033-00-9 | 200-280-6 | 56-55-3 | | | | | | | | | |
| 29 | | chrysene | | | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| | | 601-048-00-0 | 205-923-4 | 218-01-9 | | | | | | | | | |
| 30 | | benzo[b]fluoranthene | | | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| | | 601-034-00-4 | 205-911-9 | 205-99-2 | | | | | | | | | |
| 31 | | benzo[k]fluoranthene | | | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| | | 601-036-00-5 | 205-916-6 | 207-08-9 | | | | | | | | | |
| 32 | | benzo[a]pyrene; benzo[def]chrysene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-032-00-3 | 200-028-5 | 50-32-8 | | | | | | | | | |
| 33 | | indeno[123-cd]pyrene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-893-2 | 193-39-5 | | | | | | | | | |
| 34 | | dibenz[a,h]anthracene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-041-00-2 | 200-181-8 | 53-70-3 | | | | | | | | | |
| 35 | | benzo[ghi]perylene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-883-8 | 191-24-2 | | | | | | | | | |
| 36 | | polychlorobiphenyls; PCB | | | | <0.035 | mg/kg | | <0.035 | mg/kg | <0.0000035 % | | <LOD |
| | | 602-039-00-4 | 215-648-1 | 1336-36-3 | | | | | | | | | |
| 37 | | barium { barium oxide } | | | | 49 | mg/kg | 1.117 | 35.998 | mg/kg | 0.0036 % | ✓ | |
| | | | 215-127-9 | 1304-28-5 | | | | | | | | | |
| 38 | | coronene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-881-7 | 191-07-1 | | | | | | | | | |
| 39 | | benzo[j]fluoranthene | | | | <1 | mg/kg | | <1 | mg/kg | <0.0001 % | | <LOD |
| | | 601-035-00-X | 205-910-3 | 205-82-3 | | | | | | | | | |
| | | | | | | | | | | Total: | 0.0869 % | | |

| Key | |
|---|---|
| | User supplied data |
| | Determinand values ignored for classification, see column 'Conc. Not Used' for reason |
| | Determinand defined or amended by HazWasteOnline (see Appendix A) |
| | Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration |
| **<LOD** | Below limit of detection |
| **ND** | Not detected |
| CLP: Note 1 | Only the metal concentration has been used for classification |

## Supplementary Hazardous Property Information

**HP 3(i): Flammable** "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Solid waste without liquid phase

Hazard Statements hit:

**Flam. Liq. 3; H226** "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0433%)

## Classification of sample: TP13-11/12/2019-0.50m

**Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

## Sample details

Sample Name:
**TP13-11/12/2019-0.50m**
Moisture content:
**6.6%**
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

## Hazard properties

None identified

## Determinands

Moisture content: 6.6% Wet Weight Moisture Correction applied (MC)

| # | Determinand | CLP index number | EC Number | CAS Number | CLP Note | User entered data | Conv. Factor | Compound conc. | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | antimony { antimony trioxide } | 051-005-00-X | 215-175-0 | 1309-64-4 | | 2 mg/kg | 1.197 | 2.236 mg/kg | 0.000224 % | ✓ | |
| 2 | arsenic { arsenic pentoxide } | 033-004-00-6 | 215-116-9 | 1303-28-2 | | 25.2 mg/kg | 1.534 | 36.103 mg/kg | 0.00361 % | ✓ | |
| 3 | cadmium { cadmium oxide } | 048-002-00-0 | 215-146-2 | 1306-19-0 | | 0.1 mg/kg | 1.142 | 0.107 mg/kg | 0.0000107 % | ✓ | |
| 4 | chromium in chromium(III) compounds { chromium(III) oxide } | | 215-160-9 | 1308-38-9 | | 31.5 mg/kg | 1.462 | 43 mg/kg | 0.0043 % | ✓ | |
| 5 | chromium in chromium(VI) compounds { chromium(VI) oxide } | 024-001-00-0 | 215-607-8 | 1333-82-0 | | <0.3 mg/kg | 1.923 | <0.577 mg/kg | <0.0000577 % | | <**LOD** |
| 6 | copper { dicopper oxide; copper (I) oxide } | 029-002-00-X | 215-270-7 | 1317-39-1 | | 42 mg/kg | 1.126 | 44.166 mg/kg | 0.00442 % | ✓ | |
| 7 | lead { lead compounds with the exception of those specified elsewhere in this Annex } | 082-001-00-6 | | | 1 | 19 mg/kg | | 17.746 mg/kg | 0.00177 % | ✓ | |
| 8 | mercury { mercury dichloride } | 080-010-00-X | 231-299-8 | 7487-94-7 | | <0.1 mg/kg | 1.353 | <0.135 mg/kg | <0.0000135 % | | <**LOD** |
| 9 | molybdenum { molybdenum(VI) oxide } | 042-001-00-9 | 215-204-7 | 1313-27-5 | | 0.4 mg/kg | 1.5 | 0.56 mg/kg | 0.000056 % | ✓ | |
| 10 | nickel { nickel chromate } | 028-035-00-7 | 238-766-5 | 14721-18-7 | | 29.3 mg/kg | 2.976 | 81.449 mg/kg | 0.00814 % | ✓ | |
| 11 | selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } | 034-002-00-8 | | | | 1 mg/kg | 2.554 | 2.385 mg/kg | 0.000239 % | ✓ | |
| 12 | zinc { zinc oxide } | 030-013-00-7 | 215-222-5 | 1314-13-2 | | 217 mg/kg | 1.245 | 252.276 mg/kg | 0.0252 % | ✓ | |
| 13 | TPH (C6 to C40) petroleum group | | | TPH | | <52 mg/kg | | <52 mg/kg | <0.0052 % | | <**LOD** |
| 14 | tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane | 603-181-00-X | 216-653-1 | 1634-04-4 | | <0.005 mg/kg | | <0.005 mg/kg | <0.0000005 % | | <**LOD** |

| # | | Determinand | CLP index number | EC Number | CAS Number | CLP Note | User entered data | | Conv. Factor | Compound conc. | | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | | benzene | 601-020-00-8 | 200-753-7 | 71-43-2 | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <**LOD** |
| 16 | | toluene | 601-021-00-3 | 203-625-9 | 108-88-3 | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <**LOD** |
| 17 | | ethylbenzene | 601-023-00-4 | 202-849-4 | 100-41-4 | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <**LOD** |
| 18 | | xylene | 601-022-00-9 | 202-422-2 [1]<br>203-396-5 [2]<br>203-576-3 [3]<br>215-535-7 [4] | 95-47-6 [1]<br>106-42-3 [2]<br>108-38-3 [3]<br>1330-20-7 [4] | | <0.01 | mg/kg | | <0.01 | mg/kg | <0.000001 % | | <**LOD** |
| 19 | | pH | | | PH | | 7.19 | pH | | 7.19 | pH | 7.19 pH | | |
| 20 | | naphthalene | 601-052-00-2 | 202-049-5 | 91-20-3 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <**LOD** |
| 21 | | acenaphthylene | | 205-917-1 | 208-96-8 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <**LOD** |
| 22 | | acenaphthene | | 201-469-6 | 83-32-9 | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <**LOD** |
| 23 | | fluorene | | 201-695-5 | 86-73-7 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <**LOD** |
| 24 | | phenanthrene | | 201-581-5 | 85-01-8 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <**LOD** |
| 25 | | anthracene | | 204-371-1 | 120-12-7 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <**LOD** |
| 26 | | fluoranthene | | 205-912-4 | 206-44-0 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <**LOD** |
| 27 | | pyrene | | 204-927-3 | 129-00-0 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <**LOD** |
| 28 | | benzo[a]anthracene | 601-033-00-9 | 200-280-6 | 56-55-3 | | <0.06 | mg/kg | | <0.06 | mg/kg | <0.000006 % | | <**LOD** |
| 29 | | chrysene | 601-048-00-0 | 205-923-4 | 218-01-9 | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <**LOD** |
| 30 | | benzo[b]fluoranthene | 601-034-00-4 | 205-911-9 | 205-99-2 | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <**LOD** |
| 31 | | benzo[k]fluoranthene | 601-036-00-5 | 205-916-6 | 207-08-9 | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <**LOD** |
| 32 | | benzo[a]pyrene; benzo[def]chrysene | 601-032-00-3 | 200-028-5 | 50-32-8 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <**LOD** |
| 33 | | indeno[123-cd]pyrene | | 205-893-2 | 193-39-5 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <**LOD** |
| 34 | | dibenz[a,h]anthracene | 601-041-00-2 | 200-181-8 | 53-70-3 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <**LOD** |
| 35 | | benzo[ghi]perylene | | 205-883-8 | 191-24-2 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <**LOD** |
| 36 | | polychlorobiphenyls; PCB | 602-039-00-4 | 215-648-1 | 1336-36-3 | | 0.464 | mg/kg | | 0.433 | mg/kg | 0.0000433 % | ✓ | |
| 37 | | barium { barium oxide } | | 215-127-9 | 1304-28-5 | | 27 | mg/kg | 1.117 | 28.156 | mg/kg | 0.00282 % | ✓ | |
| 38 | | coronene | | 205-881-7 | 191-07-1 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <**LOD** |
| 39 | | benzo[j]fluoranthene | 601-035-00-X | 205-910-3 | 205-82-3 | | <1 | mg/kg | | <1 | mg/kg | <0.0001 % | | <**LOD** |
| | | | | | | | | | | | Total: | 0.0563 % | | |

Key

| | |
|---|---|
| | User supplied data |
| | Determinand values ignored for classification, see column 'Conc. Not Used' for reason |
| | Determinand defined or amended by HazWasteOnline (see Appendix A) |
| | Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration |
| **<LOD** | Below limit of detection |
| **ND** | Not detected |
| CLP: Note 1 | Only the metal concentration has been used for classification |

## Classification of sample: TP13-11/12/2019-1.50m

**Hazardous Waste**
Classified as **17 05 03 ***
in the List of Waste

## Sample details

Sample Name:
**TP13-11/12/2019-1.50m**
Moisture content:
**31.7%**
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 03 * (Soil and stones containing hazardous substances)

## Hazard properties

**HP 7: Carcinogenic** "waste which induces cancer or increases its incidence"

Hazard Statements hit:

**Carc. 1A; H350** "May cause cancer [state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard]."

Because of determinand:

arsenic pentoxide: (compound conc.: 0.168%)

**HP 14: Ecotoxic** "waste which presents or may present immediate or delayed risks for one or more sectors of the environment"

Hazard Statements hit:

**Aquatic Chronic 1; H410** "Very toxic to aquatic life with long lasting effects."

Because of determinands:

arsenic pentoxide: (compound conc.: 0.168%)
dicopper oxide; copper (I) oxide: (compound conc.: 0.487%)
lead compounds with the exception of those specified elsewhere in this Annex: (Note 1 conc.: 0.112%)
zinc oxide: (compound conc.: 0.156%)

## Determinands

Moisture content: 31.7% Wet Weight Moisture Correction applied (MC)

| # | Determinand | CLP index number | EC Number | CAS Number | CLP Note | User entered data | | Conv. Factor | Compound conc. | | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | antimony { antimony trioxide } | 051-005-00-X | 215-175-0 | 1309-64-4 | | 102 | mg/kg | 1.197 | 83.397 | mg/kg | 0.00834 % | ✓ | |
| 2 | arsenic { arsenic pentoxide } | 033-004-00-6 | 215-116-9 | 1303-28-2 | | 1603 | mg/kg | 1.534 | 1679.362 | mg/kg | 0.168 % | ✓ | |
| 3 | cadmium { cadmium oxide } | 048-002-00-0 | 215-146-2 | 1306-19-0 | | 4.6 | mg/kg | 1.142 | 3.589 | mg/kg | 0.000359 % | ✓ | |
| 4 | chromium in chromium(III) compounds { chromium(III) oxide } | | 215-160-9 | 1308-38-9 | | <0.5 | mg/kg | 1.462 | <0.731 | mg/kg | <0.0000731 % | | <**LOD** |
| 5 | chromium in chromium(VI) compounds { chromium(VI) oxide } | 024-001-00-0 | 215-607-8 | 1333-82-0 | | <0.3 | mg/kg | 1.923 | <0.577 | mg/kg | <0.0000577 % | | <**LOD** |
| 6 | copper { dicopper oxide; copper (I) oxide } | 029-002-00-X | 215-270-7 | 1317-39-1 | | 6327 | mg/kg | 1.126 | 4865.347 | mg/kg | 0.487 % | ✓ | |

| # | | Determinand | CLP index number | EC Number | CAS Number | CLP Note | User entered data | | Conv. Factor | Compound conc. | | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | | lead { lead compounds with the exception of those specified elsewhere in this Annex } | 082-001-00-6 | | | 1 | 1633 | mg/kg | | 1115.339 | mg/kg | 0.112 % | ✓ | |
| 8 | | mercury { mercury dichloride } | 080-010-00-X | 231-299-8 | 7487-94-7 | | 0.8 | mg/kg | 1.353 | 0.74 | mg/kg | 0.000074 % | ✓ | |
| 9 | | molybdenum { molybdenum(VI) oxide } | 042-001-00-9 | 215-204-7 | 1313-27-5 | | 110.8 | mg/kg | 1.5 | 113.529 | mg/kg | 0.0114 % | ✓ | |
| 10 | | nickel { nickel chromate } | 028-035-00-7 | 238-766-5 | 14721-18-7 | | <0.7 | mg/kg | 2.976 | <2.083 | mg/kg | <0.000208 % | | <LOD |
| 11 | | selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } | 034-002-00-8 | | | | <1 | mg/kg | 2.554 | <2.554 | mg/kg | <0.000255 % | | <LOD |
| 12 | | zinc { zinc oxide } | 030-013-00-7 | 215-222-5 | 1314-13-2 | | 1830 | mg/kg | 1.245 | 1555.756 | mg/kg | 0.156 % | ✓ | |
| 13 | | TPH (C6 to C40) petroleum group | | | TPH | | <52 | mg/kg | | <52 | mg/kg | <0.0052 % | | <LOD |
| 14 | | tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane | 603-181-00-X | 216-653-1 | 1634-04-4 | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| 15 | | benzene | 601-020-00-8 | 200-753-7 | 71-43-2 | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| 16 | | toluene | 601-021-00-3 | 203-625-9 | 108-88-3 | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| 17 | | ethylbenzene | 601-023-00-4 | 202-849-4 | 100-41-4 | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| 18 | | xylene | 601-022-00-9 | 202-422-2 [1]<br>203-396-5 [2]<br>203-576-3 [3]<br>215-535-7 [4] | 95-47-6 [1]<br>106-42-3 [2]<br>108-38-3 [3]<br>1330-20-7 [4] | | <0.01 | mg/kg | | <0.01 | mg/kg | <0.000001 % | | <LOD |
| 19 | | pH | | | PH | | 4.55 | pH | | 4.55 | pH | 4.55 pH | | |
| 20 | | naphthalene | 601-052-00-2 | 202-049-5 | 91-20-3 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 21 | | acenaphthylene | | 205-917-1 | 208-96-8 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| 22 | | acenaphthene | | 201-469-6 | 83-32-9 | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| 23 | | fluorene | | 201-695-5 | 86-73-7 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 24 | | phenanthrene | | 201-581-5 | 85-01-8 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| 25 | | anthracene | | 204-371-1 | 120-12-7 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 26 | | fluoranthene | | 205-912-4 | 206-44-0 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| 27 | | pyrene | | 204-927-3 | 129-00-0 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| 28 | | benzo[a]anthracene | 601-033-00-9 | 200-280-6 | 56-55-3 | | <0.06 | mg/kg | | <0.06 | mg/kg | <0.000006 % | | <LOD |
| 29 | | chrysene | 601-048-00-0 | 205-923-4 | 218-01-9 | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| 30 | | benzo[b]fluoranthene | 601-034-00-4 | 205-911-9 | 205-99-2 | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| 31 | | benzo[k]fluoranthene | 601-036-00-5 | 205-916-6 | 207-08-9 | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| 32 | | benzo[a]pyrene; benzo[def]chrysene | 601-032-00-3 | 200-028-5 | 50-32-8 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 33 | | indeno[123-cd]pyrene | | 205-893-2 | 193-39-5 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |

| # | | Determinand | | | CLP Note | User entered data | | Conv. Factor | Compound conc. | | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CLP index number | EC Number | CAS Number | | | | | | | | | |
| 34 | | dibenz[a,h]anthracene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <**LOD** |
| | | 601-041-00-2 | 200-181-8 | 53-70-3 | | | | | | | | | |
| 35 | | benzo[ghi]perylene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <**LOD** |
| | | | 205-883-8 | 191-24-2 | | | | | | | | | |
| 36 | | polychlorobiphenyls; PCB | | | | <0.035 | mg/kg | | <0.035 | mg/kg | <0.0000035 % | | <**LOD** |
| | | 602-039-00-4 | 215-648-1 | 1336-36-3 | | | | | | | | | |
| 37 | | barium { barium oxide } | | | | 20 | mg/kg | 1.117 | 15.251 | mg/kg | 0.00153 % | ✓ | |
| | | | 215-127-9 | 1304-28-5 | | | | | | | | | |
| 38 | | coronene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <**LOD** |
| | | | 205-881-7 | 191-07-1 | | | | | | | | | |
| 39 | | benzo[j]fluoranthene | | | | <1 | mg/kg | | <1 | mg/kg | <0.0001 % | | <**LOD** |
| | | 601-035-00-X | 205-910-3 | 205-82-3 | | | | | | | | | |
| | | | | | | | | | | Total: | 0.949 % | | |

Key

| | |
|---|---|
| | User supplied data |
| | Determinand values ignored for classification, see column 'Conc. Not Used' for reason |
| | Hazardous result |
| | Determinand defined or amended by HazWasteOnline (see Appendix A) |
| | Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration |
| **<LOD** | Below limit of detection |
| **ND** | Not detected |
| CLP: Note 1 | Only the metal concentration has been used for classification |

## Classification of sample: TP16-09/12/2019-0.50m

**Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

## Sample details

Sample Name:
**TP16-09/12/2019-0.50m**
Moisture content:
**7.1%**
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

## Hazard properties

None identified

## Determinands

Moisture content: 7.1% Wet Weight Moisture Correction applied (MC)

| # | Determinand | CLP index number | EC Number | CAS Number | CLP Note | User entered data | Conv. Factor | Compound conc. | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | antimony { antimony trioxide } | 051-005-00-X | 215-175-0 | 1309-64-4 | | 3 mg/kg | 1.197 | 3.336 mg/kg | 0.000334 % | ✓ | |
| 2 | arsenic { arsenic pentoxide } | 033-004-00-6 | 215-116-9 | 1303-28-2 | | 7.6 mg/kg | 1.534 | 10.83 mg/kg | 0.00108 % | ✓ | |
| 3 | cadmium { cadmium oxide } | 048-002-00-0 | 215-146-2 | 1306-19-0 | | 0.2 mg/kg | 1.142 | 0.212 mg/kg | 0.0000212 % | ✓ | |
| 4 | chromium in chromium(III) compounds { chromium(III) oxide } | | 215-160-9 | 1308-38-9 | | 205.3 mg/kg | 1.462 | 278.753 mg/kg | 0.0279 % | ✓ | |
| 5 | chromium in chromium(VI) compounds { chromium(VI) oxide } | 024-001-00-0 | 215-607-8 | 1333-82-0 | | <0.3 mg/kg | 1.923 | <0.577 mg/kg | <0.0000577 % | | <**LOD** |
| 6 | copper { dicopper oxide; copper (I) oxide } | 029-002-00-X | 215-270-7 | 1317-39-1 | | 56 mg/kg | 1.126 | 58.573 mg/kg | 0.00586 % | ✓ | |
| 7 | lead { lead compounds with the exception of those specified elsewhere in this Annex } | 082-001-00-6 | | | 1 | 40 mg/kg | | 37.16 mg/kg | 0.00372 % | ✓ | |
| 8 | mercury { mercury dichloride } | 080-010-00-X | 231-299-8 | 7487-94-7 | | <0.1 mg/kg | 1.353 | <0.135 mg/kg | <0.0000135 % | | <**LOD** |
| 9 | molybdenum { molybdenum(VI) oxide } | 042-001-00-9 | 215-204-7 | 1313-27-5 | | 1.4 mg/kg | 1.5 | 1.951 mg/kg | 0.000195 % | ✓ | |
| 10 | nickel { nickel chromate } | 028-035-00-7 | 238-766-5 | 14721-18-7 | | 20.4 mg/kg | 2.976 | 56.405 mg/kg | 0.00564 % | ✓ | |
| 11 | selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } | 034-002-00-8 | | | | 1 mg/kg | 2.554 | 2.372 mg/kg | 0.000237 % | ✓ | |
| 12 | zinc { zinc oxide } | 030-013-00-7 | 215-222-5 | 1314-13-2 | | 258 mg/kg | 1.245 | 298.336 mg/kg | 0.0298 % | ✓ | |
| 13 | TPH (C6 to C40) petroleum group | | | TPH | | 127 mg/kg | | 117.983 mg/kg | 0.0118 % | ✓ | |
| 14 | tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane | 603-181-00-X | 216-653-1 | 1634-04-4 | | <0.005 mg/kg | | <0.005 mg/kg | <0.0000005 % | | <**LOD** |

| # | | Determinand | | | CLP Note | User entered data | | Conv. Factor | Compound conc. | | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CLP index number | EC Number | CAS Number | | | | | | | | | |
| 15 | | benzene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-020-00-8 | 200-753-7 | 71-43-2 | | | | | | | | | |
| 16 | | toluene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-021-00-3 | 203-625-9 | 108-88-3 | | | | | | | | | |
| 17 | | ethylbenzene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-023-00-4 | 202-849-4 | 100-41-4 | | | | | | | | | |
| 18 | | xylene | | | | <0.01 | mg/kg | | <0.01 | mg/kg | <0.000001 % | | <LOD |
| | | 601-022-00-9 | 202-422-2 [1]<br>203-396-5 [2]<br>203-576-3 [3]<br>215-535-7 [4] | 95-47-6 [1]<br>106-42-3 [2]<br>108-38-3 [3]<br>1330-20-7 [4] | | | | | | | | | |
| 19 | | pH | | | | 8.33 | pH | | 8.33 | pH | 8.33 pH | | |
| | | | | PH | | | | | | | | | |
| 20 | | naphthalene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-052-00-2 | 202-049-5 | 91-20-3 | | | | | | | | | |
| 21 | | acenaphthylene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 205-917-1 | 208-96-8 | | | | | | | | | |
| 22 | | acenaphthene | | | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| | | | 201-469-6 | 83-32-9 | | | | | | | | | |
| 23 | | fluorene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 201-695-5 | 86-73-7 | | | | | | | | | |
| 24 | | phenanthrene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 201-581-5 | 85-01-8 | | | | | | | | | |
| 25 | | anthracene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 204-371-1 | 120-12-7 | | | | | | | | | |
| 26 | | fluoranthene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 205-912-4 | 206-44-0 | | | | | | | | | |
| 27 | | pyrene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 204-927-3 | 129-00-0 | | | | | | | | | |
| 28 | | benzo[a]anthracene | | | | <0.06 | mg/kg | | <0.06 | mg/kg | <0.000006 % | | <LOD |
| | | 601-033-00-9 | 200-280-6 | 56-55-3 | | | | | | | | | |
| 29 | | chrysene | | | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| | | 601-048-00-0 | 205-923-4 | 218-01-9 | | | | | | | | | |
| 30 | | benzo[b]fluoranthene | | | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| | | 601-034-00-4 | 205-911-9 | 205-99-2 | | | | | | | | | |
| 31 | | benzo[k]fluoranthene | | | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| | | 601-036-00-5 | 205-916-6 | 207-08-9 | | | | | | | | | |
| 32 | | benzo[a]pyrene; benzo[def]chrysene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-032-00-3 | 200-028-5 | 50-32-8 | | | | | | | | | |
| 33 | | indeno[123-cd]pyrene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-893-2 | 193-39-5 | | | | | | | | | |
| 34 | | dibenz[a,h]anthracene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-041-00-2 | 200-181-8 | 53-70-3 | | | | | | | | | |
| 35 | | benzo[ghi]perylene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-883-8 | 191-24-2 | | | | | | | | | |
| 36 | | polychlorobiphenyls; PCB | | | | 0.093 | mg/kg | | 0.0864 | mg/kg | 0.00000864 % | ✓ | |
| | | 602-039-00-4 | 215-648-1 | 1336-36-3 | | | | | | | | | |
| 37 | | barium { barium oxide } | | | | 23 | mg/kg | 1.117 | 23.856 | mg/kg | 0.00239 % | ✓ | |
| | | | 215-127-9 | 1304-28-5 | | | | | | | | | |
| 38 | | coronene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-881-7 | 191-07-1 | | | | | | | | | |
| 39 | | benzo[j]fluoranthene | | | | <1 | mg/kg | | <1 | mg/kg | <0.0001 % | | <LOD |
| | | 601-035-00-X | 205-910-3 | 205-82-3 | | | | | | | | | |
| | | | | | | | | | | Total: | 0.0892 % | | |

| Key | |
|---|---|
| | User supplied data |
| | Determinand values ignored for classification, see column 'Conc. Not Used' for reason |
| | Determinand defined or amended by HazWasteOnline (see Appendix A) |
| | Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration |
| **<LOD** | Below limit of detection |
| **ND** | Not detected |
| CLP: Note 1 | Only the metal concentration has been used for classification |

## Supplementary Hazardous Property Information

**HP 3(i): Flammable** "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Solid waste without liquid phase

Hazard Statements hit:

**Flam. Liq. 3; H226** "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0118%)

## Classification of sample: TP17-12/12/2019-1.50m

**Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

## Sample details

Sample Name:
**TP17-12/12/2019-1.50m**
Moisture content:
**39.4%**
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

## Hazard properties

None identified

## Determinands

Moisture content: 39.4% Wet Weight Moisture Correction applied (MC)

| # | Determinand | CLP index number | EC Number | CAS Number | CLP Note | User entered data | Conv. Factor | Compound conc. | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | antimony { antimony trioxide } | 051-005-00-X | 215-175-0 | 1309-64-4 | | 2 mg/kg | 1.197 | 1.451 mg/kg | 0.000145 % | ✓ | |
| 2 | arsenic { arsenic pentoxide } | 033-004-00-6 | 215-116-9 | 1303-28-2 | | 55.2 mg/kg | 1.534 | 51.31 mg/kg | 0.00513 % | ✓ | |
| 3 | cadmium { cadmium oxide } | 048-002-00-0 | 215-146-2 | 1306-19-0 | | 0.4 mg/kg | 1.142 | 0.277 mg/kg | 0.0000277 % | ✓ | |
| 4 | chromium in chromium(III) compounds { chromium(III) oxide } | | 215-160-9 | 1308-38-9 | | 39.3 mg/kg | 1.462 | 34.808 mg/kg | 0.00348 % | ✓ | |
| 5 | chromium in chromium(VI) compounds { chromium(VI) oxide } | 024-001-00-0 | 215-607-8 | 1333-82-0 | | <0.3 mg/kg | 1.923 | <0.577 mg/kg | <0.0000577 % | | <**LOD** |
| 6 | copper { dicopper oxide; copper (I) oxide } | 029-002-00-X | 215-270-7 | 1317-39-1 | | 98 mg/kg | 1.126 | 66.864 mg/kg | 0.00669 % | ✓ | |
| 7 | lead { lead compounds with the exception of those specified elsewhere in this Annex } | 082-001-00-6 | | | 1 | 100 mg/kg | | 60.6 mg/kg | 0.00606 % | ✓ | |
| 8 | mercury { mercury dichloride } | 080-010-00-X | 231-299-8 | 7487-94-7 | | <0.1 mg/kg | 1.353 | <0.135 mg/kg | <0.0000135 % | | <**LOD** |
| 9 | molybdenum { molybdenum(VI) oxide } | 042-001-00-9 | 215-204-7 | 1313-27-5 | | 0.9 mg/kg | 1.5 | 0.818 mg/kg | 0.0000818 % | ✓ | |
| 10 | nickel { nickel chromate } | 028-035-00-7 | 238-766-5 | 14721-18-7 | | 23.4 mg/kg | 2.976 | 42.205 mg/kg | 0.00422 % | ✓ | |
| 11 | selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } | 034-002-00-8 | | | | 2 mg/kg | 2.554 | 3.095 mg/kg | 0.000309 % | ✓ | |
| 12 | zinc { zinc oxide } | 030-013-00-7 | 215-222-5 | 1314-13-2 | | 428 mg/kg | 1.245 | 322.839 mg/kg | 0.0323 % | ✓ | |
| 13 | TPH (C6 to C40) petroleum group | | | TPH | | <52 mg/kg | | <52 mg/kg | <0.0052 % | | <**LOD** |
| 14 | tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane | 603-181-00-X | 216-653-1 | 1634-04-4 | | <0.005 mg/kg | | <0.005 mg/kg | <0.0000005 % | | <**LOD** |

| # | | Determinand | | | CLP Note | User entered data | | Conv. Factor | Compound conc. | | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CLP index number | EC Number | CAS Number | | | | | | | | | |
| 15 | | benzene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-020-00-8 | 200-753-7 | 71-43-2 | | | | | | | | | |
| 16 | | toluene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-021-00-3 | 203-625-9 | 108-88-3 | | | | | | | | | |
| 17 | | ethylbenzene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-023-00-4 | 202-849-4 | 100-41-4 | | | | | | | | | |
| 18 | | xylene | | | | <0.01 | mg/kg | | <0.01 | mg/kg | <0.000001 % | | <LOD |
| | | 601-022-00-9 | 202-422-2 [1]<br>203-396-5 [2]<br>203-576-3 [3]<br>215-535-7 [4] | 95-47-6 [1]<br>106-42-3 [2]<br>108-38-3 [3]<br>1330-20-7 [4] | | | | | | | | | |
| 19 | | pH | | | | 7.56 | pH | | 7.56 | pH | 7.56 pH | | |
| | | | | PH | | | | | | | | | |
| 20 | | naphthalene | | | | 0.18 | mg/kg | | 0.109 | mg/kg | 0.0000109 % | ✓ | |
| | | 601-052-00-2 | 202-049-5 | 91-20-3 | | | | | | | | | |
| 21 | | acenaphthylene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 205-917-1 | 208-96-8 | | | | | | | | | |
| 22 | | acenaphthene | | | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| | | | 201-469-6 | 83-32-9 | | | | | | | | | |
| 23 | | fluorene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 201-695-5 | 86-73-7 | | | | | | | | | |
| 24 | | phenanthrene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 201-581-5 | 85-01-8 | | | | | | | | | |
| 25 | | anthracene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 204-371-1 | 120-12-7 | | | | | | | | | |
| 26 | | fluoranthene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 205-912-4 | 206-44-0 | | | | | | | | | |
| 27 | | pyrene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 204-927-3 | 129-00-0 | | | | | | | | | |
| 28 | | benzo[a]anthracene | | | | <0.06 | mg/kg | | <0.06 | mg/kg | <0.000006 % | | <LOD |
| | | 601-033-00-9 | 200-280-6 | 56-55-3 | | | | | | | | | |
| 29 | | chrysene | | | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| | | 601-048-00-0 | 205-923-4 | 218-01-9 | | | | | | | | | |
| 30 | | benzo[b]fluoranthene | | | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| | | 601-034-00-4 | 205-911-9 | 205-99-2 | | | | | | | | | |
| 31 | | benzo[k]fluoranthene | | | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| | | 601-036-00-5 | 205-916-6 | 207-08-9 | | | | | | | | | |
| 32 | | benzo[a]pyrene; benzo[def]chrysene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-032-00-3 | 200-028-5 | 50-32-8 | | | | | | | | | |
| 33 | | indeno[123-cd]pyrene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-893-2 | 193-39-5 | | | | | | | | | |
| 34 | | dibenz[a,h]anthracene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-041-00-2 | 200-181-8 | 53-70-3 | | | | | | | | | |
| 35 | | benzo[ghi]perylene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-883-8 | 191-24-2 | | | | | | | | | |
| 36 | | polychlorobiphenyls; PCB | | | | <0.035 | mg/kg | | <0.035 | mg/kg | <0.0000035 % | | <LOD |
| | | 602-039-00-4 | 215-648-1 | 1336-36-3 | | | | | | | | | |
| 37 | | barium { barium oxide } | | | | 178 | mg/kg | 1.117 | 120.435 | mg/kg | 0.012 % | ✓ | |
| | | | 215-127-9 | 1304-28-5 | | | | | | | | | |
| 38 | | coronene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-881-7 | 191-07-1 | | | | | | | | | |
| 39 | | benzo[j]fluoranthene | | | | <1 | mg/kg | | <1 | mg/kg | <0.0001 % | | <LOD |
| | | 601-035-00-X | 205-910-3 | 205-82-3 | | | | | | | | | |
| | | | | | | | | | | Total: | 0.0759 % | | |

Key

| | |
|---|---|
| | User supplied data |
| | Determinand values ignored for classification, see column 'Conc. Not Used' for reason |
| | Determinand defined or amended by HazWasteOnline (see Appendix A) |
| | Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration |
| **<LOD** | Below limit of detection |
| **ND** | Not detected |
| CLP: Note 1 | Only the metal concentration has been used for classification |

## Classification of sample: TP19-11/12/2019-0.50m

**Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

## Sample details

Sample Name:
**TP19-11/12/2019-0.50m**
Moisture content:
**6%**
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

## Hazard properties

None identified

## Determinands

Moisture content: 6% Wet Weight Moisture Correction applied (MC)

| # | Determinand | CLP Note | User entered data | Conv. Factor | Compound conc. | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|
| | CLP index number / EC Number / CAS Number | | | | | | | |
| 1 | antimony { antimony trioxide } | | 2 mg/kg | 1.197 | 2.251 mg/kg | 0.000225 % | ✓ | |
| | 051-005-00-X / 215-175-0 / 1309-64-4 | | | | | | | |
| 2 | arsenic { arsenic pentoxide } | | 18.6 mg/kg | 1.534 | 26.818 mg/kg | 0.00268 % | ✓ | |
| | 033-004-00-6 / 215-116-9 / 1303-28-2 | | | | | | | |
| 3 | cadmium { cadmium oxide } | | <0.1 mg/kg | 1.142 | <0.114 mg/kg | <0.0000114 % | | <**LOD** |
| | 048-002-00-0 / 215-146-2 / 1306-19-0 | | | | | | | |
| 4 | chromium in chromium(III) compounds { chromium(III) oxide } | | 36.9 mg/kg | 1.462 | 50.696 mg/kg | 0.00507 % | ✓ | |
| | / 215-160-9 / 1308-38-9 | | | | | | | |
| 5 | chromium in chromium(VI) compounds { chromium(VI) oxide } | | <0.3 mg/kg | 1.923 | <0.577 mg/kg | <0.0000577 % | | <**LOD** |
| | 024-001-00-0 / 215-607-8 / 1333-82-0 | | | | | | | |
| 6 | copper { dicopper oxide; copper (I) oxide } | | 37 mg/kg | 1.126 | 39.158 mg/kg | 0.00392 % | ✓ | |
| | 029-002-00-X / 215-270-7 / 1317-39-1 | | | | | | | |
| 7 | lead { lead compounds with the exception of those specified elsewhere in this Annex } | 1 | 17 mg/kg | | 15.98 mg/kg | 0.0016 % | ✓ | |
| | 082-001-00-6 / / | | | | | | | |
| 8 | mercury { mercury dichloride } | | <0.1 mg/kg | 1.353 | <0.135 mg/kg | <0.0000135 % | | <**LOD** |
| | 080-010-00-X / 231-299-8 / 7487-94-7 | | | | | | | |
| 9 | molybdenum { molybdenum(VI) oxide } | | 1.2 mg/kg | 1.5 | 1.692 mg/kg | 0.000169 % | ✓ | |
| | 042-001-00-9 / 215-204-7 / 1313-27-5 | | | | | | | |
| 10 | nickel { nickel chromate } | | 25 mg/kg | 2.976 | 69.942 mg/kg | 0.00699 % | ✓ | |
| | 028-035-00-7 / 238-766-5 / 14721-18-7 | | | | | | | |
| 11 | selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } | | 1 mg/kg | 2.554 | 2.4 mg/kg | 0.00024 % | ✓ | |
| | 034-002-00-8 / / | | | | | | | |
| 12 | zinc { zinc oxide } | | 134 mg/kg | 1.245 | 156.784 mg/kg | 0.0157 % | ✓ | |
| | 030-013-00-7 / 215-222-5 / 1314-13-2 | | | | | | | |
| 13 | TPH (C6 to C40) petroleum group | | 169 mg/kg | | 158.86 mg/kg | 0.0159 % | ✓ | |
| | / / TPH | | | | | | | |
| 14 | tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane | | <0.005 mg/kg | | <0.005 mg/kg | <0.0000005 % | | <**LOD** |
| | 603-181-00-X / 216-653-1 / 1634-04-4 | | | | | | | |

| # | | Determinand | | | CLP Note | User entered data | | Conv. Factor | Compound conc. | | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CLP index number | EC Number | CAS Number | | | | | | | | | |
| 15 | | benzene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-020-00-8 | 200-753-7 | 71-43-2 | | | | | | | | | |
| 16 | | toluene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-021-00-3 | 203-625-9 | 108-88-3 | | | | | | | | | |
| 17 | | ethylbenzene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-023-00-4 | 202-849-4 | 100-41-4 | | | | | | | | | |
| 18 | | xylene | | | | <0.01 | mg/kg | | <0.01 | mg/kg | <0.000001 % | | <LOD |
| | | 601-022-00-9 | 202-422-2 [1]<br>203-396-5 [2]<br>203-576-3 [3]<br>215-535-7 [4] | 95-47-6 [1]<br>106-42-3 [2]<br>108-38-3 [3]<br>1330-20-7 [4] | | | | | | | | | |
| 19 | | pH | | | | 8.33 | pH | | 8.33 | pH | 8.33 pH | | |
| | | | | PH | | | | | | | | | |
| 20 | | naphthalene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-052-00-2 | 202-049-5 | 91-20-3 | | | | | | | | | |
| 21 | | acenaphthylene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 205-917-1 | 208-96-8 | | | | | | | | | |
| 22 | | acenaphthene | | | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| | | | 201-469-6 | 83-32-9 | | | | | | | | | |
| 23 | | fluorene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 201-695-5 | 86-73-7 | | | | | | | | | |
| 24 | | phenanthrene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 201-581-5 | 85-01-8 | | | | | | | | | |
| 25 | | anthracene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 204-371-1 | 120-12-7 | | | | | | | | | |
| 26 | | fluoranthene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 205-912-4 | 206-44-0 | | | | | | | | | |
| 27 | | pyrene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 204-927-3 | 129-00-0 | | | | | | | | | |
| 28 | | benzo[a]anthracene | | | | <0.06 | mg/kg | | <0.06 | mg/kg | <0.000006 % | | <LOD |
| | | 601-033-00-9 | 200-280-6 | 56-55-3 | | | | | | | | | |
| 29 | | chrysene | | | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| | | 601-048-00-0 | 205-923-4 | 218-01-9 | | | | | | | | | |
| 30 | | benzo[b]fluoranthene | | | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| | | 601-034-00-4 | 205-911-9 | 205-99-2 | | | | | | | | | |
| 31 | | benzo[k]fluoranthene | | | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| | | 601-036-00-5 | 205-916-6 | 207-08-9 | | | | | | | | | |
| 32 | | benzo[a]pyrene; benzo[def]chrysene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-032-00-3 | 200-028-5 | 50-32-8 | | | | | | | | | |
| 33 | | indeno[123-cd]pyrene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-893-2 | 193-39-5 | | | | | | | | | |
| 34 | | dibenz[a,h]anthracene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-041-00-2 | 200-181-8 | 53-70-3 | | | | | | | | | |
| 35 | | benzo[ghi]perylene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-883-8 | 191-24-2 | | | | | | | | | |
| 36 | | polychlorobiphenyls; PCB | | | | 0.069 | mg/kg | | 0.0649 | mg/kg | 0.00000649 % | ✓ | |
| | | 602-039-00-4 | 215-648-1 | 1336-36-3 | | | | | | | | | |
| 37 | | barium { barium oxide } | | | | 60 | mg/kg | 1.117 | 62.971 | mg/kg | 0.0063 % | ✓ | |
| | | | 215-127-9 | 1304-28-5 | | | | | | | | | |
| 38 | | coronene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-881-7 | 191-07-1 | | | | | | | | | |
| 39 | | benzo[j]fluoranthene | | | | <1 | mg/kg | | <1 | mg/kg | <0.0001 % | | <LOD |
| | | 601-035-00-X | 205-910-3 | 205-82-3 | | | | | | | | | |
| | | | | | | | | | | Total: | 0.059 % | | |

| Key | |
|---|---|
| | User supplied data |
| | Determinand values ignored for classification, see column 'Conc. Not Used' for reason |
| | Determinand defined or amended by HazWasteOnline (see Appendix A) |
| | Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration |
| **<LOD** | Below limit of detection |
| **ND** | Not detected |
| CLP: Note 1 | Only the metal concentration has been used for classification |

## Supplementary Hazardous Property Information

**HP 3(i): Flammable** "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Solid waste without liquid phase

Hazard Statements hit:

**Flam. Liq. 3; H226** "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0159%)

## Classification of sample: TP19-11/12/2019-1.50m

**Hazardous Waste**
Classified as **17 05 03 ***
in the List of Waste

## Sample details

Sample Name:
**TP19-11/12/2019-1.50m**
Moisture content:
**25.9%**
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 03 * (Soil and stones containing hazardous substances)

## Hazard properties

**HP 7: Carcinogenic** "waste which induces cancer or increases its incidence"

Hazard Statements hit:

**Carc. 1B; H350** "May cause cancer [state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard]."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.113%)

**HP 11: Mutagenic** "waste which may cause a mutation, that is a permanent change in the amount or structure of the genetic material in a cell"

Hazard Statements hit:

**Muta. 1B; H340** "May cause genetic defects [state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard]."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.113%)

## Determinands

Moisture content: 25.9% Wet Weight Moisture Correction applied (MC)

| # | Determinand | CLP index number | EC Number | CAS Number | CLP Note | User entered data | | Conv. Factor | Compound conc. | | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | antimony { antimony trioxide } | 051-005-00-X | 215-175-0 | 1309-64-4 | | 2 | mg/kg | 1.197 | 1.774 | mg/kg | 0.000177 % | ✓ | |
| 2 | arsenic { arsenic pentoxide } | 033-004-00-6 | 215-116-9 | 1303-28-2 | | 28.3 | mg/kg | 1.534 | 32.166 | mg/kg | 0.00322 % | ✓ | |
| 3 | cadmium { cadmium oxide } | 048-002-00-0 | 215-146-2 | 1306-19-0 | | 0.2 | mg/kg | 1.142 | 0.169 | mg/kg | 0.0000169 % | ✓ | |
| 4 | chromium in chromium(III) compounds { chromium(III) oxide } | | 215-160-9 | 1308-38-9 | | 48.3 | mg/kg | 1.462 | 52.31 | mg/kg | 0.00523 % | ✓ | |
| 5 | chromium in chromium(VI) compounds { chromium(VI) oxide } | 024-001-00-0 | 215-607-8 | 1333-82-0 | | <0.3 | mg/kg | 1.923 | <0.577 | mg/kg | <0.0000577 % | | <**LOD** |
| 6 | copper { dicopper oxide; copper (I) oxide } | 029-002-00-X | 215-270-7 | 1317-39-1 | | 93 | mg/kg | 1.126 | 77.588 | mg/kg | 0.00776 % | ✓ | |
| 7 | lead { lead compounds with the exception of those specified elsewhere in this Annex } | 082-001-00-6 | | | 1 | 145 | mg/kg | | 107.445 | mg/kg | 0.0107 % | ✓ | |

| # | | Determinand | | | CLP Note | User entered data | | Conv. Factor | Compound conc. | | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CLP index number | EC Number | CAS Number | | | | | | | | | |
| 8 | | mercury { mercury dichloride } | | | | <0.1 | mg/kg | 1.353 | <0.135 | mg/kg | <0.0000135 % | | <LOD |
| | | 080-010-00-X | 231-299-8 | 7487-94-7 | | | | | | | | | |
| 9 | | molybdenum { molybdenum(VI) oxide } | | | | 1.8 | mg/kg | 1.5 | 2.001 | mg/kg | 0.0002 % | ✓ | |
| | | 042-001-00-9 | 215-204-7 | 1313-27-5 | | | | | | | | | |
| 10 | | nickel { nickel chromate } | | | | 29 | mg/kg | 2.976 | 63.957 | mg/kg | 0.0064 % | ✓ | |
| | | 028-035-00-7 | 238-766-5 | 14721-18-7 | | | | | | | | | |
| 11 | | selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } | | | | 2 | mg/kg | 2.554 | 3.784 | mg/kg | 0.000378 % | ✓ | |
| | | 034-002-00-8 | | | | | | | | | | | |
| 12 | | zinc { zinc oxide } | | | | 162 | mg/kg | 1.245 | 149.418 | mg/kg | 0.0149 % | ✓ | |
| | | 030-013-00-7 | 215-222-5 | 1314-13-2 | | | | | | | | | |
| 13 | | TPH (C6 to C40) petroleum group | | | | 1524 | mg/kg | | 1129.284 | mg/kg | 0.113 % | ✓ | |
| | | | | TPH | | | | | | | | | |
| 14 | | tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 603-181-00-X | 216-653-1 | 1634-04-4 | | | | | | | | | |
| 15 | | benzene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-020-00-8 | 200-753-7 | 71-43-2 | | | | | | | | | |
| 16 | | toluene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-021-00-3 | 203-625-9 | 108-88-3 | | | | | | | | | |
| 17 | | ethylbenzene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-023-00-4 | 202-849-4 | 100-41-4 | | | | | | | | | |
| 18 | | xylene | | | | 0.048 | mg/kg | | 0.0356 | mg/kg | 0.00000356 % | ✓ | |
| | | 601-022-00-9 | 202-422-2 [1]<br>203-396-5 [2]<br>203-576-3 [3]<br>215-535-7 [4] | 95-47-6 [1]<br>106-42-3 [2]<br>108-38-3 [3]<br>1330-20-7 [4] | | | | | | | | | |
| 19 | | pH | | | | 8.04 | pH | | 8.04 | pH | 8.04 pH | | |
| | | | | PH | | | | | | | | | |
| 20 | | naphthalene | | | | 0.84 | mg/kg | | 0.622 | mg/kg | 0.0000622 % | ✓ | |
| | | 601-052-00-2 | 202-049-5 | 91-20-3 | | | | | | | | | |
| 21 | | acenaphthylene | | | | 0.08 | mg/kg | | 0.0593 | mg/kg | 0.00000593 % | ✓ | |
| | | | 205-917-1 | 208-96-8 | | | | | | | | | |
| 22 | | acenaphthene | | | | 0.09 | mg/kg | | 0.0667 | mg/kg | 0.00000667 % | ✓ | |
| | | | 201-469-6 | 83-32-9 | | | | | | | | | |
| 23 | | fluorene | | | | 0.32 | mg/kg | | 0.237 | mg/kg | 0.0000237 % | ✓ | |
| | | | 201-695-5 | 86-73-7 | | | | | | | | | |
| 24 | | phenanthrene | | | | 1.5 | mg/kg | | 1.112 | mg/kg | 0.000111 % | ✓ | |
| | | | 201-581-5 | 85-01-8 | | | | | | | | | |
| 25 | | anthracene | | | | 0.11 | mg/kg | | 0.0815 | mg/kg | 0.00000815 % | ✓ | |
| | | | 204-371-1 | 120-12-7 | | | | | | | | | |
| 26 | | fluoranthene | | | | 0.09 | mg/kg | | 0.0667 | mg/kg | 0.00000667 % | ✓ | |
| | | | 205-912-4 | 206-44-0 | | | | | | | | | |
| 27 | | pyrene | | | | 0.81 | mg/kg | | 0.6 | mg/kg | 0.00006 % | ✓ | |
| | | | 204-927-3 | 129-00-0 | | | | | | | | | |
| 28 | | benzo[a]anthracene | | | | 0.18 | mg/kg | | 0.133 | mg/kg | 0.0000133 % | ✓ | |
| | | 601-033-00-9 | 200-280-6 | 56-55-3 | | | | | | | | | |
| 29 | | chrysene | | | | 0.88 | mg/kg | | 0.652 | mg/kg | 0.0000652 % | ✓ | |
| | | 601-048-00-0 | 205-923-4 | 218-01-9 | | | | | | | | | |
| 30 | | benzo[b]fluoranthene | | | | 0.11 | mg/kg | | 0.0815 | mg/kg | 0.00000815 % | ✓ | |
| | | 601-034-00-4 | 205-911-9 | 205-99-2 | | | | | | | | | |
| 31 | | benzo[k]fluoranthene | | | | 0.04 | mg/kg | | 0.0296 | mg/kg | 0.00000296 % | ✓ | |
| | | 601-036-00-5 | 205-916-6 | 207-08-9 | | | | | | | | | |
| 32 | | benzo[a]pyrene; benzo[def]chrysene | | | | 0.23 | mg/kg | | 0.17 | mg/kg | 0.000017 % | ✓ | |
| | | 601-032-00-3 | 200-028-5 | 50-32-8 | | | | | | | | | |
| 33 | | indeno[123-cd]pyrene | | | | <0.4 | mg/kg | | <0.4 | mg/kg | <0.00004 % | | <LOD |
| | | | 205-893-2 | 193-39-5 | | | | | | | | | |
| 34 | | dibenz[a,h]anthracene | | | | <0.4 | mg/kg | | <0.4 | mg/kg | <0.00004 % | | <LOD |
| | | 601-041-00-2 | 200-181-8 | 53-70-3 | | | | | | | | | |

| # | | Determinand | | | CLP Note | User entered data | | Conv. Factor | Compound conc. | | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CLP index number | EC Number | CAS Number | | | | | | | | | |
| 35 | | benzo[ghi]perylene | | | | <0.4 | mg/kg | | <0.4 | mg/kg | <0.00004 % | | <LOD |
| | | | 205-883-8 | 191-24-2 | | | | | | | | | |
| 36 | | polychlorobiphenyls; PCB | | | | 0.206 | mg/kg | | 0.153 | mg/kg | 0.0000153 % | ✓ | |
| | | 602-039-00-4 | 215-648-1 | 1336-36-3 | | | | | | | | | |
| 37 | | barium { barium oxide } | | | | 52 | mg/kg | 1.117 | 43.021 | mg/kg | 0.0043 % | ✓ | |
| | | | 215-127-9 | 1304-28-5 | | | | | | | | | |
| 38 | | coronene | | | | <0.4 | mg/kg | | <0.4 | mg/kg | <0.00004 % | | <LOD |
| | | | 205-881-7 | 191-07-1 | | | | | | | | | |
| 39 | | benzo[j]fluoranthene | | | | <1 | mg/kg | | <1 | mg/kg | <0.0001 % | | <LOD |
| | | 601-035-00-X | 205-910-3 | 205-82-3 | | | | | | | | | |
| | | | | | | | | | | Total: | 0.167 % | | |

Key

| | |
|---|---|
| | User supplied data |
| | Determinand values ignored for classification, see column 'Conc. Not Used' for reason |
| | Hazardous result |
| | Determinand defined or amended by HazWasteOnline (see Appendix A) |
| | Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration |
| **<LOD** | Below limit of detection |
| **ND** | Not detected |
| CLP: Note 1 | Only the metal concentration has been used for classification |

## Supplementary Hazardous Property Information

**HP 3(i): Flammable** "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Solid waste without liquid phase

Hazard Statements hit:

**Flam. Liq. 3; H226** "Flammable liquid and vapour."

Because of determinands:

TPH (C6 to C40) petroleum group: (conc.: 0.113%)
xylene: (conc.: 3.56e-06%)

## Classification of sample: TP20-09/12/2019-0.50m

**Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

## Sample details

Sample Name:
**TP20-09/12/2019-0.50m**
Moisture content:
**14%**
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

## Hazard properties

None identified

## Determinands

Moisture content: 14% Wet Weight Moisture Correction applied (MC)

| # | Determinand | CLP index number | EC Number | CAS Number | CLP Note | User entered data | Conv. Factor | Compound conc. | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | antimony { antimony trioxide } | 051-005-00-X | 215-175-0 | 1309-64-4 | | 2 mg/kg | 1.197 | 2.059 mg/kg | 0.000206 % | ✓ | |
| 2 | arsenic { arsenic pentoxide } | 033-004-00-6 | 215-116-9 | 1303-28-2 | | 18.1 mg/kg | 1.534 | 23.876 mg/kg | 0.00239 % | ✓ | |
| 3 | cadmium { cadmium oxide } | 048-002-00-0 | 215-146-2 | 1306-19-0 | | 0.7 mg/kg | 1.142 | 0.688 mg/kg | 0.0000688 % | ✓ | |
| 4 | chromium in chromium(III) compounds { chromium(III) oxide } | | 215-160-9 | 1308-38-9 | | 90.6 mg/kg | 1.462 | 113.879 mg/kg | 0.0114 % | ✓ | |
| 5 | chromium in chromium(VI) compounds { chromium(VI) oxide } | 024-001-00-0 | 215-607-8 | 1333-82-0 | | <0.3 mg/kg | 1.923 | <0.577 mg/kg | <0.0000577 % | | <**LOD** |
| 6 | copper { dicopper oxide; copper (I) oxide } | 029-002-00-X | 215-270-7 | 1317-39-1 | | 129 mg/kg | 1.126 | 124.906 mg/kg | 0.0125 % | ✓ | |
| 7 | lead { lead compounds with the exception of those specified elsewhere in this Annex } | 082-001-00-6 | | | 1 | 77 mg/kg | | 66.22 mg/kg | 0.00662 % | ✓ | |
| 8 | mercury { mercury dichloride } | 080-010-00-X | 231-299-8 | 7487-94-7 | | <0.1 mg/kg | 1.353 | <0.135 mg/kg | <0.0000135 % | | <**LOD** |
| 9 | molybdenum { molybdenum(VI) oxide } | 042-001-00-9 | 215-204-7 | 1313-27-5 | | 2.7 mg/kg | 1.5 | 3.483 mg/kg | 0.000348 % | ✓ | |
| 10 | nickel { nickel chromate } | 028-035-00-7 | 238-766-5 | 14721-18-7 | | 25.4 mg/kg | 2.976 | 65.014 mg/kg | 0.0065 % | ✓ | |
| 11 | selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } | 034-002-00-8 | | | | <1 mg/kg | 2.554 | <2.554 mg/kg | <0.000255 % | | <**LOD** |
| 12 | zinc { zinc oxide } | 030-013-00-7 | 215-222-5 | 1314-13-2 | | 331 mg/kg | 1.245 | 354.32 mg/kg | 0.0354 % | ✓ | |
| 13 | TPH (C6 to C40) petroleum group | | | TPH | | 151 mg/kg | | 129.86 mg/kg | 0.013 % | ✓ | |
| 14 | tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane | 603-181-00-X | 216-653-1 | 1634-04-4 | | <0.005 mg/kg | | <0.005 mg/kg | <0.0000005 % | | <**LOD** |

| # | | Determinand | CLP Note | User entered data | Conv. Factor | Compound conc. | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|
| | | CLP index number / EC Number / CAS Number | | | | | | | |
| 15 | | benzene<br>601-020-00-8 / 200-753-7 / 71-43-2 | | <0.005 mg/kg | | <0.005 mg/kg | <0.0000005 % | | <LOD |
| 16 | | toluene<br>601-021-00-3 / 203-625-9 / 108-88-3 | | <0.005 mg/kg | | <0.005 mg/kg | <0.0000005 % | | <LOD |
| 17 | | ethylbenzene<br>601-023-00-4 / 202-849-4 / 100-41-4 | | <0.005 mg/kg | | <0.005 mg/kg | <0.0000005 % | | <LOD |
| 18 | | xylene<br>601-022-00-9 / 202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4] / 95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4] | | <0.01 mg/kg | | <0.01 mg/kg | <0.000001 % | | <LOD |
| 19 | | pH<br>/ / PH | | 8.34 pH | | 8.34 pH | 8.34 pH | | |
| 20 | | naphthalene<br>601-052-00-2 / 202-049-5 / 91-20-3 | | <0.04 mg/kg | | <0.04 mg/kg | <0.000004 % | | <LOD |
| 21 | | acenaphthylene<br>/ 205-917-1 / 208-96-8 | | <0.03 mg/kg | | <0.03 mg/kg | <0.000003 % | | <LOD |
| 22 | | acenaphthene<br>/ 201-469-6 / 83-32-9 | | <0.05 mg/kg | | <0.05 mg/kg | <0.000005 % | | <LOD |
| 23 | | fluorene<br>/ 201-695-5 / 86-73-7 | | <0.04 mg/kg | | <0.04 mg/kg | <0.000004 % | | <LOD |
| 24 | | phenanthrene<br>/ 201-581-5 / 85-01-8 | | <0.03 mg/kg | | <0.03 mg/kg | <0.000003 % | | <LOD |
| 25 | | anthracene<br>/ 204-371-1 / 120-12-7 | | <0.04 mg/kg | | <0.04 mg/kg | <0.000004 % | | <LOD |
| 26 | | fluoranthene<br>/ 205-912-4 / 206-44-0 | | 0.05 mg/kg | | 0.043 mg/kg | 0.0000043 % | ✓ | |
| 27 | | pyrene<br>/ 204-927-3 / 129-00-0 | | 0.05 mg/kg | | 0.043 mg/kg | 0.0000043 % | ✓ | |
| 28 | | benzo[a]anthracene<br>601-033-00-9 / 200-280-6 / 56-55-3 | | <0.06 mg/kg | | <0.06 mg/kg | <0.000006 % | | <LOD |
| 29 | | chrysene<br>601-048-00-0 / 205-923-4 / 218-01-9 | | 0.02 mg/kg | | 0.0172 mg/kg | 0.00000172 % | ✓ | |
| 30 | | benzo[b]fluoranthene<br>601-034-00-4 / 205-911-9 / 205-99-2 | | <0.05 mg/kg | | <0.05 mg/kg | <0.000005 % | | <LOD |
| 31 | | benzo[k]fluoranthene<br>601-036-00-5 / 205-916-6 / 207-08-9 | | <0.02 mg/kg | | <0.02 mg/kg | <0.000002 % | | <LOD |
| 32 | | benzo[a]pyrene; benzo[def]chrysene<br>601-032-00-3 / 200-028-5 / 50-32-8 | | <0.04 mg/kg | | <0.04 mg/kg | <0.000004 % | | <LOD |
| 33 | | indeno[123-cd]pyrene<br>/ 205-893-2 / 193-39-5 | | <0.04 mg/kg | | <0.04 mg/kg | <0.000004 % | | <LOD |
| 34 | | dibenz[a,h]anthracene<br>601-041-00-2 / 200-181-8 / 53-70-3 | | <0.04 mg/kg | | <0.04 mg/kg | <0.000004 % | | <LOD |
| 35 | | benzo[ghi]perylene<br>/ 205-883-8 / 191-24-2 | | <0.04 mg/kg | | <0.04 mg/kg | <0.000004 % | | <LOD |
| 36 | | polychlorobiphenyls; PCB<br>602-039-00-4 / 215-648-1 / 1336-36-3 | | 3.715 mg/kg | | 3.195 mg/kg | 0.000319 % | ✓ | |
| 37 | | barium { barium oxide }<br>/ 215-127-9 / 1304-28-5 | | 45 mg/kg | 1.117 | 43.209 mg/kg | 0.00432 % | ✓ | |
| 38 | | coronene<br>/ 205-881-7 / 191-07-1 | | <0.04 mg/kg | | <0.04 mg/kg | <0.000004 % | | <LOD |
| 39 | | benzo[j]fluoranthene<br>601-035-00-X / 205-910-3 / 205-82-3 | | <1 mg/kg | | <1 mg/kg | <0.0001 % | | <LOD |
| 40 | | asbestos<br>650-013-00-6 / - - - - - - - / 12001-28-4 132207-32-0 12172-73-5 77536-66-4 77536-68-6 77536-67-5 12001-29-5 | | <10 mg/kg | | <10 mg/kg | <0.001 % | | <LOD |

| # | | Determinand | | | CLP Note | User entered data | Conv. Factor | Compound conc. | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CLP index number | EC Number | CAS Number | | | | | | | |
| | | | | | | | | Total: | 0.0946 % | | |

Key

| | |
|---|---|
| | User supplied data |
| | Determinand values ignored for classification, see column 'Conc. Not Used' for reason |
| | Determinand defined or amended by HazWasteOnline (see Appendix A) |
| | Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration |
| **<LOD** | Below limit of detection |
| **ND** | Not detected |
| CLP: Note 1 | Only the metal concentration has been used for classification |

## Supplementary Hazardous Property Information

**HP 3(i): Flammable** "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Solid waste without liquid phase

Hazard Statements hit:

**Flam. Liq. 3; H226** "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.013%)

## Classification of sample: TP20-09/12/2019-1.50m

**Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

## Sample details

Sample Name:
**TP20-09/12/2019-1.50m**
Moisture content:
**17.1%**
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

## Hazard properties

None identified

## Determinands

Moisture content: 17.1% Wet Weight Moisture Correction applied (MC)

| # | Determinand | CLP index number | EC Number | CAS Number | CLP Note | User entered data | Conv. Factor | Compound conc. | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | antimony { antimony trioxide } | 051-005-00-X | 215-175-0 | 1309-64-4 | | 13 mg/kg | 1.197 | 12.901 mg/kg | 0.00129 % | ✓ | |
| 2 | arsenic { arsenic pentoxide } | 033-004-00-6 | 215-116-9 | 1303-28-2 | | 18.7 mg/kg | 1.534 | 23.779 mg/kg | 0.00238 % | ✓ | |
| 3 | cadmium { cadmium oxide } | 048-002-00-0 | 215-146-2 | 1306-19-0 | | 0.4 mg/kg | 1.142 | 0.379 mg/kg | 0.0000379 % | ✓ | |
| 4 | chromium in chromium(III) compounds { chromium(III) oxide } | | 215-160-9 | 1308-38-9 | | 1194.5 mg/kg | 1.462 | 1447.292 mg/kg | 0.145 % | ✓ | |
| 5 | chromium in chromium(VI) compounds { chromium(VI) oxide } | 024-001-00-0 | 215-607-8 | 1333-82-0 | | <0.3 mg/kg | 1.923 | <0.577 mg/kg | <0.0000577 % | | <**LOD** |
| 6 | copper { dicopper oxide; copper (I) oxide } | 029-002-00-X | 215-270-7 | 1317-39-1 | | 124 mg/kg | 1.126 | 115.737 mg/kg | 0.0116 % | ✓ | |
| 7 | lead { lead compounds with the exception of those specified elsewhere in this Annex } | 082-001-00-6 | | | 1 | 71 mg/kg | | 58.859 mg/kg | 0.00589 % | ✓ | |
| 8 | mercury { mercury dichloride } | 080-010-00-X | 231-299-8 | 7487-94-7 | | <0.1 mg/kg | 1.353 | <0.135 mg/kg | <0.0000135 % | | <**LOD** |
| 9 | molybdenum { molybdenum(VI) oxide } | 042-001-00-9 | 215-204-7 | 1313-27-5 | | 1.3 mg/kg | 1.5 | 1.617 mg/kg | 0.000162 % | ✓ | |
| 10 | nickel { nickel chromate } | 028-035-00-7 | 238-766-5 | 14721-18-7 | | 104.9 mg/kg | 2.976 | 258.822 mg/kg | 0.0259 % | ✓ | |
| 11 | selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } | 034-002-00-8 | | | | <1 mg/kg | 2.554 | <2.554 mg/kg | <0.000255 % | | <**LOD** |
| 12 | zinc { zinc oxide } | 030-013-00-7 | 215-222-5 | 1314-13-2 | | 182 mg/kg | 1.245 | 187.8 mg/kg | 0.0188 % | ✓ | |
| 13 | TPH (C6 to C40) petroleum group | | | TPH | | 197 mg/kg | | 163.313 mg/kg | 0.0163 % | ✓ | |
| 14 | tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane | 603-181-00-X | 216-653-1 | 1634-04-4 | | <0.005 mg/kg | | <0.005 mg/kg | <0.0000005 % | | <**LOD** |

| # | | Determinand | | | CLP Note | User entered data | | Conv. Factor | Compound conc. | | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CLP index number | EC Number | CAS Number | | | | | | | | | |
| 15 | | benzene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-020-00-8 | 200-753-7 | 71-43-2 | | | | | | | | | |
| 16 | | toluene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-021-00-3 | 203-625-9 | 108-88-3 | | | | | | | | | |
| 17 | | ethylbenzene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-023-00-4 | 202-849-4 | 100-41-4 | | | | | | | | | |
| 18 | | xylene | | | | <0.01 | mg/kg | | <0.01 | mg/kg | <0.000001 % | | <LOD |
| | | 601-022-00-9 | 202-422-2 [1]<br>203-396-5 [2]<br>203-576-3 [3]<br>215-535-7 [4] | 95-47-6 [1]<br>106-42-3 [2]<br>108-38-3 [3]<br>1330-20-7 [4] | | | | | | | | | |
| 19 | | pH | | | | 7.82 | pH | | 7.82 | pH | 7.82 pH | | |
| | | | | PH | | | | | | | | | |
| 20 | | naphthalene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-052-00-2 | 202-049-5 | 91-20-3 | | | | | | | | | |
| 21 | | acenaphthylene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 205-917-1 | 208-96-8 | | | | | | | | | |
| 22 | | acenaphthene | | | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| | | | 201-469-6 | 83-32-9 | | | | | | | | | |
| 23 | | fluorene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 201-695-5 | 86-73-7 | | | | | | | | | |
| 24 | | phenanthrene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 201-581-5 | 85-01-8 | | | | | | | | | |
| 25 | | anthracene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 204-371-1 | 120-12-7 | | | | | | | | | |
| 26 | | fluoranthene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 205-912-4 | 206-44-0 | | | | | | | | | |
| 27 | | pyrene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 204-927-3 | 129-00-0 | | | | | | | | | |
| 28 | | benzo[a]anthracene | | | | <0.06 | mg/kg | | <0.06 | mg/kg | <0.000006 % | | <LOD |
| | | 601-033-00-9 | 200-280-6 | 56-55-3 | | | | | | | | | |
| 29 | | chrysene | | | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| | | 601-048-00-0 | 205-923-4 | 218-01-9 | | | | | | | | | |
| 30 | | benzo[b]fluoranthene | | | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| | | 601-034-00-4 | 205-911-9 | 205-99-2 | | | | | | | | | |
| 31 | | benzo[k]fluoranthene | | | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| | | 601-036-00-5 | 205-916-6 | 207-08-9 | | | | | | | | | |
| 32 | | benzo[a]pyrene; benzo[def]chrysene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-032-00-3 | 200-028-5 | 50-32-8 | | | | | | | | | |
| 33 | | indeno[123-cd]pyrene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-893-2 | 193-39-5 | | | | | | | | | |
| 34 | | dibenz[a,h]anthracene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-041-00-2 | 200-181-8 | 53-70-3 | | | | | | | | | |
| 35 | | benzo[ghi]perylene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-883-8 | 191-24-2 | | | | | | | | | |
| 36 | | polychlorobiphenyls; PCB | | | | <0.035 | mg/kg | | <0.035 | mg/kg | <0.0000035 % | | <LOD |
| | | 602-039-00-4 | 215-648-1 | 1336-36-3 | | | | | | | | | |
| 37 | | barium { barium oxide } | | | | 35 | mg/kg | 1.117 | 32.395 | mg/kg | 0.00324 % | ✓ | |
| | | | 215-127-9 | 1304-28-5 | | | | | | | | | |
| 38 | | coronene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-881-7 | 191-07-1 | | | | | | | | | |
| 39 | | benzo[j]fluoranthene | | | | <1 | mg/kg | | <1 | mg/kg | <0.0001 % | | <LOD |
| | | 601-035-00-X | 205-910-3 | 205-82-3 | | | | | | | | | |
| 40 | | asbestos | | | | <10 | mg/kg | | <10 | mg/kg | <0.001 % | | <LOD |
| | | 650-013-00-6 | - - - - - - - | 12001-28-4<br>132207-32-0<br>12172-73-5<br>77536-66-4<br>77536-68-6<br>77536-67-5<br>12001-29-5 | | | | | | | | | |

| # | | Determinand | | | CLP Note | User entered data | Conv. Factor | Compound conc. | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CLP index number | EC Number | CAS Number | | | | | | | |
| | | | | | | | | Total: | 0.232 % | | |

Key

| | |
|---|---|
| | User supplied data |
| | Determinand values ignored for classification, see column 'Conc. Not Used' for reason |
| | Determinand defined or amended by HazWasteOnline (see Appendix A) |
| | Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration |
| **<LOD** | Below limit of detection |
| **ND** | Not detected |
| CLP: Note 1 | Only the metal concentration has been used for classification |

## Supplementary Hazardous Property Information

**HP 3(i): Flammable** "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Solid waste without liquid phase

Hazard Statements hit:

**Flam. Liq. 3; H226** "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0163%)

## Classification of sample: TP21-09/12/2019-0.50m

**Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

## Sample details

Sample Name:
**TP21-09/12/2019-0.50m**
Moisture content:
**6.8%**
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

## Hazard properties

None identified

## Determinands

Moisture content: 6.8% Wet Weight Moisture Correction applied (MC)

| # | Determinand | CLP index number | EC Number | CAS Number | CLP Note | User entered data | Conv. Factor | Compound conc. | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | antimony { antimony trioxide } | 051-005-00-X | 215-175-0 | 1309-64-4 | | 1 mg/kg | 1.197 | 1.116 mg/kg | 0.000112 % | ✓ | |
| 2 | arsenic { arsenic pentoxide } | 033-004-00-6 | 215-116-9 | 1303-28-2 | | 14.6 mg/kg | 1.534 | 20.872 mg/kg | 0.00209 % | ✓ | |
| 3 | cadmium { cadmium oxide } | 048-002-00-0 | 215-146-2 | 1306-19-0 | | 0.1 mg/kg | 1.142 | 0.106 mg/kg | 0.0000106 % | ✓ | |
| 4 | chromium in chromium(III) compounds { chromium(III) oxide } | | 215-160-9 | 1308-38-9 | | 46.3 mg/kg | 1.462 | 63.068 mg/kg | 0.00631 % | ✓ | |
| 5 | chromium in chromium(VI) compounds { chromium(VI) oxide } | 024-001-00-0 | 215-607-8 | 1333-82-0 | | <0.3 mg/kg | 1.923 | <0.577 mg/kg | <0.0000577 % | | <**LOD** |
| 6 | copper { dicopper oxide; copper (I) oxide } | 029-002-00-X | 215-270-7 | 1317-39-1 | | 86 mg/kg | 1.126 | 90.242 mg/kg | 0.00902 % | ✓ | |
| 7 | lead { lead compounds with the exception of those specified elsewhere in this Annex } | 082-001-00-6 | | | 1 | 53 mg/kg | | 49.396 mg/kg | 0.00494 % | ✓ | |
| 8 | mercury { mercury dichloride } | 080-010-00-X | 231-299-8 | 7487-94-7 | | <0.1 mg/kg | 1.353 | <0.135 mg/kg | <0.0000135 % | | <**LOD** |
| 9 | molybdenum { molybdenum(VI) oxide } | 042-001-00-9 | 215-204-7 | 1313-27-5 | | 1.4 mg/kg | 1.5 | 1.957 mg/kg | 0.000196 % | ✓ | |
| 10 | nickel { nickel chromate } | 028-035-00-7 | 238-766-5 | 14721-18-7 | | 22.1 mg/kg | 2.976 | 61.303 mg/kg | 0.00613 % | ✓ | |
| 11 | selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } | 034-002-00-8 | | | | <1 mg/kg | 2.554 | <2.554 mg/kg | <0.000255 % | | <**LOD** |
| 12 | zinc { zinc oxide } | 030-013-00-7 | 215-222-5 | 1314-13-2 | | 357 mg/kg | 1.245 | 414.146 mg/kg | 0.0414 % | ✓ | |
| 13 | TPH (C6 to C40) petroleum group | | | TPH | | 263 mg/kg | | 245.116 mg/kg | 0.0245 % | ✓ | |
| 14 | tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane | 603-181-00-X | 216-653-1 | 1634-04-4 | | <0.005 mg/kg | | <0.005 mg/kg | <0.0000005 % | | <**LOD** |

| # | | Determinand | | | CLP Note | User entered data | | Conv. Factor | Compound conc. | | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CLP index number | EC Number | CAS Number | | | | | | | | | |
| 15 | | benzene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-020-00-8 | 200-753-7 | 71-43-2 | | | | | | | | | |
| 16 | | toluene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-021-00-3 | 203-625-9 | 108-88-3 | | | | | | | | | |
| 17 | | ethylbenzene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-023-00-4 | 202-849-4 | 100-41-4 | | | | | | | | | |
| 18 | | xylene | | | | <0.01 | mg/kg | | <0.01 | mg/kg | <0.000001 % | | <LOD |
| | | 601-022-00-9 | 202-422-2 [1]<br>203-396-5 [2]<br>203-576-3 [3]<br>215-535-7 [4] | 95-47-6 [1]<br>106-42-3 [2]<br>108-38-3 [3]<br>1330-20-7 [4] | | | | | | | | | |
| 19 | | pH | | | | 8.34 | pH | | 8.34 | pH | 8.34 pH | | |
| | | | | PH | | | | | | | | | |
| 20 | | naphthalene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-052-00-2 | 202-049-5 | 91-20-3 | | | | | | | | | |
| 21 | | acenaphthylene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 205-917-1 | 208-96-8 | | | | | | | | | |
| 22 | | acenaphthene | | | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| | | | 201-469-6 | 83-32-9 | | | | | | | | | |
| 23 | | fluorene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 201-695-5 | 86-73-7 | | | | | | | | | |
| 24 | | phenanthrene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 201-581-5 | 85-01-8 | | | | | | | | | |
| 25 | | anthracene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 204-371-1 | 120-12-7 | | | | | | | | | |
| 26 | | fluoranthene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 205-912-4 | 206-44-0 | | | | | | | | | |
| 27 | | pyrene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 204-927-3 | 129-00-0 | | | | | | | | | |
| 28 | | benzo[a]anthracene | | | | <0.06 | mg/kg | | <0.06 | mg/kg | <0.000006 % | | <LOD |
| | | 601-033-00-9 | 200-280-6 | 56-55-3 | | | | | | | | | |
| 29 | | chrysene | | | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| | | 601-048-00-0 | 205-923-4 | 218-01-9 | | | | | | | | | |
| 30 | | benzo[b]fluoranthene | | | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| | | 601-034-00-4 | 205-911-9 | 205-99-2 | | | | | | | | | |
| 31 | | benzo[k]fluoranthene | | | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| | | 601-036-00-5 | 205-916-6 | 207-08-9 | | | | | | | | | |
| 32 | | benzo[a]pyrene; benzo[def]chrysene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-032-00-3 | 200-028-5 | 50-32-8 | | | | | | | | | |
| 33 | | indeno[123-cd]pyrene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-893-2 | 193-39-5 | | | | | | | | | |
| 34 | | dibenz[a,h]anthracene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-041-00-2 | 200-181-8 | 53-70-3 | | | | | | | | | |
| 35 | | benzo[ghi]perylene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-883-8 | 191-24-2 | | | | | | | | | |
| 36 | | polychlorobiphenyls; PCB | | | | <0.035 | mg/kg | | <0.035 | mg/kg | <0.0000035 % | | <LOD |
| | | 602-039-00-4 | 215-648-1 | 1336-36-3 | | | | | | | | | |
| 37 | | barium { barium oxide } | | | | 21 | mg/kg | 1.117 | 21.852 | mg/kg | 0.00219 % | ✓ | |
| | | | 215-127-9 | 1304-28-5 | | | | | | | | | |
| 38 | | coronene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-881-7 | 191-07-1 | | | | | | | | | |
| 39 | | benzo[j]fluoranthene | | | | <1 | mg/kg | | <1 | mg/kg | <0.0001 % | | <LOD |
| | | 601-035-00-X | 205-910-3 | 205-82-3 | | | | | | | | | |
| | | | | | | | | | | Total: | 0.0974 % | | |

| Key | |
|---|---|
| | User supplied data |
| | Determinand values ignored for classification, see column 'Conc. Not Used' for reason |
| | Determinand defined or amended by HazWasteOnline (see Appendix A) |
| | Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration |
| **<LOD** | Below limit of detection |
| **ND** | Not detected |
| CLP: Note 1 | Only the metal concentration has been used for classification |

## Supplementary Hazardous Property Information

**HP 3(i): Flammable** "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Solid waste without liquid phase

Hazard Statements hit:

**Flam. Liq. 3; H226** "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0245%)

## Classification of sample: TP21-09/12/2019-1.50m

**Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

## Sample details

Sample Name:
**TP21-09/12/2019-1.50m**
Moisture content:
**33.9%**
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

## Hazard properties

None identified

## Determinands

Moisture content: 33.9% Wet Weight Moisture Correction applied (MC)

| # | Determinand | CLP index number | EC Number | CAS Number | CLP Note | User entered data | | Conv. Factor | Compound conc. | | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | antimony { antimony trioxide } | 051-005-00-X | 215-175-0 | 1309-64-4 | | 1 | mg/kg | 1.197 | 0.791 | mg/kg | 0.0000791 % | ✓ | |
| 2 | arsenic { arsenic pentoxide } | 033-004-00-6 | 215-116-9 | 1303-28-2 | | 48.8 | mg/kg | 1.534 | 49.478 | mg/kg | 0.00495 % | ✓ | |
| 3 | cadmium { cadmium oxide } | 048-002-00-0 | 215-146-2 | 1306-19-0 | | <0.1 | mg/kg | 1.142 | <0.114 | mg/kg | <0.0000114 % | | <**LOD** |
| 4 | chromium in chromium(III) compounds { chromium(III) oxide } | | 215-160-9 | 1308-38-9 | | 40.4 | mg/kg | 1.462 | 39.03 | mg/kg | 0.0039 % | ✓ | |
| 5 | chromium in chromium(VI) compounds { chromium(VI) oxide } | 024-001-00-0 | 215-607-8 | 1333-82-0 | | <0.3 | mg/kg | 1.923 | <0.577 | mg/kg | <0.0000577 % | | <**LOD** |
| 6 | copper { dicopper oxide; copper (I) oxide } | 029-002-00-X | 215-270-7 | 1317-39-1 | | 28 | mg/kg | 1.126 | 20.838 | mg/kg | 0.00208 % | ✓ | |
| 7 | lead { lead compounds with the exception of those specified elsewhere in this Annex } | 082-001-00-6 | | | 1 | 46 | mg/kg | | 30.406 | mg/kg | 0.00304 % | ✓ | |
| 8 | mercury { mercury dichloride } | 080-010-00-X | 231-299-8 | 7487-94-7 | | <0.1 | mg/kg | 1.353 | <0.135 | mg/kg | <0.0000135 % | | <**LOD** |
| 9 | molybdenum { molybdenum(VI) oxide } | 042-001-00-9 | 215-204-7 | 1313-27-5 | | 0.8 | mg/kg | 1.5 | 0.793 | mg/kg | 0.0000793 % | ✓ | |
| 10 | nickel { nickel chromate } | 028-035-00-7 | 238-766-5 | 14721-18-7 | | 21 | mg/kg | 2.976 | 41.314 | mg/kg | 0.00413 % | ✓ | |
| 11 | selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } | 034-002-00-8 | | | | 5 | mg/kg | 2.554 | 8.44 | mg/kg | 0.000844 % | ✓ | |
| 12 | zinc { zinc oxide } | 030-013-00-7 | 215-222-5 | 1314-13-2 | | 103 | mg/kg | 1.245 | 84.744 | mg/kg | 0.00847 % | ✓ | |
| 13 | TPH (C6 to C40) petroleum group | | | TPH | | <52 | mg/kg | | <52 | mg/kg | <0.0052 % | | <**LOD** |
| 14 | tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane | 603-181-00-X | 216-653-1 | 1634-04-4 | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <**LOD** |

| # | | Determinand | | | CLP Note | User entered data | | Conv. Factor | Compound conc. | | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CLP index number | EC Number | CAS Number | | | | | | | | | |
| 15 | | benzene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-020-00-8 | 200-753-7 | 71-43-2 | | | | | | | | | |
| 16 | | toluene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-021-00-3 | 203-625-9 | 108-88-3 | | | | | | | | | |
| 17 | | ethylbenzene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-023-00-4 | 202-849-4 | 100-41-4 | | | | | | | | | |
| 18 | | xylene | | | | <0.01 | mg/kg | | <0.01 | mg/kg | <0.000001 % | | <LOD |
| | | 601-022-00-9 | 202-422-2 [1]<br>203-396-5 [2]<br>203-576-3 [3]<br>215-535-7 [4] | 95-47-6 [1]<br>106-42-3 [2]<br>108-38-3 [3]<br>1330-20-7 [4] | | | | | | | | | |
| 19 | | pH | | | | 7.12 | pH | | 7.12 | pH | 7.12 pH | | |
| | | | | PH | | | | | | | | | |
| 20 | | naphthalene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-052-00-2 | 202-049-5 | 91-20-3 | | | | | | | | | |
| 21 | | acenaphthylene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 205-917-1 | 208-96-8 | | | | | | | | | |
| 22 | | acenaphthene | | | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| | | | 201-469-6 | 83-32-9 | | | | | | | | | |
| 23 | | fluorene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 201-695-5 | 86-73-7 | | | | | | | | | |
| 24 | | phenanthrene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 201-581-5 | 85-01-8 | | | | | | | | | |
| 25 | | anthracene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 204-371-1 | 120-12-7 | | | | | | | | | |
| 26 | | fluoranthene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 205-912-4 | 206-44-0 | | | | | | | | | |
| 27 | | pyrene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 204-927-3 | 129-00-0 | | | | | | | | | |
| 28 | | benzo[a]anthracene | | | | <0.06 | mg/kg | | <0.06 | mg/kg | <0.000006 % | | <LOD |
| | | 601-033-00-9 | 200-280-6 | 56-55-3 | | | | | | | | | |
| 29 | | chrysene | | | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| | | 601-048-00-0 | 205-923-4 | 218-01-9 | | | | | | | | | |
| 30 | | benzo[b]fluoranthene | | | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| | | 601-034-00-4 | 205-911-9 | 205-99-2 | | | | | | | | | |
| 31 | | benzo[k]fluoranthene | | | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| | | 601-036-00-5 | 205-916-6 | 207-08-9 | | | | | | | | | |
| 32 | | benzo[a]pyrene; benzo[def]chrysene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-032-00-3 | 200-028-5 | 50-32-8 | | | | | | | | | |
| 33 | | indeno[123-cd]pyrene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-893-2 | 193-39-5 | | | | | | | | | |
| 34 | | dibenz[a,h]anthracene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-041-00-2 | 200-181-8 | 53-70-3 | | | | | | | | | |
| 35 | | benzo[ghi]perylene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-883-8 | 191-24-2 | | | | | | | | | |
| 36 | | polychlorobiphenyls; PCB | | | | <0.035 | mg/kg | | <0.035 | mg/kg | <0.0000035 % | | <LOD |
| | | 602-039-00-4 | 215-648-1 | 1336-36-3 | | | | | | | | | |
| 37 | | barium { barium oxide } | | | | 52 | mg/kg | 1.117 | 38.377 | mg/kg | 0.00384 % | ✓ | |
| | | | 215-127-9 | 1304-28-5 | | | | | | | | | |
| 38 | | coronene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-881-7 | 191-07-1 | | | | | | | | | |
| 39 | | benzo[j]fluoranthene | | | | <1 | mg/kg | | <1 | mg/kg | <0.0001 % | | <LOD |
| | | 601-035-00-X | 205-910-3 | 205-82-3 | | | | | | | | | |
| | | | | | | | | | | Total: | 0.0369 % | | |

Key

| | |
|---|---|
| | User supplied data |
| | Determinand values ignored for classification, see column 'Conc. Not Used' for reason |
| | Determinand defined or amended by HazWasteOnline (see Appendix A) |
| | Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration |
| **<LOD** | Below limit of detection |
| **ND** | Not detected |
| CLP: Note 1 | Only the metal concentration has been used for classification |

## Classification of sample: TP22-09/12/2019-0.50m

**Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

## Sample details

Sample Name:
**TP22-09/12/2019-0.50m**
Moisture content:
**22.2%**
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

## Hazard properties

None identified

## Determinands

Moisture content: 22.2% Wet Weight Moisture Correction applied (MC)

| # | Determinand | CLP index number | EC Number | CAS Number | CLP Note | User entered data | Conv. Factor | Compound conc. | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | antimony { antimony trioxide } | 051-005-00-X | 215-175-0 | 1309-64-4 | | 4 mg/kg | 1.197 | 3.725 mg/kg | 0.000373 % | ✓ | |
| 2 | arsenic { arsenic pentoxide } | 033-004-00-6 | 215-116-9 | 1303-28-2 | | 30.4 mg/kg | 1.534 | 36.278 mg/kg | 0.00363 % | ✓ | |
| 3 | cadmium { cadmium oxide } | 048-002-00-0 | 215-146-2 | 1306-19-0 | | 0.3 mg/kg | 1.142 | 0.267 mg/kg | 0.0000267 % | ✓ | |
| 4 | chromium in chromium(III) compounds { chromium(III) oxide } | | 215-160-9 | 1308-38-9 | | 23.6 mg/kg | 1.462 | 26.835 mg/kg | 0.00268 % | ✓ | |
| 5 | chromium in chromium(VI) compounds { chromium(VI) oxide } | 024-001-00-0 | 215-607-8 | 1333-82-0 | | <0.3 mg/kg | 1.923 | <0.577 mg/kg | <0.0000577 % | | <**LOD** |
| 6 | copper { dicopper oxide; copper (I) oxide } | 029-002-00-X | 215-270-7 | 1317-39-1 | | 99 mg/kg | 1.126 | 86.718 mg/kg | 0.00867 % | ✓ | |
| 7 | lead { lead compounds with the exception of those specified elsewhere in this Annex } | 082-001-00-6 | | | 1 | 244 mg/kg | | 189.832 mg/kg | 0.019 % | ✓ | |
| 8 | mercury { mercury dichloride } | 080-010-00-X | 231-299-8 | 7487-94-7 | | <0.1 mg/kg | 1.353 | <0.135 mg/kg | <0.0000135 % | | <**LOD** |
| 9 | molybdenum { molybdenum(VI) oxide } | 042-001-00-9 | 215-204-7 | 1313-27-5 | | 1.2 mg/kg | 1.5 | 1.401 mg/kg | 0.00014 % | ✓ | |
| 10 | nickel { nickel chromate } | 028-035-00-7 | 238-766-5 | 14721-18-7 | | 14 mg/kg | 2.976 | 32.417 mg/kg | 0.00324 % | ✓ | |
| 11 | selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } | 034-002-00-8 | | | | 1 mg/kg | 2.554 | 1.987 mg/kg | 0.000199 % | ✓ | |
| 12 | zinc { zinc oxide } | 030-013-00-7 | 215-222-5 | 1314-13-2 | | 132 mg/kg | 1.245 | 127.827 mg/kg | 0.0128 % | ✓ | |
| 13 | TPH (C6 to C40) petroleum group | | | TPH | | 143 mg/kg | | 111.254 mg/kg | 0.0111 % | ✓ | |
| 14 | tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane | 603-181-00-X | 216-653-1 | 1634-04-4 | | <0.005 mg/kg | | <0.005 mg/kg | <0.0000005 % | | <**LOD** |

| # | Determinand | CLP index number | EC Number | CAS Number | CLP Note | User entered data | | Conv. Factor | Compound conc. | | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | benzene | 601-020-00-8 | 200-753-7 | 71-43-2 | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| 16 | toluene | 601-021-00-3 | 203-625-9 | 108-88-3 | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| 17 | ethylbenzene | 601-023-00-4 | 202-849-4 | 100-41-4 | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| 18 | xylene | 601-022-00-9 | 202-422-2 [1]<br>203-396-5 [2]<br>203-576-3 [3]<br>215-535-7 [4] | 95-47-6 [1]<br>106-42-3 [2]<br>108-38-3 [3]<br>1330-20-7 [4] | | <0.01 | mg/kg | | <0.01 | mg/kg | <0.000001 % | | <LOD |
| 19 | pH | | | PH | | 9.59 | pH | | 9.59 | pH | 9.59 pH | | |
| 20 | naphthalene | 601-052-00-2 | 202-049-5 | 91-20-3 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 21 | acenaphthylene | | 205-917-1 | 208-96-8 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| 22 | acenaphthene | | 201-469-6 | 83-32-9 | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| 23 | fluorene | | 201-695-5 | 86-73-7 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 24 | phenanthrene | | 201-581-5 | 85-01-8 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| 25 | anthracene | | 204-371-1 | 120-12-7 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 26 | fluoranthene | | 205-912-4 | 206-44-0 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| 27 | pyrene | | 204-927-3 | 129-00-0 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| 28 | benzo[a]anthracene | 601-033-00-9 | 200-280-6 | 56-55-3 | | <0.06 | mg/kg | | <0.06 | mg/kg | <0.000006 % | | <LOD |
| 29 | chrysene | 601-048-00-0 | 205-923-4 | 218-01-9 | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| 30 | benzo[b]fluoranthene | 601-034-00-4 | 205-911-9 | 205-99-2 | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| 31 | benzo[k]fluoranthene | 601-036-00-5 | 205-916-6 | 207-08-9 | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| 32 | benzo[a]pyrene; benzo[def]chrysene | 601-032-00-3 | 200-028-5 | 50-32-8 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 33 | indeno[123-cd]pyrene | | 205-893-2 | 193-39-5 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 34 | dibenz[a,h]anthracene | 601-041-00-2 | 200-181-8 | 53-70-3 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 35 | benzo[ghi]perylene | | 205-883-8 | 191-24-2 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 36 | polychlorobiphenyls; PCB | 602-039-00-4 | 215-648-1 | 1336-36-3 | | <0.035 | mg/kg | | <0.035 | mg/kg | <0.0000035 % | | <LOD |
| 37 | barium { barium oxide } | | 215-127-9 | 1304-28-5 | | 34 | mg/kg | 1.117 | 29.534 | mg/kg | 0.00295 % | ✓ | |
| 38 | coronene | | 205-881-7 | 191-07-1 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 39 | benzo[j]fluoranthene | 601-035-00-X | 205-910-3 | 205-82-3 | | <1 | mg/kg | | <1 | mg/kg | <0.0001 % | | <LOD |
| | | | | | | | | | | Total: | 0.065 % | | |

| Key | |
|---|---|
| | User supplied data |
| | Determinand values ignored for classification, see column 'Conc. Not Used' for reason |
| | Determinand defined or amended by HazWasteOnline (see Appendix A) |
| | Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration |
| **<LOD** | Below limit of detection |
| **ND** | Not detected |
| CLP: Note 1 | Only the metal concentration has been used for classification |

## Supplementary Hazardous Property Information

**HP 3(i): Flammable** "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Solid waste without liquid phase

Hazard Statements hit:

**Flam. Liq. 3; H226** "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0111%)

## Classification of sample: TP24-09/12/2019-0.50m

**Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

## Sample details

Sample Name:
**TP24-09/12/2019-0.50m**
Moisture content:
**8.6%**
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

## Hazard properties

None identified

## Determinands

Moisture content: 8.6% Wet Weight Moisture Correction applied (MC)

| # | Determinand | CLP index number | EC Number | CAS Number | CLP Note | User entered data | Conv. Factor | Compound conc. | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | antimony { antimony trioxide } | 051-005-00-X | 215-175-0 | 1309-64-4 | | 1 mg/kg | 1.197 | 1.094 mg/kg | 0.000109 % | ✓ | |
| 2 | arsenic { arsenic pentoxide } | 033-004-00-6 | 215-116-9 | 1303-28-2 | | 20.9 mg/kg | 1.534 | 29.301 mg/kg | 0.00293 % | ✓ | |
| 3 | cadmium { cadmium oxide } | 048-002-00-0 | 215-146-2 | 1306-19-0 | | 0.2 mg/kg | 1.142 | 0.209 mg/kg | 0.0000209 % | ✓ | |
| 4 | chromium in chromium(III) compounds { chromium(III) oxide } | | 215-160-9 | 1308-38-9 | | 28.2 mg/kg | 1.462 | 37.671 mg/kg | 0.00377 % | ✓ | |
| 5 | chromium in chromium(VI) compounds { chromium(VI) oxide } | 024-001-00-0 | 215-607-8 | 1333-82-0 | | <0.3 mg/kg | 1.923 | <0.577 mg/kg | <0.0000577 % | | <**LOD** |
| 6 | copper { dicopper oxide; copper (I) oxide } | 029-002-00-X | 215-270-7 | 1317-39-1 | | 75 mg/kg | 1.126 | 77.18 mg/kg | 0.00772 % | ✓ | |
| 7 | lead { lead compounds with the exception of those specified elsewhere in this Annex } | 082-001-00-6 | | | 1 | 98 mg/kg | | 89.572 mg/kg | 0.00896 % | ✓ | |
| 8 | mercury { mercury dichloride } | 080-010-00-X | 231-299-8 | 7487-94-7 | | <0.1 mg/kg | 1.353 | <0.135 mg/kg | <0.0000135 % | | <**LOD** |
| 9 | molybdenum { molybdenum(VI) oxide } | 042-001-00-9 | 215-204-7 | 1313-27-5 | | 0.9 mg/kg | 1.5 | 1.234 mg/kg | 0.000123 % | ✓ | |
| 10 | nickel { nickel chromate } | 028-035-00-7 | 238-766-5 | 14721-18-7 | | 20.7 mg/kg | 2.976 | 56.31 mg/kg | 0.00563 % | ✓ | |
| 11 | selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } | 034-002-00-8 | | | | <1 mg/kg | 2.554 | <2.554 mg/kg | <0.000255 % | | <**LOD** |
| 12 | zinc { zinc oxide } | 030-013-00-7 | 215-222-5 | 1314-13-2 | | 235 mg/kg | 1.245 | 267.352 mg/kg | 0.0267 % | ✓ | |
| 13 | TPH (C6 to C40) petroleum group | | | TPH | | 149 mg/kg | | 136.186 mg/kg | 0.0136 % | ✓ | |
| 14 | tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane | 603-181-00-X | 216-653-1 | 1634-04-4 | | <0.005 mg/kg | | <0.005 mg/kg | <0.0000005 % | | <**LOD** |

| # | | Determinand | | | CLP Note | User entered data | | Conv. Factor | Compound conc. | | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CLP index number | EC Number | CAS Number | | | | | | | | | |
| 15 | | benzene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-020-00-8 | 200-753-7 | 71-43-2 | | | | | | | | | |
| 16 | | toluene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-021-00-3 | 203-625-9 | 108-88-3 | | | | | | | | | |
| 17 | | ethylbenzene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-023-00-4 | 202-849-4 | 100-41-4 | | | | | | | | | |
| 18 | | xylene | | | | <0.01 | mg/kg | | <0.01 | mg/kg | <0.000001 % | | <LOD |
| | | 601-022-00-9 | 202-422-2 [1]<br>203-396-5 [2]<br>203-576-3 [3]<br>215-535-7 [4] | 95-47-6 [1]<br>106-42-3 [2]<br>108-38-3 [3]<br>1330-20-7 [4] | | | | | | | | | |
| 19 | | pH | | | | 8.04 | pH | | 8.04 | pH | 8.04 pH | | |
| | | | | PH | | | | | | | | | |
| 20 | | naphthalene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-052-00-2 | 202-049-5 | 91-20-3 | | | | | | | | | |
| 21 | | acenaphthylene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 205-917-1 | 208-96-8 | | | | | | | | | |
| 22 | | acenaphthene | | | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| | | | 201-469-6 | 83-32-9 | | | | | | | | | |
| 23 | | fluorene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 201-695-5 | 86-73-7 | | | | | | | | | |
| 24 | | phenanthrene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 201-581-5 | 85-01-8 | | | | | | | | | |
| 25 | | anthracene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 204-371-1 | 120-12-7 | | | | | | | | | |
| 26 | | fluoranthene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 205-912-4 | 206-44-0 | | | | | | | | | |
| 27 | | pyrene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 204-927-3 | 129-00-0 | | | | | | | | | |
| 28 | | benzo[a]anthracene | | | | <0.06 | mg/kg | | <0.06 | mg/kg | <0.000006 % | | <LOD |
| | | 601-033-00-9 | 200-280-6 | 56-55-3 | | | | | | | | | |
| 29 | | chrysene | | | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| | | 601-048-00-0 | 205-923-4 | 218-01-9 | | | | | | | | | |
| 30 | | benzo[b]fluoranthene | | | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| | | 601-034-00-4 | 205-911-9 | 205-99-2 | | | | | | | | | |
| 31 | | benzo[k]fluoranthene | | | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| | | 601-036-00-5 | 205-916-6 | 207-08-9 | | | | | | | | | |
| 32 | | benzo[a]pyrene; benzo[def]chrysene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-032-00-3 | 200-028-5 | 50-32-8 | | | | | | | | | |
| 33 | | indeno[123-cd]pyrene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-893-2 | 193-39-5 | | | | | | | | | |
| 34 | | dibenz[a,h]anthracene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-041-00-2 | 200-181-8 | 53-70-3 | | | | | | | | | |
| 35 | | benzo[ghi]perylene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-883-8 | 191-24-2 | | | | | | | | | |
| 36 | | polychlorobiphenyls; PCB | | | | <0.035 | mg/kg | | <0.035 | mg/kg | <0.0000035 % | | <LOD |
| | | 602-039-00-4 | 215-648-1 | 1336-36-3 | | | | | | | | | |
| 37 | | barium { barium oxide } | | | | 36 | mg/kg | 1.117 | 36.738 | mg/kg | 0.00367 % | ✓ | |
| | | | 215-127-9 | 1304-28-5 | | | | | | | | | |
| 38 | | coronene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-881-7 | 191-07-1 | | | | | | | | | |
| 39 | | benzo[j]fluoranthene | | | | <1 | mg/kg | | <1 | mg/kg | <0.0001 % | | <LOD |
| | | 601-035-00-X | 205-910-3 | 205-82-3 | | | | | | | | | |
| 40 | | asbestos | | | | <10 | mg/kg | | <10 | mg/kg | <0.001 % | | <LOD |
| | | 650-013-00-6 | - - - - - - - | 12001-28-4<br>132207-32-0<br>12172-73-5<br>77536-66-4<br>77536-68-6<br>77536-67-5<br>12001-29-5 | | | | | | | | | |

| # | | Determinand | | | CLP Note | User entered data | Conv. Factor | Compound conc. | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CLP index number | EC Number | CAS Number | | | | | | | |
| | | | | | | | | Total: | 0.0748 % | | |

Key

| | |
|---|---|
| | User supplied data |
| | Determinand values ignored for classification, see column 'Conc. Not Used' for reason |
| | Determinand defined or amended by HazWasteOnline (see Appendix A) |
| | Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration |
| **<LOD** | Below limit of detection |
| **ND** | Not detected |
| CLP: Note 1 | Only the metal concentration has been used for classification |

## Supplementary Hazardous Property Information

**HP 3(i): Flammable** "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Solid waste without liquid phase

Hazard Statements hit:

**Flam. Liq. 3; H226** "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0136%)

## Classification of sample: TP24-09/12/2019-1.50m

**Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

## Sample details

Sample Name:
**TP24-09/12/2019-1.50m**
Moisture content:
**45.7%**
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

## Hazard properties

None identified

## Determinands

Moisture content: 45.7% Wet Weight Moisture Correction applied (MC)

| # | | Determinand | CLP index number | EC Number | CAS Number | CLP Note | User entered data | | Conv. Factor | Compound conc. | | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | antimony { antimony trioxide } | 051-005-00-X | 215-175-0 | 1309-64-4 | | 3 | mg/kg | 1.197 | 1.95 | mg/kg | 0.000195 % | ✓ | |
| 2 | | arsenic { arsenic pentoxide } | 033-004-00-6 | 215-116-9 | 1303-28-2 | | 55.8 | mg/kg | 1.534 | 46.476 | mg/kg | 0.00465 % | ✓ | |
| 3 | | cadmium { cadmium oxide } | 048-002-00-0 | 215-146-2 | 1306-19-0 | | 0.7 | mg/kg | 1.142 | 0.434 | mg/kg | 0.0000434 % | ✓ | |
| 4 | | chromium in chromium(III) compounds { chromium(III) oxide } | | 215-160-9 | 1308-38-9 | | 75.8 | mg/kg | 1.462 | 60.157 | mg/kg | 0.00602 % | ✓ | |
| 5 | | chromium in chromium(VI) compounds { chromium(VI) oxide } | 024-001-00-0 | 215-607-8 | 1333-82-0 | | <0.3 | mg/kg | 1.923 | <0.577 | mg/kg | <0.0000577 % | | **<LOD** |
| 6 | | copper { dicopper oxide; copper (I) oxide } | 029-002-00-X | 215-270-7 | 1317-39-1 | | 118 | mg/kg | 1.126 | 72.14 | mg/kg | 0.00721 % | ✓ | |
| 7 | | lead { lead compounds with the exception of those specified elsewhere in this Annex } | 082-001-00-6 | | | 1 | 364 | mg/kg | | 197.652 | mg/kg | 0.0198 % | ✓ | |
| 8 | | mercury { mercury dichloride } | 080-010-00-X | 231-299-8 | 7487-94-7 | | <0.1 | mg/kg | 1.353 | <0.135 | mg/kg | <0.0000135 % | | **<LOD** |
| 9 | | molybdenum { molybdenum(VI) oxide } | 042-001-00-9 | 215-204-7 | 1313-27-5 | | 4.8 | mg/kg | 1.5 | 3.91 | mg/kg | 0.000391 % | ✓ | |
| 10 | | nickel { nickel chromate } | 028-035-00-7 | 238-766-5 | 14721-18-7 | | 27.6 | mg/kg | 2.976 | 44.605 | mg/kg | 0.00446 % | ✓ | |
| 11 | | selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } | 034-002-00-8 | | | | 2 | mg/kg | 2.554 | 2.773 | mg/kg | 0.000277 % | ✓ | |
| 12 | | zinc { zinc oxide } | 030-013-00-7 | 215-222-5 | 1314-13-2 | | 260 | mg/kg | 1.245 | 175.729 | mg/kg | 0.0176 % | ✓ | |
| 13 | | TPH (C6 to C40) petroleum group | | | TPH | | 70 | mg/kg | | 38.01 | mg/kg | 0.0038 % | ✓ | |
| 14 | | tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane | 603-181-00-X | 216-653-1 | 1634-04-4 | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | **<LOD** |

| # | | Determinand | CLP index number | EC Number | CAS Number | CLP Note | User entered data | | Conv. Factor | Compound conc. | | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | | benzene | 601-020-00-8 | 200-753-7 | 71-43-2 | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <**LOD** |
| 16 | | toluene | 601-021-00-3 | 203-625-9 | 108-88-3 | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <**LOD** |
| 17 | | ethylbenzene | 601-023-00-4 | 202-849-4 | 100-41-4 | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <**LOD** |
| 18 | | xylene | 601-022-00-9 | 202-422-2 [1]<br>203-396-5 [2]<br>203-576-3 [3]<br>215-535-7 [4] | 95-47-6 [1]<br>106-42-3 [2]<br>108-38-3 [3]<br>1330-20-7 [4] | | <0.01 | mg/kg | | <0.01 | mg/kg | <0.000001 % | | <**LOD** |
| 19 | | pH | | | PH | | 6.69 | pH | | 6.69 | pH | 6.69 pH | | |
| 20 | | naphthalene | 601-052-00-2 | 202-049-5 | 91-20-3 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <**LOD** |
| 21 | | acenaphthylene | | 205-917-1 | 208-96-8 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <**LOD** |
| 22 | | acenaphthene | | 201-469-6 | 83-32-9 | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <**LOD** |
| 23 | | fluorene | | 201-695-5 | 86-73-7 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <**LOD** |
| 24 | | phenanthrene | | 201-581-5 | 85-01-8 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <**LOD** |
| 25 | | anthracene | | 204-371-1 | 120-12-7 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <**LOD** |
| 26 | | fluoranthene | | 205-912-4 | 206-44-0 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <**LOD** |
| 27 | | pyrene | | 204-927-3 | 129-00-0 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <**LOD** |
| 28 | | benzo[a]anthracene | 601-033-00-9 | 200-280-6 | 56-55-3 | | <0.06 | mg/kg | | <0.06 | mg/kg | <0.000006 % | | <**LOD** |
| 29 | | chrysene | 601-048-00-0 | 205-923-4 | 218-01-9 | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <**LOD** |
| 30 | | benzo[b]fluoranthene | 601-034-00-4 | 205-911-9 | 205-99-2 | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <**LOD** |
| 31 | | benzo[k]fluoranthene | 601-036-00-5 | 205-916-6 | 207-08-9 | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <**LOD** |
| 32 | | benzo[a]pyrene; benzo[def]chrysene | 601-032-00-3 | 200-028-5 | 50-32-8 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <**LOD** |
| 33 | | indeno[123-cd]pyrene | | 205-893-2 | 193-39-5 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <**LOD** |
| 34 | | dibenz[a,h]anthracene | 601-041-00-2 | 200-181-8 | 53-70-3 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <**LOD** |
| 35 | | benzo[ghi]perylene | | 205-883-8 | 191-24-2 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <**LOD** |
| 36 | | polychlorobiphenyls; PCB | 602-039-00-4 | 215-648-1 | 1336-36-3 | | <0.035 | mg/kg | | <0.035 | mg/kg | <0.0000035 % | | <**LOD** |
| 37 | | barium { barium oxide } | | 215-127-9 | 1304-28-5 | | 92 | mg/kg | 1.117 | 55.776 | mg/kg | 0.00558 % | ✓ | |
| 38 | | coronene | | 205-881-7 | 191-07-1 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <**LOD** |
| 39 | | benzo[j]fluoranthene | 601-035-00-X | 205-910-3 | 205-82-3 | | <1 | mg/kg | | <1 | mg/kg | <0.0001 % | | <**LOD** |
| | | | | | | | | | | | Total: | 0.0702 % | | |

| Key | |
|---|---|
| | User supplied data |
| | Determinand values ignored for classification, see column 'Conc. Not Used' for reason |
| | Determinand defined or amended by HazWasteOnline (see Appendix A) |
| | Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration |
| **<LOD** | Below limit of detection |
| **ND** | Not detected |
| CLP: Note 1 | Only the metal concentration has been used for classification |

## Supplementary Hazardous Property Information

**HP 3(i): Flammable** "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Solid waste without liquid phase

Hazard Statements hit:

**Flam. Liq. 3; H226** "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0038%)

## Classification of sample: TP25-10/12/2019-0.50m

**Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

## Sample details

Sample Name:
**TP25-10/12/2019-0.50m**
Moisture content:
**11.1%**
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

## Hazard properties

None identified

## Determinands

Moisture content: 11.1% Wet Weight Moisture Correction applied (MC)

| # | Determinand | CLP index number | EC Number | CAS Number | CLP Note | User entered data | | Conv. Factor | Compound conc. | | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | antimony { antimony trioxide } | 051-005-00-X | 215-175-0 | 1309-64-4 | | 2 | mg/kg | 1.197 | 2.128 | mg/kg | 0.000213 % | ✓ | |
| 2 | arsenic { arsenic pentoxide } | 033-004-00-6 | 215-116-9 | 1303-28-2 | | 8.3 | mg/kg | 1.534 | 11.318 | mg/kg | 0.00113 % | ✓ | |
| 3 | cadmium { cadmium oxide } | 048-002-00-0 | 215-146-2 | 1306-19-0 | | <0.1 | mg/kg | 1.142 | <0.114 | mg/kg | <0.0000114 % | | <**LOD** |
| 4 | chromium in chromium(III) compounds { chromium(III) oxide } | | 215-160-9 | 1308-38-9 | | 49.7 | mg/kg | 1.462 | 64.576 | mg/kg | 0.00646 % | ✓ | |
| 5 | chromium in chromium(VI) compounds { chromium(VI) oxide } | 024-001-00-0 | 215-607-8 | 1333-82-0 | | <0.3 | mg/kg | 1.923 | <0.577 | mg/kg | <0.0000577 % | | <**LOD** |
| 6 | copper { dicopper oxide; copper (I) oxide } | 029-002-00-X | 215-270-7 | 1317-39-1 | | 44 | mg/kg | 1.126 | 44.04 | mg/kg | 0.0044 % | ✓ | |
| 7 | lead { lead compounds with the exception of those specified elsewhere in this Annex } | 082-001-00-6 | | | 1 | 17 | mg/kg | | 15.113 | mg/kg | 0.00151 % | ✓ | |
| 8 | mercury { mercury dichloride } | 080-010-00-X | 231-299-8 | 7487-94-7 | | <0.1 | mg/kg | 1.353 | <0.135 | mg/kg | <0.0000135 % | | <**LOD** |
| 9 | molybdenum { molybdenum(VI) oxide } | 042-001-00-9 | 215-204-7 | 1313-27-5 | | 0.5 | mg/kg | 1.5 | 0.667 | mg/kg | 0.0000667 % | ✓ | |
| 10 | nickel { nickel chromate } | 028-035-00-7 | 238-766-5 | 14721-18-7 | | 28.1 | mg/kg | 2.976 | 74.35 | mg/kg | 0.00743 % | ✓ | |
| 11 | selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } | 034-002-00-8 | | | | 1 | mg/kg | 2.554 | 2.27 | mg/kg | 0.000227 % | ✓ | |
| 12 | zinc { zinc oxide } | 030-013-00-7 | 215-222-5 | 1314-13-2 | | 119 | mg/kg | 1.245 | 131.68 | mg/kg | 0.0132 % | ✓ | |
| 13 | TPH (C6 to C40) petroleum group | | | TPH | | <52 | mg/kg | | <52 | mg/kg | <0.0052 % | | <**LOD** |
| 14 | tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane | 603-181-00-X | 216-653-1 | 1634-04-4 | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <**LOD** |

| # | | Determinand | | | CLP Note | User entered data | | Conv. Factor | Compound conc. | | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CLP index number | EC Number | CAS Number | | | | | | | | | |
| 15 | | benzene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-020-00-8 | 200-753-7 | 71-43-2 | | | | | | | | | |
| 16 | | toluene | | | | 0.018 | mg/kg | | 0.016 | mg/kg | 0.0000016 % | ✓ | |
| | | 601-021-00-3 | 203-625-9 | 108-88-3 | | | | | | | | | |
| 17 | | ethylbenzene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-023-00-4 | 202-849-4 | 100-41-4 | | | | | | | | | |
| 18 | | xylene | | | | <0.01 | mg/kg | | <0.01 | mg/kg | <0.000001 % | | <LOD |
| | | 601-022-00-9 | 202-422-2 [1]<br>203-396-5 [2]<br>203-576-3 [3]<br>215-535-7 [4] | 95-47-6 [1]<br>106-42-3 [2]<br>108-38-3 [3]<br>1330-20-7 [4] | | | | | | | | | |
| 19 | | pH | | | | 7.08 | pH | | 7.08 | pH | 7.08 pH | | |
| | | | | PH | | | | | | | | | |
| 20 | | naphthalene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-052-00-2 | 202-049-5 | 91-20-3 | | | | | | | | | |
| 21 | | acenaphthylene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 205-917-1 | 208-96-8 | | | | | | | | | |
| 22 | | acenaphthene | | | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| | | | 201-469-6 | 83-32-9 | | | | | | | | | |
| 23 | | fluorene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 201-695-5 | 86-73-7 | | | | | | | | | |
| 24 | | phenanthrene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 201-581-5 | 85-01-8 | | | | | | | | | |
| 25 | | anthracene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 204-371-1 | 120-12-7 | | | | | | | | | |
| 26 | | fluoranthene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 205-912-4 | 206-44-0 | | | | | | | | | |
| 27 | | pyrene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 204-927-3 | 129-00-0 | | | | | | | | | |
| 28 | | benzo[a]anthracene | | | | <0.06 | mg/kg | | <0.06 | mg/kg | <0.000006 % | | <LOD |
| | | 601-033-00-9 | 200-280-6 | 56-55-3 | | | | | | | | | |
| 29 | | chrysene | | | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| | | 601-048-00-0 | 205-923-4 | 218-01-9 | | | | | | | | | |
| 30 | | benzo[b]fluoranthene | | | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| | | 601-034-00-4 | 205-911-9 | 205-99-2 | | | | | | | | | |
| 31 | | benzo[k]fluoranthene | | | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| | | 601-036-00-5 | 205-916-6 | 207-08-9 | | | | | | | | | |
| 32 | | benzo[a]pyrene; benzo[def]chrysene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-032-00-3 | 200-028-5 | 50-32-8 | | | | | | | | | |
| 33 | | indeno[123-cd]pyrene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-893-2 | 193-39-5 | | | | | | | | | |
| 34 | | dibenz[a,h]anthracene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-041-00-2 | 200-181-8 | 53-70-3 | | | | | | | | | |
| 35 | | benzo[ghi]perylene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-883-8 | 191-24-2 | | | | | | | | | |
| 36 | | polychlorobiphenyls; PCB | | | | <0.035 | mg/kg | | <0.035 | mg/kg | <0.0000035 % | | <LOD |
| | | 602-039-00-4 | 215-648-1 | 1336-36-3 | | | | | | | | | |
| 37 | | barium { barium oxide } | | | | 38 | mg/kg | 1.117 | 37.718 | mg/kg | 0.00377 % | ✓ | |
| | | | 215-127-9 | 1304-28-5 | | | | | | | | | |
| 38 | | coronene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-881-7 | 191-07-1 | | | | | | | | | |
| 39 | | benzo[j]fluoranthene | | | | <1 | mg/kg | | <1 | mg/kg | <0.0001 % | | <LOD |
| | | 601-035-00-X | 205-910-3 | 205-82-3 | | | | | | | | | |
| | | | | | | | | | | Total: | 0.0438 % | | |

| Key | |
|---|---|
| | User supplied data |
| | Determinand values ignored for classification, see column 'Conc. Not Used' for reason |
| | Determinand defined or amended by HazWasteOnline (see Appendix A) |
| | Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration |
| **<LOD** | Below limit of detection |
| **ND** | Not detected |
| CLP: Note 1 | Only the metal concentration has been used for classification |

## Supplementary Hazardous Property Information

**HP 3(i): Flammable** "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Solid waste without liquid phase

Hazard Statements hit:

**Flam. Liq. 2; H225** "Highly flammable liquid and vapour."

Because of determinand:

toluene: (conc.: 1.6e-06%)

## Classification of sample: TP26-12/12/2019-0.50m

**Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

## Sample details

Sample Name:
**TP26-12/12/2019-0.50m**
Moisture content:
**14.6%**
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

## Hazard properties

None identified

## Determinands

Moisture content: 14.6% Wet Weight Moisture Correction applied (MC)

| # | | Determinand | CLP index number | EC Number | CAS Number | CLP Note | User entered data | | Conv. Factor | Compound conc. | | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | antimony { antimony trioxide } | 051-005-00-X | 215-175-0 | 1309-64-4 | | 2 | mg/kg | 1.197 | 2.045 | mg/kg | 0.000204 % | ✓ | |
| 2 | | arsenic { arsenic pentoxide } | 033-004-00-6 | 215-116-9 | 1303-28-2 | | 16.7 | mg/kg | 1.534 | 21.876 | mg/kg | 0.00219 % | ✓ | |
| 3 | | cadmium { cadmium oxide } | 048-002-00-0 | 215-146-2 | 1306-19-0 | | <0.1 | mg/kg | 1.142 | <0.114 | mg/kg | <0.0000114 % | | <**LOD** |
| 4 | | chromium in chromium(III) compounds { chromium(III) oxide } | | 215-160-9 | 1308-38-9 | | 38.4 | mg/kg | 1.462 | 47.93 | mg/kg | 0.00479 % | ✓ | |
| 5 | | chromium in chromium(VI) compounds { chromium(VI) oxide } | 024-001-00-0 | 215-607-8 | 1333-82-0 | | <0.3 | mg/kg | 1.923 | <0.577 | mg/kg | <0.0000577 % | | <**LOD** |
| 6 | | copper { dicopper oxide; copper (I) oxide } | 029-002-00-X | 215-270-7 | 1317-39-1 | | 34 | mg/kg | 1.126 | 32.691 | mg/kg | 0.00327 % | ✓ | |
| 7 | | lead { lead compounds with the exception of those specified elsewhere in this Annex } | 082-001-00-6 | | | 1 | 19 | mg/kg | | 16.226 | mg/kg | 0.00162 % | ✓ | |
| 8 | | mercury { mercury dichloride } | 080-010-00-X | 231-299-8 | 7487-94-7 | | <0.1 | mg/kg | 1.353 | <0.135 | mg/kg | <0.0000135 % | | <**LOD** |
| 9 | | molybdenum { molybdenum(VI) oxide } | 042-001-00-9 | 215-204-7 | 1313-27-5 | | <0.1 | mg/kg | 1.5 | <0.15 | mg/kg | <0.000015 % | | <**LOD** |
| 10 | | nickel { nickel chromate } | 028-035-00-7 | 238-766-5 | 14721-18-7 | | 37 | mg/kg | 2.976 | 94.044 | mg/kg | 0.0094 % | ✓ | |
| 11 | | selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } | 034-002-00-8 | | | | 1 | mg/kg | 2.554 | 2.181 | mg/kg | 0.000218 % | ✓ | |
| 12 | | zinc { zinc oxide } | 030-013-00-7 | 215-222-5 | 1314-13-2 | | 122 | mg/kg | 1.245 | 129.684 | mg/kg | 0.013 % | ✓ | |
| 13 | | TPH (C6 to C40) petroleum group | | | TPH | | 55 | mg/kg | | 46.97 | mg/kg | 0.0047 % | ✓ | |
| 14 | | tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane | 603-181-00-X | 216-653-1 | 1634-04-4 | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <**LOD** |

| # | | Determinand | CLP index number | EC Number | CAS Number | CLP Note | User entered data | | Conv. Factor | Compound conc. | | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | | benzene | 601-020-00-8 | 200-753-7 | 71-43-2 | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <**LOD** |
| 16 | | toluene | 601-021-00-3 | 203-625-9 | 108-88-3 | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <**LOD** |
| 17 | | ethylbenzene | 601-023-00-4 | 202-849-4 | 100-41-4 | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <**LOD** |
| 18 | | xylene | 601-022-00-9 | 202-422-2 [1]<br>203-396-5 [2]<br>203-576-3 [3]<br>215-535-7 [4] | 95-47-6 [1]<br>106-42-3 [2]<br>108-38-3 [3]<br>1330-20-7 [4] | | <0.01 | mg/kg | | <0.01 | mg/kg | <0.000001 % | | <**LOD** |
| 19 | | pH | | | PH | | 7.17 | pH | | 7.17 | pH | 7.17 pH | | |
| 20 | | naphthalene | 601-052-00-2 | 202-049-5 | 91-20-3 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <**LOD** |
| 21 | | acenaphthylene | | 205-917-1 | 208-96-8 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <**LOD** |
| 22 | | acenaphthene | | 201-469-6 | 83-32-9 | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <**LOD** |
| 23 | | fluorene | | 201-695-5 | 86-73-7 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <**LOD** |
| 24 | | phenanthrene | | 201-581-5 | 85-01-8 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <**LOD** |
| 25 | | anthracene | | 204-371-1 | 120-12-7 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <**LOD** |
| 26 | | fluoranthene | | 205-912-4 | 206-44-0 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <**LOD** |
| 27 | | pyrene | | 204-927-3 | 129-00-0 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <**LOD** |
| 28 | | benzo[a]anthracene | 601-033-00-9 | 200-280-6 | 56-55-3 | | <0.06 | mg/kg | | <0.06 | mg/kg | <0.000006 % | | <**LOD** |
| 29 | | chrysene | 601-048-00-0 | 205-923-4 | 218-01-9 | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <**LOD** |
| 30 | | benzo[b]fluoranthene | 601-034-00-4 | 205-911-9 | 205-99-2 | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <**LOD** |
| 31 | | benzo[k]fluoranthene | 601-036-00-5 | 205-916-6 | 207-08-9 | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <**LOD** |
| 32 | | benzo[a]pyrene; benzo[def]chrysene | 601-032-00-3 | 200-028-5 | 50-32-8 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <**LOD** |
| 33 | | indeno[123-cd]pyrene | | 205-893-2 | 193-39-5 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <**LOD** |
| 34 | | dibenz[a,h]anthracene | 601-041-00-2 | 200-181-8 | 53-70-3 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <**LOD** |
| 35 | | benzo[ghi]perylene | | 205-883-8 | 191-24-2 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <**LOD** |
| 36 | | polychlorobiphenyls; PCB | 602-039-00-4 | 215-648-1 | 1336-36-3 | | <0.035 | mg/kg | | <0.035 | mg/kg | <0.0000035 % | | <**LOD** |
| 37 | | barium { barium oxide } | | 215-127-9 | 1304-28-5 | | 38 | mg/kg | 1.117 | 36.233 | mg/kg | 0.00362 % | ✓ | |
| 38 | | coronene | | 205-881-7 | 191-07-1 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <**LOD** |
| 39 | | benzo[j]fluoranthene | 601-035-00-X | 205-910-3 | 205-82-3 | | <1 | mg/kg | | <1 | mg/kg | <0.0001 % | | <**LOD** |
| | | | | | | | | | | | Total: | 0.0433 % | | |

| Key | |
|---|---|
| | User supplied data |
| | Determinand values ignored for classification, see column 'Conc. Not Used' for reason |
| | Determinand defined or amended by HazWasteOnline (see Appendix A) |
| | Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration |
| **<LOD** | Below limit of detection |
| **ND** | Not detected |
| CLP: Note 1 | Only the metal concentration has been used for classification |

## Supplementary Hazardous Property Information

**HP 3(i): Flammable** "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Solid waste without liquid phase

Hazard Statements hit:

**Flam. Liq. 3; H226** "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0047%)

## Classification of sample: TP27-10/12/2019-0.50m

**Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

## Sample details

Sample Name:
**TP27-10/12/2019-0.50m**
Moisture content:
**12.4%**
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

## Hazard properties

None identified

## Determinands

Moisture content: 12.4% Wet Weight Moisture Correction applied (MC)

| # | Determinand | CLP index number | EC Number | CAS Number | CLP Note | User entered data | Conv. Factor | Compound conc. | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | antimony { antimony trioxide } | 051-005-00-X | 215-175-0 | 1309-64-4 | | 3 mg/kg | 1.197 | 3.146 mg/kg | 0.000315 % | ✓ | |
| 2 | arsenic { arsenic pentoxide } | 033-004-00-6 | 215-116-9 | 1303-28-2 | | 19.6 mg/kg | 1.534 | 26.336 mg/kg | 0.00263 % | ✓ | |
| 3 | cadmium { cadmium oxide } | 048-002-00-0 | 215-146-2 | 1306-19-0 | | <0.1 mg/kg | 1.142 | <0.114 mg/kg | <0.0000114 % | | <**LOD** |
| 4 | chromium in chromium(III) compounds { chromium(III) oxide } | | 215-160-9 | 1308-38-9 | | 46.2 mg/kg | 1.462 | 59.151 mg/kg | 0.00592 % | ✓ | |
| 5 | chromium in chromium(VI) compounds { chromium(VI) oxide } | 024-001-00-0 | 215-607-8 | 1333-82-0 | | <0.3 mg/kg | 1.923 | <0.577 mg/kg | <0.0000577 % | | <**LOD** |
| 6 | copper { dicopper oxide; copper (I) oxide } | 029-002-00-X | 215-270-7 | 1317-39-1 | | 48 mg/kg | 1.126 | 47.341 mg/kg | 0.00473 % | ✓ | |
| 7 | lead { lead compounds with the exception of those specified elsewhere in this Annex } | 082-001-00-6 | | | 1 | 42 mg/kg | | 36.792 mg/kg | 0.00368 % | ✓ | |
| 8 | mercury { mercury dichloride } | 080-010-00-X | 231-299-8 | 7487-94-7 | | <0.1 mg/kg | 1.353 | <0.135 mg/kg | <0.0000135 % | | <**LOD** |
| 9 | molybdenum { molybdenum(VI) oxide } | 042-001-00-9 | 215-204-7 | 1313-27-5 | | <0.1 mg/kg | 1.5 | <0.15 mg/kg | <0.000015 % | | <**LOD** |
| 10 | nickel { nickel chromate } | 028-035-00-7 | 238-766-5 | 14721-18-7 | | 58.5 mg/kg | 2.976 | 152.522 mg/kg | 0.0153 % | ✓ | |
| 11 | selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } | 034-002-00-8 | | | | 2 mg/kg | 2.554 | 4.474 mg/kg | 0.000447 % | ✓ | |
| 12 | zinc { zinc oxide } | 030-013-00-7 | 215-222-5 | 1314-13-2 | | 149 mg/kg | 1.245 | 162.465 mg/kg | 0.0162 % | ✓ | |
| 13 | TPH (C6 to C40) petroleum group | | | TPH | | <52 mg/kg | | <52 mg/kg | <0.0052 % | | <**LOD** |
| 14 | tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane | 603-181-00-X | 216-653-1 | 1634-04-4 | | <0.005 mg/kg | | <0.005 mg/kg | <0.0000005 % | | <**LOD** |

| # | | Determinand | | | CLP Note | User entered data | | Conv. Factor | Compound conc. | | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CLP index number | EC Number | CAS Number | | | | | | | | | |
| 15 | | benzene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-020-00-8 | 200-753-7 | 71-43-2 | | | | | | | | | |
| 16 | | toluene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-021-00-3 | 203-625-9 | 108-88-3 | | | | | | | | | |
| 17 | | ethylbenzene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-023-00-4 | 202-849-4 | 100-41-4 | | | | | | | | | |
| 18 | | xylene | | | | <0.01 | mg/kg | | <0.01 | mg/kg | <0.000001 % | | <LOD |
| | | 601-022-00-9 | 202-422-2 [1]<br>203-396-5 [2]<br>203-576-3 [3]<br>215-535-7 [4] | 95-47-6 [1]<br>106-42-3 [2]<br>108-38-3 [3]<br>1330-20-7 [4] | | | | | | | | | |
| 19 | | pH | | | | 7.12 | pH | | 7.12 | pH | 7.12 pH | | |
| | | | | PH | | | | | | | | | |
| 20 | | naphthalene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-052-00-2 | 202-049-5 | 91-20-3 | | | | | | | | | |
| 21 | | acenaphthylene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 205-917-1 | 208-96-8 | | | | | | | | | |
| 22 | | acenaphthene | | | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| | | | 201-469-6 | 83-32-9 | | | | | | | | | |
| 23 | | fluorene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 201-695-5 | 86-73-7 | | | | | | | | | |
| 24 | | phenanthrene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 201-581-5 | 85-01-8 | | | | | | | | | |
| 25 | | anthracene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 204-371-1 | 120-12-7 | | | | | | | | | |
| 26 | | fluoranthene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 205-912-4 | 206-44-0 | | | | | | | | | |
| 27 | | pyrene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 204-927-3 | 129-00-0 | | | | | | | | | |
| 28 | | benzo[a]anthracene | | | | <0.06 | mg/kg | | <0.06 | mg/kg | <0.000006 % | | <LOD |
| | | 601-033-00-9 | 200-280-6 | 56-55-3 | | | | | | | | | |
| 29 | | chrysene | | | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| | | 601-048-00-0 | 205-923-4 | 218-01-9 | | | | | | | | | |
| 30 | | benzo[b]fluoranthene | | | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| | | 601-034-00-4 | 205-911-9 | 205-99-2 | | | | | | | | | |
| 31 | | benzo[k]fluoranthene | | | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| | | 601-036-00-5 | 205-916-6 | 207-08-9 | | | | | | | | | |
| 32 | | benzo[a]pyrene; benzo[def]chrysene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-032-00-3 | 200-028-5 | 50-32-8 | | | | | | | | | |
| 33 | | indeno[123-cd]pyrene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-893-2 | 193-39-5 | | | | | | | | | |
| 34 | | dibenz[a,h]anthracene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-041-00-2 | 200-181-8 | 53-70-3 | | | | | | | | | |
| 35 | | benzo[ghi]perylene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-883-8 | 191-24-2 | | | | | | | | | |
| 36 | | polychlorobiphenyls; PCB | | | | <0.035 | mg/kg | | <0.035 | mg/kg | <0.0000035 % | | <LOD |
| | | 602-039-00-4 | 215-648-1 | 1336-36-3 | | | | | | | | | |
| 37 | | barium { barium oxide } | | | | 70 | mg/kg | 1.117 | 68.464 | mg/kg | 0.00685 % | ✓ | |
| | | | 215-127-9 | 1304-28-5 | | | | | | | | | |
| 38 | | coronene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-881-7 | 191-07-1 | | | | | | | | | |
| 39 | | benzo[j]fluoranthene | | | | <1 | mg/kg | | <1 | mg/kg | <0.0001 % | | <LOD |
| | | 601-035-00-X | 205-910-3 | 205-82-3 | | | | | | | | | |
| | | | | | | | | | | Total: | 0.0615 % | | |

Key

| | |
|---|---|
| | User supplied data |
| | Determinand values ignored for classification, see column 'Conc. Not Used' for reason |
| | Determinand defined or amended by HazWasteOnline (see Appendix A) |
| | Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration |
| **<LOD** | Below limit of detection |
| **ND** | Not detected |
| CLP: Note 1 | Only the metal concentration has been used for classification |

## Classification of sample: TP28-10/12/2019-0.50m

**Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

## Sample details

Sample Name:
**TP28-10/12/2019-0.50m**
Moisture content:
**13.2%**
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

## Hazard properties

None identified

## Determinands

Moisture content: 13.2% Wet Weight Moisture Correction applied (MC)

| # | Determinand | CLP index number | EC Number | CAS Number | CLP Note | User entered data | Conv. Factor | Compound conc. | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | antimony { antimony trioxide } | 051-005-00-X | 215-175-0 | 1309-64-4 | | 3 mg/kg | 1.197 | 3.117 mg/kg | 0.000312 % | ✓ | |
| 2 | arsenic { arsenic pentoxide } | 033-004-00-6 | 215-116-9 | 1303-28-2 | | 12 mg/kg | 1.534 | 15.977 mg/kg | 0.0016 % | ✓ | |
| 3 | cadmium { cadmium oxide } | 048-002-00-0 | 215-146-2 | 1306-19-0 | | <0.1 mg/kg | 1.142 | <0.114 mg/kg | <0.0000114 % | | <**LOD** |
| 4 | chromium in chromium(III) compounds { chromium(III) oxide } | | 215-160-9 | 1308-38-9 | | 38.1 mg/kg | 1.462 | 48.335 mg/kg | 0.00483 % | ✓ | |
| 5 | chromium in chromium(VI) compounds { chromium(VI) oxide } | 024-001-00-0 | 215-607-8 | 1333-82-0 | | <0.3 mg/kg | 1.923 | <0.577 mg/kg | <0.0000577 % | | <**LOD** |
| 6 | copper { dicopper oxide; copper (I) oxide } | 029-002-00-X | 215-270-7 | 1317-39-1 | | 35 mg/kg | 1.126 | 34.204 mg/kg | 0.00342 % | ✓ | |
| 7 | lead { lead compounds with the exception of those specified elsewhere in this Annex } | 082-001-00-6 | | | 1 | 20 mg/kg | | 17.36 mg/kg | 0.00174 % | ✓ | |
| 8 | mercury { mercury dichloride } | 080-010-00-X | 231-299-8 | 7487-94-7 | | <0.1 mg/kg | 1.353 | <0.135 mg/kg | <0.0000135 % | | <**LOD** |
| 9 | molybdenum { molybdenum(VI) oxide } | 042-001-00-9 | 215-204-7 | 1313-27-5 | | <0.1 mg/kg | 1.5 | <0.15 mg/kg | <0.000015 % | | <**LOD** |
| 10 | nickel { nickel chromate } | 028-035-00-7 | 238-766-5 | 14721-18-7 | | 41.8 mg/kg | 2.976 | 107.986 mg/kg | 0.0108 % | ✓ | |
| 11 | selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } | 034-002-00-8 | | | | 2 mg/kg | 2.554 | 4.433 mg/kg | 0.000443 % | ✓ | |
| 12 | zinc { zinc oxide } | 030-013-00-7 | 215-222-5 | 1314-13-2 | | 133 mg/kg | 1.245 | 143.695 mg/kg | 0.0144 % | ✓ | |
| 13 | TPH (C6 to C40) petroleum group | | | TPH | | 85 mg/kg | | 73.78 mg/kg | 0.00738 % | ✓ | |
| 14 | tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane | 603-181-00-X | 216-653-1 | 1634-04-4 | | <0.005 mg/kg | | <0.005 mg/kg | <0.0000005 % | | <**LOD** |

| # | | Determinand | CLP index number | EC Number | CAS Number | CLP Note | User entered data | | Conv. Factor | Compound conc. | | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | | benzene | 601-020-00-8 | 200-753-7 | 71-43-2 | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| 16 | | toluene | 601-021-00-3 | 203-625-9 | 108-88-3 | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| 17 | | ethylbenzene | 601-023-00-4 | 202-849-4 | 100-41-4 | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| 18 | | xylene | 601-022-00-9 | 202-422-2 [1]<br>203-396-5 [2]<br>203-576-3 [3]<br>215-535-7 [4] | 95-47-6 [1]<br>106-42-3 [2]<br>108-38-3 [3]<br>1330-20-7 [4] | | <0.01 | mg/kg | | <0.01 | mg/kg | <0.000001 % | | <LOD |
| 19 | | pH | | | PH | | 6.28 | pH | | 6.28 | pH | 6.28 pH | | |
| 20 | | naphthalene | 601-052-00-2 | 202-049-5 | 91-20-3 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 21 | | acenaphthylene | | 205-917-1 | 208-96-8 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| 22 | | acenaphthene | | 201-469-6 | 83-32-9 | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| 23 | | fluorene | | 201-695-5 | 86-73-7 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 24 | | phenanthrene | | 201-581-5 | 85-01-8 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| 25 | | anthracene | | 204-371-1 | 120-12-7 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 26 | | fluoranthene | | 205-912-4 | 206-44-0 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| 27 | | pyrene | | 204-927-3 | 129-00-0 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| 28 | | benzo[a]anthracene | 601-033-00-9 | 200-280-6 | 56-55-3 | | <0.06 | mg/kg | | <0.06 | mg/kg | <0.000006 % | | <LOD |
| 29 | | chrysene | 601-048-00-0 | 205-923-4 | 218-01-9 | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| 30 | | benzo[b]fluoranthene | 601-034-00-4 | 205-911-9 | 205-99-2 | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| 31 | | benzo[k]fluoranthene | 601-036-00-5 | 205-916-6 | 207-08-9 | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| 32 | | benzo[a]pyrene; benzo[def]chrysene | 601-032-00-3 | 200-028-5 | 50-32-8 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 33 | | indeno[123-cd]pyrene | | 205-893-2 | 193-39-5 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 34 | | dibenz[a,h]anthracene | 601-041-00-2 | 200-181-8 | 53-70-3 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 35 | | benzo[ghi]perylene | | 205-883-8 | 191-24-2 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 36 | | polychlorobiphenyls; PCB | 602-039-00-4 | 215-648-1 | 1336-36-3 | | <0.035 | mg/kg | | <0.035 | mg/kg | <0.0000035 % | | <LOD |
| 37 | | barium { barium oxide } | | 215-127-9 | 1304-28-5 | | 54 | mg/kg | 1.117 | 52.333 | mg/kg | 0.00523 % | ✓ | |
| 38 | | coronene | | 205-881-7 | 191-07-1 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 39 | | benzo[j]fluoranthene | 601-035-00-X | 205-910-3 | 205-82-3 | | <1 | mg/kg | | <1 | mg/kg | <0.0001 % | | <LOD |
| | | | | | | | | | | | Total: | 0.0504 % | | |

| Key | |
|---|---|
| | User supplied data |
| | Determinand values ignored for classification, see column 'Conc. Not Used' for reason |
| | Determinand defined or amended by HazWasteOnline (see Appendix A) |
| | Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration |
| **<LOD** | Below limit of detection |
| **ND** | Not detected |
| CLP: Note 1 | Only the metal concentration has been used for classification |

## Supplementary Hazardous Property Information

**HP 3(i): Flammable** "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Solid waste without liquid phase

Hazard Statements hit:

**Flam. Liq. 3; H226** "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.00738%)

## Classification of sample: TP28-10/12/2019-1.50m

**Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

## Sample details

Sample Name:
**TP28-10/12/2019-1.50m**
Moisture content:
**39.5%**
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

## Hazard properties

None identified

## Determinands

Moisture content: 39.5% Wet Weight Moisture Correction applied (MC)

| # | Determinand | CLP index number | EC Number | CAS Number | CLP Note | User entered data | Conv. Factor | Compound conc. | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | antimony { antimony trioxide } | 051-005-00-X | 215-175-0 | 1309-64-4 | | 1 mg/kg | 1.197 | 0.724 mg/kg | 0.0000724 % | ✓ | |
| 2 | arsenic { arsenic pentoxide } | 033-004-00-6 | 215-116-9 | 1303-28-2 | | 50.3 mg/kg | 1.534 | 46.678 mg/kg | 0.00467 % | ✓ | |
| 3 | cadmium { cadmium oxide } | 048-002-00-0 | 215-146-2 | 1306-19-0 | | 1.7 mg/kg | 1.142 | 1.175 mg/kg | 0.000117 % | ✓ | |
| 4 | chromium in chromium(III) compounds { chromium(III) oxide } | | 215-160-9 | 1308-38-9 | | 37.4 mg/kg | 1.462 | 33.071 mg/kg | 0.00331 % | ✓ | |
| 5 | chromium in chromium(VI) compounds { chromium(VI) oxide } | 024-001-00-0 | 215-607-8 | 1333-82-0 | | <0.3 mg/kg | 1.923 | <0.577 mg/kg | <0.0000577 % | | <**LOD** |
| 6 | copper { dicopper oxide; copper (I) oxide } | 029-002-00-X | 215-270-7 | 1317-39-1 | | 132 mg/kg | 1.126 | 89.913 mg/kg | 0.00899 % | ✓ | |
| 7 | lead { lead compounds with the exception of those specified elsewhere in this Annex } | 082-001-00-6 | | | 1 | 210 mg/kg | | 127.05 mg/kg | 0.0127 % | ✓ | |
| 8 | mercury { mercury dichloride } | 080-010-00-X | 231-299-8 | 7487-94-7 | | <0.1 mg/kg | 1.353 | <0.135 mg/kg | <0.0000135 % | | <**LOD** |
| 9 | molybdenum { molybdenum(VI) oxide } | 042-001-00-9 | 215-204-7 | 1313-27-5 | | 1.1 mg/kg | 1.5 | 0.998 mg/kg | 0.0000998 % | ✓ | |
| 10 | nickel { nickel chromate } | 028-035-00-7 | 238-766-5 | 14721-18-7 | | 26.8 mg/kg | 2.976 | 48.257 mg/kg | 0.00483 % | ✓ | |
| 11 | selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } | 034-002-00-8 | | | | 2 mg/kg | 2.554 | 3.09 mg/kg | 0.000309 % | ✓ | |
| 12 | zinc { zinc oxide } | 030-013-00-7 | 215-222-5 | 1314-13-2 | | 263 mg/kg | 1.245 | 198.053 mg/kg | 0.0198 % | ✓ | |
| 13 | TPH (C6 to C40) petroleum group | | | TPH | | <52 mg/kg | | <52 mg/kg | <0.0052 % | | <**LOD** |
| 14 | tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane | 603-181-00-X | 216-653-1 | 1634-04-4 | | <0.005 mg/kg | | <0.005 mg/kg | <0.0000005 % | | <**LOD** |

| # | | Determinand | | | CLP Note | User entered data | | Conv. Factor | Compound conc. | | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CLP index number | EC Number | CAS Number | | | | | | | | | |
| 15 | | benzene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-020-00-8 | 200-753-7 | 71-43-2 | | | | | | | | | |
| 16 | | toluene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-021-00-3 | 203-625-9 | 108-88-3 | | | | | | | | | |
| 17 | | ethylbenzene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-023-00-4 | 202-849-4 | 100-41-4 | | | | | | | | | |
| 18 | | xylene | | | | <0.01 | mg/kg | | <0.01 | mg/kg | <0.000001 % | | <LOD |
| | | 601-022-00-9 | 202-422-2 [1]<br>203-396-5 [2]<br>203-576-3 [3]<br>215-535-7 [4] | 95-47-6 [1]<br>106-42-3 [2]<br>108-38-3 [3]<br>1330-20-7 [4] | | | | | | | | | |
| 19 | | pH | | | | 7.4 | pH | | 7.4 | pH | 7.4 pH | | |
| | | | | PH | | | | | | | | | |
| 20 | | naphthalene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-052-00-2 | 202-049-5 | 91-20-3 | | | | | | | | | |
| 21 | | acenaphthylene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 205-917-1 | 208-96-8 | | | | | | | | | |
| 22 | | acenaphthene | | | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| | | | 201-469-6 | 83-32-9 | | | | | | | | | |
| 23 | | fluorene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 201-695-5 | 86-73-7 | | | | | | | | | |
| 24 | | phenanthrene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 201-581-5 | 85-01-8 | | | | | | | | | |
| 25 | | anthracene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 204-371-1 | 120-12-7 | | | | | | | | | |
| 26 | | fluoranthene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 205-912-4 | 206-44-0 | | | | | | | | | |
| 27 | | pyrene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 204-927-3 | 129-00-0 | | | | | | | | | |
| 28 | | benzo[a]anthracene | | | | <0.06 | mg/kg | | <0.06 | mg/kg | <0.000006 % | | <LOD |
| | | 601-033-00-9 | 200-280-6 | 56-55-3 | | | | | | | | | |
| 29 | | chrysene | | | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| | | 601-048-00-0 | 205-923-4 | 218-01-9 | | | | | | | | | |
| 30 | | benzo[b]fluoranthene | | | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| | | 601-034-00-4 | 205-911-9 | 205-99-2 | | | | | | | | | |
| 31 | | benzo[k]fluoranthene | | | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| | | 601-036-00-5 | 205-916-6 | 207-08-9 | | | | | | | | | |
| 32 | | benzo[a]pyrene; benzo[def]chrysene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-032-00-3 | 200-028-5 | 50-32-8 | | | | | | | | | |
| 33 | | indeno[123-cd]pyrene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-893-2 | 193-39-5 | | | | | | | | | |
| 34 | | dibenz[a,h]anthracene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-041-00-2 | 200-181-8 | 53-70-3 | | | | | | | | | |
| 35 | | benzo[ghi]perylene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-883-8 | 191-24-2 | | | | | | | | | |
| 36 | | polychlorobiphenyls; PCB | | | | <0.035 | mg/kg | | <0.035 | mg/kg | <0.0000035 % | | <LOD |
| | | 602-039-00-4 | 215-648-1 | 1336-36-3 | | | | | | | | | |
| 37 | | barium { barium oxide } | | | | 67 | mg/kg | 1.117 | 45.258 | mg/kg | 0.00453 % | ✓ | |
| | | | 215-127-9 | 1304-28-5 | | | | | | | | | |
| 38 | | coronene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-881-7 | 191-07-1 | | | | | | | | | |
| 39 | | benzo[j]fluoranthene | | | | <1 | mg/kg | | <1 | mg/kg | <0.0001 % | | <LOD |
| | | 601-035-00-X | 205-910-3 | 205-82-3 | | | | | | | | | |
| | | | | | | | | | | Total: | 0.0649 % | | |

Key

| | |
|---|---|
| | User supplied data |
| | Determinand values ignored for classification, see column 'Conc. Not Used' for reason |
| | Determinand defined or amended by HazWasteOnline (see Appendix A) |
| | Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration |
| **<LOD** | Below limit of detection |
| **ND** | Not detected |
| CLP: Note 1 | Only the metal concentration has been used for classification |

## Classification of sample: TP29-12/12/2019-0.50m

**Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

## Sample details

Sample Name:
**TP29-12/12/2019-0.50m**
Moisture content:
**7.6%**
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

## Hazard properties

None identified

## Determinands

Moisture content: 7.6% Wet Weight Moisture Correction applied (MC)

| # | | Determinand | CLP index number | EC Number | CAS Number | CLP Note | User entered data | | Conv. Factor | Compound conc. | | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | antimony { antimony trioxide } | 051-005-00-X | 215-175-0 | 1309-64-4 | | 1 | mg/kg | 1.197 | 1.106 | mg/kg | 0.000111 % | ✓ | |
| 2 | | arsenic { arsenic pentoxide } | 033-004-00-6 | 215-116-9 | 1303-28-2 | | <0.5 | mg/kg | 1.534 | <0.767 | mg/kg | <0.0000767 % | | <**LOD** |
| 3 | | cadmium { cadmium oxide } | 048-002-00-0 | 215-146-2 | 1306-19-0 | | <0.1 | mg/kg | 1.142 | <0.114 | mg/kg | <0.0000114 % | | <**LOD** |
| 4 | | chromium in chromium(III) compounds { chromium(III) oxide } | | 215-160-9 | 1308-38-9 | | 41.4 | mg/kg | 1.462 | 55.91 | mg/kg | 0.00559 % | ✓ | |
| 5 | | chromium in chromium(VI) compounds { chromium(VI) oxide } | 024-001-00-0 | 215-607-8 | 1333-82-0 | | <0.3 | mg/kg | 1.923 | <0.577 | mg/kg | <0.0000577 % | | <**LOD** |
| 6 | | copper { dicopper oxide; copper (I) oxide } | 029-002-00-X | 215-270-7 | 1317-39-1 | | 35 | mg/kg | 1.126 | 36.411 | mg/kg | 0.00364 % | ✓ | |
| 7 | | lead { lead compounds with the exception of those specified elsewhere in this Annex } | 082-001-00-6 | | | 1 | 10 | mg/kg | | 9.24 | mg/kg | 0.000924 % | ✓ | |
| 8 | | mercury { mercury dichloride } | 080-010-00-X | 231-299-8 | 7487-94-7 | | <0.1 | mg/kg | 1.353 | <0.135 | mg/kg | <0.0000135 % | | <**LOD** |
| 9 | | molybdenum { molybdenum(VI) oxide } | 042-001-00-9 | 215-204-7 | 1313-27-5 | | 0.8 | mg/kg | 1.5 | 1.109 | mg/kg | 0.000111 % | ✓ | |
| 10 | | nickel { nickel chromate } | 028-035-00-7 | 238-766-5 | 14721-18-7 | | 10.1 | mg/kg | 2.976 | 27.776 | mg/kg | 0.00278 % | ✓ | |
| 11 | | selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } | 034-002-00-8 | | | | <1 | mg/kg | 2.554 | <2.554 | mg/kg | <0.000255 % | | <**LOD** |
| 12 | | zinc { zinc oxide } | 030-013-00-7 | 215-222-5 | 1314-13-2 | | 169 | mg/kg | 1.245 | 194.37 | mg/kg | 0.0194 % | ✓ | |
| 13 | | TPH (C6 to C40) petroleum group | | | TPH | | 176 | mg/kg | | 162.624 | mg/kg | 0.0163 % | ✓ | |
| 14 | | tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane | 603-181-00-X | 216-653-1 | 1634-04-4 | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <**LOD** |

| # | | Determinand | CLP index number | EC Number | CAS Number | CLP Note | User entered data | | Conv. Factor | Compound conc. | | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | | benzene | 601-020-00-8 | 200-753-7 | 71-43-2 | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| 16 | | toluene | 601-021-00-3 | 203-625-9 | 108-88-3 | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| 17 | | ethylbenzene | 601-023-00-4 | 202-849-4 | 100-41-4 | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| 18 | | xylene | 601-022-00-9 | 202-422-2 [1]<br>203-396-5 [2]<br>203-576-3 [3]<br>215-535-7 [4] | 95-47-6 [1]<br>106-42-3 [2]<br>108-38-3 [3]<br>1330-20-7 [4] | | <0.01 | mg/kg | | <0.01 | mg/kg | <0.000001 % | | <LOD |
| 19 | | pH | | | PH | | 8.43 | pH | | 8.43 | pH | 8.43 pH | | |
| 20 | | naphthalene | 601-052-00-2 | 202-049-5 | 91-20-3 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 21 | | acenaphthylene | | 205-917-1 | 208-96-8 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| 22 | | acenaphthene | | 201-469-6 | 83-32-9 | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| 23 | | fluorene | | 201-695-5 | 86-73-7 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 24 | | phenanthrene | | 201-581-5 | 85-01-8 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| 25 | | anthracene | | 204-371-1 | 120-12-7 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 26 | | fluoranthene | | 205-912-4 | 206-44-0 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| 27 | | pyrene | | 204-927-3 | 129-00-0 | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| 28 | | benzo[a]anthracene | 601-033-00-9 | 200-280-6 | 56-55-3 | | <0.06 | mg/kg | | <0.06 | mg/kg | <0.000006 % | | <LOD |
| 29 | | chrysene | 601-048-00-0 | 205-923-4 | 218-01-9 | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| 30 | | benzo[b]fluoranthene | 601-034-00-4 | 205-911-9 | 205-99-2 | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| 31 | | benzo[k]fluoranthene | 601-036-00-5 | 205-916-6 | 207-08-9 | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| 32 | | benzo[a]pyrene; benzo[def]chrysene | 601-032-00-3 | 200-028-5 | 50-32-8 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 33 | | indeno[123-cd]pyrene | | 205-893-2 | 193-39-5 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 34 | | dibenz[a,h]anthracene | 601-041-00-2 | 200-181-8 | 53-70-3 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 35 | | benzo[ghi]perylene | | 205-883-8 | 191-24-2 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 36 | | polychlorobiphenyls; PCB | 602-039-00-4 | 215-648-1 | 1336-36-3 | | 0.36 | mg/kg | | 0.333 | mg/kg | 0.0000333 % | ✓ | |
| 37 | | barium { barium oxide } | | 215-127-9 | 1304-28-5 | | 15 | mg/kg | 1.117 | 15.475 | mg/kg | 0.00155 % | ✓ | |
| 38 | | coronene | | 205-881-7 | 191-07-1 | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| 39 | | benzo[j]fluoranthene | 601-035-00-X | 205-910-3 | 205-82-3 | | <1 | mg/kg | | <1 | mg/kg | <0.0001 % | | <LOD |
| | | | | | | | | | | | Total: | 0.051 % | | |

| Key | |
|---|---|
| | User supplied data |
| | Determinand values ignored for classification, see column 'Conc. Not Used' for reason |
| | Determinand defined or amended by HazWasteOnline (see Appendix A) |
| | Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration |
| **<LOD** | Below limit of detection |
| **ND** | Not detected |
| CLP: Note 1 | Only the metal concentration has been used for classification |

## Supplementary Hazardous Property Information

**HP 3(i): Flammable** "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Solid waste without liquid phase

Hazard Statements hit:

**Flam. Liq. 3; H226** "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0163%)

## Classification of sample: TP29-12/12/2019-1.50m

**Hazardous Waste**
Classified as **17 05 03 ***
in the List of Waste

## Sample details

Sample Name:
**TP29-12/12/2019-1.50m**
Moisture content:
**22.3%**
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 03 * (Soil and stones containing hazardous substances)

## Hazard properties

**HP 7: Carcinogenic** "waste which induces cancer or increases its incidence"

Hazard Statements hit:

**Carc. 1B; H350** "May cause cancer [state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard]."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.123%)

**HP 11: Mutagenic** "waste which may cause a mutation, that is a permanent change in the amount or structure of the genetic material in a cell"

Hazard Statements hit:

**Muta. 1B; H340** "May cause genetic defects [state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard]."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.123%)

## Determinands

Moisture content: 22.3% Wet Weight Moisture Correction applied (MC)

| # | Determinand | CLP index number | EC Number | CAS Number | CLP Note | User entered data | Conv. Factor | Compound conc. | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | antimony { antimony trioxide } | 051-005-00-X | 215-175-0 | 1309-64-4 | | 6 mg/kg | 1.197 | 5.581 mg/kg | 0.000558 % | ✓ | |
| 2 | arsenic { arsenic pentoxide } | 033-004-00-6 | 215-116-9 | 1303-28-2 | | 24.1 mg/kg | 1.534 | 28.723 mg/kg | 0.00287 % | ✓ | |
| 3 | cadmium { cadmium oxide } | 048-002-00-0 | 215-146-2 | 1306-19-0 | | 0.6 mg/kg | 1.142 | 0.533 mg/kg | 0.0000533 % | ✓ | |
| 4 | chromium in chromium(III) compounds { chromium(III) oxide } | | 215-160-9 | 1308-38-9 | | 530.3 mg/kg | 1.462 | 602.224 mg/kg | 0.0602 % | ✓ | |
| 5 | chromium in chromium(VI) compounds { chromium(VI) oxide } | 024-001-00-0 | 215-607-8 | 1333-82-0 | | <0.3 mg/kg | 1.923 | <0.577 mg/kg | <0.0000577 % | | <**LOD** |
| 6 | copper { dicopper oxide; copper (I) oxide } | 029-002-00-X | 215-270-7 | 1317-39-1 | | 98 mg/kg | 1.126 | 85.732 mg/kg | 0.00857 % | ✓ | |
| 7 | lead { lead compounds with the exception of those specified elsewhere in this Annex } | 082-001-00-6 | | | 1 | 67 mg/kg | | 52.059 mg/kg | 0.00521 % | ✓ | |

| # | | Determinand | | | CLP Note | User entered data | | Conv. Factor | Compound conc. | | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CLP index number | EC Number | CAS Number | | | | | | | | | |
| 8 | | mercury { mercury dichloride } | | | | <0.1 | mg/kg | 1.353 | <0.135 | mg/kg | <0.0000135 % | | <LOD |
| | | 080-010-00-X | 231-299-8 | 7487-94-7 | | | | | | | | | |
| 9 | | molybdenum { molybdenum(VI) oxide } | | | | 1.7 | mg/kg | 1.5 | 1.982 | mg/kg | 0.000198 % | ✓ | |
| | | 042-001-00-9 | 215-204-7 | 1313-27-5 | | | | | | | | | |
| 10 | | nickel { nickel chromate } | | | | 31.7 | mg/kg | 2.976 | 73.308 | mg/kg | 0.00733 % | ✓ | |
| | | 028-035-00-7 | 238-766-5 | 14721-18-7 | | | | | | | | | |
| 11 | | selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } | | | | 1 | mg/kg | 2.554 | 1.984 | mg/kg | 0.000198 % | ✓ | |
| | | 034-002-00-8 | | | | | | | | | | | |
| 12 | | zinc { zinc oxide } | | | | 134 | mg/kg | 1.245 | 129.597 | mg/kg | 0.013 % | ✓ | |
| | | 030-013-00-7 | 215-222-5 | 1314-13-2 | | | | | | | | | |
| 13 | | TPH (C6 to C40) petroleum group | | | | 1587 | mg/kg | | 1233.099 | mg/kg | 0.123 % | ✓ | |
| | | | | TPH | | | | | | | | | |
| 14 | | tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 603-181-00-X | 216-653-1 | 1634-04-4 | | | | | | | | | |
| 15 | | benzene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-020-00-8 | 200-753-7 | 71-43-2 | | | | | | | | | |
| 16 | | toluene | | | | <0.005 | mg/kg | | <0.005 | mg/kg | <0.0000005 % | | <LOD |
| | | 601-021-00-3 | 203-625-9 | 108-88-3 | | | | | | | | | |
| 17 | | ethylbenzene | | | | 0.108 | mg/kg | | 0.0839 | mg/kg | 0.00000839 % | ✓ | |
| | | 601-023-00-4 | 202-849-4 | 100-41-4 | | | | | | | | | |
| 18 | | xylene | | | | 1.007 | mg/kg | | 0.782 | mg/kg | 0.0000782 % | ✓ | |
| | | 601-022-00-9 | 202-422-2 [1]<br>203-396-5 [2]<br>203-576-3 [3]<br>215-535-7 [4] | 95-47-6 [1]<br>106-42-3 [2]<br>108-38-3 [3]<br>1330-20-7 [4] | | | | | | | | | |
| 19 | | pH | | | | 7.44 | pH | | 7.44 | pH | 7.44 pH | | |
| | | | | PH | | | | | | | | | |
| 20 | | naphthalene | | | | 0.12 | mg/kg | | 0.0932 | mg/kg | 0.00000932 % | ✓ | |
| | | 601-052-00-2 | 202-049-5 | 91-20-3 | | | | | | | | | |
| 21 | | acenaphthylene | | | | <0.03 | mg/kg | | <0.03 | mg/kg | <0.000003 % | | <LOD |
| | | | 205-917-1 | 208-96-8 | | | | | | | | | |
| 22 | | acenaphthene | | | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| | | | 201-469-6 | 83-32-9 | | | | | | | | | |
| 23 | | fluorene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 201-695-5 | 86-73-7 | | | | | | | | | |
| 24 | | phenanthrene | | | | 0.13 | mg/kg | | 0.101 | mg/kg | 0.0000101 % | ✓ | |
| | | | 201-581-5 | 85-01-8 | | | | | | | | | |
| 25 | | anthracene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 204-371-1 | 120-12-7 | | | | | | | | | |
| 26 | | fluoranthene | | | | 0.09 | mg/kg | | 0.0699 | mg/kg | 0.00000699 % | ✓ | |
| | | | 205-912-4 | 206-44-0 | | | | | | | | | |
| 27 | | pyrene | | | | 0.14 | mg/kg | | 0.109 | mg/kg | 0.0000109 % | ✓ | |
| | | | 204-927-3 | 129-00-0 | | | | | | | | | |
| 28 | | benzo[a]anthracene | | | | <0.06 | mg/kg | | <0.06 | mg/kg | <0.000006 % | | <LOD |
| | | 601-033-00-9 | 200-280-6 | 56-55-3 | | | | | | | | | |
| 29 | | chrysene | | | | 0.13 | mg/kg | | 0.101 | mg/kg | 0.0000101 % | ✓ | |
| | | 601-048-00-0 | 205-923-4 | 218-01-9 | | | | | | | | | |
| 30 | | benzo[b]fluoranthene | | | | <0.05 | mg/kg | | <0.05 | mg/kg | <0.000005 % | | <LOD |
| | | 601-034-00-4 | 205-911-9 | 205-99-2 | | | | | | | | | |
| 31 | | benzo[k]fluoranthene | | | | <0.02 | mg/kg | | <0.02 | mg/kg | <0.000002 % | | <LOD |
| | | 601-036-00-5 | 205-916-6 | 207-08-9 | | | | | | | | | |
| 32 | | benzo[a]pyrene; benzo[def]chrysene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-032-00-3 | 200-028-5 | 50-32-8 | | | | | | | | | |
| 33 | | indeno[123-cd]pyrene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-893-2 | 193-39-5 | | | | | | | | | |
| 34 | | dibenz[a,h]anthracene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | 601-041-00-2 | 200-181-8 | 53-70-3 | | | | | | | | | |

| # | | Determinand | | | CLP Note | User entered data | | Conv. Factor | Compound conc. | | Classification value | MC Applied | Conc. Not Used |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CLP index number | EC Number | CAS Number | | | | | | | | | |
| 35 | | benzo[ghi]perylene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-883-8 | 191-24-2 | | | | | | | | | |
| 36 | | polychlorobiphenyls; PCB | | | | <0.175 | mg/kg | | <0.175 | mg/kg | <0.0000175 % | | <LOD |
| | | 602-039-00-4 | 215-648-1 | 1336-36-3 | | | | | | | | | |
| 37 | | barium { barium oxide } | | | | 40 | mg/kg | 1.117 | 34.701 | mg/kg | 0.00347 % | ✓ | |
| | | | 215-127-9 | 1304-28-5 | | | | | | | | | |
| 38 | | coronene | | | | <0.04 | mg/kg | | <0.04 | mg/kg | <0.000004 % | | <LOD |
| | | | 205-881-7 | 191-07-1 | | | | | | | | | |
| 39 | | benzo[j]fluoranthene | | | | <1 | mg/kg | | <1 | mg/kg | <0.0001 % | | <LOD |
| | | 601-035-00-X | 205-910-3 | 205-82-3 | | | | | | | | | |
| 40 | | asbestos | | | | <10 | mg/kg | | <10 | mg/kg | <0.001 % | | <LOD |
| | | 650-013-00-6 | - - - - - - - | 12001-28-4<br>132207-32-0<br>12172-73-5<br>77536-66-4<br>77536-68-6<br>77536-67-5<br>12001-29-5 | | | | | | | | | |
| | | | | | | | | | | Total: | 0.226 % | | |

Key

| | |
|---|---|
| | User supplied data |
| | Determinand values ignored for classification, see column 'Conc. Not Used' for reason |
| | Hazardous result |
| | Determinand defined or amended by HazWasteOnline (see Appendix A) |
| | Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration |
| **<LOD** | Below limit of detection |
| **ND** | Not detected |
| CLP: Note 1 | Only the metal concentration has been used for classification |

## Supplementary Hazardous Property Information

**HP 3(i): Flammable** "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Solid waste without liquid phase

Hazard Statements hit:

**Flam. Liq. 2; H225** "Highly flammable liquid and vapour."

Because of determinand:

ethylbenzene: (conc.: 8.39e-06%)

**Flam. Liq. 3; H226** "Flammable liquid and vapour."

Because of determinands:

TPH (C6 to C40) petroleum group: (conc.: 0.123%)
xylene: (conc.: 0.00007%)

## Appendix A: Classifier defined and non CLP determinands

**chromium(III) oxide** (EC Number: 215-160-9, CAS Number: 1308-38-9)

Conversion factor: 1.462
Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Aquatic Chronic 1 H410 , Aquatic Acute 1 H400 , Repr. 1B H360FD , Skin Sens. 1 H317 , Resp. Sens. 1 H334 , Skin Irrit. 2 H315 , STOT SE 3 H335 , Eye Irrit. 2 H319 , Acute Tox. 4 H302 , Acute Tox. 4 H332

**lead compounds with the exception of those specified elsewhere in this Annex**

CLP index number: 082-001-00-6
Description/Comments: Least-worst case: Lead REACH Consortium considers some lead compounds Carcinogenic category 2B
Data source: Regulation 1272/2008/EC - Classification, labelling and packaging of substances and mixtures. (CLP)
Additional Hazard Statement(s): Carc. 2 H351
Reason for additional Hazards Statement(s):
03 Jun 2015 - Carc. 2 H351 hazard statement sourced from: IARC Group 2A (Sup 7, 87) 2006; Lead REACH Consortium www.reach-lead.eu/substanceinformation.html. Review date 29/09/2015

**TPH (C6 to C40) petroleum group** (CAS Number: TPH)

Description/Comments: Hazard statements taken from WM3 1st Edition 2015; Risk phrases: WM2 3rd Edition 2013
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: Aquatic Chronic 2 H411 , Repr. 2 H361d , Carc. 1B H350 , Muta. 1B H340 , STOT RE 2 H373 , Asp. Tox. 1 H304 , Flam. Liq. 3 H226

**ethylbenzene** (EC Number: 202-849-4, CAS Number: 100-41-4)

CLP index number: 601-023-00-4
Description/Comments:
Data source: Commission Regulation (EU) No 605/2014 – 6th Adaptation to Technical Progress for Regulation (EC) No 1272/2008. (ATP6)
Additional Hazard Statement(s): Carc. 2 H351
Reason for additional Hazards Statement(s):
03 Jun 2015 - Carc. 2 H351 hazard statement sourced from: IARC Group 2B (77) 2000

**pH** (CAS Number: PH)

Description/Comments: Appendix C4
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: None.

**acenaphthylene** (EC Number: 205-917-1, CAS Number: 208-96-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Skin Irrit. 2 H315 , STOT SE 3 H335 , Eye Irrit. 2 H319 , Acute Tox. 1 H310 , Acute Tox. 1 H330 , Acute Tox. 4 H302

**acenaphthene** (EC Number: 201-469-6, CAS Number: 83-32-9)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Aquatic Chronic 2 H411 , Aquatic Chronic 1 H410 , Aquatic Acute 1 H400 , Skin Irrit. 2 H315 , STOT SE 3 H335 , Eye Irrit. 2 H319

**fluorene** (EC Number: 201-695-5, CAS Number: 86-73-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Aquatic Chronic 1 H410 , Aquatic Acute 1 H400

**phenanthrene** (EC Number: 201-581-5, CAS Number: 85-01-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Skin Irrit. 2 H315 , Aquatic Chronic 1 H410 , Aquatic Acute 1 H400 , Skin Sens. 1 H317 , Carc. 2 H351 , STOT SE 3 H335 , Eye Irrit. 2 H319 , Acute Tox. 4 H302

- **anthracene** (EC Number: 204-371-1, CAS Number: 120-12-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Aquatic Chronic 1 H410 , Aquatic Acute 1 H400 , Skin Sens. 1 H317 , Skin Irrit. 2 H315 , STOT SE 3 H335 , Eye Irrit. 2 H319

- **fluoranthene** (EC Number: 205-912-4, CAS Number: 206-44-0)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Aquatic Chronic 1 H410 , Aquatic Acute 1 H400 , Acute Tox. 4 H302

- **pyrene** (EC Number: 204-927-3, CAS Number: 129-00-0)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 2014
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Aquatic Chronic 1 H410 , Aquatic Acute 1 H400 , STOT SE 3 H335 , Eye Irrit. 2 H319 , Skin Irrit. 2 H315

- **indeno[123-cd]pyrene** (EC Number: 205-893-2, CAS Number: 193-39-5)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Carc. 2 H351

- **benzo[ghi]perylene** (EC Number: 205-883-8, CAS Number: 191-24-2)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 28/02/2015
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 23 Jul 2015
Hazard Statements: Aquatic Chronic 1 H410 , Aquatic Acute 1 H400

- **polychlorobiphenyls; PCB** (EC Number: 215-648-1, CAS Number: 1336-36-3)

CLP index number: 602-039-00-4
Description/Comments: Worst Case: IARC considers PCB Group 1; Carcinogenic to humans; POP specific threshold from ATP1 (Regulation 756/2010/EU) to POPs Regulation (Regulation 850/2004/EC). Where applicable, the calculation method laid down in European standards EN 12766-1 and EN 12766-2 shall be applied.
Data source: Regulation 1272/2008/EC - Classification, labelling and packaging of substances and mixtures. (CLP)
Additional Hazard Statement(s): Carc. 1A H350
Reason for additional Hazards Statement(s):
29 Sep 2015 - Carc. 1A H350 hazard statement sourced from: IARC Group 1 (23, Sup 7, 100C) 2012

- **barium oxide** (EC Number: 215-127-9, CAS Number: 1304-28-5)

Conversion factor: 1.117
Description/Comments: Data from C&L Inventory Database; No entries in Registered Substances Database, IARC or Pesticide Properties Database
Data source:
http://clp-inventory.echa.europa.eu/SummaryOfClassAndLabelling.aspx?SubstanceID=88825&HarmOnly=no?fc=true&lang=en
Data source date: 02 Jun 2014
Hazard Statements: Skin Irrit. 2 H315 , STOT SE 3 H335 , Eye Irrit. 2 H319 , Skin Corr. 1A H314 , Acute Tox. 3 H301 , Acute Tox. 4 H302 , Acute Tox. 4 H332

- **coronene** (EC Number: 205-881-7, CAS Number: 191-07-1)

Description/Comments: Data from C&L Inventory Database; no entries in Registered Substances or Pesticides Properties databases; SDS: Sigma Aldrich, 1907/2006 compliant, dated 2012 - no entries; IARC – Group 3, not carcinogenic.
Data source:
http://clp-inventory.echa.europa.eu/SummaryOfClassAndLabelling.aspx?SubstanceID=17010&HarmOnly=no?fc=true&lang=en
Data source date: 16 Jun 2014
Hazard Statements: STOT SE 2 H371

## Appendix B: Rationale for selection of metal species

**antimony {antimony trioxide}**

Worst case CLP species based on hazard statements/molecular weight and low solubility. Industrial sources include: flame retardants in electrical apparatus, textiles and coatings (edit as required)

**arsenic {arsenic pentoxide}**

worst case

**cadmium {cadmium oxide}**

Reasonable case CLP species based on hazard statements/molecular weight, very low solubility in water. Industrial sources include: electroplating baths, electrodes for storage batteries, catalysts, ceramic glazes, phosphors, pigments and nematocides. (edit as required) Worst case compounds in CLP: cadmium sulphate, chloride, fluoride & iodide not expected as either very soluble and/or compound's industrial usage not related to site history (edit as required)

**chromium in chromium(III) compounds {chromium(III) oxide}**

Reasonable case species based on hazard statements/molecular weight. Industrial sources include: tanning, pigment in paint, inks and glass (edit as required)

**chromium in chromium(VI) compounds {chromium(VI) oxide}**

Worst case CLP species based on hazard statements/molecular weight. Industrial sources include: production stainless steel, electroplating, wood preservation, anti-corrosion agents or coatings, pigments (edit as required)

**copper {dicopper oxide; copper (I) oxide}**

Reasonable case CLP species based on hazard statements/molecular weight and insolubility in water. Industrial sources include: oxidised copper metal, brake pads, pigments, antifouling paints, fungicide. (edit as required) Worse case copper sulphate is very soluble and likely to have been leached away if ever present and/or not enough soluble sulphate detected. (edit as required)

**lead {lead compounds with the exception of those specified elsewhere in this Annex}**

Cr VI not detected

**mercury {mercury dichloride}**

Worst case CLP species based on hazard statements/molecular weight (edit as required)

**molybdenum {molybdenum(VI) oxide}**

Worst case CLP species based on hazard statements/molecular weight (edit as required)

**nickel {nickel chromate}**

Worst case CLP species based on hazard statements/molecular weight (edit as required)

**selenium {selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex}**

Harmonised group entry used as most reasonable case. Pigment cadmium sulphoselenide not likely to be present in this soil. No evidence for the other CLP entries: sodium selenite, nickel II selenite and nickel selenide, to be present in this soil. (edit as required)

**zinc {zinc oxide}**

Cr Vi not detected

**barium {barium oxide}**

Cr VI not detected

## Appendix C: Version

HazWasteOnline Classification Engine: WM3 1st Edition v1.1, May 2018
HazWasteOnline Classification Engine Version: 2020.42.4165.8301 (11 Feb 2020)
HazWasteOnline Database: 2020.42.4165.8301 (11 Feb 2020)

This classification utilises the following guidance and legislation:
**WM3 v1.1 - Waste Classification** - 1st Edition v1.1 - May 2018
**CLP Regulation** - Regulation 1272/2008/EC of 16 December 2008
**1st ATP** - Regulation 790/2009/EC of 10 August 2009
**2nd ATP** - Regulation 286/2011/EC of 10 March 2011
**3rd ATP** - Regulation 618/2012/EU of 10 July 2012
**4th ATP** - Regulation 487/2013/EU of 8 May 2013
**Correction to 1st ATP** - Regulation 758/2013/EU of 7 August 2013
**5th ATP** - Regulation 944/2013/EU of 2 October 2013
**6th ATP** - Regulation 605/2014/EU of 5 June 2014
**WFD Annex III replacement** - Regulation 1357/2014/EU of 18 December 2014
**Revised List of Wastes 2014** - Decision 2014/955/EU of 18 December 2014
**7th ATP** - Regulation 2015/1221/EU of 24 July 2015
**8th ATP** - Regulation (EU) 2016/918 of 19 May 2016
**9th ATP** - Regulation (EU) 2016/1179 of 19 July 2016
**10th ATP** - Regulation (EU) 2017/776 of 4 May 2017
**HP14 amendment** - Regulation (EU) 2017/997 of 8 June 2017
**13th ATP** - Regulation (EU) 2018/1480 of 4 October 2018
**POPs Regulation 2004** - Regulation 850/2004/EC of 29 April 2004
**1st ATP to POPs Regulation** - Regulation 756/2010/EU of 24 August 2010
**2nd ATP to POPs Regulation** - Regulation 757/2010/EU of 24 August 2010

# **APPENDIX 11** – WAC Summary Data

**Waste Categorisation Summary Table**

**Avoca River Park, December 2019**

| Sample ID | TP02 | TP03 | TP05 | TP06 | TP08 | TP08 | TP09 | TP09 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Depth (m) | 0.50 | 0.50 | 1.20 | 1.50 | 1.50 | 2.50 | 0.50 | 1.50 | | | | | |
| Material Description | Made Ground | Made Ground | Clay | Silt | Made Ground | Silt | Made Ground | Clay | | | | | |
| Sample Date | 05/12/2019 | 04/12/2019 | 04/12/2019 | 06/12/2019 | 05/12/2019 | 05/12/2019 | 05/12/2019 | 05/12/2019 | | | | | |
| LoW Code | 17 05 04 | 17 05 04 | 17 05 04 | 17 05 04 | 17 05 03 | 17 05 04 | 17 05 04 | 17 05 03 | Inert Criteria | IMS* Criteria | Hazardous Criteria | LOD LOR | Units |
| Waste Category | Category C | Category B1 | Category A | Category A | Category D | Category C | Category B2 | Category D | | | | | |
| **Metals** | | | | | | | | | | | | | |
| Antimony | 1 | 2 | 2 | 2 | 104 | 2 | 15 | 3 | - | - | HazWaste | <1 | mg/kg |
| Arsenic | 4.5 | 19.6 | 54.5 | 58.0 | 1658.0 | 61.5 | 414.2 | 78.4 | - | - | HazWaste | <0.5 | mg/kg |
| Barium | 114 | 42 | 50 | 55 | 50 | 67 | 32 | 80 | - | - | HazWaste | <1 | mg/kg |
| Cadmium | 1.0 | <0.1 | <0.1 | 4.8 | 11.3 | 0.9 | 2.7 | <0.1 | - | - | HazWaste | <0.1 | mg/kg |
| Chromium | 86.1 | 41.0 | 46.8 | 35.8 | <0.5 | 34.8 | 16.2 | 44.3 | - | - | HazWaste | <0.5 | mg/kg |
| Copper | 47 | 49 | 34 | 1508 | 4010 | 236 | 762 | 172 | - | - | HazWaste | <1 | mg/kg |
| Lead | 41 | 24 | 51 | 74 | 1617 | 45 | 532 | 113 | - | - | HazWaste | <5 | mg/kg |
| Mercury | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | - | - | HazWaste | <0.1 | mg/kg |
| Molybdenum | 3.0 | 0.1 | 0.9 | 1.0 | 83.9 | 0.4 | 15.5 | 0.5 | - | - | HazWaste | <0.1 | mg/kg |
| Nickel | 2.0 | 41.3 | 21.9 | 21.8 | <0.7 | 17.5 | 16.9 | 32.3 | - | - | HazWaste | <0.7 | mg/kg |
| Selenium | 2 | 1 | 3 | 3 | <1 | 5 | 2 | 3 | - | - | HazWaste | <1 | mg/kg |
| Zinc | 6 | 125 | 114 | 1141 | 4572 | 892 | 927 | 4693 | - | - | HazWaste | <5 | mg/kg |
| Hexavalent Chromium | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | - | - | HazWaste | <0.3 | mg/kg |
| | | | | | | | | | | | | | |
| pH (solid sample) | 4.64 | 8.16 | 7.08 | 7.03 | 6.74 | 5.82 | 6.21 | 7.12 | - | - | HazWaste | <0.01 | pH units |
| alkali reserve | - | - | - | - | - | - | - | - | - | - | - | <0.000 | gNaOH/100g |
| | | | | | | | | | | | | | |
| **Asbestos** | | | | | | | | | | | | | |
| Asbestos Fibres | NAD | NAD | NAD | NAD | NAD | NAD | NAD | NAD | - | - | 0.1 | <0.001 | % |
| ACM Detected | - | - | - | - | - | - | - | - | - | - | - | Presence | Presence |
| | | | | | | | | | | | | | |
| **PAHs** | | | | | | | | | | | | | |
| Naphthalene | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | - | - | HazWaste | <0.04 | mg/kg |
| Acenaphthylene | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | - | - | HazWaste | <0.03 | mg/kg |
| Acenaphthene | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | - | - | HazWaste | <0.05 | mg/kg |
| Fluorene | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | - | - | HazWaste | <0.04 | mg/kg |
| Phenanthrene | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | - | - | HazWaste | <0.03 | mg/kg |
| Anthracene | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | - | - | HazWaste | <0.04 | mg/kg |
| Fluoranthene | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | - | - | HazWaste | <0.03 | mg/kg |
| Pyrene | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | - | - | HazWaste | <0.03 | mg/kg |
| Benzo(a)anthracene | <0.06 | <0.06 | <0.06 | <0.06 | <0.06 | <0.06 | <0.06 | <0.06 | - | - | HazWaste | <0.06 | mg/kg |
| Chrysene | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | - | - | HazWaste | <0.02 | mg/kg |
| Benzo(bk)fluoranthene | <0.07 | <0.07 | <0.07 | <0.07 | <0.07 | <0.07 | <0.07 | <0.07 | - | - | HazWaste | <0.07 | mg/kg |
| Benzo(a)pyrene | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | - | - | HazWaste | <0.04 | mg/kg |
| Indeno(123cd)pyrene | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | - | - | HazWaste | <0.04 | mg/kg |
| Dibenzo(ah)anthracene | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | - | - | HazWaste | <0.04 | mg/kg |
| Benzo(ghi)perylene | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | - | - | HazWaste | <0.04 | mg/kg |
| Coronene | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | - | - | HazWaste | <0.04 | mg/kg |
| PAH 6 Total | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | - | - | - | <0.22 | mg/kg |
| PAH 17 Total | <0.64 | <0.64 | <0.64 | <0.64 | <0.64 | <0.64 | <0.64 | <0.64 | 100 | 100 | - | <0.64 | mg/kg |
| Benzo(b)fluoranthene | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | - | - | HazWaste | <0.05 | mg/kg |
| Benzo(k)fluoranthene | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | - | - | HazWaste | <0.02 | mg/kg |
| Benzo(j)fluoranthene | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | - | - | HazWaste | <1 | mg/kg |
| | | | | | | | | | | | | | |
| **Hydrocarbons** | | | | | | | | | | | | | |
| TPH (C5-40) | 65 | 63 | <26 | <26 | <26 | <26 | <26 | <26 | - | - | HazWaste | <52 | mg/kg |
| MTBE | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | - | - | HazWaste | <5 | ug/kg |
| Benzene | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | - | - | HazWaste | <5 | ug/kg |
| Toluene | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | - | - | HazWaste | <5 | ug/kg |
| Ethylbenzene | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | - | - | HazWaste | <5 | ug/kg |
| m/p-Xylene | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | - | - | HazWaste | <5 | ug/kg |
| o-Xylene | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | - | - | HazWaste | <5 | ug/kg |
| Total 7 PCBs | <35 | <35 | <35 | <35 | <35 | <35 | <35 | <35 | 1,000 | 1,000 | HazWaste | <35 | ug/kg |
| | | | | | | | | | | | | | |
| **WAC** Solid Sample Summary** | | | | | | | | | | | | | |
| Total Organic Carbon * | 0.40 | 0.33 | 0.61 | 1.38 | 0.38 | 0.28 | 0.24 | 2.47 | 3 | 6 | - | <0.02 | % |
| Sum of BTEX | <0.025 | <0.025 | <0.025 | <0.025 | <0.025 | <0.025 | <0.025 | <0.025 | 6 | 6 | - | <0.025 | mg/kg |
| Sum of 7 PCBs | <0.035 | <0.035 | <0.035 | <0.035 | <0.035 | <0.035 | <0.035 | <0.035 | 1 | 1 | - | <0.035 | mg/kg |
| Mineral Oil | 136 | <30 | <30 | <30 | <30 | <30 | <30 | <30 | 500 | 500 | - | <30 | mg/kg |
| PAH Sum of 6 | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | - | - | - | <0.22 | mg/kg |
| PAH Sum of 17 | <0.64 | <0.64 | <0.64 | <0.64 | <0.64 | <0.64 | <0.64 | <0.64 | 100 | 100 | - | <0.64 | mg/kg |
| | | | | | | | | | | | | | |
| **WAC** Leachate Data** | | | | | | | | | | | | | |
| Arsenic | 1.129 | <0.025 | 0.165 | 0.165 | 0.995 | <0.025 | 0.580 | 0.773 | 0.5 | 1.5 | - | <0.025 | mg/kg |
| Barium | 0.18 | <0.03 | 0.07 | 0.07 | 0.10 | 0.16 | <0.03 | 0.06 | 20 | 20 | - | <0.03 | mg/kg |
| Cadmium | 0.039 | <0.005 | <0.005 | 0.007 | 0.020 | <0.005 | <0.005 | <0.005 | 0.04 | 0.04 | - | <0.005 | mg/kg |
| Chromium | 0.059 | <0.015 | <0.015 | <0.015 | <0.015 | 0.100 | <0.015 | <0.015 | 0.5 | 0.5 | - | <0.015 | mg/kg |
| Copper | 0.09 | <0.07 | <0.07 | 0.43 | 0.60 | <0.07 | <0.07 | 0.14 | 2 | 2 | - | <0.07 | mg/kg |
| Mercury | <0.0001 | <0.0001 | <0.0001 | 0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | 0.01 | 0.01 | - | <0.0001 | mg/kg |
| Molybdenum | 0.04 | 0.06 | <0.02 | <0.02 | 0.43 | <0.02 | 0.84 | 0.07 | 0.5 | 1.5 | - | <0.02 | mg/kg |
| Nickel | 0.09 | <0.02 | <0.02 | <0.02 | <0.02 | 0.05 | <0.02 | 0.04 | 0.4 | 0.4 | - | <0.02 | mg/kg |
| Lead | 0.13 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | 0.14 | 0.5 | 0.5 | - | <0.05 | mg/kg |
| Antimony | 0.07 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | 0.05 | 0.06 | 0.18 | - | <0.02 | mg/kg |
| Selenium | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | 0.28 | <0.03 | <0.03 | 0.1 | 0.3 | - | <0.03 | mg/kg |
| Zinc | 0.70 | 0.04 | 0.07 | 0.44 | 5.04 | 4.65 | 0.18 | 4.20 | 4 | 4 | - | <0.03 | mg/kg |
| Total Dissolved Solids | 23,559 | 480 | 1040 | 650 | 1190 | 3311 | 1680 | 990 | 4000 | 12,000 | - | <350 | mg/kg |
| Dissolved Organic Carbon | 60 | <20 | 110 | 160 | 50 | <20 | 30 | 250 | 500 | 500 | - | <20 | mg/kg |
| Phenol | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 1 | 1 | - | <0.1 | mg/kg |
| Sulphate as SO4 | 13,331 | 19 | 136 | <5 | 724 | 1,885 | 743 | <5 | 1000 | 3,000 | - | <0.5 | mg/kg |
| Chloride | <3 | <3 | 6 | <3 | 16 | 18 | 6 | 79 | 800 | 2,400 | - | <3 | mg/kg |

NAD- no asbestos detected

* - Integrated Materials Solutions Landfill, Hollywood Great, Nag's Head, The Naul, Co. Dublin

** - limits as specified in Council Decision 2003/33/EC

**Waste Categorisation Summary Table**

**Avoca River Park, December 2019**

| Sample ID | TP11 | TP11 | TP13 | TP13 | TP16 | TP17 | TP19 | TP19 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Depth (m) | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | | | | | |
| Material Description | Made Ground | Made Ground | Made Ground | Made Ground | Made Ground | Clay | Made Ground | Made Ground | | | | | |
| Sample Date | 05/12/2019 | 05/12/2019 | 11/12/2019 | 11/12/2019 | 09/12/2019 | 12/12/2019 | 11/12/2019 | 11/12/2019 | | | | | |
| LoW Code | 17 05 04 | 17 05 04 | 17 05 04 | 17 05 03 | 17 05 04 | 17 05 04 | 17 05 04 | 17 05 03 | Inert Criteria | IMS* Criteria | Hazardous Criteria | LOD LOR | Units |
| Waste Category | Category B1 | Category B1 | Category B1 | Category D | Category B1 | Category C | Category B1 | Category D | | | | | |
| **Metals** | | | | | | | | | | | | | |
| Antimony | 1 | 3 | 2 | 102 | 3 | 2 | 2 | 2 | - | - | HazWaste | <1 | mg/kg |
| Arsenic | 2.6 | 31.6 | 25.2 | 1,603.0 | 7.6 | 55.2 | 18.6 | 28.3 | - | - | HazWaste | <0.5 | mg/kg |
| Barium | 24 | 49 | 27 | 20 | 23 | 178 | 60 | 52 | - | - | HazWaste | <1 | mg/kg |
| Cadmium | <0.1 | 0.4 | 0.1 | 4.6 | 0.2 | 0.4 | <0.1 | 0.2 | - | - | HazWaste | <0.1 | mg/kg |
| Chromium | 17.5 | 50.6 | 31.5 | <0.5 | 205.3 | 39.3 | 36.9 | 48.3 | - | - | HazWaste | <0.5 | mg/kg |
| Copper | 18 | 65 | 42 | 6,327 | 56 | 98 | 37 | 93 | - | - | HazWaste | <1 | mg/kg |
| Lead | 39 | 63 | 19 | 1,633 | 40 | 100 | 17 | 145 | - | - | HazWaste | <5 | mg/kg |
| Mercury | <0.1 | <0.1 | <0.1 | 0.8 | <0.1 | <0.1 | <0.1 | <0.1 | - | - | HazWaste | <0.1 | mg/kg |
| Molybdenum | 0.5 | 0.8 | 0.4 | 110.8 | 1.4 | 0.9 | 1.2 | 1.8 | - | - | HazWaste | <0.1 | mg/kg |
| Nickel | 10.0 | 32.8 | 29.3 | <0.7 | 20.4 | 23.4 | 25.0 | 29.0 | - | - | HazWaste | <0.7 | mg/kg |
| Selenium | <1 | 2 | 1 | <1 | 1 | 2 | 1 | 2 | - | - | HazWaste | <1 | mg/kg |
| Zinc | 109 | 191 | 217 | 1,830 | 258 | 428 | 134 | 162 | - | - | HazWaste | <5 | mg/kg |
| Hexavalent Chromium | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | - | - | HazWaste | <0.3 | mg/kg |
| | | | | | | | | | | | | | |
| pH (solid sample) | 8.56 | 7.17 | 7.19 | 4.55 | 8.33 | 7.56 | 8.33 | 8.04 | - | - | HazWaste | <0.01 | pH units |
| alkali reserve | - | - | | | | | | | - | - | - | <0.000 | gNaOH/100g |
| | | | | | | | | | | | | | |
| **Asbestos** | | | | | | | | | | | | | |
| Asbestos Fibres | NAD | NAD | NAD | NAD | NAD | NAD | NAD | NAD | - | - | 0.1 | <0.001 | % |
| ACM Detected | - | - | - | - | - | - | - | - | - | - | - | Presence | Presence |
| | | | | | | | | | | | | | |
| **PAHs** | | | | | | | | | | | | | |
| Naphthalene | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | 0.18 | <0.04 | 0.84 | - | - | HazWaste | <0.04 | mg/kg |
| Acenaphthylene | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | 0.08 | - | - | HazWaste | <0.03 | mg/kg |
| Acenaphthene | <0.05 | 0.14 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | 0.09 | - | - | HazWaste | <0.05 | mg/kg |
| Fluorene | <0.04 | 0.08 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | 0.32 | - | - | HazWaste | <0.04 | mg/kg |
| Phenanthrene | <0.03 | 0.15 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | 1.50 | - | - | HazWaste | <0.03 | mg/kg |
| Anthracene | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | 0.11 | - | - | HazWaste | <0.04 | mg/kg |
| Fluoranthene | <0.03 | 0.06 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | 0.09 | - | - | HazWaste | <0.03 | mg/kg |
| Pyrene | <0.03 | 0.06 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | 0.81 | - | - | HazWaste | <0.03 | mg/kg |
| Benzo(a)anthracene | <0.06 | <0.06 | <0.06 | <0.06 | <0.06 | <0.06 | <0.06 | 0.18 | - | - | HazWaste | <0.06 | mg/kg |
| Chrysene | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | 0.88 | - | - | HazWaste | <0.02 | mg/kg |
| Benzo(bk)fluoranthene | <0.07 | <0.07 | <0.07 | <0.07 | <0.07 | <0.07 | <0.07 | 0.15 | - | - | HazWaste | <0.07 | mg/kg |
| Benzo(a)pyrene | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | 0.23 | - | - | HazWaste | <0.04 | mg/kg |
| Indeno(123cd)pyrene | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.40 | - | - | HazWaste | <0.04 | mg/kg |
| Dibenzo(ah)anthracene | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | - | - | HazWaste | <0.04 | mg/kg |
| Benzo(ghi)perylene | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | - | - | HazWaste | <0.04 | mg/kg |
| Coronene | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | - | - | HazWaste | <0.04 | mg/kg |
| PAH 6 Total | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | 0.47 | - | - | - | <0.22 | mg/kg |
| PAH 17 Total | <0.64 | <0.64 | <0.64 | <0.64 | <0.64 | <0.64 | <0.64 | 5.28 | 100 | 100 | - | <0.64 | mg/kg |
| Benzo(b)fluoranthene | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | 0.11 | - | - | HazWaste | <0.05 | mg/kg |
| Benzo(k)fluoranthene | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | 0.04 | - | - | HazWaste | <0.02 | mg/kg |
| Benzo(j)fluoranthene | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | - | - | HazWaste | <1 | mg/kg |
| | | | | | | | | | | | | | |
| **Hydrocarbons** | | | | | | | | | | | | | |
| TPH (C5-40) | <26 | 409 | <52 | <52 | 127 | <52 | 169 | 1,524 | - | - | HazWaste | <52 | mg/kg |
| MTBE | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | - | - | HazWaste | <5 | ug/kg |
| Benzene | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | - | - | HazWaste | <5 | ug/kg |
| Toluene | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | - | - | HazWaste | <5 | ug/kg |
| Ethylbenzene | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | - | - | HazWaste | <5 | ug/kg |
| m/p-Xylene | <5 | <5 | <5 | <5 | <5 | <5 | <5 | 26 | - | - | HazWaste | <5 | ug/kg |
| o-Xylene | <5 | <5 | <5 | <5 | <5 | <5 | <5 | 22 | - | - | HazWaste | <5 | ug/kg |
| Total 7 PCBs | <35 | <35 | **464** | <35 | **93** | <35 | **69** | **206** | 1,000 | 1,000 | HazWaste | <35 | ug/kg |
| | | | | | | | | | | | | | |
| **WAC** Solid Sample Summary** | | | | | | | | | | | | | |
| Total Organic Carbon * | 0.10 | 2.30 | 0.32 | 0.11 | 0.70 | 7.23 | 0.42 | 3.94 | 3 | 6 | - | <0.02 | % |
| Sum of BTEX | <0.025 | <0.025 | <0.025 | <0.025 | <0.025 | <0.025 | <0.025 | 0.048 | 6 | 6 | - | <0.025 | mg/kg |
| Sum of 7 PCBs | <0.035 | <0.035 | 0.464 | <0.035 | 0.093 | <0.035 | 0.069 | 0.206 | 1 | 1 | - | <0.035 | mg/kg |
| Mineral Oil | <30 | 249 | 31 | <30 | 61 | <30 | 82 | 576 | 500 | 500 | - | <30 | mg/kg |
| PAH Sum of 6 | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | 0.47 | - | - | - | <0.22 | mg/kg |
| PAH Sum of 17 | <0.64 | <0.64 | <0.64 | <0.64 | <0.64 | <0.64 | <0.64 | 5.28 | 100 | 100 | - | <0.64 | mg/kg |
| | | | | | | | | | | | | | |
| **WAC** Leachate Data** | | | | | | | | | | | | | |
| Arsenic | <0.025 | <0.025 | <0.025 | 0.265 | <0.025 | 0.267 | <0.025 | 0.203 | 0.5 | 1.5 | - | <0.025 | mg/kg |
| Barium | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | 0.23 | <0.03 | 0.06 | 20 | 20 | - | <0.03 | mg/kg |
| Cadmium | <0.005 | <0.005 | <0.005 | 0.021 | <0.005 | <0.005 | <0.005 | <0.005 | 0.04 | 0.04 | - | <0.005 | mg/kg |
| Chromium | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | 0.033 | 0.5 | 0.5 | - | <0.015 | mg/kg |
| Copper | <0.07 | <0.07 | <0.07 | 0.28 | <0.07 | <0.07 | <0.07 | <0.07 | 2 | 2 | - | <0.07 | mg/kg |
| Mercury | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | 0.01 | 0.01 | - | <0.0001 | mg/kg |
| Molybdenum | 0.03 | <0.02 | <0.02 | 0.13 | 0.06 | 0.15 | 0.03 | 0.26 | 0.5 | 1.5 | - | <0.02 | mg/kg |
| Nickel | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | 0.4 | 0.4 | - | <0.02 | mg/kg |
| Lead | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | 0.5 | 0.5 | - | <0.05 | mg/kg |
| Antimony | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | 0.02 | <0.02 | 0.06 | 0.06 | 0.18 | - | <0.02 | mg/kg |
| Selenium | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | 0.1 | 0.3 | - | <0.03 | mg/kg |
| Zinc | 0.04 | 0.06 | 0.18 | 3.81 | 0.04 | 0.04 | 0.05 | 0.07 | 4 | 4 | - | <0.03 | mg/kg |
| Total Dissolved Solids | 620 | 880 | 1390 | 2820 | <350 | 4,561 | 430 | 1330 | 4000 | 12,000 | - | <350 | mg/kg |
| Dissolved Organic Carbon | <20 | 40 | 30 | <20 | <20 | 170 | <20 | 300 | 500 | 500 | - | <20 | mg/kg |
| Phenol | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 1 | 1 | - | <0.1 | mg/kg |
| Sulphate as SO4 | 104 | 405 | 425 | 1,216 | <5 | 1,904 | 11 | 240 | 1000 | 3,000 | - | <0.5 | mg/kg |
| Chloride | 12 | 6 | <3 | 7 | <3 | 21 | <3 | 95 | 800 | 2,400 | - | <3 | mg/kg |

NAD- no asbestos detected

* - Integrated Materials Solutions Landfill, Hollywood Great, Nag's Head, The Naul, Co. Dublin

** - limits as specified in Council Decision 2003/33/EC

**Waste Categorisation Summary Table**

**Avoca River Park, December 2019**

| Sample ID | TP20 | TP20 | TP21 | TP21 | TP22 | TP24 | TP24 | TP25 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Depth (m) | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 0.50 | | | | | |
| Material Description | Made Ground | Silt | Made Ground | Clay | Made Ground | Made Ground | Peat | Made Ground | | | | | |
| Sample Date | 09/12/2019 | 09/12/2019 | 09/12/2019 | 09/12/2019 | 09/12/2019 | 09/12/2019 | 09/12/2019 | 10/12/2019 | | | | | |
| LoW Code | 17 05 04 | 17 05 04 | 17 05 04 | 17 05 04 | 17 05 04 | 17 05 04 | 17 05 04 | 17 05 04 | Inert Criteria | IMS* Criteria | Hazardous Criteria | LOD LOR | Units |
| Waste Category | Category C1 | Category C1 | Category B1 | Cateogy A | Category B2 | Category C1 | Category C | Category B1 | | | | | |
| **Metals** | | | | | | | | | | | | | |
| Antimony | 2 | 13 | 1 | 1 | 4 | 1 | 3 | 2 | - | - | HazWaste | <1 | mg/kg |
| Arsenic | 18.1 | 18.7 | 14.6 | 48.8 | 30.4 | 20.9 | 55.8 | 8.3 | - | - | HazWaste | <0.5 | mg/kg |
| Barium | 45 | 35 | 21 | 52 | 34 | 36 | 92 | 38 | - | - | HazWaste | <1 | mg/kg |
| Cadmium | 0.7 | 0.4 | 0.1 | <0.1 | 0.3 | 0.2 | 0.7 | <0.1 | - | - | HazWaste | <0.1 | mg/kg |
| Chromium | 90.6 | 1194.5 | 46.3 | 40.4 | 23.6 | 28.2 | 75.8 | 49.7 | - | - | HazWaste | <0.5 | mg/kg |
| Copper | 129 | 124 | 86 | 28 | 99 | 75 | 118 | 44 | - | - | HazWaste | <1 | mg/kg |
| Lead | 77 | 71 | 53 | 46 | 244 | 98 | 364 | 17 | - | - | HazWaste | <5 | mg/kg |
| Mercury | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | - | - | HazWaste | <0.1 | mg/kg |
| Molybdenum | 2.7 | 1.3 | 1.4 | 0.8 | 1.2 | 0.9 | 4.8 | 0.5 | - | - | HazWaste | <0.1 | mg/kg |
| Nickel | 25.4 | 104.9 | 22.1 | 21.0 | 14.0 | 20.7 | 27.6 | 28.1 | - | - | HazWaste | <0.7 | mg/kg |
| Selenium | <1 | <1 | <1 | 5 | 1 | <1 | 2 | 1 | - | - | HazWaste | <1 | mg/kg |
| Zinc | 331 | 182 | 357 | 103 | 132 | 235 | 260 | 119 | - | - | HazWaste | <5 | mg/kg |
| Hexavalent Chromium | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | - | - | HazWaste | <0.3 | mg/kg |
| | | | | | | | | | | | | | |
| pH (solid sample) | 8.34 | 7.82 | 8.34 | 7.12 | 9.59 | 8.04 | 6.69 | 7.08 | - | - | HazWaste | <0.01 | pH units |
| alkali reserve | | | | | | | | | - | - | - | <0.000 | gNaOH/100g |
| | | | | | | | | | | | | | |
| **Asbestos** | | | | | | | | | | | | | |
| Asbestos Fibres | <0.001 | <0.001 | NAD | NAD | NAD | <0.001 | NAD | NAD | - | - | 0.1 | <0.001 | % |
| ACM Detected | - | - | - | - | - | - | - | - | - | - | - | Presence | Presence |
| | | | | | | | | | | | | | |
| **PAHs** | | | | | | | | | | | | | |
| Naphthalene | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | - | - | HazWaste | <0.04 | mg/kg |
| Acenaphthylene | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | - | - | HazWaste | <0.03 | mg/kg |
| Acenaphthene | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | - | - | HazWaste | <0.05 | mg/kg |
| Fluorene | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | - | - | HazWaste | <0.04 | mg/kg |
| Phenanthrene | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | - | - | HazWaste | <0.03 | mg/kg |
| Anthracene | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | - | - | HazWaste | <0.04 | mg/kg |
| Fluoranthene | 0.05 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | - | - | HazWaste | <0.03 | mg/kg |
| Pyrene | 0.05 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | - | - | HazWaste | <0.03 | mg/kg |
| Benzo(a)anthracene | <0.06 | <0.06 | <0.06 | <0.06 | <0.06 | <0.06 | <0.06 | <0.06 | - | - | HazWaste | <0.06 | mg/kg |
| Chrysene | 0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | - | - | HazWaste | <0.02 | mg/kg |
| Benzo(bk)fluoranthene | <0.07 | <0.07 | <0.07 | <0.07 | <0.07 | <0.07 | <0.07 | <0.07 | - | - | HazWaste | <0.07 | mg/kg |
| Benzo(a)pyrene | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | - | - | HazWaste | <0.04 | mg/kg |
| Indeno(123cd)pyrene | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | - | - | HazWaste | <0.04 | mg/kg |
| Dibenzo(ah)anthracene | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | - | - | HazWaste | <0.04 | mg/kg |
| Benzo(ghi)perylene | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | - | - | HazWaste | <0.04 | mg/kg |
| Coronene | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | - | - | HazWaste | <0.04 | mg/kg |
| PAH 6 Total | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | - | - | - | <0.22 | mg/kg |
| PAH 17 Total | <0.64 | <0.64 | <0.64 | <0.64 | <0.64 | <0.64 | <0.64 | <0.64 | 100 | 100 | - | <0.64 | mg/kg |
| Benzo(b)fluoranthene | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | - | - | HazWaste | <0.05 | mg/kg |
| Benzo(k)fluoranthene | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | - | - | HazWaste | <0.02 | mg/kg |
| Benzo(j)fluoranthene | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | - | - | HazWaste | <1 | mg/kg |
| | | | | | | | | | | | | | |
| **Hydrocarbons** | | | | | | | | | | | | | |
| TPH (C5-40) | 151 | 197 | 263 | <52 | 143 | 149 | 70 | <52 | - | - | HazWaste | <52 | mg/kg |
| MTBE | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | - | - | HazWaste | <5 | ug/kg |
| Benzene | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | - | - | HazWaste | <5 | ug/kg |
| Toluene | <5 | <5 | <5 | <5 | <5 | <5 | <5 | 18 | - | - | HazWaste | <5 | ug/kg |
| Ethylbenzene | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | - | - | HazWaste | <5 | ug/kg |
| m/p-Xylene | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | - | - | HazWaste | <5 | ug/kg |
| o-Xylene | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | - | - | HazWaste | <5 | ug/kg |
| Total 7 PCBs | **3715** | <35 | <35 | <35 | <35 | <35 | <35 | <35 | 1,000 | 1,000 | HazWaste | <35 | ug/kg |
| | | | | | | | | | | | | | |
| **WAC** Solid Sample Summary** | | | | | | | | | | | | | |
| Total Organic Carbon * | NDP | NDP | 0.22 | 0.40 | 1.65 | NDP | 3.43 | 0.14 | 3 | 6 | - | <0.02 | % |
| Sum of BTEX | <0.025 | <0.025 | <0.025 | <0.025 | <0.025 | <0.025 | <0.025 | <0.025 | 6 | 6 | - | <0.025 | mg/kg |
| Sum of 7 PCBs | 3.715 | <0.035 | <0.035 | <0.035 | <0.035 | <0.035 | <0.035 | <0.035 | 1 | 1 | - | <0.035 | mg/kg |
| Mineral Oil | 60 | 93 | 168 | <30 | 90 | 67 | <30 | <30 | 500 | 500 | - | <30 | mg/kg |
| PAH Sum of 6 | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | - | - | - | <0.22 | mg/kg |
| PAH Sum of 17 | <0.64 | <0.64 | <0.64 | <0.64 | <0.64 | <0.64 | <0.64 | <0.64 | 100 | 100 | - | <0.64 | mg/kg |
| | | | | | | | | | | | | | |
| **WAC** Leachate Data** | | | | | | | | | | | | | |
| Arsenic | 0.038 | 0.035 | 0.078 | 0.294 | 0.148 | 0.058 | 0.477 | <0.025 | 0.5 | 1.5 | - | <0.025 | mg/kg |
| Barium | 0.03 | 0.04 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | 20 | 20 | - | <0.03 | mg/kg |
| Cadmium | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | 0.006 | <0.005 | 0.04 | 0.04 | - | <0.005 | mg/kg |
| Chromium | 0.024 | <0.015 | <0.015 | <0.015 | 0.043 | <0.015 | 0.017 | <0.015 | 0.5 | 0.5 | - | <0.015 | mg/kg |
| Copper | <0.07 | <0.07 | 0.08 | <0.07 | 1.04 | <0.07 | 1.01 | <0.07 | 2 | 2 | - | <0.07 | mg/kg |
| Mercury | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | 0.0002 | <0.0001 | 0.01 | 0.01 | - | <0.0001 | mg/kg |
| Molybdenum | 0.13 | 0.14 | 0.06 | 0.04 | 0.10 | 0.06 | 0.06 | 0.05 | 0.5 | 1.5 | - | <0.02 | mg/kg |
| Nickel | <0.02 | 0.03 | <0.02 | <0.02 | 0.05 | <0.02 | 0.04 | <0.02 | 0.4 | 0.4 | - | <0.02 | mg/kg |
| Lead | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | 0.97 | <0.05 | 0.5 | 0.5 | - | <0.05 | mg/kg |
| Antimony | <0.02 | <0.02 | <0.02 | <0.02 | 0.09 | <0.02 | 0.02 | <0.02 | 0.06 | 0.18 | - | <0.02 | mg/kg |
| Selenium | <0.03 | <0.03 | <0.03 | <0.03 | 0.07 | <0.03 | <0.03 | <0.03 | 0.1 | 0.3 | - | <0.03 | mg/kg |
| Zinc | 0.03 | 0.05 | 0.06 | 0.07 | <0.03 | <0.03 | 0.24 | <0.03 | 4 | 4 | - | <0.03 | mg/kg |
| Total Dissolved Solids | 770 | 1310 | 840 | 620 | 3570 | <350 | <350 | 420 | 4000 | 12,000 | - | <350 | mg/kg |
| Dissolved Organic Carbon | <20 | 50 | 60 | 150 | 270 | <20 | 360 | <20 | 500 | 500 | - | <20 | mg/kg |
| Phenol | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 1 | 1 | - | <0.1 | mg/kg |
| Sulphate as SO4 | 89 | 155 | 51 | <5 | 217 | 37 | <5 | 43 | 1000 | 3,000 | - | <0.5 | mg/kg |
| Chloride | <3 | <3 | 24 | 23 | 48 | <3 | 84 | <3 | 800 | 2,400 | - | <3 | mg/kg |

NAD- no asbestos detected

* - Integrated Materials Solutions Landfill, Hollywood Great, Nag's Head, The Naul, Co. Dublin

** - limits as specified in Council Decision 2003/33/EC

**Waste Categorisation Summary Table**

**Avoca River Park, December 2019**

| Sample ID | TP26 | TP27 | TP28 | TP28 | TP29 | TP29 | Inert Criteria | IMS* Criteria | Hazardous Criteria | LOD LOR | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Depth (m) | 0.50 | 0.50 | 0.50 | 1.50 | 0.50 | 1.50 | | | | | |
| Material Description | Made Ground | Made Ground | Made Ground | Silt | Made Ground | Clay | | | | | |
| Sample Date | 12/12/2019 | 10/12/2019 | 10/12/2019 | 10/12/2019 | 12/12/2019 | 12/12/2019 | | | | | |
| LoW Code | 17 05 04 | 17 05 04 | 17 05 04 | 17 05 04 | 17 05 04 | 17 05 03 | | | | | |
| Waste Category | Category B1 | Category B1 | Category B1 | Category B2 | Category B1 | Category D | | | | | |
| **Metals** | | | | | | | | | | | |
| Antimony | 2 | 3 | 3 | 1 | 1 | 6 | - | - | HazWaste | <1 | mg/kg |
| Arsenic | 16.7 | 19.6 | 12.0 | 50.3 | <0.5 | 24.1 | - | - | HazWaste | <0.5 | mg/kg |
| Barium | 38 | 70 | 54 | 67 | 15 | 40 | - | - | HazWaste | <1 | mg/kg |
| Cadmium | <0.1 | <0.1 | <0.1 | 1.7 | <0.1 | 0.6 | - | - | HazWaste | <0.1 | mg/kg |
| Chromium | 38.4 | 46.2 | 38.1 | 37.4 | 41.4 | 530.3 | - | - | HazWaste | <0.5 | mg/kg |
| Copper | 34 | 48 | 35 | 132 | 35 | 98 | - | - | HazWaste | <1 | mg/kg |
| Lead | 19 | 42 | 20 | 210 | 10 | 67 | - | - | HazWaste | <5 | mg/kg |
| Mercury | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | - | - | HazWaste | <0.1 | mg/kg |
| Molybdenum | <0.1 | <0.1 | <0.1 | 1.1 | 0.8 | 1.7 | - | - | HazWaste | <0.1 | mg/kg |
| Nickel | 37.0 | 58.5 | 41.8 | 26.8 | 10.1 | 31.7 | - | - | HazWaste | <0.7 | mg/kg |
| Selenium | 1 | 2 | 2 | 2 | <1 | 1 | - | - | HazWaste | <1 | mg/kg |
| Zinc | 122 | 149 | 133 | 263 | 169 | 134 | - | - | HazWaste | <5 | mg/kg |
| Hexavalent Chromium | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | - | - | HazWaste | <0.3 | mg/kg |
| | | | | | | | | | | | |
| pH (solid sample) | 7.17 | 7.12 | 6.28 | 7.40 | 8.43 | 7.44 | - | - | HazWaste | <0.01 | pH units |
| alkali reserve | | | | | | | - | - | - | <0.000 | gNaOH/100g |
| | | | | | | | | | | | |
| **Asbestos** | | | | | | | | | | | |
| Asbestos Fibres | NAD | NAD | NAD | NAD | NAD | <0.001 | - | - | 0.1 | <0.001 | % |
| ACM Detected | - | - | - | - | - | - | - | - | - | Presence | Presence |
| | | | | | | | | | | | |
| **PAHs** | | | | | | | | | | | |
| Naphthalene | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | 0.12 | - | - | HazWaste | <0.04 | mg/kg |
| Acenaphthylene | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | - | - | HazWaste | <0.03 | mg/kg |
| Acenaphthene | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | - | - | HazWaste | <0.05 | mg/kg |
| Fluorene | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | - | - | HazWaste | <0.04 | mg/kg |
| Phenanthrene | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | 0.13 | - | - | HazWaste | <0.03 | mg/kg |
| Anthracene | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | - | - | HazWaste | <0.04 | mg/kg |
| Fluoranthene | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | 0.09 | - | - | HazWaste | <0.03 | mg/kg |
| Pyrene | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | 0.14 | - | - | HazWaste | <0.03 | mg/kg |
| Benzo(a)anthracene | <0.06 | <0.06 | <0.06 | <0.06 | <0.06 | <0.06 | - | - | HazWaste | <0.06 | mg/kg |
| Chrysene | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | 0.13 | - | - | HazWaste | <0.02 | mg/kg |
| Benzo(bk)fluoranthene | <0.07 | <0.07 | <0.07 | <0.07 | <0.07 | <0.07 | - | - | HazWaste | <0.07 | mg/kg |
| Benzo(a)pyrene | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | - | - | HazWaste | <0.04 | mg/kg |
| Indeno(123cd)pyrene | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | - | - | HazWaste | <0.04 | mg/kg |
| Dibenzo(ah)anthracene | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | - | - | HazWaste | <0.04 | mg/kg |
| Benzo(ghi)perylene | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | - | - | HazWaste | <0.04 | mg/kg |
| Coronene | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | <0.04 | - | - | HazWaste | <0.04 | mg/kg |
| PAH 6 Total | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | - | - | - | <0.22 | mg/kg |
| PAH 17 Total | <0.64 | <0.64 | <0.64 | <0.64 | <0.64 | <0.64 | 100 | 100 | - | <0.64 | mg/kg |
| Benzo(b)fluoranthene | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | - | - | HazWaste | <0.05 | mg/kg |
| Benzo(k)fluoranthene | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | - | - | HazWaste | <0.02 | mg/kg |
| Benzo(j)fluoranthene | <1 | <1 | <1 | <1 | <1 | <1 | - | - | HazWaste | <1 | mg/kg |
| | | | | | | | | | | | |
| **Hydrocarbons** | | | | | | | | | | | |
| TPH (C5-40) | 55 | <52 | 85 | <52 | 176 | 1587 | - | - | HazWaste | <52 | mg/kg |
| MTBE | <5 | <5 | <5 | <5 | <5 | <5 | - | - | HazWaste | <5 | ug/kg |
| Benzene | <5 | <5 | <5 | <5 | <5 | <5 | - | - | HazWaste | <5 | ug/kg |
| Toluene | <5 | <5 | <5 | <5 | <5 | <5 | - | - | HazWaste | <5 | ug/kg |
| Ethylbenzene | <5 | <5 | <5 | <5 | <5 | 108 | - | - | HazWaste | <5 | ug/kg |
| m/p-Xylene | <5 | <5 | <5 | <5 | <5 | 859 | - | - | HazWaste | <5 | ug/kg |
| o-Xylene | <5 | <5 | <5 | <5 | <5 | 148 | - | - | HazWaste | <5 | ug/kg |
| Total 7 PCBs | <35 | <35 | <35 | <35 | **360** | <175 | 1,000 | 1,000 | HazWaste | <35 | ug/kg |
| | | | | | | | | | | | |
| **WAC** Solid Sample Summary** | | | | | | | | | | | |
| Total Organic Carbon * | 0.45 | 0.21 | 0.14 | 2.15 | 0.07 | NDP | 3 | 6 | - | <0.02 | % |
| Sum of BTEX | <0.025 | <0.025 | <0.025 | <0.025 | <0.025 | 1.115 | 6 | 6 | - | <0.025 | mg/kg |
| Sum of 7 PCBs | <0.035 | <0.035 | <0.035 | <0.035 | 0.360 | <0.175 | 1 | 1 | - | <0.035 | mg/kg |
| Mineral Oil | <30 | <30 | 44 | - | - | 542 | 500 | 500 | - | <30 | mg/kg |
| PAH Sum of 6 | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | - | - | - | <0.22 | mg/kg |
| PAH Sum of 17 | <0.64 | <0.64 | <0.64 | <0.64 | <0.64 | <0.64 | 100 | 100 | - | <0.64 | mg/kg |
| | | | | | | | | | | | |
| **WAC** Leachate Data** | | | | | | | | | | | |
| Arsenic | <0.025 | <0.025 | 0.028 | 0.882 | 0.073 | 0.115 | 0.5 | 1.5 | - | <0.025 | mg/kg |
| Barium | <0.03 | <0.03 | <0.03 | 0.12 | <0.03 | 0.06 | 20 | 20 | - | <0.03 | mg/kg |
| Cadmium | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | 0.04 | 0.04 | - | <0.005 | mg/kg |
| Chromium | <0.015 | <0.015 | <0.015 | 0.051 | <0.015 | <0.015 | 0.5 | 0.5 | - | <0.015 | mg/kg |
| Copper | <0.07 | <0.07 | <0.07 | 0.27 | <0.07 | <0.07 | 2 | 2 | - | <0.07 | mg/kg |
| Mercury | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | 0.01 | 0.01 | - | <0.0001 | mg/kg |
| Molybdenum | 0.03 | <0.02 | <0.02 | 0.09 | 0.03 | 0.21 | 0.5 | 1.5 | - | <0.02 | mg/kg |
| Nickel | <0.02 | <0.02 | <0.02 | 0.07 | <0.02 | 0.07 | 0.4 | 0.4 | - | <0.02 | mg/kg |
| Lead | <0.05 | <0.05 | <0.05 | 0.42 | <0.05 | <0.05 | 0.5 | 0.5 | - | <0.05 | mg/kg |
| Antimony | <0.02 | <0.02 | <0.02 | 0.04 | <0.02 | 0.03 | 0.06 | 0.18 | - | <0.02 | mg/kg |
| Selenium | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | 0.1 | 0.3 | - | <0.03 | mg/kg |
| Zinc | <0.03 | 0.03 | 0.04 | 0.22 | 0.03 | 0.04 | 4 | 4 | - | <0.03 | mg/kg |
| Total Dissolved Solids | 670 | <350 | 420 | 740 | 450 | 3728 | 4000 | 12,000 | - | <350 | mg/kg |
| Dissolved Organic Carbon | 30 | <20 | <20 | 480 | <20 | 140 | 500 | 500 | - | <20 | mg/kg |
| Phenol | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 1 | 1 | - | <0.1 | mg/kg |
| Sulphate as SO4 | 37 | 32 | 74 | <5 | 8 | 2294 | 1000 | 3,000 | - | <0.5 | mg/kg |
| Chloride | 4 | <3 | <3 | 101 | <3 | 56 | 800 | 2,400 | - | <3 | mg/kg |

NAD- no asbestos detected

* - Integrated Materials Solutions Landfill, Hollywood Great, Nag's Head, The Naul, Co. Dublin

** - limits as specified in Council Decision 2003/33/EC

# **APPENDIX 12** – Suitable 4 Waste Data

**S4UL - Metals, (Commerical), Avoca River Park, December 2019**

| Sample ID | TP02 | TP03 | TP05 | TP06 | TP08 | TP08 | TP09 | TP09 | TP11 | TP11 | Max Level Detected | Units | Commercial |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Depth (m) | 0.5 | 0.5 | 1.2 | 1.5 | 1.5 | 2.5 | 0.5 | 1.5 | 0.5 | 1.5 | | | |
| Antimony | 1 | 2 | 2 | 2 | 104 | 2 | 15 | 3 | 1 | 3 | 104 | mg/kg | ne |
| Arsenic | 4.5 | 19.6 | 54.5 | 58 | 1658 | 61.5 | 414.2 | 78.4 | 2.6 | 31.6 | 1658 | mg/kg | 640 |
| Barium | 114 | 42 | 50 | 55 | 50 | 67 | 32 | 80 | 24 | 49 | 114 | mg/kg | ne |
| Cadmium | 1 | <0.1 | <0.1 | 4.8 | 11.3 | 0.9 | 2.7 | <0.1 | <0.1 | 0.4 | 11.3 | mg/kg | 190 |
| Chromium | 86.1 | 41 | 46.8 | 35.8 | <0.5 | 34.8 | 16.2 | 44.3 | 17.5 | 50.6 | 86.1 | mg/kg | 8,600 |
| Copper | 47 | 49 | 34 | 1508 | 4010 | 236 | 762 | 172 | 18 | 65 | 4010 | mg/kg | 68,000 |
| Lead | 41 | 24 | 51 | 74 | 1617 | 45 | 532 | 113 | 39 | 63 | 1617 | mg/kg | ne |
| Mercury | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0 | mg/kg | 58 |
| Molybdenum | 3 | 0.1 | 0.9 | 1 | 83.9 | 0.4 | 15.5 | 0.5 | 0.5 | 0.8 | 83.9 | mg/kg | ne |
| Nickel | 2 | 41.3 | 21.9 | 21.8 | <0.7 | 17.5 | 16.9 | 32.3 | 10 | 32.8 | 41.3 | mg/kg | 980 |
| Selenium | 2 | 1 | 3 | 3 | <1 | 5 | 2 | 3 | <1 | 2 | 5 | mg/kg | 12,000 |
| Zinc | 6 | 125 | 114 | 1141 | 4572 | 892 | 927 | 4693 | 109 | 191 | 4693 | mg/kg | 730,000 |
| Hexavalent Chromium | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | 0 | mg/kg | 33* |

**S4UL - Metals, (Commerical), Avoca River Park, December 2019**

| Sample ID | TP13 | TP13 | TP16 | TP17 | TP19 | TP19 | TP20 | TP20 | TP21 | TP21 | Max Level Detected | Units | Commercial |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Depth (m) | 0.5 | 1.5 | 0.5 | 1.5 | 0.5 | 1.5 | 0.5 | 1.5 | 0.5 | 1.5 | | | |
| Antimony | 2 | 102 | 3 | 2 | 2 | 2 | 2 | 13 | 1 | 1 | 102 | mg/kg | ne |
| Arsenic | 25.2 | 1603 | 7.6 | 55.2 | 18.6 | 28.3 | 18.1 | 18.7 | 14.6 | 48.8 | 1603 | mg/kg | 640 |
| Barium | 27 | 20 | 23 | 178 | 60 | 52 | 45 | 35 | 21 | 52 | 178 | mg/kg | ne |
| Cadmium | 0.1 | 4.6 | 0.2 | 0.4 | <0.1 | 0.2 | 0.7 | 0.4 | 0.1 | <0.1 | 4.6 | mg/kg | 190 |
| Chromium | 31.5 | <0.5 | 205.3 | 39.3 | 36.9 | 48.3 | 90.6 | 1194.5 | 46.3 | 40.4 | 1194.5 | mg/kg | 8,600 |
| Copper | 42 | 6327 | 56 | 98 | 37 | 93 | 129 | 124 | 86 | 28 | 6327 | mg/kg | 68,000 |
| Lead | 19 | 1633 | 40 | 100 | 17 | 93 | 77 | 71 | 53 | 46 | 1633 | mg/kg | ne |
| Mercury | <0.1 | 0.8 | <0.1 | <0.1 | <0.1 | 93 | <0.1 | <0.1 | <0.1 | <0.1 | 93 | mg/kg | 58 |
| Molybdenum | 0.4 | 110.8 | 1.4 | 0.9 | 1.2 | 93 | 2.7 | 1.3 | 1.4 | 0.8 | 110.8 | mg/kg | ne |
| Nickel | 29.3 | <0.7 | 20.4 | 23.4 | 25 | 93 | 25.4 | 104.9 | 22.1 | 21 | 104.9 | mg/kg | 980 |
| Selenium | 1 | <1 | 1 | 2 | 1 | 93 | <1 | <1 | <1 | 5 | 93 | mg/kg | 12,000 |
| Zinc | 217 | 1830 | 258 | 428 | 134 | 93 | 331 | 182 | 357 | 103 | 1830 | mg/kg | 730,000 |
| Hexavalent Chromium | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | 93 | <0.3 | <0.3 | <0.3 | <0.3 | 93 | mg/kg | 33* |

**S4UL - Metals, (Commerical), Avoca River Park, December 2019**

| Sample ID | TP22 | TP24 | TP24 | TP25 | TP26 | TP27 | TP28 | TP28 | TP29 | TP29 | Max Level Detected | Units | Commercial |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample Depth (m)** | **0.5** | **0.5** | **1.5** | **0.5** | **0.5** | **0.5** | **0.5** | **1.5** | **0.5** | **1.5** | | | |
| Antimony | 4 | 1 | 3 | 2 | 2 | 3 | 3 | 1 | 1 | 6 | 6 | mg/kg | ne |
| Arsenic | 30.4 | 20.9 | 55.8 | 8.3 | 16.7 | 19.6 | 12 | 50.3 | <0.5 | 24.1 | 55.8 | mg/kg | 640 |
| Barium | 34 | 36 | 92 | 38 | 38 | 70 | 54 | 67 | 15 | 40 | 92 | mg/kg | ne |
| Cadmium | 0.3 | 0.2 | 0.7 | <0.1 | <0.1 | <0.1 | <0.1 | 1.7 | <0.1 | 0.6 | 1.7 | mg/kg | 190 |
| Chromium | 23.6 | 28.2 | 75.8 | 49.7 | 38.4 | 46.2 | 38.1 | 37.4 | 41.4 | 530.3 | 530.3 | mg/kg | 8,600 |
| Copper | 99 | 75 | 118 | 44 | 34 | 48 | 35 | 132 | 35 | 98 | 132 | mg/kg | 68,000 |
| Lead | 244 | 98 | 364 | 17 | 19 | 42 | 20 | 210 | 10 | 67 | 364 | mg/kg | ne |
| Mercury | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0 | mg/kg | 58 |
| Molybdenum | 1.2 | 0.9 | 4.8 | 0.5 | <0.1 | <0.1 | <0.1 | 1.1 | 0.8 | 1.7 | 4.8 | mg/kg | ne |
| Nickel | 14 | 20.7 | 27.6 | 28.1 | 37 | 58.5 | 41.8 | 26.8 | 10.1 | 31.7 | 58.5 | mg/kg | 980 |
| Selenium | 1 | <1 | 2 | 1 | 1 | 2 | 2 | 2 | <1 | 1 | 2 | mg/kg | 12,000 |
| Zinc | 132 | 235 | 260 | 119 | 122 | 149 | 133 | 263 | 169 | 134 | 263 | mg/kg | 730,000 |
| Hexavalent Chromium | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | 0 | mg/kg | 33* |

# **APPENDIX 13** – Potential Material Outlets

| Waste Category | Classification Criteria | Potential Outlets |
|---|---|---|
| Category A<br>Unlined Soil Recovery Facilities | Soil and Stone only which are free from[23] anthropogenic materials such as concrete, brock timber. Soil must be free from "contamination" e.g. PAHs, Hydrocarbons. | Soil Recovery Facilities, Waste Facility Permitted Sites, COR Sites or potential by-product if deemed not to be a waste and complying with requirements under Article 27 of European Waste Directive Regulations (2011).[24] |
| Category B1<br>Inert Landfill | Reported concentrations within inert waste limits, which are set out by the adopted EU Council Decision 2003/33/EC establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 and Annex II of Directive 1999/31/EC (2002).<br>Results also found to be non-hazardous using the HWOL application. | Integrated Materials Solutions Limited Partnership (IMS), Naul, County Dublin<br>W0129-02<br><br>Walshestown Landfill<br>Walshestown, Blackhall, Tipperkevin & Bawnoge, Naas,<br>County Kildare<br>W0254-01 |
| Category B2<br>Inert Landfill | Reported concentrations greater than Category B1 criteria but less than IMS Hollywood Landfill acceptance criteria, as set out in their Waste Licence W0129-02.<br>Results also found to be non-hazardous using the<br>HWOL application* | Integrated Materials Solutions Limited Partnership (IMS), Naul, County Dublin<br>W0129-02<br>Walshestown Landfill<br>Walshestown, Blackhall, Tipperkevin & Bawnoge, Naas,<br>County Kildare<br>W0254-01[25] |
| Category C<br>Non-Haz Landfill | Reported concentrations greater than Category B2 criteria but within non-haz landfill waste acceptance limits set out by the adopted EU Council Decision 2003/33/EC establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 and Annex II of Directive 1999/31/EC (2002).<br>Results also found to be non-hazardous using the<br>HWOL application. | Walshestown Landfill<br>Walshestown, Blackhall, Tipperkevin & Bawnoge, Naas,<br>County Kildare<br>W0254-01[26]<br><br>Ballynagran Landfill, Co. Wicklow.<br>W165-02<br><br>Drehid Landfill, Co. Kildare.<br>W0201-01<br><br>East Galway Landfill, Co. Galway.<br>W0178-02<br><br>Knockharley Landfill, Co. Meath.<br>W0146-02 |
| Category C 1<br>Non-Haz Landfill | As Category C but containing < 0.001% w/w asbestos fibres. | RILTA Environmental LTD.<br>W0192-03<br><br>Enva Portlaoise.<br>W0184-02 |

[23] Free from equates to less than 2%.
[24] S.I. No. 126/2011 - European Communities (Waste Directive) Regulations 2011 (Article 27).
[25] Licenced to accept Category B2 material for recovery.
[26] Licenced to accept Category C material for recovery.

| | | |
|---|---|---|
| Category C 2<br>Non-Haz Landfill | As Category C but containing >0.001% and <0.01% w/w asbestos fibres | RILTA Environmental LTD.<br>W0192-03<br><br>Enva Portlaoise.<br>W0184-02 |
| Category C<br>Non-Haz Landfill | As Category C but containing >0.01% and <0.1% w/w asbestos fibres. | RILTA Environmental LTD.<br>W0192-03<br><br>Enva Portlaoise.<br>W0184-02 |
| Category D<br>Hazardous Treatment | Results found to be hazardous using HWOL<br>Application. | RILTA Environmental LTD.<br>W0192-03<br><br>Enva Portlaoise.<br>W0184-02 |
| Category D 1<br>Hazardous Treatment | Results found to be hazardous due to the presence of asbestos (>0.1%). | RILTA Environmental LTD.<br>W0192-03 |

# 6.0 HYDROLOGY

## 6.1 INTRODUCTION

This chapter presents an assessment of the existing environment and the likely impacts of the proposed development on hydrology of the site and the surrounding area. The impact on land, soils, geology and hydrogeology is addressed in Chapter 5 (Lands, Soils, Geology and Hydrogeology).

This chapter presents an assessment of the existing environment and the likely impacts of the proposed development on hydrology within the local environment.

## 6.2 STUDY METHODOLOGY

This assessment was considered in the context of the available baseline information; potential impacts; consultations with statutory bodies and other parties and other available relevant information. The assessment was carried out according to the methodology specified in the following guidance documents:

- Environmental Protection Agency (EPA) Guidelines on the Information to be Contained in Environmental Impact Statements (2002)[1];
- EPA Advice Notes on Current Practice (in the Preparation of EIS) (2003)[2].
- 'Draft Guidelines on the Information to be contained in Environmental Impact Statements' (EPA, 2017)[3];

The following sources of information were consulted:

- Latest EPA Envision water quality monitoring data for watercourses in the area[4];
- Eastern River Basin District (ERBD) Management Plan – Liffey Water Management Unit and Programme of Measures – ERBD[5]
- The Planning System and Flood Risk Management, Guidelines for Planning Authorities (Department of the Environment, Heritage and Local Government (DoEHLG) and the Office of Public Works (OPW))[6]
- Requirements for the Protection of Fisheries Habitat During Construction and Development Works at River Sites (Eastern Regional Fisheries Board (ERFB))[7]
- Dublin City Council (2005) Greater Dublin Strategic Drainage Study: Technical Documents of Regional Drainage Policies. Dublin: Dublin City Council[8]
- Greater Dublin Regional Code of Practice for Drainage Works: Version Draft 6.0 (Wicklow County Council, South Dublin County Council (SDCC), Meath County Council, Kildare County Council, Fingal County Council, Dún Laoghaire- Rathdown County Council & Dublin City Council)[9]
- Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors" (CIRIA 532, 2001)[10]

The quality, magnitude and duration of potential impacts are defined in accordance with the criteria provided in the EPA Guidelines (Chapter 1, Table 1.2.)

In addition, due cognisance is also given to the document entitled '*Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology*

*for National Road Schemes*' by the National Roads Authority (NRA, 2009) where appropriate. The NRA criteria for rating the magnitude and significance of impacts at EIA stage are also relevant in determining impact assessment and are presented in Appendix 6.1.

## 6.3 RECEIVING ENVIRONMENT

### 6.3.1 Site Area Description

The subject site is located to the north of the Avoca River, in Avoca River Park, approximately 2.5 km northwest of Arklow town centre. The wider landholding comprises a large primarily brownfield site which is served by existing roads infrastructure implemented as part of the setting out of the Industrial Park. The wider landholding is subject to an extant permission (Planning Application No. 18940) for a data storage facility and ancillary development.

It is proposed to demolish the existing building onsite as part of the enabling works for this project. The total ground floor area of structures to be demolished is 2187m$^2$.

The site is bound to the north by a local access road which serves Avoca River Park. To the south and to the west the site is bound by Holfeld Plastics Limited. To the east the site is bound by the wider landholding that currently incorporate Harmony Timber and Stunt Drive Ireland which will cease operation and relocate prior to commencement of the data storage facility.

The existing site currently comprises brownfield lands. The Avoca River Park is well developed, current operations include timber fabrication plant, a plastic manufacturing plant, an existing substation and a storage area for scrapped vehicles.

The Avoca River Park site is located on land historically owned by Irish Fertiliser Industries Limited (IFI), who ceased their operations in 2002. The IFI site, including land of the proposed development, formerly operated under an EPA Integrated Pollution Control license (No. P0031-02). Upon liquidation of IFI in 2005, the license was transferred to Holfeld Plastics Ltd and portions of the landholding were subsequently removed from the license. The Avoca River Park site is no longer within an EPA license boundary. Its eastern portion is bounded by land formerly owned by IFI; this land was used by IFI as sedimentation lagoons and for landfilling of phosphogypsum, carbon and general plant wastes. The waste materials have been capped using imported soil and stone and vegetated.

The lands in the immediate vicinity surrounding the industrial park are composed of a mix of agricultural, forested, residential, commercial and institutional development. Shelton Abbey Prison is located to the north-west, Glenart Castle to the south-west and Sigma Aldrich facility to the south-east.

### 6.3.2 Hydrology

The Avoca River is the primary watercourse/surface water body in the local region. The Avoca is situated approximately 230 m south of the site and flows west to east. The development is located within Hydrometric Area No. 10 of the Irish River Network (Avoca-Vartry). It is within the Avoca River WFD Sub Catchment (Avoca_030, WFD code IE_EA_10A031140).

The Avoca River is formed by the confluence of the Avonmore and Avonbeg Rivers, which converge approximately 10.2 km upstream, to the northwest of the subject site;

and a further convergence with the Aughrim River at Woodenbridge approximately 3.3 km northwest and upstream of the site. The Avoca River contributing catchment is approximately 650 km$^2$ which produces a long-term average flow rate of 22 m$^3$/s. The river catchment drains the south-eastern slopes of the Wicklow Mountains and ultimately discharges to the Irish Sea at Arklow Harbour, approximately 3.5 km southeast of the site.

The Avoca catchment contains some of the most polluted stretches of river in Ireland as a result of acid mine drainage, which originates upstream of the site, having a profound impact on the lower 15 km of the river.

Two minor streams the Raheen Stream and the Sheepwalk stream flow into the Avoca river approximately 500 m to the west and 700 m to the east of the site, respectively. There is a small drainage stream crossing the lands located to the north of the Avoca River Park facility which flows along the Kilbride Road. This stream presumably discharges into a drainage channel which bisects the Avoca River Park site. This channel is connected to an attenuation basin located in the south-eastern corner of the Avoca River Park site which discharges to the Avoca River via a pump. The Shelton Abbey Canal runs from the eastern site boundary of the Avoca River Park through the former landfill / lagoons east of the site before discharging into the Avoca River (refer to Figure 6.1 below).

The future overhead line (OHL) and the towers which feed the Pollahoney Substation will cross the lands to the north of the Avoca Park site and will therefore cross the local drainage stream mentioned above.




***Figure 6.1*** Hydrological Environment

The Avoca River Valley and the Arklow Town Marsh are two proposed Natural heritage Areas, (NHAs) which are located c. 580m and 1 Km to the northwest and

southeast of the subject site, respectively and are dependent on the hydrological regime of the Avoca River (Figure 6.2 below).




***Figure 6.2*** Natura Sites in the Surrounding Area

### 6.3.3 Water Quality

The existing site is within the Avoca River WFD Sub catchment, which is the main hydrological feature in the study area, as shown in Figure 6.1.

The development is located within the ERBD, as defined under the EU Water Framework Directive (2000/60EC) European Communities Directive 2000/60EC, establishing a framework for community action in the field of water policy, (commonly known as the Water Framework Directive [WFD]).

The WFD requires 'Good Water Status' for all European waters, to be achieved through a system of river basin management planning and extensive monitoring. 'Good status' means both 'good ecological status' and 'good chemical status'.

The River Avoca downstream the confluence with the Ballyduff Stream belongs to the AVOCA_030 WFD Surface Waterbody (European Code IE_EA_10A031140). Upstream it is associated with the AVOCA_020 WFD Surface Waterbody (EC: IE_EA_10A031050).

The current status for the River Avoca downstream of Ballyduff Stream (i.e. AVOCA_030) is 'Unassigned' and its risk of not achieve Good status is under 'Review'. Upstream the confluence with the Ballyduff Stream (i.e., AVOCA_020 surface waterbody), the Avoca River has a 'Bad' status and is risk is also under review. This 'Bad' status is related to its biological (fish) status and specific pollutant conditions. The most recent data (2013-2019) show recurring exceedances of the

threshold values defined to achieve 'Good Status' (EU Environmental Objectives Regulations, SI 272/2009 and amendment SI 77/2019) for Copper and Zinc[1].

Downstream of the site, the Avoca river surface waterbody discharges into the Avoca Estuary Transitional Waterbody (EC: IE_EA_150_0100) which finally outfalls into the Southwestern Irish Sea - Brittas Bay Coastal Waterbody (EC: IE_EA_140_0000). The Avoca Estuary has a '*Moderate*' status and is '*At risk of not achieve Good status*'. Brittas Bay does not have an assigned WFD status currently whilst its risk status is advised as '*Not at risk*'.

*Surface Water Quality Results*

Q Values are used to express the biological water quality by the EPA, based on changes in the macro invertebrate communities of riffle areas brought about by organic pollution. Q1 indicates a seriously polluted water body, Q5 indicates unpolluted water of high quality.

Q Values for the River Avoca and its tributaries (for which data are available) are shown in Table 6.1 below and the descriptions of each of the Q Ratings are shown in Table 6.2. The Avoca Bridge EPA station is located c. 6.5 upstream of the subject site. The Aughrim river outfalls into the Avoca River c. 3.3 Km upstream of the site (i.e. c. 3.2 Km downstream the Avoca Bridge EPA station) and its EPA Station (Wooden bridge) is located c. 750 m upstream the confluence between both rivers. Refer to Figure 6.3 below for location of these points.

***Table 6.1*** EPA Biological Q Ratings for the Camac River

| RIVER | Station No. | Location | Biological Quality Ratings (Q Values) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1990 | 1994 | 1997 | 1999 | 2000 | 2003 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2015 | 2018 | 2019 |
| Avoca | RS10A030700 | Avoca Bridge | 1 | 1 | | | 1 | | 4 | 1 | 2 | | 4 | 3 | 3 | 3 | 2 | 2-3 |
| Aughrim (Wicklow) | RS10A020400 | Wooden Bridge | 5 | 4-5 | 4-5 | 4 | | 4 | 4 | | | 4 | | | 3-4 | 3-4 | 3-4 | |

***Table 6.2*** EPA Biological Q Ratings

| Quality Ratings | Quality Class | Pollution Status | Condition |
|---|---|---|---|
| Q5, Q4-5, Q4 | Class A | Unpolluted | Satisfactory |
| Q3-4 | Class B | Slightly Polluted | Unsatisfactory |
| Q3, Q2-3 | Class C | Moderately Polluted | Unsatisfactory |
| Q2, Q1-2, Q1 | Class D | Seriously Polluted | Unsatisfactory |

The water quality at the nearest gauging station which was tested in 2019 (Avoca Br, RS10A030700) is classified as 2-3 (moderately polluted). The Aughrim River at the nearest gauging station (Wooden Br, RS10A020400) was classified as 3-4 (slightly polluted). Both stations are upgradient of the proposed development.

[1] These exceedances are related with the Annual average – Environmental Quality Standard (EQS) defined in S.I. 272/2009, Table 10 – Psycho-chemicals conditions supporting the biological elements; Specific pollutants.

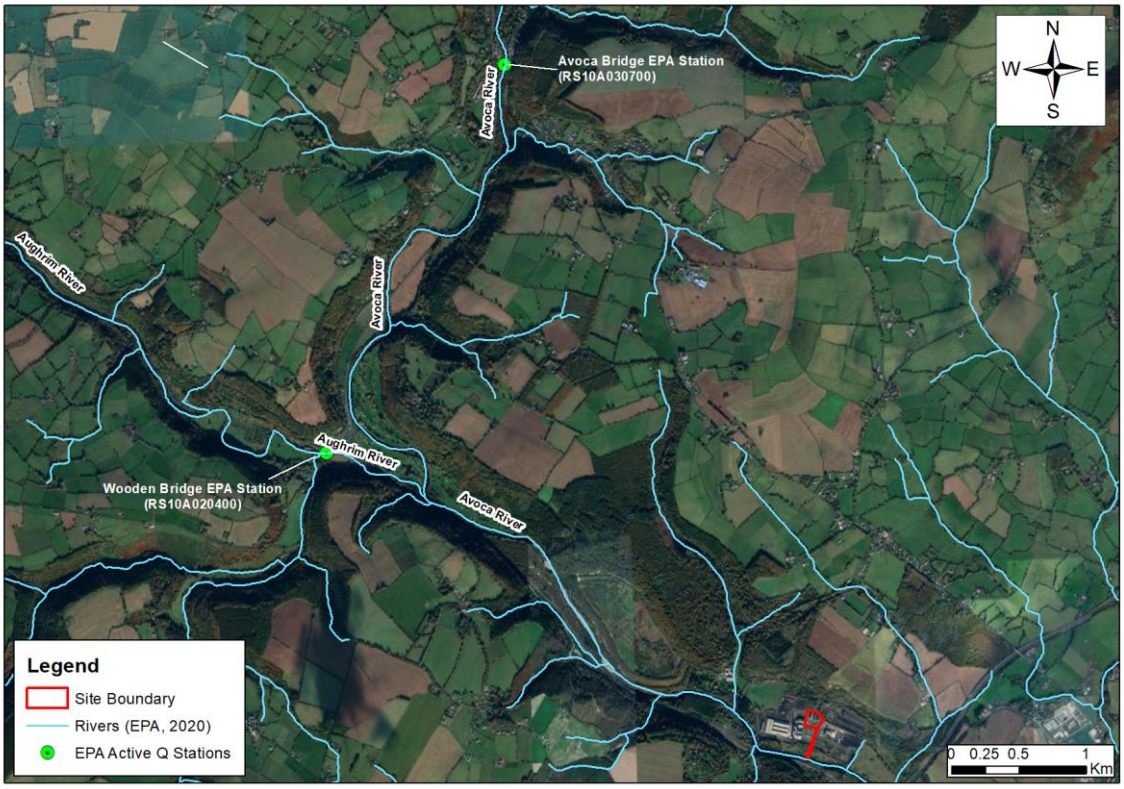



***Figure 6.3*** EPA Water Quality Stations

During May 2020 site investigations at the Avoca Park adjacent site were carried out by Ground Investigations Ireland (GII). These works included a surface water sample collected from the Avoca River upstream the site. This sample was analysed for dissolved metals, PAH, MTBE, BTEX, VOC and typical psycho-chemical parameters. The laboratory testing was competed by Element Materials Technology in the UK, which is a UKAS accredited laboratory.

These results were compared to the Environmental Quality Standard (EQS) defined by the EU Environmental Objectives Regulations (SI 272/2009 and amendment SI 77/2019). Exceedances for Dissolved Zinc and Ammonical Nitrogen EQS were registered. Low levels of PAHS were also detected.

### 6.3.4 Flooding

A Flood Risk Assessment for the site has been undertaken by Malachy Walsh and Partners and is included as Appendix 6.2. A summary of the flood risk for the site is provided in below.

Based on the Draft PFRA maps, the proposed development resides within ***Flood Zone C***. No coastal or fluvial risk exists to the site in the event that the 10%, 0.5% or 0.1% AEP occurs (refer to Figure 6.3 below). The development will not increase the flood risk outside its boundaries due to the application of SuDS within the design.

It should be noted that the flood embankment defence system on the Avoca River located to the south of the subject site contributes significantly to the reduced flood risk. The site would likely be liable to flooding in the 1% AEP fluvial flood event if this flood defence mechanism was not present.

To cater for residual risk of overtopping or breaching of the embankment the finished floor level (FFL) of the proposed substation is +3.1m. which is 150mm higher than the surrounding hardstand area and a further height above the wider area, this ensures the flood risk to the proposed structure is minimised.

The OPW web site (www.floodmaps.ie), shows no record of flooding events in the vicinity of the site. The closest recorded flooding event took place further downstream in the Avoca River 2.2 km to the south east.

Therefore, it is concluded that the proposed development is located appropriately with regard to flooding.

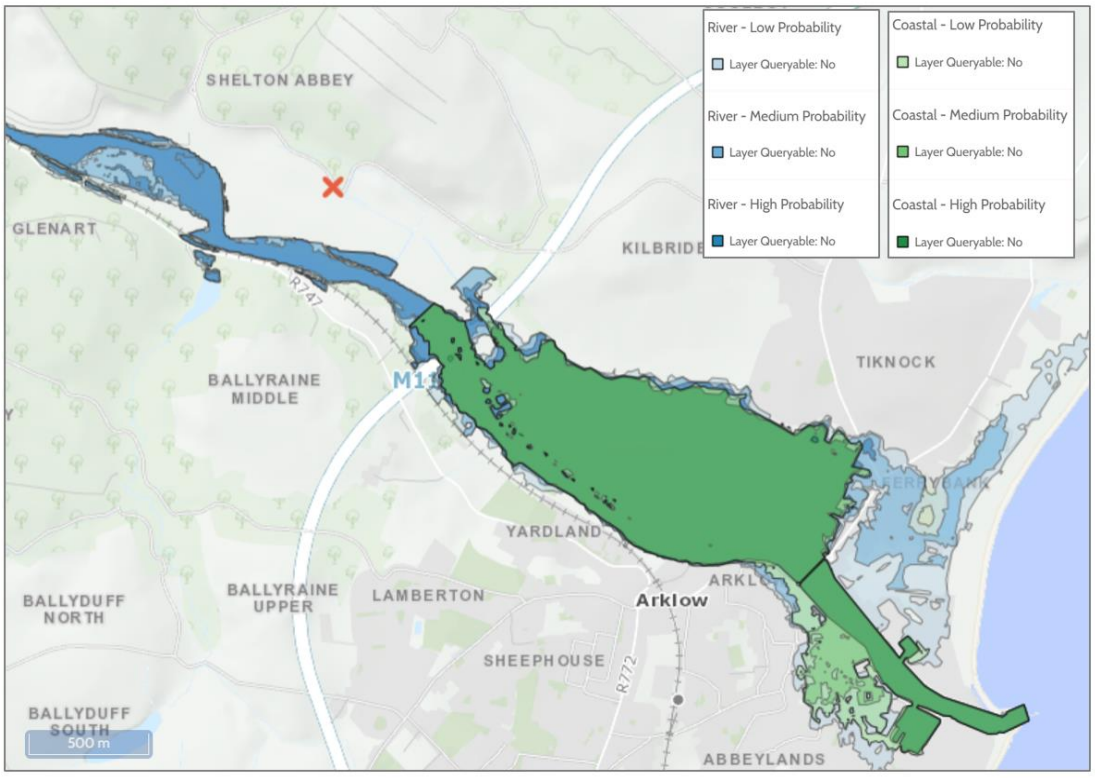



***Figure 6.4*** Flooding Zones (site location marked with a red cross)

### 6.3.5 Rating of Site Importance of the Hydrological Features

Based on the TII/NRA methodology, the site importance of hydrological features at this site is rated **Medium Importance** based on the following:

- There is direct connectivity with the Arklow Marsh proposed NHA, and the receiving waterbodies Avoca Estuary and Brittas Bay (which are not protected areas) through the Avoca River.

## 6.4 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

### 6.4.1 Water Supply

It is proposed to install a rainwater harvesting unit to supply non-potable water that is suitable for flushing toilets and washing hands. The rainwater harvesting unit is to be

Molloy Environmental Systems H+ Tank or similarly approved. The tank is to supply a minimum volume of 3500 litres capacity catering for 5 users (reserve supply for 10 days for 5 people). The system is to be installed in accordance with the manufacturer's requirements and is to be fitted with a UV bulb, pressure vessel with and an overflow to the storm network. Refer to the Water and Sewage Design Report (Malashy Walsh and Partners, December 2020) for further details.

### 6.4.2 Foul Sewage

The proposed substation will be served by a single 150mm diameter foul sewer which will discharge into a storage tank on site. The storage tank is to be designed for 5 maintenance personnel being present on site 6-8 times per month with the system emptied approximately twice per annum.

Sewer System

The flow rate assumed for the design is what is advised for an industrial office/factory type setting without a canteen given the nature and usage which is advised as being which is 50l/person/day within Irish Water's Code of Practice. This equates to 250l/day for the substation. As a result, the peak flow will be below 2.5l/s. Therefore, the drains are proposed to be laid at the minimum recommended gradient of 1 in 60.

Holding Tank System

The volume of effluent that would be generated by the flow rates is estimated to be 2.0$m^3$/month which equates to 12$m^3$ every six months. The proposed volume of the holding tank is 15$m^3$ which has spare capacity of 3$m^3$.

### 6.4.3 Surface Water Drainage

Construction

During the construction phase, a site drainage system will be constructed on the site so as to attenuate run-off, guard against soil erosion and safeguard downstream water quality. The drainage system will be implemented along the substation compound, internal access road and site construction temporary compound. The drainage system will be excavated and constructed in conjunction with the construction works. The surface water run-off drainage system will be implemented along all areas to be developed in order to separate and collect 'dirty water' run-off from the roads and compound, and to intercept clean over land surface water flows from upslope areas.

The site drainage system is designed as a measure to ensure that the design will not change the existing flow regime across the site, will not deteriorate water quality and will safeguard existing water quality status of the catchment from sediment runoff. To achieve separation, clean water drains will be positioned around the upslope areas of the substation compound, internal access road and site construction temporary compound while dirty water drains will be positioned on the downslope sides, with road surfaces and compounds sloped towards dirty drains.

Operation

It is proposed to construct a new surface water drainage network to intercept, attenuate and discharge surface water generated by the proposed development on our site. The system will consist of a piped network, underground attenuation system,

petrol interceptor and a hydrobrake. The hydrobrake will limit the rate of discharge from the site to a suitable outflow rate.

The outflow rate was calculated using the IH124 method developed by the UK Institute of Hydrology with further guidance adopted from the Greater Dublin Strategic Drainage Study (GDSDS). For small sites it is deemed appropriate to use a single outflow rate rather than separate control rates.

In accordance with current good design practice and guidance the surface water runoff from the proposed development will be limited to a pre-development greenfield rate. The total site area is 1.65 Ha but only 0.61 Ha is anticipated to be impermeable. As such, a mean annual peak flow (Qbar) of 4.86l/s was estimated.

Controlled discharge to the Avoca River will be via a pumping system. Separate attenuation systems are proposed for the MV Control Building and GIS Substation Building as these will be operated and maintained by separate entities in the future scenario. A hydrobrake will be installed at the outlet of each respected attenuation tank. The discharged flow rate will combine at a pumping station, located on common grounds, near the site entrance. It is proposed to install approximately 250m of rising main to pump storm water to a discharge manhole and subsequently discharge stormwater directly to the Avoca River. All surface water from the proposed site will discharge via a class 1 hydrocarbon interceptor to capture any potential hydrocarbon contamination prior to discharge into the attenuation system and the Avoca River. This is in accordance with the requirements of Wicklow CC Water Objective

The storm drainage proposals will incorporate the following elements:

- Pipes are designed to reach maintain self-cleansing velocity in the one in 5-year event.
- Sewers not surcharging in the 5-year event with 10% Climate Change in line with what is advised for industrial areas within IS EN 752.
- Sewers not flooding in the 100-year event with 10% Climate Change.
- Trapped road gullies pots are proposed in line with PPG by the Environment Agency in the UK. Manholes immediately upstream and downstream of the soakaway are to have a sump also.
- A sub-surface infiltration system designed for full storage of a 1 in 100-year storm plus climate change.

Further details of the surface water drainage system can be found in the Water and Sewage Design Report (Malachy Walsh and Partners, December 2020).

## 6.5 POTENTIAL IMPACT OF THE PROPOSED DEVELOPMENT

The potential impacts during construction and operation phases of the proposed development on the surface water environment are outlined in the following paragraphs.

### 6.5.1 Construction Phase

The key civil engineering works at the proposed development will involve the excavation of material for foundations and deliveries of imported engineering fill, crushed stone, concrete, reinforcement and other construction materials. Other construction activities will include site storage of cement and concrete materials, fuels for construction vehicles.

*Increased Run-off and Sediment Loading*

Surface water run-off from site preparation, levelling, landscape contouring and excavations during the construction phase may contain increased silt levels or become polluted from construction activities. Run-off containing large amounts of silt can cause damage to surface water systems and receiving watercourses. Silt water can arise from excavations, exposed ground, stockpiles, and access roads.

During the construction phase at this site there is potential for an increase in run-off due to the introduction of impermeable surfaces and the compaction of soils. This will reduce the infiltration capacity and increase the rate and volume of direct surface run-off. The potential impact of this is a possible increase in surface water run-off and sediment loading which could potentially impact local drainage. Previous uses of the site and site testing has not indicated any evidence of soil contamination at the site.

There is a possible direct pathway from the excavations works area to the surface water drainage ditches onsite and the Avoca River via the drainage system. Mitigation measures highlighted in Section *6*.7 will be employed to remove the risk to affect the Avoca River regime.

*Uncontrolled Discharges, Fuel and Other Accidental Spills*

During the construction phase, there is a risk of accidental pollution incidences from the following sources:

- Spillage or leakage of fuels (and oils) stored on site.
- Spillage or leakage of fuels (and oils) from construction machinery or site vehicles.
- Spillage of oil or fuel from refuelling machinery on site.
- The use of concrete and cement.

Machinery activities on site during the construction phase may result in contamination of runoff into surface water. Potential impacts could arise from accidental spillage of fuels, oils, paints etc. which could impact surface water if allowed to runoff into surface water systems and/or receiving watercourses.

Concreting operations carried out near surface water drainage points during construction activities have the potential to lead to discharges to a watercourse. Concrete (specifically, the cement component) is highly alkaline and any spillage to a local watercourse would be detrimental to water quality and local fauna and flora.

The implementation of the mitigation measures detailed in Section 6.7 and in the CEMP will ensure that any accidental release will be mitigated with negligible impact.

*Wastewater*

Welfare facilities will be provided for the contractors on site during the construction works. During construction, portable sanitary facilities will be provided with waste collected and disposed of appropriately. There are no predicted adverse impacts on wastewater during construction.

### 6.5.2 Operational Phase

During operation measures there is no requirement for bulk fuels or chemical storage (apart from the small bunded storage of diesel for the transformer), no requirement for discharge to ground and no requirement for abstraction of groundwater. The site will be frequented by a maximum of 5 personnel and therefore the potential wastewater loading and water requirement is very low. Potential impacts which have been considered are outlined below:

*Surface Water Runoff*

Without proper control measures, increase in hard stand would result in increase in the rate of run-off. The Wicklow County Council Development Plan requires all new developments to adhere to the practice of Sustainable Urban Drainage Systems (SuDS) for the control of surface water on site. This is highlighted in the Greater Dublin Strategic Drainage Strategy and the design has incorporated SUDs within the drainage design for the proposed development.

*Uncontrolled Discharges, Fuel and Other Accidental Spills*

There is a low potential for leaks and spillages during operation and maintenance of the development as no bulk fuel or chemicals required for operation. However, there is a requirement for oil storage for the transformers; the maximum storage is c. 36 $m^3$ and this will be stored within a bunded area which is greater than 110% of the storage capacity. Any accidental emissions during storage, transfer, or delivery or leakage in the car parks could cause localised contamination if the emissions enter the soil and groundwater environment without adequate mitigation. However, it is noted that any accidental discharge will more likely impact stormwater drainage due to the hardstand and drainage infrastructure proposed.

There is a direct pathway to surface water from this site, however mitigation measures mentioned above and below in section 6.7 will avoid potential impact on offsite and onsite watercourses.

*Foul Water*

The proposed development will not increase the foul water discharge in the public sewer as the proposed substation will be served by an internal foul sewer which will discharge into a storage tank on site. The tank is to be fitted with an alarm which will advise when emptying is required thereby avoiding potential for overflow.

*Water Supply*

The proposed development will not increase the demand for water from the public water supply system as it is considered to install a rainwater harvesting unit to supply non-potable water that is suitable for flushing toilets and washing hands.

## 6.6 DO NOTHING SCENARIO

Should the proposed development not take place, the runoff from the site will continue to directly enter the existing drainage system.

It is noted that the proposed redevelopment for the site should have a positive gain for the receiving waters as the drainage design will comply with GDSDS Guidelines resulting in attenuated run-off from the site and improved water quality management.

## 6.7 REMEDIAL AND MITIGATION MEASURES

The design of the proposed development has taken account of the potential impacts of the development and the risks to the water environment. Measures have been developed to mitigate the potential effects on the local water environment. These measures seek to avoid or minimise potential effects in the main through the implementation of best practice construction methods and adherence to all relevant legislation.

The following mitigation measures are designed to address the impacts associated with the construction and operational phase of the project. Due to the inter-relationship between this section and Section 5.0 (Soils, Geology and Hydrogeology) the following mitigation measures discussed will be considered applicable to both.

### 6.7.1 Construction Phase

During the construction phase, mitigation measures have been applied for the following potential impacts:

- Increased runoff and sediment loading
- Fuel and Chemical Handling

These mitigation measures will ensure that no contaminated runoff or untreated wastewater will enter any watercourses during construction of the proposed development.

A Construction Environmental Management Plan (CEMP) will be developed by the Applicant and the construction contractor prior to commencement of construction. The CEMP will incorporate the mitigation measures outlined below as they relate to the construction phase. The CEMP will include emergency response procedures in the event of a spill, leak, fire or other environmental incident related to construction. This is an active document which is continuously updated to manage risk during the construction programme. All relevant personnel working on the site will be trained in the implementation of the procedures.

As a minimum, the manual will be formulated in consideration of the standard best international practice including but not limited to:

- CIRIA, (2001), Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors.
- Construction Industry Research and Information Association (CIRIA) Environmental Good Practice on Site (C650), 2005.
- BPGCS005, Oil Storage Guidelines.

- Eastern Regional Fisheries Board, (2006), Fisheries Protection Guidelines: Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites.
- CIRIA 697, The SUDS Manual, 2007.
- UK Pollution Prevention Guidelines (PPG) UK Environment Agency, 2004.

*Management of sediment loading and water quality*

During the construction phase, any drains carrying construction site runoff will be diverted into settlement ponds, which will promote sediment deposition and reduce hydraulic loading by slowing flow velocities allowing sediment to settle. Settlement ponds will be designed in the form of a three stage tiered pond system. These will be maintained by the contractor to the satisfaction of Inland Fisheries Ireland for the entire construction period.

Flow from the settlement ponds will enter the sediment traps where runoff will be cleaned further by a series of graded gravel filters. Hy-Tex Terrastop silt fences will require regular inspection and cleaning and removed material will be disposed of at an appropriate location.

Hy-Tex Terrastop silt fences will be placed at the end of any locally steep section of drain. They will have the double benefit of effectively producing a localised swale to reduce scour effects and also attenuating and filtering the discharge.

Temporary deposition areas will be designated adjacent to the site construction compound to hold temporary stockpiles. These will be located away from existing drains. Stockpiles that are at risk of erosion will be protected by Hy-Tex Terrastop silt curtain fencing to prevent contamination of runoff.

The substation compound and internal access road will be graded so that all runoff is directed to the dirty water drains. A low mound will be constructed between the compounds / road and the clean water drain to ensure that runoff from the compound / road cannot flow into the clean water system.

A wheel wash will be provided for heavy vehicles exiting the site to ensure that roads outside of the site boundary are clean. These can take the form of dry or wet wheel wash facilities. In the case of a wet wheel wash it is recommended that a designated bunded and impermeable wheel wash area is provided and that the resultant waste water is diverted to a settlement pond for settling out of suspended solids.

No disturbance will be permitted to the natural vegetative buffer. They will be fenced where necessary.

The area of exposed ground will be kept to a minimum by maintaining where possible existing vegetation that would otherwise be subject to erosion in the vicinity of the development. The clearing of topsoil will be delayed until just before construction begins rather than stripping the entire site months in advance.

Permanent drainage measures such as the underground rainwater harvesting tank, foul tank, oil bypass separator and storm water filtration tank will be installed within the compound.

Piped and channel drainage systems incorporating roadside gullies will be installed to collect storm water from the finished compound areas and internal access road.

Collected storm water runoff will pass through the oil bypass separator before discharging to the storm water filtration tank.

Excavation and stockpiling activities will be minimised during wet weather periods. Stockpiles of excavated soil and/or subsoil will be graded so as to shed water. Stockpiles of soil/subsoil will be restricted to less than 3m in height. Interception and channelling of surface water runoff over exposed soil/subsoil surfaces to sumps, silt traps or settlement ponds, will occur prior to discharge to existing drains or outfalls. Interception and diversion of surface water runoff away from open excavations will occur. Repeated handling of soil will be avoided and ideally all soil stockpiles will remain undisturbed pending later re-use for landscaping.

*Fuel and Chemical Handling*

To minimise any impact on the underlying subsurface strata from material spillages, all oils, solvents and paints used during construction will be stored within temporary bunded areas.

Leakages of oil from oil stores will be prevented by storing these oils in bunded tanks which have a capacity of 110% of the total volume of the stored oil. Ancillary equipment such as hoses and pipes will be contained within the bunded storage container. Drainage from the bunded area(s) shall be diverted for collection and safe disposal.

Refuelling of construction machinery and vehicles and the addition of hydraulic oils or lubricants to vehicles will take place in designated refuelling areas using a prescribed re-fuelling procedure. Plant nappies or absorbent mats to be place under refuelling point during all refuelling to absorb drips. All relevant personnel will be fully trained in the use of this equipment. Guidelines such as “Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors” (CIRIA 532, 2001) will be complied with.

Should there be an oil leak or spill, the leak or spill will be contained immediately using oil spill kits; the nearby dirty water drain outlet will be blocked with an oil absorbent boom until the fuel/oil spill has been cleaned up and all oil and any contaminated material removed from the area. This contaminated material will be properly disposed of in a licensed facility.

All ready-mixed concrete will be brought to site by truck. A suitable risk assessment for wet concreting will be completed prior to works being carried out which will include measures to prevent discharge of alkaline wastewaters or contaminated storm water to the underlying subsoil. The pouring of concrete will take place within a designated area using a geosynthetic material to prevent concrete runoff into the soil/groundwater media. Pours will not take place during forecasted heavy rainfall. Washout of concrete transporting vehicles will not take place on site. Concrete trucks will be washed out off site at the source quarry.

To reduce the volume of cementitious water, only concrete truck chutes will be washed down on site. The concrete trucks will wash down their chutes at a designated chute wash down area in the site compound. The wash down area will consist of a polythene lined bunded area with a capacity of about $20m^3$. The location of the chute washdown area will be appropriately located. The system is sealed with no overflow discharge to the drainage system.

In the event of a spillage on site, the dirty water drains in the immediate area will temporarily be blocked and the pH levels of the water in the associated settlement ponds will be monitored and if necessary will adjust the pH levels using $CO_2$ entrainment. Any spillage will be cleared immediately and deposited in the Chute wash down area

In the case of drummed fuel or other chemical which may be used during construction containers will be stored in a dedicated internally bunded chemical storage cabinet and labelled clearly to allow appropriate remedial action in the event of a spillage.

### 6.7.2 Operational Phase

The following containment measures are included within the design to reduce potential for environmental impact.

*Environmental Procedures*

There will be comprehensive emergency response procedures and standard operating procedures to respond to chemical spillage all types. All employees will be provided with such equipment, information, training and supervision as is necessary to implement the emergency response procedures and standard operating procedures.

*Fuel and Chemical Handling*

During operation measures there is no requirement for bulk fuels or chemical storage, no requirement for discharge to ground and no requirement for abstraction of groundwater. However, there is a requirement for oil storage for the transformers. The maximum storage is c. 36 $m^3$ and this will be stored within a bunded area in line with the requirements of the *Guidance to Storage and Transfer of Materials for Scheduled Activities* (EPA, 2005).

A standard operating procedure for fuel unloading should be in place at the site and tanks will be fitted with high level alarms to prevent overfilling. All staff should be trained in spill containment measures and emergency response.

*Surface Water Drainage*

The proposed development will provide a significant improvement to the local drainage catchment as it is proposed to provide an attenuation system prior to discharge into the Avoca River.

A number of measures will be put in place to minimise the likelihood of any spills entering the water environment to include the design of the car park, fitting of refuelling areas with hydrocarbon interceptors and on-site speed restrictions.

A Flood Risk Assessment for the site has been undertaken by Malachy Walsh and Partners in accordance with the OPW's 'The Planning System and Flood Risk Management Guidelines for Planning Authorities', November 2009 and is included in the present planning application. According to this report, the development has a very low risk of flooding. Refer to Appendix 6.2 at the end of this report for full *Flood Risk Assessment* report for the proposed development site.

*Foul Water*

The proposed substation will be served by a single 150mm diameter foul sewer which will discharge into a storage tank on site. The storage tank is to be designed for 5 maintenance personnel being present on site 6-8 times per month with the system emptied approximately twice per annum.

Emptying times of the holding tank may vary depending on usage on the site but should be emptied every 6 months at a minimum. An alarm will be fitted to the tank to advise the maintenance management that the system is close to capacity. This is so that the system can be emptied to prevent the risk of it overflowing and causing an environmental impact on the local environmental impact.

*Water Supply*

The proposed rainwater harvesting unit is to be is to be Molloy Environmental Systems H+ Tank or similarly approved. The tank is to supply a minimum volume of 3500 litres capacity catering for 5 users (reserve supply for 10 days for 5 people). The system is to be installed in accordance with the manufacturer's requirements and is to be fitted with a UV bulb, pressure vessel with and an overflow to the storm network.

## 6.8 PREDICTED IMPACT OF THE PROPOSED DEVELOPMENT

This section describes the predicted impact of the proposed development following the implementation of the remedial and mitigation measures.

### 6.8.1 Construction Phase

The implementation of mitigation measures highlighted in Section 7.7.1 will ensure that the predicted impacts on the surface water environment do not occur during the construction phase and that the residual impact will be ***short term-imperceptible-neutral***.

### 6.8.2 Operational Phase

The implementation of mitigation measures highlighted in Section 7.7.2 will ensure that the predicted impacts on the surface water environment do not occur during the operational phase and that the residual impact will be ***long term-imperceptible-neutral***.

## 6.9 MONITORING

Visual inspection of the surface water run-off controls (settlement ponds, silt filters, drains) and water quality monitoring of the discharge from on-site sediment and erosion controls will be undertaken during the construction phase to confirm that there is no impact on surface water during the construction and operation of the development.

## 6.10 RESIDUAL IMPACTS

The residual impacts are those that would occur after the mitigation measures, as outlined in Section 7.7 above have taken effect.

### 6.10.1 Construction Phase

In relation to the construction phase the impact on the water during construction (EPA, 2002) is considered to be have a ***Short term, Imperceptible Impact with a neutral impact on quality*****,** i.e. an impact capable of measurement but without noticeable consequences. This is based on the following assessments.

There will be no significant increase in runoff from the site during construction and run-off quality will be mitigated if required.

### 6.10.2 Operational Phase

There are no likely significant impacts on the hydrological environment associated with the proposed development of the site and considering cumulative impact. It is not anticipated that any impacts will arise following the implementation of the mitigation measures discussed in Section 6.7 above. As such the impact (EPA, 2002) is considered to have a ***Long term- imperceptible significance with a neutral impact on quality*** i.e. an impact capable of measurement but without noticeable consequences.

- The proposed development will not negatively impact on any surface waterbody during operation.
- There will be no increase in flood risk as result of the site operation.

## 6.11 CUMULATIVE IMPACTS

The cumulative impact of the proposed development with any/all relevant other planned or permitted developments are discussed below. Related and permitted, concurrent, and future developments are listed in Chapter 2 (Description of the proposed development) Section 2.15. Planned development in the surrounding area have been defined in Chapter 3 (Planning and Development Context).

### 6.11.1 Construction Phase

In relation to the potential cumulative impact on hydrology during the construction phases, the construction works which would have potential cumulative impacts include:

- Surface water run-off during the construction phase may contain increased silt levels or become polluted from construction activities. Run-off containing large amounts of silt can cause damage to surface water systems and receiving watercourses.
- Contamination of local water sources from accidental spillage and leakage from construction traffic and construction materials unless project-specific CEMPs are put in place for each development and complied with. As stated, there are no notable surface water features onsite and no direct hydrological pathways to offsite surface water bodies.
- There is a potential for contamination of watercourses during mitigation measures are required to manage sediment run-off and fuel leakages during construction and operation. All developments are required to ensure they do not have an impact on the receiving water environment in accordance with the relevant legislation (S.I No 77/2019 EU Environmental Objectives (Surface Waters) Amendment Regulations 2019) such that they would be required to manage runoff and fuel leakages.

The residual cumulative impact on water and hydrology for the construction phase is anticipated to be ***short-term***, ***neutral*** in terms of quality and of ***not significant*** significance, once appropriate mitigation measures to manage water quality runoff in compliance with legislative requirement are put in place for each development.

### 6.11.2 Operational Phase

Potential cumulative impacts included in the operational phase include:

- Increased hard standing areas will reduce local recharge to ground and increase surface water run-off potential if not limited to the green field run-off rate from the site;
- Increased risk of accidental releases from fuel storage/delivery unless mitigated adequately
- Increased risk of accidental discharge of hydrocarbons from car parking areas and along roads and unless diverted to surface water system with petrol interceptor; and
- Any additional foul discharges should be treated where appropriate and/or diverted to the foul sewer system and not directly to ground.

Similar mitigation measures to those described in Section 6.7 will need to be implemented to protect water quality.

Increase in wastewater loading and water supply requirement is an impact of all development: Each development will require approval from IW confirming available capacity in the water and wastewater infrastructure. The surface water and foul drainage infrastructure and water supply requirements for the proposed development has been designed to accommodate the future indicative substation development.

Development will result in an increase in hard standing which will result in localised reduced recharge to ground and increase in run-off rate. However, each permitted development is required by the Local Authority to comply with the Greater Dublin Strategic Drainage Strategy (GDSDS) and Local Authority requirements by providing suitable attenuation on site to ensure greenfield run-off rates and ensure that there is no increase in offsite flooding as a result of development.

The residual cumulative impact on water and hydrology for the operational phases is anticipated to be ***long-term***, ***neutral*** in terms of quality and ***not significant*** significance, once appropriate mitigation measures to manage water quality runoff in compliance with legislative requirement are put in place for each development.

# APPENDIX 6.1

## Methodology for Assessment of the Impacts

## EIAR Guideline tables for Hydrology

Table 7.1: Criteria for rating impact magnitude at EIS stage – Estimation of magnitude of impact on hydrology attributes (NRA, 2009)

| Magnitude of Impact | Criteria | Typical Examples |
|---|---|---|
| Large Adverse | Results in loss of attribute and/ or quality and integrity of attribute | Loss or extensive change to a water body or water dependent habitat |
| Moderate Adverse | Results in impact on integrity of attribute or loss of part of attribute | Calculated risk of serious pollution incident >1% annually2 |
| Small Adverse | Results in minor impact on integrity of attribute or loss of small part of attribute | Increase in predicted peak flood level >10mm1 |
| Negligible | Results in an impact on attribute but of insufficient magnitude to affect either use or integrity | Negligible change in predicted peak flood level1 |
| Minor Beneficial | Results in minor improvement of attribute quality | Calculated reduction in pollution risk of 50% or more where existing risk is <1% annually2 |
| Moderate Beneficial | Results in moderate improvement of attribute quality | Calculated reduction in pollution risk of 50% or more where existing risk is >1% annually2 |
| Major Beneficial | Results in major improvement of attribute quality | Reduction in predicted peak flood level >100mm1 |

*Additional examples are provided in the NRA Guidance Document*

*1 Refer to Annex 1, Methods E and F, Annex 1 of HA216/06*

*1 Refer to Appendix B3 / Annex 1, Method D, Annex 1 of HA216/06*

**Source: 'Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes' by the National Roads Authority (NRA, 2009)**

**Table 7.2 Criteria for Rating Impact Significance of Hydrological Attributes (NRA, 2009)**

| Importance | Criteria | Typical Examples |
|---|---|---|
| Extremely High | Attribute has a high quality or value on an international scale | River, wetland or surface water body ecosystem protected by EU legislation e.g. 'European sites' designated under the Habitats Regulations or 'Salmonid waters' designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988. |
| Very High | Attribute has a high quality or value on a regional or national scale | River, wetland or surface water body ecosystem protected by national legislation – NHA status<br>Regionally important potable water source supplying >2500 homes<br>Quality Class A (Biotic Index Q4, Q5)<br>Flood plain protecting more than 50 residential or commercial properties from flooding<br>Nationally important amenity site for wide range of leisure activities |
| High | Attribute has a high quality or value on a local scale | Salmon fishery<br>Locally important potable water source supplying >1000 homes<br>Quality Class B (Biotic Index Q3-4)<br>Flood plain protecting between 5 and 50 residential or commercial properties from flooding<br>Locally important amenity site for wide range of leisure activities |
| Medium | Attribute has a medium quality or value on a local scale | Coarse fishery<br>Local potable water source supplying >50 homes Quality Class C (Biotic Index Q3, Q2- 3)<br>Flood plain protecting between 1 and 5 residential or commercial properties from flooding |
| Low | Attribute has a low quality or value on a local scale | Locally important amenity site for small range of leisure activities<br>Local potable water source supplying <50 homes Quality Class D (Biotic Index Q2, Q1)<br>Flood plain protecting 1 residential or commercial property from flooding<br>Amenity site used by small numbers of local people |

**Source: 'Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes' by the National Roads Authority (NRA, 2009)**

# APPENDIX 6.2

## Flood Risk Assessment

# Malachy Walsh and Partners

## Consulting Engineers

Cork | Tralee | Limerick | London

# Echelon 110 kV GIS Substation & MV Control Building

## Avoca River Park Industrial Estate, Arklow, Co Wicklow

## Flood Risk Assessment

on behalf of H&MV Engineering.

| Project | Document | Revision | Issue | Prepared | Checked | Date |
|---|---|---|---|---|---|---|
| 21697 | 6004 | A | Information | Greg McNamara | Brian Sayers<br>Jack O'Leary | October 2020 |

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# 1 General

## 1.1 Introduction

This Flood Risk Assessment (FRA) report has been prepared on behalf H&MV Engineering Ltd as part of the planning submission for the development of a 110kV GIS substation, associated transformer infrastructure and MV Control Building. This development is located in the Avoca River Park Industrial Estate, Arklow, Co Wicklow. The 1.65ha approx. site is located north of the Avoca River. It is proposed to demolish the existing building onsite as part of the enabling works for this project. The total ground floor area of structures to be demolished is approximately 2200m$^2$.

The proposed 110kV GIS substation and MV Control Building will be entirely contained within the site. A narrow strip of land has been extended to provide provision for associated drainage infrastructure. This extends from the main site area to a proposed outfall location at the Avoca River. The GIS substation building comprises of a battery room, control room, mess room, WC, workshop, generator room, cable entry room, GIS room, storage room and car parking. The MV Control building will consist of MV sub rooms and control rooms.

The site is approximately 300m north of to the River Avoca. A flood embankment extends upstream and downstream of the site. The site is bound to the north by a local access road which serves Avoca River Park. To the south and to the west the site is bound by Holfeld Plastics Limited. To the east the site is bound by the wider landholding that currently incorporate Harmony Timber and Stunt Drive Ireland which will cease operation and relocate prior to commencement of the proposed neighbouring data centre facility.

The site is generally level, with elevations varying from +2mOD in the east to +2.8mOD in the west approximately. The FFL of the current buildings proposed to be demolished vary between +2.1 mOD on the eastern portion of the site and +2.8 mOD on the western portion of the site. An aerial image of the site is shown in Figure 1 below.

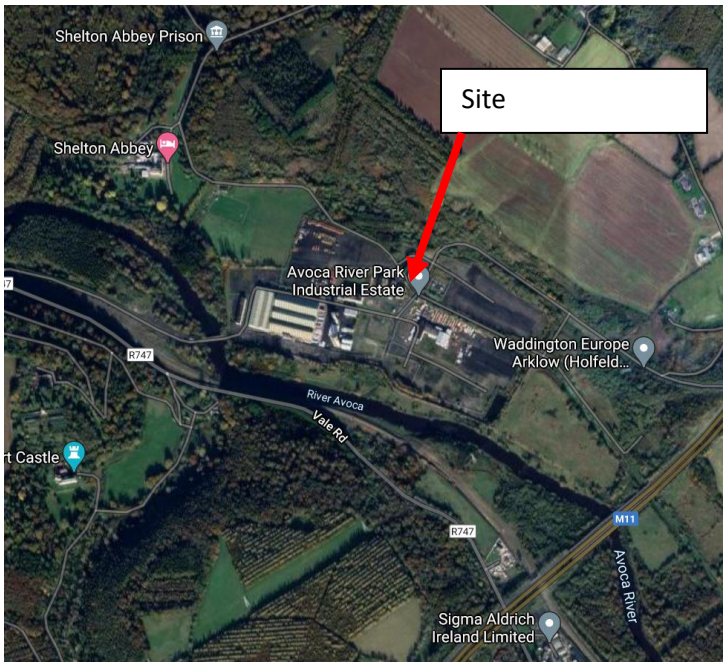



Figure 1 – Aerial Image of Site

## 1.2 Objectives

The purpose of the report is to establish the flood risk associated with the proposed development and, if appropriate, to recommend mitigation measures to prevent any increase in flood risk within or outside the site.

The report has been prepared in the context of *The Planning System and Flood Risk Management – Guidelines for Planning Authorities, November 2009*, published by the Office of Public Works and the Department of Environment, Heritage and Local Government. Flood Risk Assessments are carried out at different scales by different organisations. The hierarchy of assessment types are Regional (RFRA), Strategic (SFRA) and Site-specific (FRA). This report is site-specific.

The report has been prepared taking cognisance of the objectives outlined in the "Arklow and Environs Local Areas Plan 2017 Strategic Flood Risk Assessment" and the "Wicklow County Council Development Plan 2016-2022.

Possible source of flood risk were identified by

- Topographical survey of the site
- Examination of available information on the OPW website (www.floodmaps.ie)
- Structural design drawings for the proposed substation building.
- National Flood Hazard Mapping

## 1.3 Methodology

The Flood Risk Management Guidelines document outlines three stages in the assessment of flood risk as follows:

- *Stage 1 Flood risk identification* – to identify whether there may be any flooding or surface water management issues related to a plan area or proposed development site that may warrant further investigation;
- *Stage 2 Initial flood risk assessment* – to confirm sources of flooding that may affect a plan area or proposed development site, to appraise the adequacy of existing information and to determine what surveys and modelling approach is appropriate to match the spatial resolution required and complexity of the flood risk issues. The extent of the risk of flooding should be assessed which may involve preparing indicative flood zone maps. Where existing river or coastal models exist, these should be used broadly to assess the extent of the risk of flooding and potential impact of a development on flooding elsewhere and of the scope of possible mitigation measures; and
- *Stage 3 Detailed risk assessment* – to assess flood risk issues in sufficient detail and to provide a quantitative appraisal of potential flood risk to a proposed or existing development, of its potential impact on flood risk elsewhere and of the effectiveness of any proposed mitigation measures. This will typically involve use of an existing or construction of a hydraulic model or a river or coastal cell across a wide enough area to appreciate the catchment wide impacts and hydrological processes involved.

Sections 2 to 4 of this report have been prepared generally in accordance with these stages.

# 2 Flood Risk Identification (Stage 1)

The Eastern CFRAM Study was published in July 2016 and supersedes the Preliminary Flood Risk Assessments (PFRA). These maps can be found on www.floodinfo.ie and show the current scenarios for coastal and fluvial flood events. These flood extents are illustrated for the 10%, 1% and 0.1% AEP flood events. These are the extents that are likely to be equalled or exceeded once in a 10, 100 or 1,000 year period respectively

## 2.1 Coastal Flood Risk

Given the proximity to the coast, the tidal extents of the River Avoca require consideration. Coastal flooding results from sea levels which are higher than normal and result in sea water overflowing onto the land. Coastal flooding is influenced by the following three factors which often work in combination, high tide level, storm surges and wave action

A detailed flood map does not extend to the site location as seen in Figure 2. Coastal flood maps




Figure 2: Floodinfo Maps available in pdf

The present day coastal flood extent is shown in Figure 3. This confirms that no coastal flood risk exists to the site in the in the 10%, 0.5% and 0.1% AEP for this event.

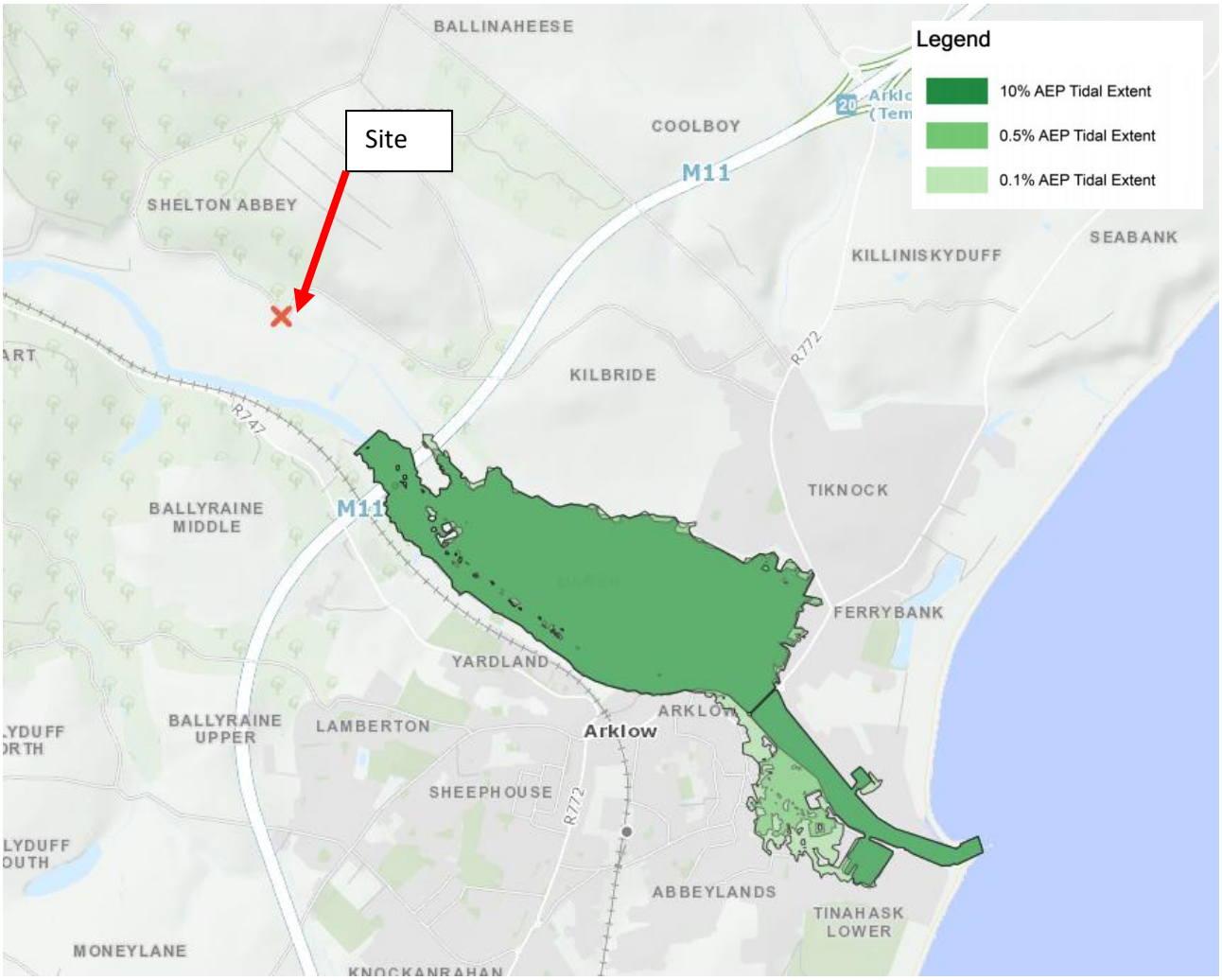



Figure 3: Floodinfo Map Coastal Flooding Extents

## 2.2 Fluvial Flood Risk

The present day fluvial flood extent is shown in Figure 4. This confirms that no fluvial flood risk exists to the site in the in the 10%, 0.5% and 0.1% AEP for this event. It should be noted that the flood embankment defence system located to the south of our site contributes significantly to the reduced flood risk of our site. The site would likely be liable to flooding in the 1% AEP fluvial flood event if this flood defence mechanism was not present.

The OPW web site, http://www.floodmaps.ie (Figure 5), shows no record of flooding events in the vicinity of the site. The closest recorded flooding event took place further downstream in the Avoca River 2.2 km to the south east.

The local area plan shows that the site is outside an area of flood risk, Figure 6. The site is zoned for Employment Uses.

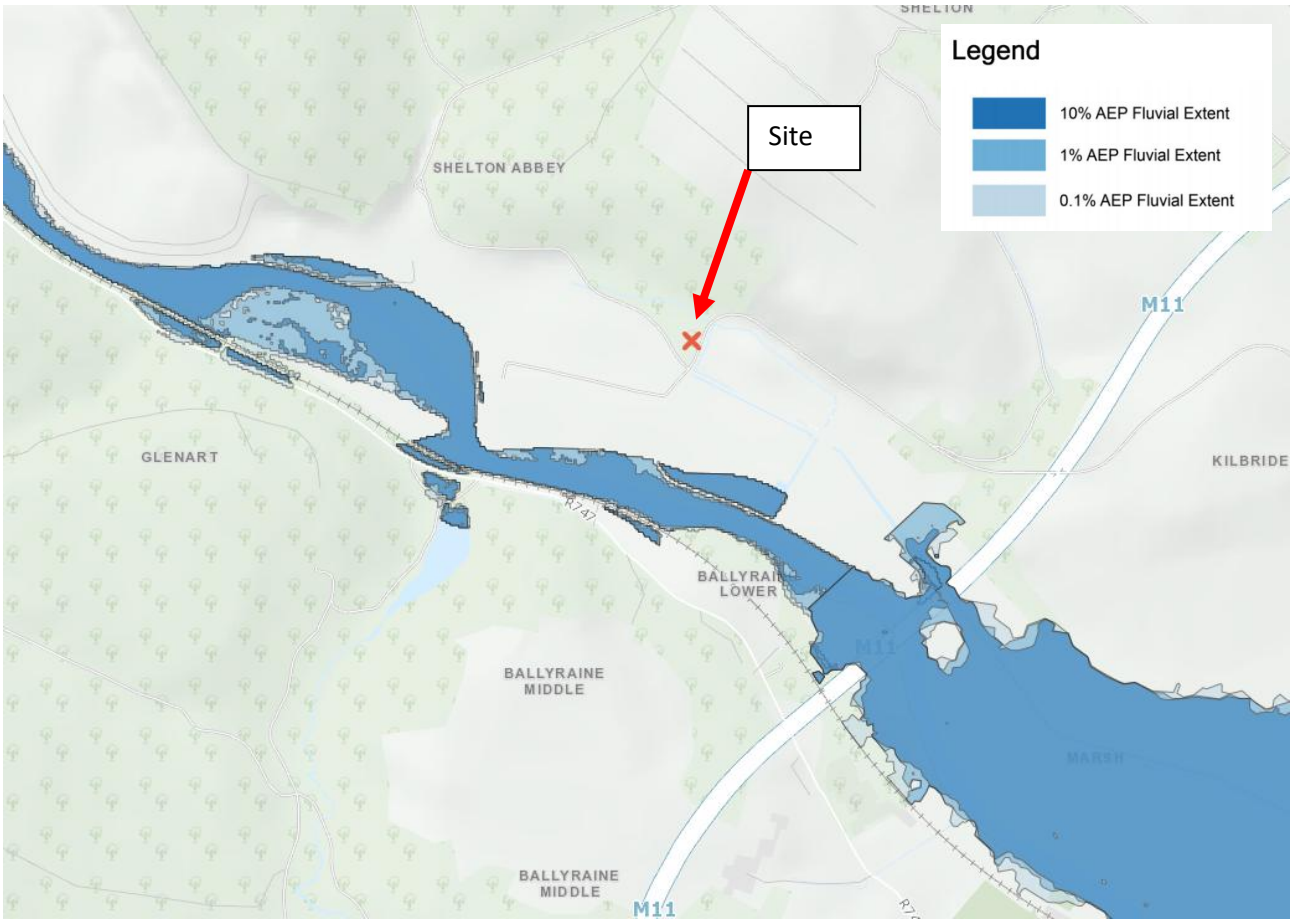



Figure 4 : Floodinfo Map Fluvial Flooding Extents

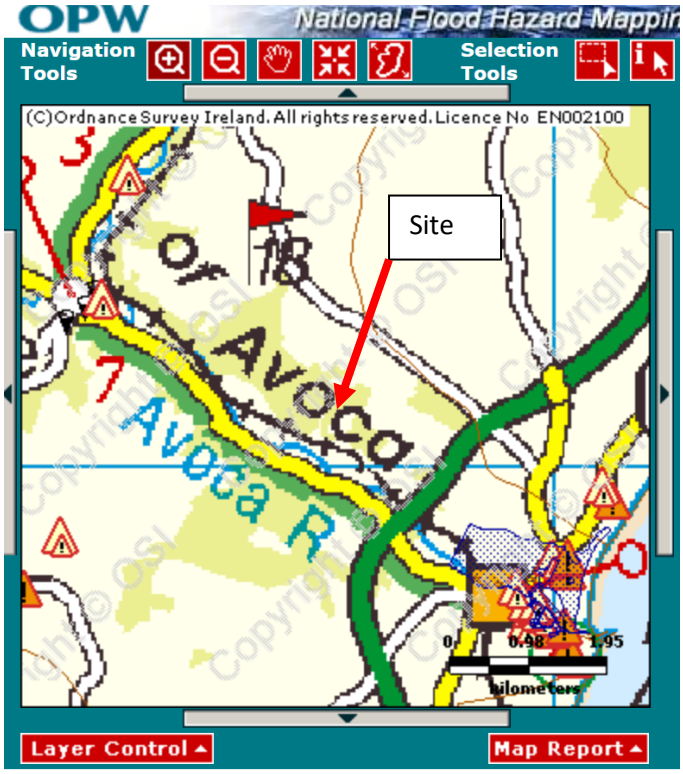



Figure 5 – OPW Summary Local Area Report

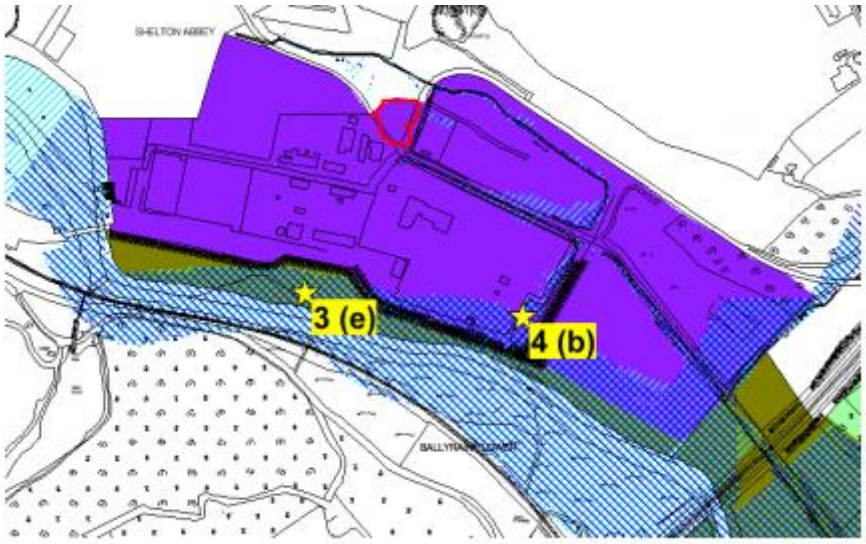



Figure 6: Extract from Local Area Plan

# 3 Initial Flood Risk Assessment (Stage 2)

The purpose of Initial Flood Risk Assessment is to ensure that the relevant flood risk sources are identified so that they can be addressed appropriately in the Detailed Flood Risk Assessment.

## 3.1 Flooding Sources

The potential sources of flooding and their relevance to the flood risk to the site are outlined in the following sub-sections.

### 3.1.1 River flooding

River flooding occurs when the capacity of a river channel is exceeded and water flows onto the adjacent land or flood plain. The Avoca River passes to the south of the site and outfalls at Arklow town to the south east of the site. This can be regarded as a primary source for potential flooding for the site.

### 3.1.2 Overland flow

Overland or pluvial flow occurs when rainfall intensity exceeds the infiltration capacity of the ground. The excess water flows overland to the nearest watercourse or results in ponding in low areas or upstream of physical obstructions. Overland flow is most likely to occur following periods of sustained rainfall when the ground surface becomes saturated. Most of the area surrounding the site is developed and is drained to closed pipe systems. The drainage for site will be designed in accordance with the Greater Dublin Strategic Drainage Strategy Code of Practice, thus reducing the risk of the development to areas beyond the site boundaries and the site itself.

### 3.1.3 Estuarial flooding

Estuarial or tidal flooding occurs when peak flows in a river coincide with extreme high tides resulting in abnormally high water surface levels in the lower reaches of a river channel. An extreme tide will not flood the site owing to its distance from the coast, 3km to the east. As previously outlined flood maps from floodinfo.ie illustrates no coastal flood risk exists to the site in the in the 10%, 0.5% and 0.1% AEP for this event.

### 3.1.4 Groundwater flooding

Groundwater flooding occurs when the water table rises to the level of the ground surface due to rainfall and flows out over the surface. The site is generally sloping to the south. The finished floor

level of the substation is proposed to be set at +3.1 mOD which is approximately 600mm higher than the average existing ground level on site and 900mm higher than the estate road which bounds the site to the east and south.

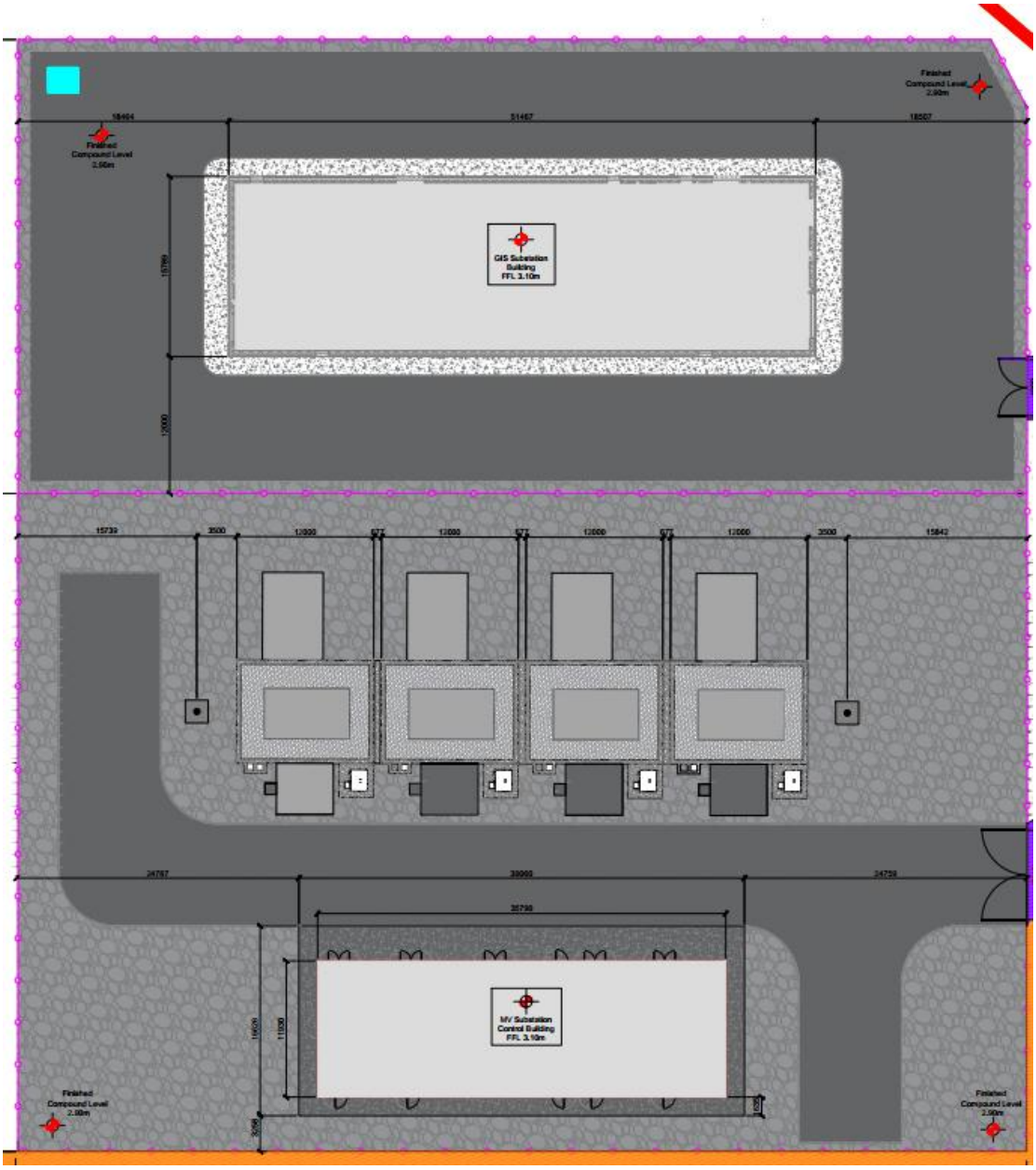



Figure 6: Site Compound layout

The hardstanding area around the building will be kept at 150mm below finished floor level (FFL = +2.95 mOD) and will be drained through a comprehensive drainage system. The storm water discharge from the site will be attenuated in line with the Local Area Development Plan requirements.

## 3.2 Requirements for a Stage 3 FRA

A Stage 3 detailed flood risk assessment is not warranted given the low risk of flooding in the area.

## 3.3 Flood Risk Assessment by AECOM for Data Centre Site

A detailed flood risk assessment was carried out on the Data Centre site in August 2018 for Craig Digital Avoca Ltd. This site is proposed to be constructed in tandem with the proposed substation outlined in this report in which the substation will subsequently serve.

The FRA indicates that the data centre site is protected from flooding by the existing flood defence embankment up to and including the 0.1% AEP event (1,000yr). The flood levels at the most upstream locations of the data centre site are:

| Event | Flood Level mOD |
|---|---|
| 1% (100 yr) | 4.38m |
| 0.1% (1,000 yr) | 5.03m |
| 1% with MRFS climate change allowance | 4.74m |
| 0.1% with MRFS climate change allowance | 5.30m |

**Table 1: AECOM Modelling Results**

AECOM carried out detailed flood modelling analysis using Flood Modeller Pro which made a number of recommendations and concluded that:

*The flood embankment is the primary flood defence. It is vital that works are undertaken to ensure the embankment is suitably robust and that it is maintained at above the 0.1% AEP event (1,000 yr) taking into account the MRFS climate change scenario and freeboard. Adjacent to the upstream corner of site the recommended top of bank level is +6.0m. The topographic survey indicated typically top of bank levels in this location of +6.5m. At the overtopping location a top of bank level of +6.5m is recommended. It is recommended that the building owners put in place a regular inspection and maintenance regime for the flood embankment. In addition, to cater for residual risk associated with overtopping and breaching of the embankment we would recommend that consideration be given to the incorporation of flood resilient design into the development. The actual measures can be defined at detailed design stage but could include:*

- *Demountable flood barriers to be provided at all openings which will be deployed in the event of overtopping of the embankment.*
- *All service penetrations into the buildings below +3.1m to be sealed. Void air vents should be fitted with automatic covers that close in contact with water.*
- *Placing of sensitive power, electric cables, switches, data equipment and the like to be mounted above +3.1m OD if possible.*
- *Flood resilient materials to be used on the floor and on the wall below +3.1m OD*

# 4 Summary and Conclusions

The proposed GIS substation and MV Control Building will be constructed outside of Flood Zones A and B, therefore the risk to the site is minimal. It will not increase the flood risk outside the confines of the site through the application of SUDS. The site is protected from the 0.1% AEP (1,000 yr) flood event by a flood embankment. To cater for residual risk of overtopping or breaching of the embankment the FFL of the substation is +3.1m. The FFL is set 150mm higher than the surrounding hardstand area and a further height above the wider area, this ensures the flood risk to the proposed structure is minimised.

To mitigate against the risk of flooding to this site the following measures should be implemented in the design.

- Demountable flood barriers to be provided at all openings which will be deployed in the event of overtopping of the embankment.
- All service penetrations into the buildings below +3.1m to be sealed. Void air vents should be fitted with automatic covers that close in contact with water.
- Placing of sensitive power, electric cables, switches, data equipment and the like to be mounted above +3.1m OD if possible.
- Flood resilient materials to be used on the floor and on the wall below +3.*1m OD*

The proposal development is therefore appropriate in the context of the guidelines.

# 5 References

*The Planning System and Flood Risk Management – Guidelines for Planning Authorities*, Office of Public Works and the Department of Environment, Heritage and Local Government, November 2009.

OPW *Planning and Development Flood Policy*, published on www.flooding.ie

OPW *Flood Hazard Mapping*, www.floodmaps.ie

*National Preliminary Flood Risk Assessment (NFRA) Report*, Office of Public Works, August 2011.

*IPCC 4th Assessment on Climate Change*, 2007.

*Ireland and the IPCC 4th Assessment Report,* Irish Committee on Climate Change, 2007.

*Flood Studies Report, Volumes I-V*, Natural Environmental Research Council (NERC), 1975.

# 7.0 BIODIVERSITY; FLORA & FAUNA

## 7.1 INTRODUCTION

This chapter provides an assessment of the impacts of the proposed development on the ecological environment, i.e. biodiversity, flora and fauna. It has been compiled in compliance with the European Communities Legal requirements with regard to Environmental Impact Assessment and follows the revised Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports (EPA, 2017) and Draft Advice Notes for preparing Environmental Impact Statements (EPA, 2015).

This chapter was compiled by Ger O'Donohoe (B.Sc. Applied Aquatic Sciences (GMIT, 1993) & M.Sc. Environmental Sciences (TCD, 1999)) who has over 25 years' experience in environmental impact assessment and has completed numerous Appropriate Assessment Screening Reports and Natura Impact Statements on terrestrial and aquatic habitats.

## 7.2 CHARACTERISTICS OF THE DEVELOPMENT

The Applicant is applying to ABP for planning permission for the provision of a 110 kV GIS substation along with associated and ancillary works (hereafter referred to as the 'proposed development').

The GIS substation building comprises a battery room, control room, mess room, WC, workshop, generator room, cable entry room, GIS room, storage room and car parking. The MV Control building will consist of MV sub rooms and control rooms.

The works will also include installation of cable ducts for three 110 kV underground cables (UGC), one to each of the two new OHL towers and one to the existing Shelton Abbey 110 kV adjacent to the new Pollahoney 110 kV Substation inside cable ducts. The external works which include connection to overhead lines and underground grid connections will be undertaken by EirGrid.

A full description of the proposed development is provided in Chapter 2 (Description of the proposed development).

## 7.3 METHODOLOGY

This chapter of the EIA Report concentrates on ecological features within the development area of particular significance, primarily designated habitats and species. This includes habitats/species listed in Annex I, II and IV of the EU Habitats Directive, rare plants listed in the Flora Protection Order and other semi-natural habitats of conservation value.

A Report for the purposes of Appropriate Assessment Screening was undertaken by Moore Group for the proposed development which is presented as Appendix 7.1 to this chapter.

In order to screen out a project, it must be *excluded*, on the basis of objective information, that the proposed development, individually or in combination with other plans or projects, will have a significant effect on a European site.

### 7.3.1 Policy & Guidance

#### *7.3.1.1 EU Habitats Directive*

The "Habitats Directive" (Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna) is the main legislative instrument for the protection and conservation of biodiversity within the European Union and lists certain habitats and species that must be protected within wildlife conservation areas, considered to be important at a European as well as at a national level. A "Special Conservation Area" or SAC is a designation under the Habitats Directive. The Habitats Directive sets out the protocol for the protection and management of SACs.

The Directive sets out key elements of the system of protection including the requirement for "Appropriate Assessment" of plans and projects.

Both the Habitats Directive and the Birds Directive have been transposed into Irish law by one set of regulations (i.e. The European Communities (Birds and Natural Habitats) Regulations 2011 to 2015 (S.I. No. 477/2011 as amended by S.I. No. 355 of 2015)).

#### *7.3.1.2 Birds Directive*

The "Birds Directive" (Council Directive 2009/147/EC on the Conservation of Wild Birds) provides for a network of sites in all member states to protect birds at their breeding, feeding, roosting and wintering areas. This directive identifies species that are rare, in danger of extinction or vulnerable to changes in habitat and which need protection (Annex I species). Appendix 1 indicates Annex I bird species as listed on the Birds Directive. A "Special Protection Area" or SPA, is a designation under The Birds Directive.

Special Areas of Conservation and Special Protection Areas form a pan-European network of protected sites known as Natura 2000 sites and European sites.

#### *7.3.1.3 Wildlife Acts (1976 - 2012)*

The primary domestic legislation providing for the protection of wildlife in general, and the control of some activities adversely impacting upon wildlife is the Wildlife Act of 1976. The aims of the wildlife act according to the National Parks and Wildlife Service are "... to provide for the protection and conservation of wild fauna and flora, to conserve a representative sample of important ecosystems, to provide for the development and protection of game resources and to regulate their exploitation, and to provide the services necessary to accomplish such aims." All bird species are protected under the act. The Wildlife (Amendment) Act of 2000 amended the original Act to improve the effectiveness of the Act to achieve its aims.

### 7.3.2 Habitat Survey

The habitat survey was carried out in three stages, firstly through desktop research to determine existing records in relation to habitats and species present in the study area. This included research on the National Parks and Wildlife Service (NPWS) metadata website, the National Biodiversity Data Centre (NBDC) database and a literature review of published information on flora and fauna occurring in the proposed development area.

Other environmental information for the area was reviewed, e.g. in relation to soils, geology, hydrogeology and hydrology. Interactions in terms of the chapters on these topics presented in this EIA Report were important in the determination of source vector pathways and links with potentially hydrologically connected areas outside the proposed development site.

The second phase of the survey involved a site visit in November 2020 to establish the existing environment in the footprint of the proposed development area. Areas which were highlighted during desktop assessment were investigated in closer detail according to the Heritage Council Best Practice Guidance for Habitat Survey and Mapping (Smith *et al*., 2011). Habitats in the proposed development area were classified according to the Heritage Council publication "A Guide to Habitats in Ireland" (Fossitt, 2000). This publication sets out a standard scheme for identifying, describing and classifying wildlife habitats in Ireland. This form of classification uses codes to classify different habitats based on the plant species present. Species recorded in this report are given in both their Latin and English names. Latin names for plant species follow the nomenclature of "An Irish Flora" (Parnell & Curtis, 2012).

Habitats were surveyed on the 12 November 2020 by conducting a study area walkover covering the main ecological areas identified in the desktop assessment. The survey dates are outside the optimal survey periods for botanical species, but adequate given the industrial nature of the site. A photographic record was made of features of interest.

Signs of mammals such as badgers and otters were searched for while surveying the study area noting any sights, signs or any activity in the vicinity especially along adjacent boundaries.

A site specific bat survey was carried out during fieldwork. The survey included an inspection of the interior and exterior of buildings to be demolished.

Birds were surveyed using standard transect methodology and signs were recorded where encountered during the field walkover surveys.

Following desktop assessment an evaluation of the development area and determination of the potential impacts on the flora and fauna of the area is based on the following guidelines and publications:

- EPA Draft EIA Report Guidelines 2017;
- Assessment of plans and projects significantly affecting Natura 2000 sites (EC, 2002);
- Managing Natura 2000 Sites (EC, 2000) Guidance document on Article 6(4) of the Habitats Directive 92/43/EEC (EC, 2000);
- Managing Natura 2000 Sites (EC, 2017) Guidance document on Article 6(4) of the Habitats Directive 92/43/EEC (EC, 2018);
- Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities (DEHLG, Rev. Feb. 2010); and
- Guidelines for Ecological Impact Assessment in the UK and Ireland (CIEEM, 2019).

The following resources assisted in the production of this chapter of the report:

- Ordnance Survey Ireland maps;
- OSI, Google and Bing Aerial photography (1995 – 2020);
- NPWS Mapviewer: http://www.npws.ie/en/MapsData/;
- Designated sites (SACs, SPAs, NHAs);
- Records of protected species from 10km squares; and
- National Biodiversity Data Centre Records and Maps.

## 7.4 RECEIVING ENVIRONMENT

The site comprises a number of derelict and disused buildings in the Avoca River Park industrial estate which fall into the category BL3 Buildings and artificial surfaces including driveways and hardstanding areas.

These are surrounded by areas of mixed broadleaved woodland (WD1).

The following is a description of the flora and fauna of the existing environment in the study area.

### 7.4.1 Designated Conservation Areas

Department of the Environment, Heritage and Local Government (2009) Guidance on Appropriate Assessment suggests an assessment of European sites within a zone of impact of 15 km.

This distance is a guidance only and the zone of impact has been identified taking consideration of the nature and location of the proposed development to ensure all European sites with connectivity to it are considered in terms of a catchment-based assessment.
The zone of impact may be determined by connectivity to the proposed development in terms of:

- Nature, scale, timing and duration of works and possible impacts, nature and size of excavations, storage of materials, flat/sloping sites;
- Distance and nature of pathways (dilution and dispersion; intervening 'buffer' lands, roads etc.); and
- Sensitivity and location of ecological features.

The guidance provides that, at the screening stage, it is necessary to identify the sites and compile information on their qualifying interests and conservation objectives. In preparation for this, the potential for source pathway receptor connectivity is firstly identified and detailed information is then provided on sites with connectivity.

European sites that are located within 15 km of the Project are listed in Table 7.1 and presented in Figures 7.1 and 7.2, below. Spatial boundary data on the Natura 2000 network was extracted from the NPWS website (www.npws.ie) on 13 November 2020.

***Table 7.1*** Details of European sites within the potential zone of influence of the project.

| Site Code | Site name | Distance (km)[1] |
|---|---|---|
| 000717 | Deputy's Pass Nature Reserve SAC | 14.99 |
| 000729 | Buckroney-Brittas Dunes and Fen SAC | 5.38 |
| 000733 | Vale of Clara (Rathdrum Wood) SAC | 14.46 |
| 000781 | Slaney River Valley SAC | 12.64 |
| 001742 | Kilpatrick Sandhills SAC | 8.64 |
| 001766 | Magherabeg Dunes SAC | 14.63 |

The nearest European sites to the proposed development Buckroney-Brittas Dunes and Fen SAC (Site Code 000729) which is located approximately 5km to the north of the discharge point of the Avoca River.

[1] Distances indicated are the closest geographical distance between the proposed development and the European site boundary, as made available by the NPWS. Connectivity along hydrological pathways may be significantly greater.

Potential impacts on the distant coastal site of Buckroney-Brittas Dunes and Fen SAC are unlikely due to the large distance of removal on the Avoca River (over 9km hydrologically from the site) and the large receiving marine water buffer separating the proposed development from the designated site over which it is anticipated that any potential pollutants would be absorbed and diluted to an extent that they would not be perceptible at the designated site. Therefore it is considered to be outside the Zone of Impact of the proposed development. Similarly, the Buckroney-Brittas Dunes and Fen SAC located even further south on the coast (over 10km hydrologically from the site) is also outside the Zone of Impact of the proposed development.

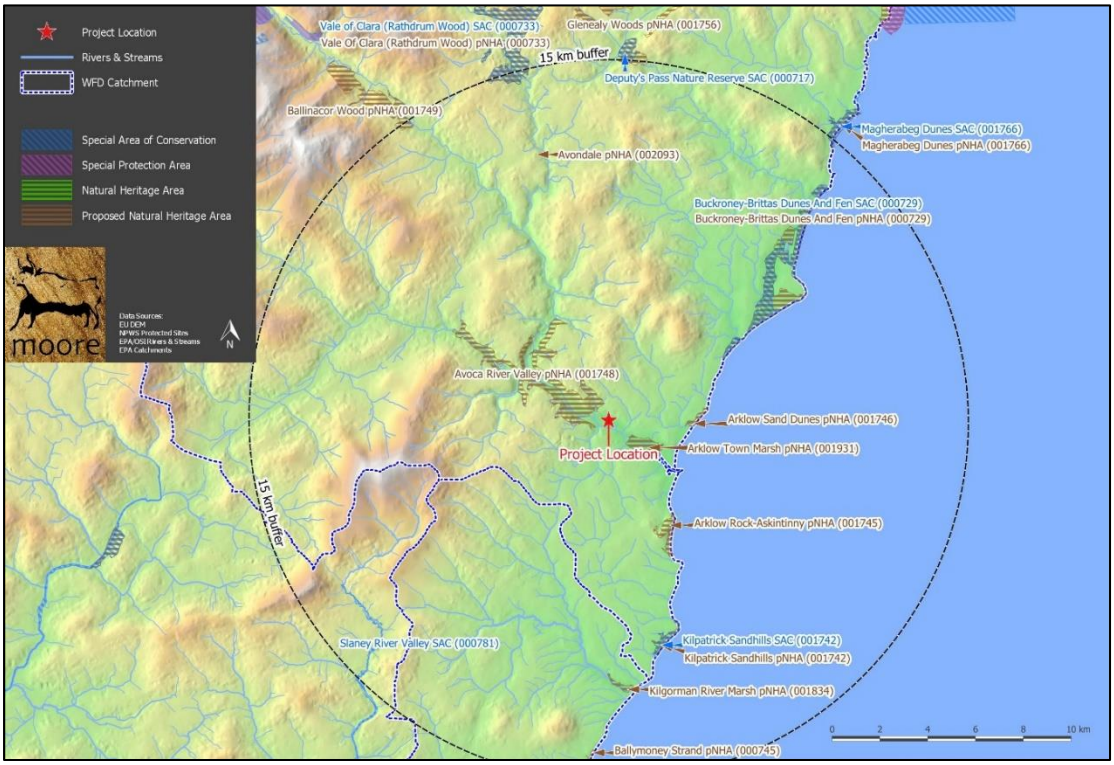



***Figure 7.1*** Site Location in relation to nearby European sites.

### 7.4.2 Non-Designated Habitats

The site comprises a number of derelict and disused buildings in the Avoca River Park industrial estate which fall into the category BL3 Buildings and artificial surfaces including driveways and hardstanding areas.

These are surrounded by areas of mixed broadleaved woodland (WD1).

The main habitats are presented on the recent aerial photography in Figure 7.2. A list of habitats recorded and their corresponding Fossitt codes is presented in Table 7.2.

***Table 7.2*** Details of habitats recorded and their corresponding Fossitt codes.

| Habitat | Habitat Category | Habitat Type |
|---|---|---|
| (W) Woodland | (WD) Modified Woodland | (WD1) Mixed broadleaved woodland |
| | (WS) Scrub/Transitional Woodland | (WS1) Scrub |
| (E) Exposed rock and disturbed ground | (E) Disturbed ground | (ED3) Recolonising bare ground |
| (B) Cultivated and Built land | (BL) Built land | (BL3) Buildings and artificial surfaces |

*7.4.2.1 Mixed broadleaved woodland (WD1)*

The woodland habitat refers to the area to the north of the proposed substation location and comprises mixed species with many mature trees of high local value (WD1). Species include Ash (*Fraxinus excelsior*), Beech (*Fagus sylvatica*), Sycamore (*Acer pseudoplatanus*), Scot's pine (*Pinus sylvestris*), Alder (*Alnus glutinosa*), Silver birch (*Betula pendula*), Willow (*Salix spp.*), Hazel (*Corylus avellana*) and Hawthorn (*Crataegus monogyna*).

While technically outside the site boundary, the woodland is considered in terms of future grid connection and potential in-combination effects.

*7.4.2.2 Scrub (WS1)*

There are large patches of scrub associated with the woodland described above and these habitats together form a dense mosaic with predominant Bramble (*Rubus fruticosus* agg.) along with Hawthorn (*Crataegus monogyna*), Blackthorn (*Prunus spinosa*) and Rowan (*Sorbus aucuparia*).

*7.4.2.3 Recolonising bare ground (ED3)*

This category refers to the surfaces surrounding and adjacent to buildings which may have been prepared for development at some stage but were left to recolonise. Species present are typical ruderal species including Thistles (Cirsium spp.), Ragwort (*Senecio jacobaea*), Cat's-ear (*Hypochaeris radicata*), Smooth sow-thistle (*Sonchus asper*), Dandelion (*Taraxacum officinale* agg.) and Great willowherb (*Epilobium hirsutum*). These are not mapped on the habitat map but are obvious on the baseline arial photography.

*7.4.2.4 Buildings and artificial surfaces (BL3)*

This category refers to four buildings and hard surfaces on site. These are not mapped on the habitat map but are obvious on the baseline arial photography. There is a small subset of this category; Flowerbeds (BC4) adjacent to the building nearest the Security hut to the east near the entrance to the estate which has planted species including Dogwood, Hydrangea and other garden species.

*7.4.2.5 Invasive Species*

The site and site boundaries were surveyed for the presence of invasive alien plant species during the habitat survey and none were recorded.

### 7.4.3 Fauna

*7.4.3.1 Badgers*

There are no suitable habitats for badgers within the proposed development site.

*7.4.3.2 Otters*

There were no signs of otters in the study area. The nearest NBDC records refer to records on the Avoca River upstream of Arklow town near Arklow Bridge, c.3km downstream from 09/02/2015.

*7.4.3.3 Bats*

The NBDC database was consulted for details on bat records held for a site specific polygon covering the Avoca River Park. The database was consulted on the 20/11/2020 for details on historical records from the site. There are no records of bat species from the selected polygon.

A systematic survey of the exterior of each of four buildings and the interior of three was carried out on the 12 November 2020 using a high powered torch and binoculars.

No roosting bats were observed and the buildings have low roosting potential being either in use as warehouse storage in the case of two (B3 & B4) with ongoing activity and lighting or having a pre-cast concrete slab roof in the case of B1.

The interior of B2 was not accessible but is considered as having low potential with a flat roof and internal suspended ceilings with limited accessibility to bats.

#### *7.4.3.4 Birds*

All birds are protected under the Wildlife Acts. Species recorded included regular urban species such as Blackbird, Magpie and Woodpigeon. A list of breeding bird species recorded during fieldwork in August 2020 is presented in Table 7.3.

***Table 7.3*** Details of birds encountered during fieldwork in November 2020.

| Birds | Scientific Name | BWI | Habitat Type |
|---|---|---|---|
| Blackbird | *Turdus merula* | Green | Dense woodland to open moorland, common in gardens |
| Magpie | *Pica pica* | Green | Open woodland, gardens and farmland |
| Woodpigeon | *Columba palumbus* | Green | Open woodland, gardens and farmland |




***Figure 7.2*** Habitats recorded in the proposed development area.

### 7.4.4 Habitat Evaluation

The ecological value of the site was assessed following the guidelines set out in the Institute of Ecology and Environmental Management's Guidelines for Ecological Impact Assessment (2019) and according to the Natura Scheme for evaluating ecological sites (after Nairn & Fossitt, 2004). Additionally, the TII Guidelines (formerly NRA) for Assessment of Ecological Impacts of National Road Schemes (NRA, 2009) outlines the methodology for evaluating ecological impacts. Judgements on the

evaluation were made using geographic frames of reference, e.g. European, National, Regional or Local, see Table 7.4 below.

***Table 7.4*** Details of , the TII Guidelines (formerly NRA) for Assessment of Ecological Impacts of National Road Schemes (NRA, 2009).

**Ecological valuation: Examples**

**International Importance:**

- 'European Site' including Special Area of Conservation (SAC), Site of Community Importance (SCI), Special Protection Area (SPA) or proposed Special Area of Conservation.
- Proposed Special Protection Area (pSPA).
- Site that fulfills the criteria for designation as a 'European Site' (see Annex III of the Habitats Directive, as amended).
- Features essential to maintaining the coherence of the Natura 2000 Network.[4]
- Site containing 'best examples' of the habitat types listed in Annex I of the Habitats Directive.
- Resident or regularly occurring populations (assessed to be important at the national level)[5] of the following:
  - Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; and/or
  - Species of animal and plants listed in Annex II and/or IV of the Habitats Directive.
- Ramsar Site (Convention on Wetlands of International Importance Especially Waterfowl Habitat 1971).
- World Heritage Site (Convention for the Protection of World Cultural & Natural Heritage, 1972).
- Biosphere Reserve (UNESCO Man & The Biosphere Programme).
- Site hosting significant species populations under the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals, 1979).
- Site hosting significant populations under the Berne Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979).
- Biogenetic Reserve under the Council of Europe.
- European Diploma Site under the Council of Europe.
- Salmonid water designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988, (S.I. No. 293 of 1988).[6]

**National Importance:**

- Site designated or proposed as a Natural Heritage Area (NHA).
- Statutory Nature Reserve.
- Refuge for Fauna and Flora protected under the Wildlife Acts.
- National Park.
- Undesignated site fulfilling the criteria for designation as a Natural Heritage Area (NHA); Statutory Nature Reserve; Refuge for Fauna and Flora protected under the Wildlife Act; and/or a National Park.
- Resident or regularly occurring populations (assessed to be important at the national level)[7] of the following:
  - Species protected under the Wildlife Acts; and/or
  - Species listed on the relevant Red Data list.
- Site containing 'viable areas'[8] of the habitat types listed in Annex I of the Habitats Directive.

**County Importance:**

- Area of Special Amenity.[9]
- Area subject to a Tree Preservation Order.
- Area of High Amenity, or equivalent, designated under the County Development Plan.
- Resident or regularly occurring populations (assessed to be important at the County level)[10] of the following:
  - Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive;
  - Species of animal and plants listed in Annex II and/or IV of the Habitats Directive;
  - Species protected under the Wildlife Acts; and/or
  - Species listed on the relevant Red Data list.
- Site containing area or areas of the habitat types listed in Annex I of the Habitats Directive that do not fulfil the criteria for valuation as of International or National importance.
- County important populations of species, or viable areas of semi-natural habitats or natural heritage features identified in the National or Local BAP,[11] if this has been prepared.
- Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness, or populations of species that are uncommon within the county.
- Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.

**Local Importance (higher value):**

- Locally important populations of priority species or habitats or natural heritage features identified in the Local BAP, if this has been prepared;
- Resident or regularly occurring populations (assessed to be important at the Local level)[12] of the following:
  - Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive;
  - Species of animal and plants listed in Annex II and/or IV of the Habitats Directive;
  - Species protected under the Wildlife Acts; and/or
  - Species listed on the relevant Red Data list.
- Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality;
- Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value.

**Local Importance (lower value):**

- Sites containing small areas of semi-natural habitat that are of some local importance for wildlife;
- Sites or features containing non-native species that are of some importance in maintaining habitat links.

## 7.5 POTENTIAL IMPACTS OF THE DEVELOPMENT

There are no rare or protected habitats recorded in the study area inside the proposed development boundary. The development area may be considered of Low Local Ecological Value.

There are no predicted emissions from dust, noise or to air or water that could have a significant effect on the European sites located in the potential Zone of Impact.

Potential impacts on the distant coastal site of Buckroney-Brittas Dunes and Fen SAC are unlikely due to the large distance of removal on the Avoca River (over 9km hydrologically from the site) and the large receiving marine water buffer separating the proposed development from the designated site over which it is anticipated that any potential pollutants would be absorbed and diluted to an extent that they would not be perceptible at the designated site. Therefore it is considered to be outside the Zone of Impact of the proposed development. Similarly, the Buckroney-Brittas Dunes and Fen SAC located even further south on the coast (over 10km hydrologically from the site) is also outside the Zone of Impact of the proposed development.

Having considered the above, significant effects on any European sites as a result of the proposed development can be ruled out and potential significant effects on European sites can be excluded at a preliminary screening stage.

### 7.5.1 Construction Phase (Impacts on Habitats)

*7.5.1.1 Mixed broadleaved woodland (WD1)*
*There will be no loss of surrounding woodland.* The potential effects on local ecology are ***neutral*** and ***imperceptible*** for the construction phase.

*7.5.1.2 Scrub (WS1)*
*There will be no loss of scrub on the proposed development site.* The potential effects on local ecology are ***neutral*** and ***imperceptible*** for the construction phase.

*7.5.1.3 Recolonising bare ground (ED3)*
*Recolonising bare ground is of low ecological value.* The potential effects on local ecology are ***neutral*** and ***imperceptible*** for the construction phase.

*7.5.1.2 Buildings and artificial surfaces (BL3)*
*The site buildings and the flowerbed are of low ecological value.* The potential effects on local ecology are ***neutral*** and ***imperceptible*** for the construction phase.

### 7.5.2 Construction Phase (Impacts on Fauna)

*7.5.2.1 Badgers*
There will be no loss of feeding habitat for badgers and the potential effect on badgers is ***neutral*** and ***imperceptible*** for the construction phase.

*7.5.2.2 Otters*
There were no otters recorded and no suitable otter habitats recorded on site and there are no potential impacts on otters during the construction phase.

*7.5.2.3 Bats*
No potential roost features were identified within the site boundary, so there is no risk of direct impacts on any roosts during the construction phase.

*7.5.2.4 Birds*
There will be a loss no risk of direct impacts on birds during the construction phase.

### 7.5.3 Operational Phase (Impacts on Habitats)

Overall site development will result in a neutral modification of habitats of light industrial nature.

The potential effects on local ecology are ***neutral*** and ***imperceptible*** for the operational phase.

### 7.5.4 Operational Phase (Impacts on Fauna)

*7.5.3.1 Badgers*

There will be no loss of feeding habitat for badgers and the potential effect on badgers is ***neutral*** and ***imperceptible*** for the operational phase.

*7.5.3.2 Otters*

There were no otters recorded and no suitable otter habitats recorded on site and there are no predicted impacts on otters for the operational phase.

*7.5.3.3 Bats*

There are some potential roost features in the vicinity of the site in the surrounding woodland habitats. If any lights were projected towards these features, roosting bats could potentially be displaced or disturbed. However, the risk of impacts is considered to be relatively low, as there are no plans for lighting to be directed toward the woodland areas.

*7.5.3.4 Birds*

The potential effects on birds are neutral and imperceptible for the operational phases.

### 7.5.5 Do Nothing Scenario

If the proposed development were no to proceed the habitats would remain as per the existing light industrial operation of the site.

Given the proposed development areas are located in an area of relatively low ecological value within the site, the do nothing scenario would have a neutral impact on biodiversity.

## 7.6 REMEDIAL AND MITIGATION MEASURES

### 7.6.1 Habitats

There are no proposed mitigation measures for habitats.

### 7.6.2 Badgers

There are no mitigation measures proposed for badgers.

### 7.6.3 Otters

There are no mitigation measures proposed for otters.

### 7.6.5 Birds

There are no mitigation measures proposed for birds.

## 7.7 RESIDUAL IMPACTS

The proposed development areas within the site are located in an areas of relatively low ecological value and as such predicted to have a ***neutral imperceptible*** effect on biodiversity.

## 7.8 CUMULATIVE EFFECTS

The proposed development is located in an area of low ecological value and there will be no significant effects on local biodiversity.

The connection of the substation to the grid will be addressed as part of a separate application and will include appropriate measures for the avoidance of significant impacts on local biodiversity and therefore cumulative effects with the proposed development can be ruled out.

## 7.9 REFERENCES


- CIEEM (2019) Guidelines for Ecological Impact Assessment in The UK and Ireland Terrestrial, Freshwater, Coastal and Marine September 2018 Version 1.1 - Updated September 2019.
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# APPENDIX 7.1

## Report for Appropriate Assessment Screening

## Moore Group November 2020

# Report for the purposes of Appropriate Assessment Screening

as required under Article 6(3) of the Habitats Directive
(Council Directive 92/43/EEC)

## Pollahoney Substation SID

Prepared by: Moore Group – Environmental Services

20 November 2020

On behalf of
Crag Digital Avoca Ltd.
& An Bord Pleanála

| | |
|---|---|
| **Project Proponent** | Crag Digital Avoca Ltd. |
| **Project** | Pollahoney Substation SID |
| **Title** | Report for the purposes of Appropriate Assessment Screening<br>Pollahoney Substation SID |

| **Project Number** | 20250 | **Document Ref** | 20250 Pollahoney SID AAS1 Rev0.docx | |
|---|---|---|---|---|
| **Revision** | **Description** | **Author** | | **Date** |
| Rev0 | Issued for client review | G. O'Donohoe | | 20 November 2020 |
| | | | | |
| | | | | |
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| **Moore Archaeological and Environmental Services Limited** | | | | |

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**Appendix A – Finding of No Significant Effects Report**

# Abbreviations

| | |
|---|---|
| AA | Appropriate Assessment |
| EEC | European Economic Community |
| EPA | Environmental Protection Agency |
| EU | European Union |
| GIS | Geographical Information System |
| NHA | Natural Heritage Area |
| NIS | Natura Impact Statement |
| NPWS | National Parks and Wildlife Service |
| OSI | Ordnance Survey Ireland |
| pNHA | proposed Natural Heritage Area |
| SAC | Special Area of Conservation |
| SPA | Special Protection Area |

# 1. Introduction

## 1.1. General Introduction

This Appropriate Assessment screening report has been prepared to support an application for planning permission for the Proposed Development. The report contains information required for the competent authority to undertake screening for Appropriate Assessment (AA) for the provision of a 110 kV GIS Substation, MV Control Building, Transformers, associated dropdown 110 kV transmission lines, along with associated and ancillary works at Avoca River Park, Arklow Co. Wicklow (hereafter referred to as the 'Proposed Development') to significantly affect European sites.

Screening is the process that addresses and records the reasoning and conclusions in relation to the first two tests of Article 6(3) of Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (as amended) (referred to as the Habitats Directive):

i) whether a plan or project is directly connected to or necessary for the management of the site, and
ii) whether a plan or project, alone or in combination with other plans and projects, is likely to have significant effects on a Natura 2000 site (also referred to as a "European site") in view of its conservation objectives.

Having regard to the provisions of the Planning and Development Act 2000 (section 177U and 177V). The purpose of a screening exercise under section 177U of the PDA 2000 is to determine whether it is necessary to carry out an "appropriate assessment" of the implications for a European site of the Proposed Development. The trigger for the requirement for an "appropriate assessment" is that the 'project', either individually or in combination with other plans or projects, is "likely to have a significant effect" on the European site.

In order to screen out a project, it must be *excluded*, on the basis of objective information, that the Proposed Development, individually or in combination with other plans or projects, will have a significant effect on a European site.

If the effects are deemed to be significant, potentially significant, or uncertain, or the screening process becomes overly complicated, or if it cannot be excluded, then the process must proceed to Stage 2 (AA). Screening should be undertaken without the inclusion of mitigation. If potential impacts clearly can be avoided through the modification or redesign of the plan or project, then the screening process is repeated on the altered plan or project.

When screening the project, there are two possible outcomes:

- the project poses no risk of a significant effect and as such requires no further assessment; and

- the project has potential to have a significant effect (or this is uncertain) and AA of the project is necessary.

This report has been prepared by Moore Group - Environmental Services to support an application for planning permission for the Proposed Development to allow An Bord Pleanála to carry out AA screening in relation to the Proposed Development. The report was compiled by Ger O'Donohoe (B.Sc. Applied Aquatic Sciences (GMIT, 1993) & M.Sc. Environmental Sciences (TCD, 1999)) who has over 25 years' experience in environmental impact assessment and has completed numerous Appropriate Assessment Screening Reports and Natura Impact Statements on terrestrial and aquatic habitats. He has completed several Reports for AA Screening and Appropriate Assessments regarding Data Storage Facilities and Strategic Infrastructure Developments.

## 1.2. Legislative Background - The Habitats and Birds Directives

The It is necessary that the Project has regard to Article 6 of the Habitats Directive. This is transposed into Irish Law by the European Communities (Birds and Natural Habitats) Regulations, 2011 – 2015 (referred to as the Habitats Regulations).

The Habitats Directive (Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora) is the main legislative instrument for the protection and conservation of biodiversity in the European Union (EU). Under the Habitats Directive, Member States are obliged to designate Special Areas of Conservation (SACs) which contain habitats or species considered important for protection and conservation in an EU context. The Planning and Development Act 2000 (section 177U and 177V) govern the requirement to carry out appropriate assessment.

The Birds Directive (Council Directive 2009/147/EC on the Conservation of Wild Birds) is concerned with the long-term protection and management of all wild bird species and their habitats in the EU. Among other things, the Birds Directive requires that Special Protection Areas (SPAs) be established to protect migratory species and species which are rare, vulnerable, in danger of extinction, or otherwise require special attention.

Special Areas of Conservation (SACs) designated under the Habitats Directive and Special Protection Areas (SPAs), designated under the Birds Directive, form a pan-European network of protected sites known as Natura 2000. The Habitats Directive sets out a unified system for the protection and management of SACs and SPAs. These sites are also referred to as European sites.

Articles 6(3) and 6(4) of the Habitats Directive set out the requirement for an assessment of proposed plans and projects likely to affect Natura 2000 sites.

Article 6(3) establishes the requirement to screen all plans and projects and to carry out a further assessment if required (Appropriate Assessment (AA)). Article 6(4) establishes requirements in cases of imperative reasons of overriding public interest:

**Article 6(3):** *"Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subjected to an appropriate assessment of its implications for the site in view of the site's conservation objectives. In light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public."*

**Article 6(4):** *"If, in spite of a negative assessment of the implications for the site and in the absence of alternative solutions, a plan or project must nevertheless be carried out for imperative reasons of overriding public interest, including those of a social or economic nature, Member States shall take all compensatory measures necessary to ensure that the overall coherence of the Natura 2000 is protected. It shall inform the Commission of the compensatory measures adopted. Where the site concerned hosts a priority natural habitat type and/or a priority species the only considerations which may be raised are those relating to human health or public safety, to the beneficial consequences of primary importance for the environment or, further to an opinion from the Commission, to other imperative reasons of overriding public interest."*

# 2. Methodology

The Commission's methodological guidance (EC, 2002) promotes a four-stage process to complete the AA and outlines the issues and tests at each stage. An important aspect of the process is that the outcome at each successive stage determines whether a further stage in the process is required.

Stages 1 and 2 deal with the main requirements for assessment under Article 6(3). Stage 3 may be part of Article 6(3) or may be a necessary precursor to Stage 4. Stage 4 is the main derogation step of Article 6(4).

**Stage 1 Screening:** This stage examines the likely effects of a project either alone or in combination with other projects upon a Natura 2000 site and considers whether it can be objectively concluded that these effects will not be significant. In order to screen out a project, it must be excluded, on the basis of objective information, that the Proposed Development, individually or in combination with other plans or projects, will have a significant effect on a European site.

**Stage 2 Appropriate Assessment:** In this stage, there is a consideration of the impact of the project with a view to ascertain whether there will be any adverse effect on the integrity of the Natura 2000 site either alone or in combination with other projects or plans, with respect to the site's structure and function and its conservation objectives. Additionally, where there are predicted impacts, an assessment of the potential mitigation of those impacts is considered.

**Stage 3 Assessment of Alternative Solutions:** This stage examines alternative ways of implementing the project that, where possible, avoid any adverse impacts on the integrity of the Natura 2000 site.

**Stage 4 Assessment where no alternative solutions exist and where adverse impacts remain:** Where imperative reasons of overriding public interest (IROPI) exist, an assessment to consider whether compensatory measures will or will not effectively offset the damage to the sites will be necessary.

To ensure that the Proposed Development complies fully with the requirements of Article 6 of the Habitats Directive and all relevant Irish transposing legislation, Moore Group compiled this report to support an application for planning permission for the Proposed Development to allow the competent authority to carry out AA screening in relation to the proposed development to determine whether the Proposed Development, individually or in combination with another plan or project will have a significant effect on a Natura 2000 site.

## 2.1. Guidance

This report has been compiled in accordance with guidance contained in the following documents:

- Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities. (Department of Environment, Heritage and Local Government, 2010 rev.).
- Appropriate Assessment under Article 6 of the Habitats Directive: Guidance for Planning Authorities. Circular NPWS 1/10 & PSSP 2/10.
- Assessment of Plans and Projects Significantly Affecting Natura 2000 sites: Methodological Guidance on the Provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC (European Commission Environment Directorate-General, 2001); hereafter referred to as the EC Article Guidance Document.
- Managing Natura 2000 Sites: The Provisions of Article 6 of the Habitat's Directive 92/43/EEC (EC Environment Directorate-General, 2000); hereafter referred to as MN2000.
- Managing Natura 2000 Sites: The Provisions of Article 6 of the Habitat's Directive 92/43/EEC (EC, 2018).

## 2.2. Data Sources

Sources of information that were used to collect data on the Natura 2000 network of sites, and the environment within which they are located, are listed below:

- The following mapping and Geographical Information Systems (GIS) data sources, as required:
    - National Parks & Wildlife (NPWS) protected site boundary data;
    - Ordnance Survey of Ireland (OSI) mapping and aerial photography;
    - OSI/Environmental Protection Agency (EPA) rivers and streams, and catchments;
    - Open Street Maps;
    - Digital Elevation Model over Europe (EU-DEM);
    - Google Earth and Bing aerial photography 1995-2020;

- Online data available on Natura 2000 sites as held by the National Parks and Wildlife Service (NPWS) from www.npws.ie including:
    - Natura 2000 - Standard Data Form;
    - Conservation Objectives;
    - Site Synopses;
- National Biodiversity Data Centre records;
    - Online database of rare, threatened and protected species;
    - Publicly accessible biodiversity datasets.
- Status of EU Protected Habitats in Ireland. (National Parks & Wildlife Service, 2013); and
- Relevant Development Plans and Local Area Plans in neighbouring areas;
    - Wicklow County Development Plan 2016-2022

# 3. Description of the Proposed Development

This report presents a screening assessment for the provision of a 110 kV GIS substation, MV Control Building, Transformers, associated dropdown 110 kV transmission lines, along with associated and ancillary works at Avoca River Park, Arklow Co. Wicklow.

The GIS substation building comprises a battery room, control room, mess room, WC, workshop, generator room, cable entry room, GIS room, storage room and car parking. The MV Control building will consist of MV sub rooms and control rooms.

The works will also include installation of cable ducts for three 110 kV underground cables (UGC), one to each of the two new OHL towers and one to the existing Shelton Abby 110 kV adjacent to the new Pollahoney 110 kV Substation inside cable ducts. The external works which include connection to overhead lines and underground grid connections will be undertaken by EirGrid.

Figure 1 shows the Proposed Development location and Figure 2 shows a detailed view of the Proposed Development boundary on recent aerial photography. The layout of the Proposed Development is presented in Figure 3.

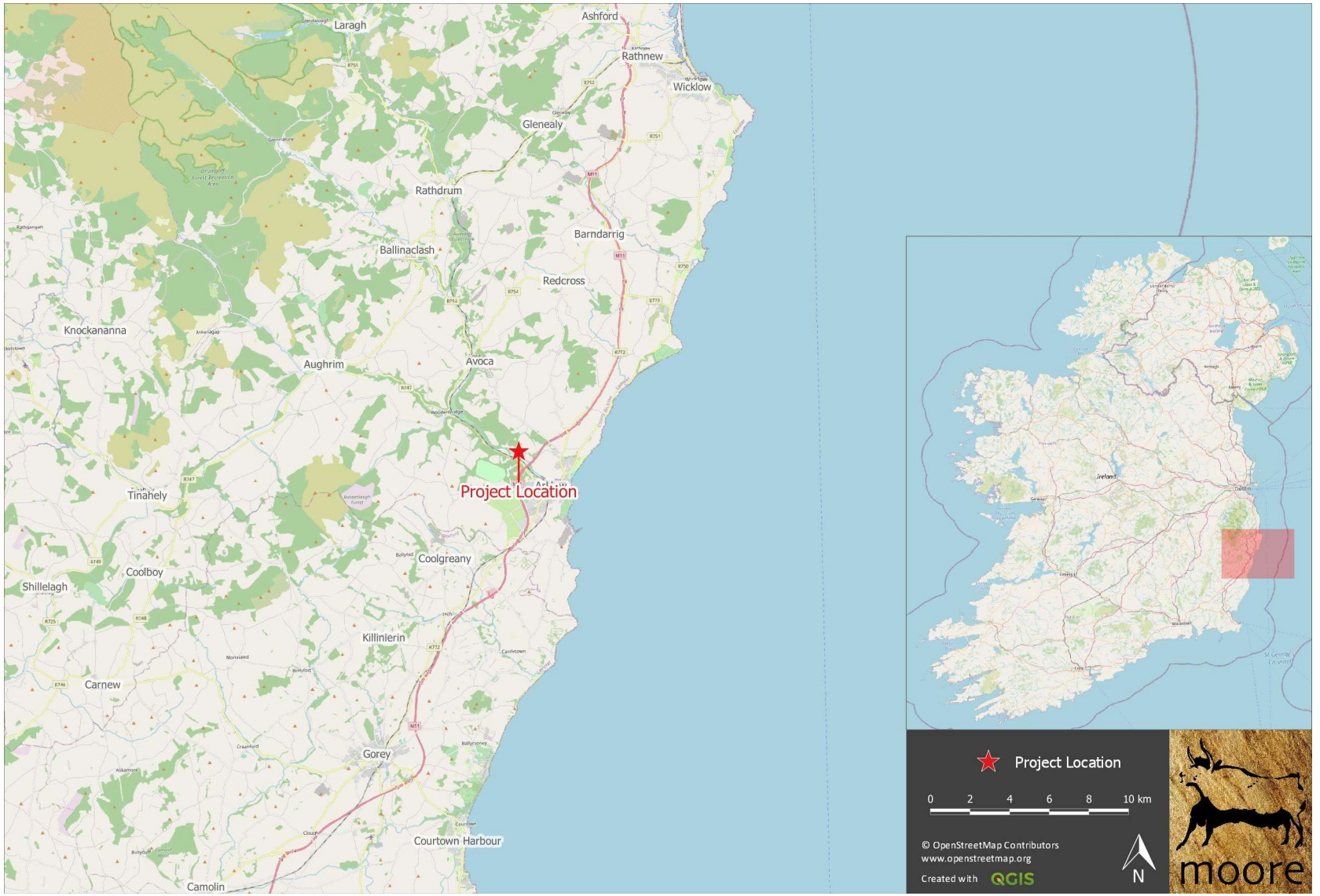



*Figure 1. Showing the Proposed Development location on the outskirts of Arklow, County Wicklow.*




*Figure 2. Showing the existing facility on recent aerial photography.*

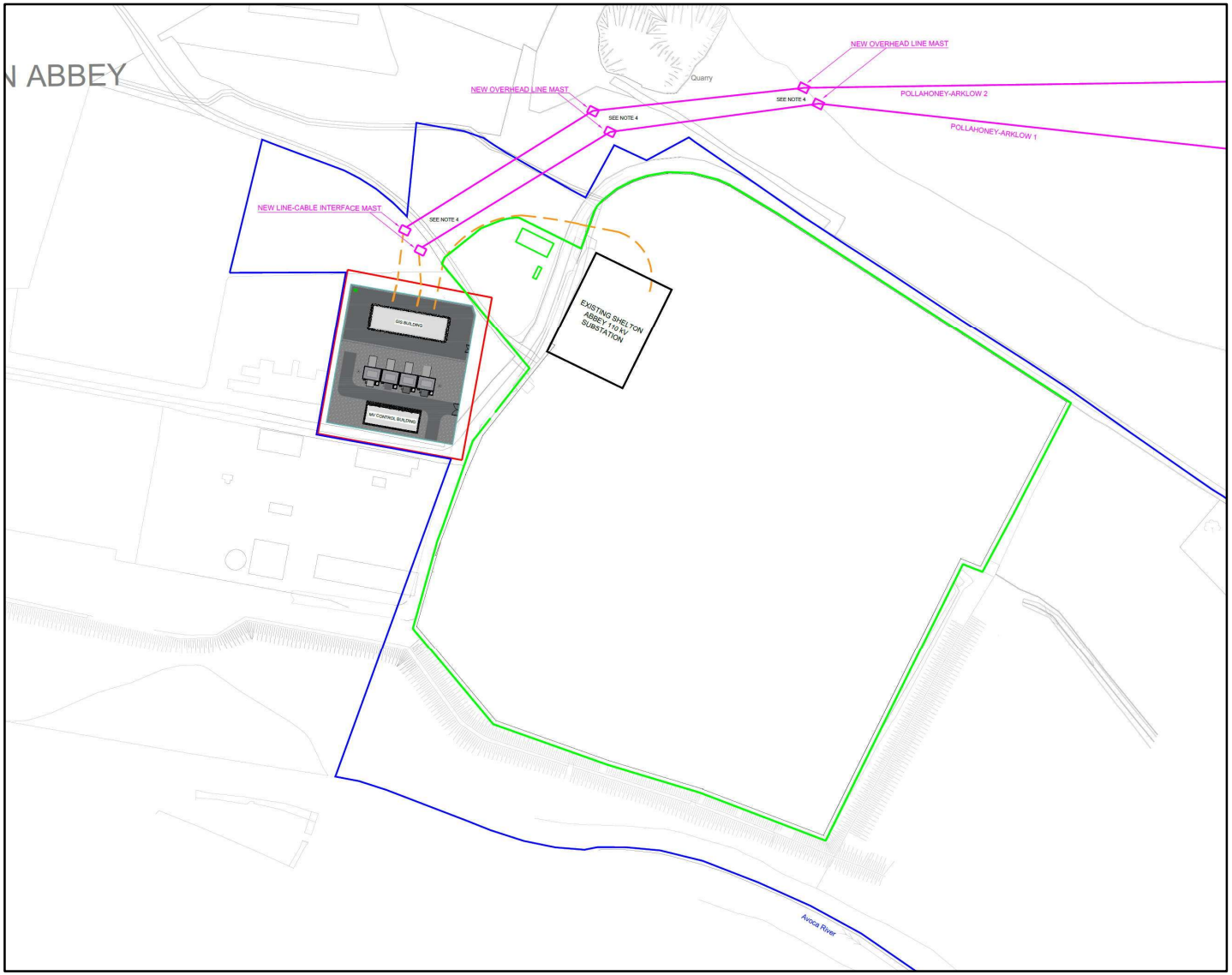



*Figure 3. Showing the layout of the Proposed Development.*

# 4. Identification of Natura 2000 Sites

## 4.1. Description of Natura Sites Potentially Affected

DoEHLG (2009) Guidance on Appropriate Assessment suggests an assessment of European sites within a zone of impact of 15 km. This distance is a guidance only and the zone of impact has been identified taking consideration of the nature and location of the Proposed Development to ensure all European sites with connectivity to it are considered in terms of a catchment-based assessment.

The zone of impact may be determined by connectivity to the Proposed Development in terms of:

- Nature, scale, timing and duration of works and possible impacts, nature and size of excavations, storage of materials, flat/sloping sites;
- Distance and nature of pathways (dilution and dispersion; intervening 'buffer' lands, roads etc.); and
- Sensitivity and location of ecological features.

The guidance provides that, at the screening stage, it is necessary to identify the sites and compile information on their qualifying interests and conservation objectives. In preparation for this, the potential for source pathway receptor connectivity is firstly identified and detailed information is then provided on sites with connectivity. European sites that are located within 15 km of the Project are listed in Table 1 and presented in Figures 3 and 4, below. Spatial boundary data on the Natura 2000 network was extracted from the NPWS website (www.npws.ie) on the 13 November 2020.

*Table 1 European Sites located within 15km or the potential zone of impact of the Project.*

| Site Code | Site name | Distance (km)[1] |
|---|---|---|
| 000717 | Deputy's Pass Nature Reserve SAC | 14.99 |
| 000729 | Buckroney-Brittas Dunes and Fen SAC | 5.38 |
| 000733 | Vale of Clara (Rathdrum Wood) SAC | 14.46 |
| 000781 | Slaney River Valley SAC | 12.64 |
| 001742 | Kilpatrick Sandhills SAC | 8.64 |
| 001766 | Magherabeg Dunes SAC | 14.63 |

The proposed development is to take place on a brownfield site within the catchment of the Avoca River which discharges to the Irish Sea at Arklow over 4 river km to the east.

[1] Distances indicated are the closest geographical distance between the Proposed Development and the European site boundary, as made available by the NPWS. Connectivity along hydrological pathways may be significantly greater.

The nearest European sites to the proposed development Buckroney-Brittas Dunes and Fen SAC (Site Code 000729) which is located approximately 5km to the north of the discharge point of the Avoca River.

Potential impacts on the distant coastal site of Buckroney-Brittas Dunes and Fen SAC are unlikely due to the large distance of removal on the Avoca River (over 9km hydrologically from the site) and the large receiving marine water buffer separating the proposed development from the designated site over which it is anticipated that any potential pollutants would be absorbed and diluted to an extent that they would not be perceptible at the designated site. Therefore it is considered to be outside the Zone of Impact of the proposed development. Similarly, the Buckroney-Brittas Dunes and Fen SAC located even further south on the coast (over 10km hydrologically from the site) is also outside the Zone of Impact of the proposed development.

There is no connectivity to any other European sites.

Having considered the above, significant effects on any European sites as a result of the proposed development can be ruled out and potential significant effects on European sites can be excluded at a preliminary screening stage.

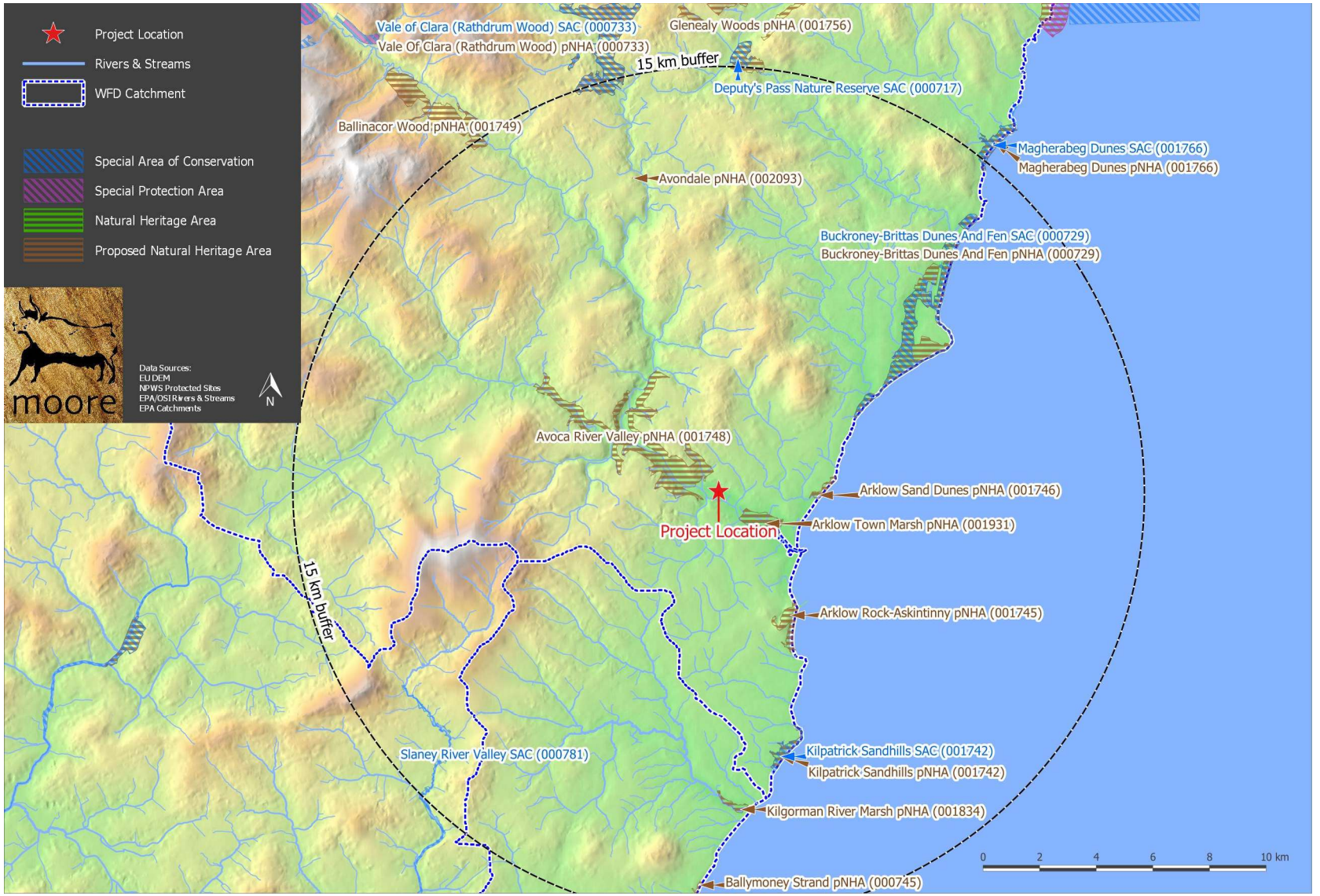



*Figure 4. Showing European sites and NHAs/pNHAs in the vicinity of the Proposed Development.*

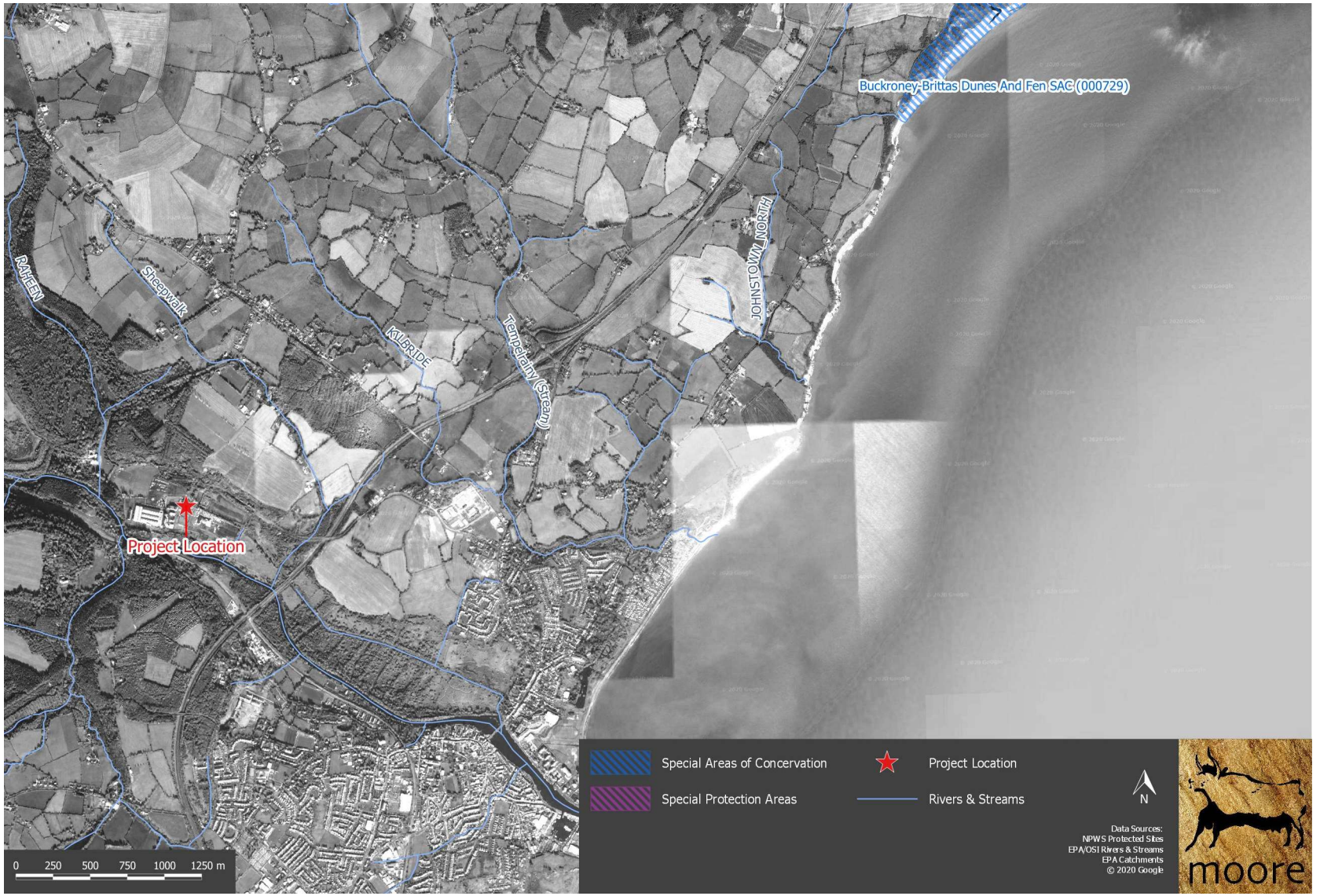



*Figure 5. Detailed view of European sites and NHAs/pNHAs in the vicinity of the Proposed Development.*

## 4.2. Ecological Network Supporting Natura 2000 Sites

An analysis of the proposed Natural Heritage Areas and designated Natural Heritage Areas in terms of their role in supporting the species using Natura 2000 sites was undertaken. It was assumed that these supporting roles mainly related to mobile fauna such as mammals and birds which may use pNHAs and NHAs as "stepping stones" between Natura 2000 sites.

Article 10 of the Habitats Directive and the Habitats Regulations 2011 place a high degree of importance on such non-Natura 2000 areas as features that connect the Natura 2000 network. Features such as ponds, woodlands and important hedgerows were taken into account during the rest of the AA process.

The Avoca River Valley pNHA is located c. 0.5km to the west and the Arklow Town Marsh pNHA is located just over 1km downstream to the east on the Avoca River. However, there are no predicted impacts on these sites given the relatively small scale of the Proposed Development.

# 5. Identification of Potential Impacts & Assessment of Significance

The Proposed Development is not directly connected with or necessary to the management of the sites considered in the assessment and therefore potential impacts must be identified and considered.

## 5.1. Potential Impacts

Potential impacts on the distant coastal site of Buckroney-Brittas Dunes and Fen SAC are unlikely due to the large distance of removal on the Avoca River (over 9km hydrologically from the site) and the large receiving marine water buffer separating the proposed development from the designated site over which it is anticipated that any potential pollutants would be absorbed and diluted to an extent that they would not be perceptible at the designated site. Therefore it is considered to be outside the Zone of Impact of the proposed development. Similarly, the Buckroney-Brittas Dunes and Fen SAC located even further south on the coast (over 10km hydrologically from the site) is also outside the Zone of Impact of the proposed development.

Having considered the above, significant effects on any European sites as a result of the proposed development can be ruled out and potential significant effects on European sites can be excluded at a preliminary screening stage.

## 5.2. Assessment of Potential In-Combination Effects

Cumulative impacts or in-combination effects are changes in the environment that result from numerous human-induced, small-scale alterations. Cumulative impacts can be thought of as occurring through two main pathways: first, through persistent additions or losses of the same materials or resource, and second, through the compounding effects as a result of the coming together of two or more effects.

As part of the Screening for an Appropriate Assessment, in addition to the Proposed Development, other relevant plans and projects in the area must also be considered at this stage. This step aims to identify at this early stage any possible significant in-combination effects of the proposed development with other such plans and projects on European sites.

A review of the National Planning Application Database was undertaken. The first stage of this review confirmed that there were no data outages in the area where the Proposed Development is located. The database was then queried for developments granted planning permission within 1km of the Proposed Development within the last three years, these are presented in Table 2.

*Table 2.Planning applications granted permission in the vicinity of the Proposed Development.*

| Planning Ref. | Description of development | Comments |
|---|---|---|
| 1831 | Erection of 3 illuminated signs at pharmaceutical complex to reflect a rebranding of the company as a subsidiary of Merck KGaA. Two signs are to be located at the entrance to the site and will replace two existing signs at the site entrance. The third sign will be located on the south west gable of the existing distribution warehouse building | No potential for in-combination effects given the scale and location of the project. |
| 181404 | Portal frame structure 69m long by 15.4 m wide by 6.5m high (floor area 1063 sqm) to enclose existing drum storage bund in pharmaceutical complex | As above. No potential for in-combination effects given the scale and location of the project. |
| 1954 | Detached two storey office building (249 sqm) detached timber factory building with canteen, wcs and 1st floor office (1432 sqm) and detached timber factory building with mezzanine office / wcs / canteen (1476 sqm), site layout to include 3 no yard areas, 30 no car parking spaces, 20 no cycle spaces, 2 no bin storage area, 3 no vehicular entrance gates, boundary fence, wastewater treatment system and associated site works | No potential for in-combination effects given the scale and location of the project. |
| 20662 | 1) A portal fame structure 20 metres long by 14 metres wide by 7.5 metres high (floor area 280m2). The building will be used as a store to house spare parts and maintenance | No potential for in-combination effects given the scale and location of the project. |

| Planning Ref. | Description of development | Comments |
|---|---|---|
| | equipment. 2) A single storey office 5.0m by 3.5m within the proposed store to keep records and specification details of the spare parts and equipment stored. 3) Associated site works | |

There are no predicted in-combination effects given that the reasons discussed in the 'Comments' column of Table 2, above, and given that the Proposed Development is unlikely to have any adverse effects on the distant coastal European sites.

The Wicklow County Development Plan in complying with the requirements of the Habitats Directive requires that all Projects and Plans that could affect the Natura 2000 sites in the same zone of impact of the Proposed Development site would be initially screened for Appropriate Assessment and if requiring Stage 2 AA, that appropriate employable mitigation measures would be put in place to avoid, reduce or ameliorate negative impacts. In this way any, in-combination impacts with Plans or Projects for the development area and surrounding townlands in which the development site is located, would be avoided.

The listed developments have been granted permission in most cases with conditions relating to sustainable development by the consenting authority in compliance with the relevant Local Authority Development Plan and in compliance with the Local Authority requirement for regard to the Habitats Directive. The development cannot have received planning permission without having met the consenting authority requirement in this regard. There are no predicted in-combination effects given that it is predicted that the Proposed Development will have no effect on any European site.

Any new applications for the Proposed Development area will be assessed on a case by case basis *initially* by Wicklow County Council which will determine the requirement for AA Screening as per the requirements of Article 6(3) of the Habitats Directive.

# 6. Conclusion

Potential impacts on the distant coastal site of Buckroney-Brittas Dunes and Fen SAC are unlikely due to the large distance of removal on the Avoca River (over 9km hydrologically from the site) and the large receiving marine water buffer separating the proposed development from the designated site over which it is anticipated that any potential pollutants would be absorbed and diluted to an extent that they would not be perceptible at the designated site. Therefore it is considered to be outside the Zone of Impact of the proposed development. Similarly, the Buckroney-Brittas Dunes and Fen SAC located even further south on the coast (over 10km hydrologically from the site) is also outside the Zone of Impact of the proposed development.

Having considered the above, significant effects on any European sites as a result of the proposed development can be ruled out and potential significant effects on European sites can be excluded at a preliminary screening stage.

It has been objectively concluded by Moore Group Environmental Services that:

1. The Proposed Development is not directly connected with, or necessary to the conservation management of the European sites considered in this assessment.
2. The Proposed Development is unlikely to significantly affect the Qualifying interests or Conservation Objectives of the European sites considered in this assessment.
3. The Proposed Development, alone or in combination with other projects, is not likely to have significant effects on the European sites considered in this assessment in view of their conservation objectives.
4. It is possible to conclude that there would be no significant effects, no potentially significant effects and no uncertain effects if the Proposed Development were to proceed.

It can be *excluded*, on the basis of objective information, that the Proposed Development, individually or in combination with other plans or projects, will have a significant effect on a European site.

It is the view of Moore Group Environmental Services that it is not necessary to undertake any further stage of the Appropriate Assessment process.

A finding of no significant effects report is presented in Appendix A in accordance with the EU Commission's methodological guidance (European Commission, 2001).

# 7. References

Department of the Environment, Heritage and Local Government (2010) Guidance on Appropriate Assessment of Plans and Projects in Ireland (as amended February 2010).

European Commission (2000) Managing Natura 2000 sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC.

European Commission Environment DG (2001) Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43EEC. European Commission, Brussels.

European Commission (2007) Guidance document on Article 6(4) of the 'Habitats Directive '92/43/EEC: Clarification of the concepts of: alternative solutions, imperative reasons of overriding public interests, compensatory measures, overall coherence and opinion of the Commission. European Commission, Brussels.

European Commission (2018) Managing Natura 2000 sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC.

NPWS (2019) The Status of EU Protected Habitats and Species in Ireland. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

NPWS (2020) National Parks and Wildlife Service Metadata available online at https://www.npws.ie/maps-and-data.

# Appendix A

## *FINDING OF NO SIGNIFICANT EFFECTS REPORT*

**Finding no significant effects report matrix**

**Name of project or plan**

Pollahoney Substation SID

**Name and location of the Natura 2000 site(s)**

The proposed development is to take place on a brownfield site within the catchment of the Avoca River which discharges to the Irish Sea at Arklow over 4 river km to the east.

The nearest European sites to the proposed development Buckroney-Brittas Dunes and Fen SAC (Site Code 000729) which is located approximately 5km to the north of the discharge point of the Avoca River.

Potential impacts on the distant coastal site of Buckroney-Brittas Dunes and Fen SAC are unlikely due to the large distance of removal on the Avoca River (over 9km hydrologically from the site) and the large receiving marine water buffer separating the proposed development from the designated site over which it is anticipated that any potential pollutants would be absorbed and diluted to an extent that they would not be perceptible at the designated site. Therefore it is considered to be outside the Zone of Impact of the proposed development. Similarly, the Buckroney-Brittas Dunes and Fen SAC located even further south on the coast (over 10km hydrologically from the site) is also outside the Zone of Impact of the proposed development.

There is no connectivity to any other European sites.

**Description of the project or plan**

This report presents a screening assessment for the provision of a 110 kV GIS substation, MV Control Building, Transformers, associated dropdown 110 kV transmission lines, along with associated and ancillary works at Avoca River Park, Arklow Co. Wicklow.

The GIS substation building comprises a battery room, control room, mess room, WC, workshop, generator room, cable entry room, GIS room, storage room and car parking. The MV Control building will consist of MV sub rooms and control rooms.

The works will also include installation of cable ducts for three 110 kV underground cables (UGC), one to each of the two new OHL towers and one to the existing Shelton Abby 110 kV adjacent to the new Pollahoney 110 kV Substation inside cable ducts. The external works which include connection to overhead lines and underground grid connections will be undertaken by EirGrid.

**Is the project or plan directly connected with or necessary to the management of the site(s)**

No

**Are there other projects or plans that together with the projects or plan being assessed could affect the site**

A review of the National Planning Application Database was undertaken. The first stage of this review confirmed that there were no data outages in the area where the Proposed Development is located. The database was then queried for developments granted planning permission within 1km of the Proposed Development within the last three years, these are presented in the Table below.

| Planning Ref. | Description of development | Comments |
|---|---|---|
| 1831 | Erection of 3 illuminated signs at pharmaceutical complex to reflect a rebranding of the company as a subsidiary of Merck KGaA. Two signs are to be located at the entrance to the site and will replace two existing signs at the site entrance. The third | No potential for in-combination effects given the scale and location of the project. |

| Planning Ref. | Description of development | Comments |
|---|---|---|
| | sign will be located on the south west gable of the existing distribution warehouse building | |
| 181404 | Portal frame structure 69m long by 15.4 m wide by 6.5m high (floor area 1063 sqm) to enclose existing drum storage bund in pharmaceutical complex | As above. No potential for in-combination effects given the scale and location of the project. |
| 1954 | Detached two storey office building (249 sqm) detached timber factory building with canteen, wcs and 1st floor office (1432 sqm) and detached timber factory building with mezzanine office / wcs / canteen (1476 sqm), site layout to include 3 no yard areas, 30 no car parking spaces, 20 no cycle spaces, 2 no bin storage area, 3 no vehicular entrance gates, boundary fence, wastewater treatment system and associated site works | No potential for in-combination effects given the scale and location of the project. |
| 20662 | 1) A portal fame structure 20 metres long by 14 metres wide by 7.5 metres high (floor area 280m2). The building will be used as a store to house spare parts and maintenance equipment. 2) A single storey office 5.0m by 3.5m within the proposed store to keep records and specification details of the spare parts and equipment stored. 3) Associated site works | No potential for in-combination effects given the scale and location of the project. |

There are no predicted in-combination effects given that the reasons discussed in the 'Comments' column of the Table above and given that the Proposed Development is unlikely to have any adverse effects on the distant coastal European sites.

The Wicklow County Development Plan in complying with the requirements of the Habitats Directive requires that all Projects and Plans that could affect the Natura 2000 sites in the same zone of impact of the Proposed Development site would be initially screened for Appropriate Assessment and if requiring Stage 2 AA, that appropriate employable mitigation measures would be put in place to avoid, reduce or ameliorate negative impacts. In this way any, in-combination impacts with Plans or Projects for the development area and surrounding townlands in which the development site is located, would be avoided.

The listed developments have been granted permission in most cases with conditions relating to sustainable development by the consenting authority in compliance with the relevant Local Authority Development Plan and in compliance with the Local Authority requirement for regard to the Habitats Directive. The development cannot have received planning permission without having met the consenting authority requirement in this regard. There are no predicted in-combination effects given that it is predicted that the Proposed Development will have no effect on any European site.

Any new applications for the Proposed Development area will be assessed on a case by case basis *initially* by Wicklow County Council which will determine the requirement for AA Screening as per the requirements of Article 6(3) of the Habitats Directive.

# *THE ASSESSMENT OF SIGNIFICANCE OF EFFECTS*

**Describe how the project or plan (alone or in combination) is likely to affect the Natura 2000 site.**

The proposed development is to take place on a brownfield site within the catchment of the Avoca River which discharges to the Irish Sea at Arklow over 4 river km to the east.

The nearest European sites to the proposed development Buckroney-Brittas Dunes and Fen SAC (Site Code 000729) which is located approximately 5km to the north of the discharge point of the Avoca River.

**Explain why these effects are not considered significant.**

The Potential impacts on the distant coastal site of Buckroney-Brittas Dunes and Fen SAC are unlikely due to the large distance of removal on the Avoca River (over 9km hydrologically from the site) and the large receiving marine water buffer separating the proposed development from the designated site over which it is anticipated that any potential pollutants would be absorbed and diluted to an extent that they would not be perceptible at the designated site. Therefore it is considered to be outside the Zone of Impact of the proposed development. Similarly, the Buckroney-Brittas Dunes and Fen SAC located even further south on the coast (over 10km hydrologically from the site) is also outside the Zone of Impact of the proposed development.

There is no connectivity to any other European sites.

Having considered the above, significant effects on any European sites as a result of the proposed development can be ruled out and potential significant effects on European sites can be excluded at a preliminary screening stage.

**List of agencies consulted: provide contact name and telephone or e-mail address**

N/A.

**Response to consultation**

N/A.

## *DATA COLLECTED TO CARRY OUT THE ASSESSMENT*

**Who carried out the assessment**

Moore Group Environmental Services.

**Sources of data**

NPWS database of designated sites at www.npws.ie

National Biodiversity Data Centre database http://maps.biodiversityireland.ie

**Level of assessment completed**

Desktop Assessment.

**Where can the full results of the assessment be accessed and viewed**

APB Web Portal

## *OVERALL CONCLUSIONS*

The Potential impacts on the distant coastal site of Buckroney-Brittas Dunes and Fen SAC are unlikely due to the large distance of removal on the Avoca River (over 9km hydrologically from the site) and the large receiving marine water buffer separating the proposed development from the designated site over which it is anticipated that any potential pollutants would be absorbed and diluted to an extent that they would not be perceptible at the designated site. Therefore it is considered to be outside the Zone of Impact of the proposed development. Similarly, the Buckroney-Brittas Dunes and Fen SAC located even further south on the coast (over 10km hydrologically from the site) is also outside the Zone of Impact of the proposed development.

There is no connectivity to any other European sites.

Having considered the above, significant effects on any European sites as a result of the proposed development can be ruled out and potential significant effects on European sites can be excluded at a preliminary screening stage.

It has been objectively concluded by Moore Group Environmental Services that:

1. The Proposed Development is not directly connected with, or necessary to the conservation management of the European sites considered in this assessment.
2. The Proposed Development is unlikely to significantly affect the Qualifying interests or Conservation Objectives of the European sites considered in this assessment.

3. The Proposed Development, alone or in combination with other projects, is not likely to have significant effects on the European sites considered in this assessment in view of their conservation objectives.
4. It is possible to conclude that there would be no significant effects, no potentially significant effects and no uncertain effects if the Proposed Development were to proceed.

It can be *excluded*, on the basis of objective information, that the Proposed Development, individually or in combination with other plans or projects, will have a significant effect on a European site.

It is the view of Moore Group Environmental Services that it is not necessary to undertake any further stage of the Appropriate Assessment process.

# 8.0 AIR QUALITY & CLIMATE

## 8.1 INTRODUCTION

This chapter evaluates the impacts in which the Proposed Development may have on Air Quality and Climate as defined in the Environmental Protection Agency (EPA) documents Draft 'Guidelines on the Information to be contained in Environmental Impact Assessment Reports' (2017) and the EPA Draft 'Advice Notes for Preparing Environmental Impact Statements' (2015).

The Proposed Development is described in Chapter 2.

## 8.2 METHODOLOGY

### 8.2.1 Criteria for Rating of Impacts

#### *8.2.1.1 Ambient Air Quality Standards*

In order to reduce the risk to health from poor air quality, National and European statutory bodies, the Department of the Environment, Heritage and Local Government in Ireland and the European Parliament and Council of the European Union, have set limit values in ambient air for a range of air pollutants. These limit values or "Air Quality Standards" are health or environmental-based levels for which additional factors may be considered. For example, natural background levels, environmental conditions and socio-economic factors may all play a part in the limit value which is set (see Table 8.1).

Air quality significance criteria are assessed based on compliance with the appropriate standards or limit values. The applicable standards in Ireland include the Air Quality Standards Regulations 2011, which incorporate European Commission Directive 2008/50/EC, which has set limit values for the pollutants $PM_{10}$, and $PM_{2.5}$ relevant to this assessment. Council Directive 2008/50/EC combines the previous Air Quality Framework Directive (96/62/EC) and its subsequent daughter directives (including 1999/30/EC and 2000/69/EC) and includes ambient limit values relating to $PM_{2.5}$. Dust emissions and $PM_{10}$/$PM_{2.5}$ emissions are the primary concern in terms of air quality in relation to the Proposed Development.

***Table 8.1*** Ambient Air Quality Standards

| Pollutant | Regulation [Note 1] | Limit Type | Value |
|---|---|---|---|
| Dust Deposition | TA Luft (German VDI 2002) | Annual average limit for nuisance dust | 350 mg/($m^2$*day) |
| Particulate Matter (as $PM_{10}$) | 2008/50/EC | 24-hour limit for protection of human health - not to be exceeded more than 35 times/year | 50 µg/$m^3$ $PM_{10}$ |
| | | Annual limit for protection of human health | 40 µg/$m^3$ $PM_{10}$ |
| Particulate Matter (as $PM_{2.5}$) | 2008/50/EC | Annual limit for protection of human health | 25 µg/$m^3$ $PM_{2.5}$ |

Note 1 EU 2008/50/EC – Clean Air For Europe (CAFÉ) Directive replaces the previous Air Framework Directive (1996/30/EC) and daughter directives 1999/30/EC and 2000/69/EC

*8.2.1.2 Dust Deposition Guidelines*

The concern from a health perspective is focused on particles of dust, which are less than 10 microns, and the EU ambient air quality standards outlined in section 8.2.1.1 have set ambient air quality limit values for $PM_{10}$ and $PM_{2.5}$.

With regard to larger dust particles that can give rise to nuisance dust, there are no statutory guidelines regarding the maximum dust deposition levels that may be generated during the construction phase of a development in Ireland.

However, guidelines for dust deposition, the German TA-Luft standard for dust deposition (non-hazardous dust) (German VDI, 2002) sets a maximum permissible emission level for dust deposition of 350 mg/($m^2$*day) averaged over a one year period at any receptors outside the site boundary. The TA-Luft standard has been applied for the purpose of this assessment based on recommendations from the EPA in Ireland in the document titled 'Environmental Management Guidelines - Environmental Management in the Extractive Industry (Non-Scheduled Minerals) (EPA, 2006). The document recommends that the Bergerhoff limit of 350 mg/($m^2$*day) be applied to the site boundary of quarries. This limit value can be implemented with regard to dust impacts from construction of the Proposed Development.

*8.2.1.3 Gothenburg Protocol*

In 1999, Ireland signed the Gothenburg Protocol to the 1979 UN Convention on Long Range Transboundary Air Pollution. The initial objective of the Protocol was to control and reduce emissions of Sulphur Dioxide ($SO_2$), Nitrogen Oxides ($NO_X$), Volatile Organic Compounds (VOCs) and Ammonia ($NH_3$). In 2012, the Gothenburg Protocol was revised to include national emission reduction commitments for the main air pollutants to be achieved in 2020 and beyond and to include emission reduction commitments for $PM_{2.5}$.

European Commission Directive 2001/81/EC and the National Emissions Ceiling Directive (NECD) prescribes the same emission limits as the 1999 Gothenburg Protocol. A National EPA Programme for the progressive reduction of emissions of these four transboundary pollutants has been in place since April 2005. The data available from the EPA in 2020 (EPA, 2020a) indicated that Ireland complied with the emissions ceilings for $SO_2$ but failed to comply with the ceilings for $NH_3$, $NO_X$ and NMVOCs in recent years. Directive (EU) 2016/2284 "*On the Reduction of National Emissions of Certain Atmospheric Pollutants and Amending Directive 2003/35/EC and Repealing Directive 2001/81/EC*" was published in December 2016. The Directive will apply the 2010 NECD limits until 2020 and establish new national emission reduction commitments, which will be applicable from 2020 and 2030 for $SO_2$, $NO_X$, NMVOC, $NH_3$, $PM_{2.5}$ and $CH_4$. In relation to Ireland, 2020 emission targets are 25.5 kt for $SO_2$ (65% on 2005 levels), 66.9 kt for $NO_X$ (49% reduction on 2005 levels), 56.9 kt for NMVOCs (25% reduction on 2005 levels), 112 kt for $NH_3$ (1% reduction on 2005 levels) and 15.6 kt for $PM_{2.5}$ (18% reduction on 2005 levels). In relation to 2030, Ireland's emission targets are 10.9 kt (85% below 2005 levels) for $SO_2$, 40.7 kt (69% reduction) for $NO_x$, 51.6 kt (32% reduction) for NMVOCs, 107.5 kt (5% reduction) for $NH_3$ and 11.2 kt (41% reduction) for $PM_{2.5}$.

*8.2.1.4 Climate Agreements*

Ireland is party to both the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol. The Paris Agreement, which entered into force in 2016, is an important milestone in terms of international climate change agreements and includes an aim of limiting global temperature increases to no more than 2°C above pre-industrial levels with efforts to limit this rise to 1.5°C. The aim is to limit global GHG emissions to 40 gigatonnes as soon as possible whilst

acknowledging that peaking of GHG emissions will take longer for developing countries. Contributions to GHG emissions will be based on Intended Nationally Determined Contributions (INDCs) which will form the foundation for climate action post 2020. Significant progress was also made in the Paris Agreement on elevating adaption onto the same level as action to cut and curb emissions.

In order to meet the commitments under the Paris Agreement, the EU enacted *Regulation (EU) 2018/842 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No. 525/2013* (the Regulation). The Regulation aims to deliver, collectively by the EU in the most cost-effective manner possible, reductions in GHG emissions from the Emission Trading Scheme (ETS) and non-ETS sectors amounting to 43% and 30%, respectively, by 2030 compared to 2005. Ireland's obligation under the Regulation is a 30% reduction in non-ETS greenhouse gas emissions by 2030 relative to its 2005 levels.

In 2015, the Climate Action and Low Carbon Development Act 2015 (No. 46 of 2015) (Government of Ireland, 2015) was enacted (the Act). The purpose of the Act was to enable Ireland '*to pursue, and achieve, the transition to a low carbon, climate resilient and environmentally sustainable economy by the end of the year 2050*' (3.(1) of No. 46 of 2015). This is referred to in the Act as the '*national transition objective*'.

The Act makes provision for a national mitigation plan, and a national adaptation framework. In addition, the Act provided for the establishment of the Climate Change Advisory Council with the function to advise and make recommendations on the preparation of the national mitigation and adaptation plans and compliance with existing climate obligations.

The *Climate Action Plan* (CAP) (Government of Ireland, 2019), published in June 2019, outlines the current status across key sectors including Electricity, Transport, Built Environment, Industry and Agriculture and outlines the various broadscale measures required for each sector to achieve ambitious decarbonisation targets. The CAP also details the required governance arrangements for implementation including carbon-proofing of policies, establishment of carbon budgets, a strengthened Climate Change Advisory Council and greater accountability to the Oireachtas. The CAP has set a built environment sector reduction target of 40 - 45% relative to 2030 pre-NDP (National Development Plan) projections.

Following on from Ireland declaring a climate and biodiversity emergency in May 2019 and the European Parliament approving a resolution declaring a climate and environment emergency in Europe in November 2019, the Government approved the publication of the General Scheme for the Climate Action (Amendment) Bill 2019 in December 2019 (Government of Ireland, 2020a). The General Scheme was prepared for the purposes of giving statutory effect to the core objectives stated within the CAP. It is expected that the new Climate Action (Amendment) Bill (the Bill) will be published before the end of 2020.

In October 2020, the Climate Action and Low Carbon Development (Amendment) Bill 2020 (Government of Ireland, 2020b) was published in draft format (draft 2020 Climate Act) which amends and enhances the 2015 Climate Act. Once approved, the purpose of the 2020 Climate Act is to provide for the approval of plans '*for the purpose of pursuing the transition to a climate resilient and climate neutral economy by the end of the year 2050'*. The 2020 Climate Act will also '*provide for carbon budgets and a decarbonisation target range for certain sectors of the economy'*. The 2020 Climate Act removes any reference to a national mitigation plan and instead

refers to both the Climate Action Plan, as published in 2019, and a series of National Long-Term Climate Action Strategies. In addition, the Environment Minister shall request each local authority to make a 'local authority climate action plan' lasting five years and to specify the mitigation measures and the adaptation measures to be adopted by the local authority.

### 8.2.2 Construction Phase

#### *8.2.2.1 Air Quality*

The current assessment focuses on identifying the existing baseline levels of $PM_{10}$ and $PM_{2.5}$ in the region of the Proposed Development by an assessment of publically available EPA monitoring data. Thereafter, the impact of the construction phase of the Proposed Development on air quality was determined by a qualitative assessment of the nature and scale of dust generating construction activities associated with the Proposed Development.

#### *8.2.2.2 Climate*

The impact of the construction phase of the Proposed Development on climate was determined by a qualitative assessment of the nature and scale of greenhouse gas generating construction activities associated with the Proposed Development.

### 8.2.3 Operational Phase

#### *8.2.3.1 Air Quality*

Operational phase traffic has the potential to impact air quality. The UK DMRB guidance (UK Highways Agency, 2019a), states that road links meeting one or more of the following criteria can be defined as being 'affected' by a Proposed Development and should be included in the local air quality assessment. The TII guidance (2011) was based on the previous version of the UK DMRB guidance (UK Highways Agency, 2007) and notes that the TII guidance should be adapted for any updates to the DMRB (see Section 1.1 of *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes, 2011)* .

- Annual average daily traffic (AADT) changes by 1,000 or more;
- Heavy duty vehicle (HDV) AADT changes by 200 or more;
- A change in speed band;
- A change in carriageway alignment by 5m or greater.

By definition of the criteria above, there are no road links impacted as a result of the Proposed Development. Therefore, no assessment using the DMRB model was required for the Proposed Development as there is no potential for significant impacts to air quality.

#### *8.2.3.2 Climate*

The UK Highways Agency has published an updated DMRB guidance document in relation to climate impact assessments *LA 114 Climate* (UK Highways Agency 2019b). The following scoping criteria are used to determine whether a detailed climate assessment is required for a proposed project during the operational stage. If any of the road links impacted by the Proposed Development meet or exceed the below criteria, then further assessment is required.

- A change of more than 10% in AADT;

- A change of more than 10% to the number of heavy duty vehicles; and
- A change in daily average speed of more than 20 km/hr.

None of the road links impacted by the Proposed Development meet the scoping criteria above and therefore a detailed assessment has been scoped out as there is no potential for significant impacts to climate.

## 8.3 RECEIVING ENVIRONMENT

### 8.3.1 Meteorological Data

A key factor in assessing temporal and spatial variations in air quality is the prevailing meteorological conditions. Depending on wind speed and direction, individual receptors may experience very significant variations in pollutant levels under the same source strength (i.e. traffic levels) (WHO, 2006). Wind is of key importance in dispersing air pollutants and for ground level sources, such as traffic emissions where pollutant concentrations are generally inversely related to wind speed. Thus, concentrations of pollutants derived from traffic sources will generally be greatest under very calm conditions and low wind speeds when the movement of air is restricted. In relation to $PM_{10}$, the situation is more complex due to the range of sources of this pollutant. Smaller particles (less than $PM_{2.5}$) from traffic sources will be dispersed more rapidly at higher wind speeds. However, fugitive emissions of coarse particles ($PM_{2.5}$ - $PM_{10}$) will actually increase at higher wind speeds. Thus, measured levels of $PM_{10}$ will be a non-linear function of wind speed.

The nearest representative weather station collating detailed weather records is Dublin Airport, which is located approximately 67 km north of the site. Dublin Airport met data has been examined to identify the prevailing wind direction and average wind speeds over a five-year period (see Figure 8.1). For data collated during five representative years (2015 – 2019) (Met Eireann, 2020), the predominant wind direction is westerly to south-westerly, with generally moderate wind speeds averaging 5.3 m/s for the period 1981 - 2010.

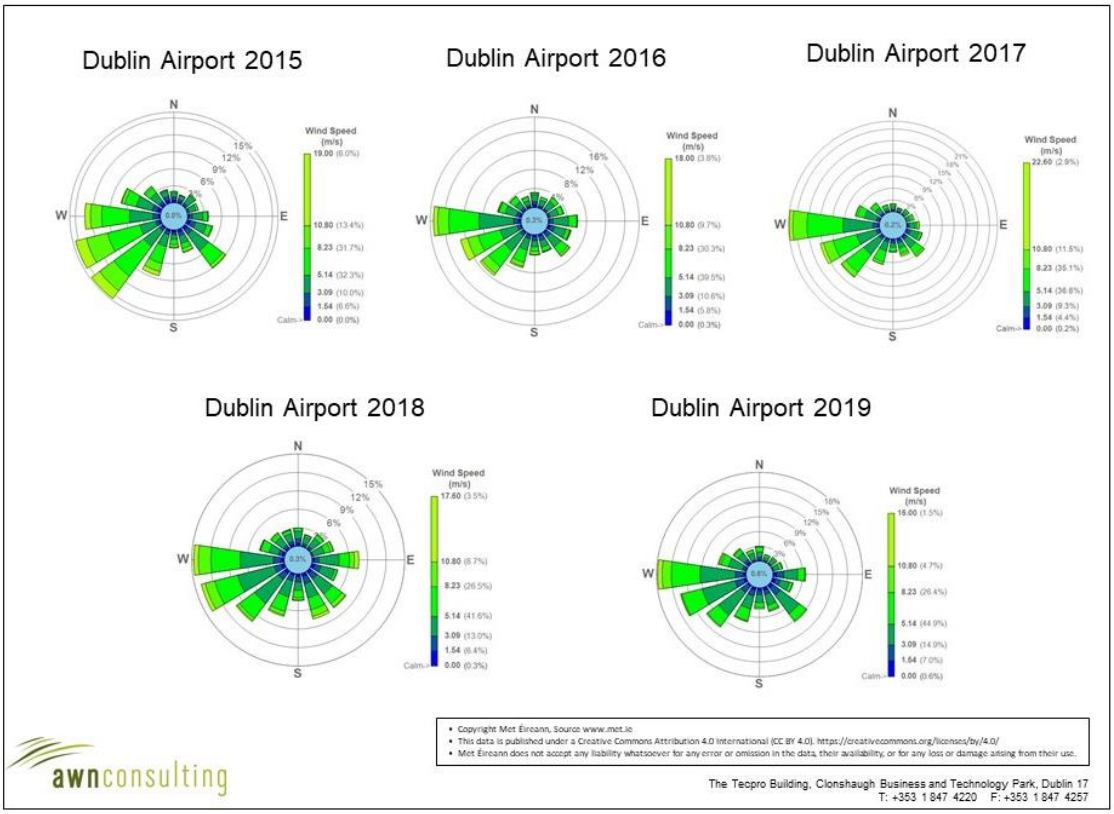



***Figure 8.1*** Dublin Airport Windrose 2015 – 2019 (MET, 2020)

### 8.3.2 Baseline Air Quality

The EPA and Local Authorities have undertaken air quality monitoring programs in recent years. The most recent EPA published annual report on air quality "Air Quality In Ireland 2019" (EPA 2020b) details the range and scope of monitoring undertaken throughout Ireland.

As part of the implementation of the Framework Directive on Air Quality (1996/62/EC), four air quality zones have been defined in Ireland for air quality management and assessment purposes as outlined within the EPA document titled 'Air Quality In Ireland 2019' (EPA 2020b). Dublin is defined as Zone A and Cork as Zone B. Zone C is composed of 23 towns with a population of greater than 15,000. The remainder of the country, which represents rural Ireland but also includes all towns with a population of less than 15,000, is defined as Zone D. In terms of air monitoring, the area of the Proposed Development in Arklow is categorised as Zone D as explained with the EPA document titled 'Air Quality In Ireland 2019' (EPA 2020b).

#### *8.3.2.1 $PM_{10}$*

Long-term $PM_{10}$ monitoring was carried out at the urban Zone D locations of Castlebar and Claremorris in 2019. The average annual mean concentrations measured at the two sites were 16 µg/m$^3$ and 11 µg/m$^3$ respectively (Table 8.2). Long-term $PM_{10}$ measurements carried out at the rural Zone D location in Kilkitt in 2019 gave an average level of 7 µg/m$^3$ (EPA, 2020b). In addition, data from the Phoenix Park provides a good indication of urban background levels, with an annual average in 2019 of 11 µg/m$^3$ (EPA, 2020b). There was at most 1 exceedance of the 24-hour limit value of 50 µg/m$^3$ in Castlebar and Kilkitt in 2019, however 35 exceedances are permitted per year (EPA, 2020b). Based on the above information a conservative estimate of the current background concentration in the region of the

Proposed Development is 12 µg/m$^3$.

***Table 8.2*** Background $PM_{10}$ Concentrations In Zone D Locations (µg/m$^3$)

| Station | Averaging Period | Year | | | | |
|---|---|---|---|---|---|---|
| | | 2015 | 2016 | 2017 | 2018 | 2019 |
| Castlebar | Annual Mean $PM_{10}$ (µg/m$^3$) | 13 | 12 | 11 | 11 | 16 |
| | 24-hr Mean > 50 µg/m$^3$ (days) | 2 | 1 | 1 | 0 | 1 |
| Killkitt | Annual Mean $PM_{10}$ (µg/m$^3$) | 9 | 8 | 8 | 9 | 7 |
| | 24-hr Mean > 50 µg/m$^3$ (days) | 1 | 0 | 0 | 0 | 1 |
| Claremorris | Annual Mean $PM_{10}$ (µg/m$^3$) | 10 | 10 | 11 | 12 | 11 |
| | 24-hr Mean > 50 µg/m$^3$ (days) | 0 | 0 | 1 | 0 | 0 |

*8.3.2.2 $PM_{2.5}$*

The results of $PM_{2.5}$ monitoring at the Zone D location of Claremorris over the period 2015 – 2019 (EPA, 2020b) indicated an average $PM_{2.5}/PM_{10}$ ratio ranging from 0.4 – 0.6. Based on this information, a conservative ratio of 0.65 was used to generate a background $PM_{2.5}$ concentration of 7.8 µg/m$^3$.

Levels of $PM_{10}$ and $PM_{2.5}$ will continue to follow recent trends in future years.

### 8.3.3 Climate Baseline

Anthropogenic emissions of greenhouse gases in Ireland included in the EU 2020 strategy are outlined in the most recent review by the EPA which details emissions up to 2018 (EPA, 2020d). The data published in 2020 states that Ireland has exceeded its 2018 annual limit set under the EU's Effort Sharing Decision (ESD), 406/2009/EC1 by 5.59 Mt. For 2018, total national greenhouse gas emissions are estimated to be 60.93 million tonnes carbon dioxide equivalent (Mt $CO_2$eq). This is 0.1% lower (0.07 Mt $CO_2$eq) than emissions in 2017. Agriculture is the largest contributor in 2018 at 33.9% of the total, with the transport sector accounting for 20.1% of emissions of $CO_2$.

The EPA 2019 GHG Emissions Projections Report for 2018 – 2040 (EPA 2019) notes that there is a long-term projected decrease in greenhouse gas emissions as a result of inclusion of new climate mitigation policies and measures that formed part of the National Development Plan (NDP) which was published in 2018. Implementation of these are classed as a "*With Additional Measures scenario*" for future scenarios. A change from generating electricity using coal and peat to wind power and diesel vehicle engines to electric vehicle engines are envisaged under this scenario. While emissions are projected to decrease in these areas, emissions from agriculture are projected to grow steadily due to an increase in animal numbers. However, over the period 2013 – 2020 Ireland is projected to cumulatively exceed its compliance obligations with the EU's Effort Sharing Decision (Decision No. 406/2009/EC) 2020 targets by approximately 10 Mt $CO_2$eq under the "*With Existing Measures*" scenario and 9 Mt $CO_2$eq under the "*With Additional Measures*" scenario (EPA, 2019).

### 8.3.4 Sensitivity of the Receiving Environment

In line with the UK Institute of Air Quality Management (IAQM) guidance document '*Guidance on the Assessment of Dust from Demolition and Construction'* (2014) prior to assessing the impact of dust from a Proposed Development the sensitivity of the

area must first be assessed as outlined below. Both receptor sensitivity and proximity to proposed works areas are taken into consideration. For the purposes of this assessment, high sensitivity receptors are regarded as residential properties where people are likely to spend the majority of their time.

In terms of receptor sensitivity to dust soiling, there are no sensitive receptors within 350m of the site. The closest high sensitivity receptors (residential propoerties) are over 700m to the east of the site. There is timber products manufacturing facility which borders the Proposed Development site to the south-west. This facility would be considered of low sensitivity in terms of dust soiling. The overall sensitivity of the area to dust soiling impacts can therefore be considered low as per Table 8.3.

***Table 8.3*** Sensitivity of the Area to Dust Soiling Effects on People and Property

| Receptor Sensitivity | Number Of Receptors | Distance from source (m) | | | |
|---|---|---|---|---|---|
| | | <20 | <50 | <100 | <350 |
| High | >100 | High | High | Medium | Low |
| | 10-100 | High | Medium | Low | Low |
| | 1-10 | Medium | Low | Low | Low |
| Medium | >1 | Medium | Low | Low | Low |
| Low | >1 | Low | Low | Low | Low |

In addition to sensitivity to dust soiling, the IAQM guidelines also outline the assessment criteria for determining the sensitivity of the area to human health impacts. The criteria take into consideration the current annual mean $PM_{10}$ concentration, receptor sensitivity based on type (residential receptors are classified as high sensitivity) and the number of receptors affected within various distance bands from the construction works. A conservative estimate of the current annual mean $PM_{10}$ concentration in the vicinity of the Proposed Development is estimated to be 12 µg/m$^3$ (see Section 8.3.2) and there is a low sensitivty timber products manufacturing facility located within 20 m of the proposed construction works. Based on the IAQM criteria outlined in Table 8.4, the worst case sensitivity of the area to human health is considered to be low.

***Table 8.4*** Sensitivity of the Area to Dust Related Human Health Impacts

| Receptor Sensitivity | Annual Mean $PM_{10}$ Concentration | Number Of Receptors | Distance from source (m) | | | | |
|---|---|---|---|---|---|---|---|
| | | | <20 | <50 | <100 | <200 | <350 |
| High | < 24 µg/m$^3$ | >100 | Medium | Low | Low | Low | Low |
| | | 10-100 | Low | Low | Low | Low | Low |
| | | 1-10 | Low | Low | Low | Low | Low |
| Medium | < 24 µg/m$^3$ | >10 | Low | Low | Low | Low | Low |
| | | 1-10 | Low | Low | Low | Low | Low |
| Low | < 24 µg/m$^3$ | >1 | Low | Low | Low | Low | Low |

The IAQM guidance also outlines the criteria for determining the sensitivity of an ecological receptor to dust impacts. The sensitivity is determined based on the designation of the site, (European, National or local designation) and the potential dust sensitivity of the ecologically important species present. There is the potential for impacts to sensitive sites within 50m of the proposed works. A section of the Avoca River Valley proposed Natural Heritage Area (pNHA) (site code 001748) is located over 500m to the west of the site. There is no potential for significant dust

related ecological impacts at this distance and therefore no further assessment is required.

## 8.4 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

### 8.4.1 Construction Phase

The Proposed Development is described in Chapter 2. The key civil engineering works that will have a potential impact on air quality and climate during construction are summarised below:

(i) During construction, an amount of soil will be generated as part of the site preparation works and during excavation for building foundations.
(ii) Infilling and landscaping will be undertaken.
(iii) Temporary storage of construction materials.
(iv) Construction traffic accessing the site will emit air pollutants and greenhouse gases during transport.

As outlined in Section 8.6, a dust minimisation plan will be formulated for the construction phase of the Proposed Development to ensure no dust nuisance occurs at nearby sensitive receptors.

### 8.4.2 Operational Phase

During the operational phase, traffic accessing the site for maintenance purposes has the potential to impact on air quality and climate. However, this traffic will not be of the magnitude to cause a significant impact. There is a single generator, for back up purposes, in the Proposed Development but this has been scoped out from further assessment due to its small size (less than 1 MW) and infrequent use.

## 8.5 POTENTIAL IMPACTS OF THE PROPOSED DEVELOPMENT

### 8.5.1 Construction Phase

#### *8.5.1.1 Air Quality*

The greatest potential impact on air quality during the construction phase of the Proposed Development is from construction dust emissions and the potential for nuisance dust. While construction dust tends to be deposited within 350m of a construction site, the majority of the deposition occurs within the first 50m. The extent of any dust generation depends on the nature of the dust (soils, peat, sands, gravels, silts etc.) and the nature of the construction activity. In addition, the potential for dust dispersion and deposition depends on local meteorological factors such as rainfall, wind speed and wind direction.

It is important to note that the potential impacts associated with the construction phase of the Proposed Development are short-term in nature. When the dust minimisation measures detailed in the mitigation section (see Section 8.6) of this chapter are implemented, fugitive emissions of dust from the site will not be significant and will pose no nuisance at nearby receptors.

In order to determine the level of dust mitigation required during the proposed works, the potential dust emission magnitude for each dust generating activity needs to be taken into account, in conjunction with the previously established sensitivity of the area (see Section 8.3.4). The major dust generating activities are divided into four types within the IAQM guidance to reflect their different potential impacts. These are:

- Demolition;
- Earthworks;
- Construction; and
- Trackout (movement of heavy vehicles).

*Demolition*

Demolition will primarily involve the removal of buildings or structures currently on the site in a potentially dusty manner. This may also involve dust generation at heights. Dust emission magnitude from demolition can be classified as small, medium and large and are described below.

- **Large**: Total building volume >50,000 $m^3$, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities >20 m above ground level;

- **Medium**: Total building volume 20,000 $m^3$ – 50,000 $m^3$, potentially dusty construction material, demolition activities 10-20 m above ground level; and

- **Small**: Total building volume less than 20,000 $m^3$.

There is some minor demolition work involved with the proposed development as the existing structures on the site are to be demolished and removed. The demolition works can be classified as small as the total building volume to be demolished will be significantly less than 20,000 $m^3$. As the overall sensitivity of the area to dust soiling and human health is low, this results in an overall negligible risk of dust soiling and human health impacts associated with the proposed demolition activities in the absence of mitigation (see Table 8.5).

***Table 8.5*** Risk of Dust Impacts – Demolition

| Sensitivity of Area | Dust Emission Magnitude | | |
|---|---|---|---|
| | **Large** | **Medium** | **Small** |
| High | High Risk | Medium Risk | Medium Risk |
| Medium | High Risk | Medium Risk | Low Risk |
| Low | Medium Risk | Low Risk | Negligible |

*Earthworks*

Earthworks primarily involve excavating material, loading and unloading of materials, tipping and stockpiling activities. Activities such as levelling the site and landscaping works are also considered under this category. The dust emission magnitude from earthworks can be classified as small, medium or large based on the definitions from the IAQM guidance as transcribed below:

- **Large:** Total site area > 10,000 $m^2$, potentially dusty soil type (e.g. clay which will be prone to suspension when dry due to small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds > 8 m in height, total material moved >100,000 tonnes;

- **Medium:** Total site area 2,500 $m^2$ – 10,000 $m^2$, moderately dusty soil type (e.g. silt), 5 - 10 heavy earth moving vehicles active at any one time,

formation of bunds 4 – 8 m in height, total material moved 20,000 – 100,000 tonnes;

- **Small:** Total site area < 2,500 $m^2$, soil type with large grain size (e.g. sand), < 5 heavy earth moving vehicles active at any one time, formation of bunds < 4 m in height, total material moved < 20,000 tonnes, earthworks during wetter months.

The dust emission magnitude for the proposed earthwork activities can be classified as small as the total material moved (both excavations and infilling works) will be less than 20,000 tonnes.

The sensitivity of the area, as determined in Section 8.3.4, is combined with the dust emission magnitude for each dust generating activity to define the risk of dust impacts in the absence of mitigation. As outlined in Table 8.6, this results in an overall negligible risk of temporary dust soiling impacts and temporary human health impacts as a result of the proposed earthworks activities.

***Table 8.6*** Risk of Dust Impacts – Earthworks

| Sensitivity of Area | Dust Emission Magnitude | | |
|---|---|---|---|
| | **Large** | **Medium** | **Small** |
| High | High Risk | Medium Risk | Low Risk |
| Medium | Medium Risk | Medium Risk | Low Risk |
| Low | Low Risk | Low Risk | Negligible |

*Construction*

Dust emission magnitude from construction can be classified as small, medium or large based on the definitions from the IAQM guidance as transcribed below:

- **Large:** Total building volume > 100,000 $m^3$, on-site concrete batching, sandblasting;

- **Medium:** Total building volume 25,000 $m^3$ – 100,000 $m^3$, potentially dusty construction material (e.g. concrete), on-site concrete batching;

- **Small:** Total building volume < 25,000 $m^3$, construction material with low potential for dust release (e.g. metal cladding or timber).

The dust emission magnitude for the proposed construction activities can be classified as small as a worst-case as the total building volume of the substation will be significantly less than 25,000 $m^3$.

The sensitivity of the area is combined with the dust emission magnitude for each dust generating activity to define the risk of dust impacts in the absence of mitigation. As outlined in Table 8.7, this results in an overall negligible risk of temporary dust soiling impacts and temporary human health impacts as a result of the proposed construction activities.

***Table 8.7*** Risk of Dust Impacts – Construction

| Sensitivity of Area | Dust Emission Magnitude | | |
|---|---|---|---|
| | **Large** | **Medium** | **Small** |
| High | High Risk | Medium Risk | Low Risk |
| Medium | Medium Risk | Medium Risk | Low Risk |
| Low | Low Risk | Low Risk | Negligible |

*Trackout*

Factors which determine the dust emission magnitude are vehicle size, vehicle speed, number of vehicles, road surface material and duration of movement. Dust emission magnitude from trackout can be classified as small, medium or large based on the definitions from the IAQM guidance as transcribed below:

- **Large:** > 50 HGV (> 3.5 t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length > 100 m;
- **Medium:** 10 - 50 HGV (> 3.5 t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 - 100 m;
- **Small:** < 10 HGV (> 3.5 t) outward movements in any one day, surface material with low potential for dust release, unpaved road length < 50 m.

The dust emission magnitude for the proposed trackout can be classified as medium, as at worst-case peak periods there will be on average 25 outward HGV movements per day. As outlined in Table 8.8, this results in an overall low risk of temporary dust soiling impacts and temporary human health impacts as a result of the proposed trackout activities.

***Table 8.8*** Risk of Dust Impacts – Trackout

| Sensitivity of Area | Dust Emission Magnitude | | |
|---|---|---|---|
| | **Large** | **Medium** | **Small** |
| High | High Risk | Medium Risk | Low Risk |
| Medium | Medium Risk | Medium Risk | Low Risk |
| Low | Low Risk | Low Risk | Negligible |

#### *8.5.1.2 Summary of Dust Emission Risk*

The risk of dust impacts as a result of the Proposed Development are summarised in Table 8.9 for each activity. The magnitude of risk determined is used to prescribe the level of site specific mitigation required for each activity in order to prevent significant impacts occurring.

While there is a worst case low risk of dust soiling and human health impacts associated with the proposed works, best practice dust mitigation measures will be implemented to ensure there are no impacts at nearby sensitive receptors. When the dust mitigation measures detailed in the mitigation section of this chapter (Section 8.6) are implemented, fugitive emissions of dust from the site will be insignificant and pose no nuisance at nearby receptors.

***Table 8.9*** Summary of Dust Impact Risk used to Define Site-Specific Mitigation

| Potential Impact | Dust Emission Magnitude | | | |
|---|---|---|---|---|
| | **Demolition** | **Earthworks** | **Construction** | **Trackout** |
| Dust Soiling | Negligible Risk | Negligible Risk | Negligible Risk | Low Risk |
| Human Health | Negligible Risk | Negligible Risk | Negligible Risk | Low Risk |

*8.5.1.3 Climate*

Construction traffic would be expected to be the dominant source of greenhouse gas emissions as a result of the Proposed Development. Construction vehicles and machinery will give rise to $CO_2$ and $N_2O$ emissions during construction of the Proposed Development. The Institute of Air Quality Management document "*Guidance on the Assessment of Dust from Demolition and Construction"* (IAQM, 2014) states that site traffic and plant is unlikely to make a significant impact on climate. Therefore, the impact on climate is considered to be imperceptible, negative and short term.

### 8.5.2 Operational Phase

*8.5.2.1 Air Quality & Climate*

Vehicles accessing the site for maintenance works have the potential to impact on air quality and climate. However, the volume of vehicles accessing the site will be significantly below the 1,000 AADT stipulated in the UK DMRB guidance in Section 8.2.3.1 and thus, a modelling assessment is not required and impacts are considered neutral. The single generator located within the substation is less than 1MW and will be used for back-up purposes only. Due to its small size and infrequent use emissions to atmosphere are predicted to be imperceptible.

### 8.5.3 Do Nothing Scenario

Under the Do Nothing Scenario, no construction works will take place and the previously identified impacts of fugitive dust and particulate matter emissions and emissions from equipment and machinery will not occur. The ambient air quality at the site will remain as per the baseline and will change in accordance with trends within the wider area (including influences from new developments in the surrounding industrial estates, changes in road traffic, etc.). Therefore, this scenario can be considered ***neutral*** in terms of both air quality and climate.

## 8.6 REMEDIAL AND MITIGATION MEASURES

### 8.6.1 Construction Phase

The objective of dust control at the site is to ensure that no significant nuisance occurs at nearby sensitive receptors. In order to develop a workable and transparent dust control strategy, the following management plan has been formulated by drawing on best practice guidance from Ireland, the UK and the USA based on the following publications:

- 'Guidance on the Assessment of Dust from Demolition and Construction' (IAQM, 2014);
- 'Planning Advice Note PAN50 Annex B: Controlling The Environmental Effects Of Surface Mineral Workings Annex B: The Control of Dust at Surface Mineral Workings' (The Scottish Office, 1996);
- 'Controlling the Environmental Effects of Recycled and Secondary

Aggregates Production Good Practice Guidance' (UK Office of Deputy Prime Minister, 2002);
- 'Controlling Particles, Vapours & Noise Pollution From Construction Sites' (BRE, 2003);
- 'Fugitive Dust Technical Information Document for the Best Available Control Measures' and the USA (USEPA, 1997); and
- 'Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition' (periodically updated) (USEPA, 1986).

In advance of work starting on site, the works contractor will prepare a detailed Construction Environmental Management Plan (CEMP). The CEMP will set out the overarching vision of how the construction of the Proposed Development will be managed in a safe and organised manner by the Contractor. The CEMP will be a live document. It will set out requirements and standards that must be met during the construction stage and will include the relevant mitigation measures outlined in the EIA Report and any subsequent planning conditions relevant to the Proposed Development.

*8.6.1.1 Site Management*

The aim is to ensure good site management by avoiding dust becoming airborne at source. This will be done through good design and effective control strategies.

At the construction planning stage, the siting of activities and storage piles will take note of the location of sensitive receptors and prevailing wind directions in order to minimise the potential for significant dust nuisance (see Figure 8.1 for the wind rose for Dublin Airport). As the prevailing wind is predominantly, westerly to south-westerly, locating construction compounds and storage piles downwind (to the east or northeast) of sensitive receptors will minimise the potential for dust nuisance to occur at sensitive receptors.

Good site management will include the ability to respond to adverse weather conditions by either restricting operations on-site or quickly implementing effective control measures before the potential for nuisance occurs. When rainfall is greater than 0.2mm/day, dust generation is generally suppressed (UK Office of Deputy Prime Minister (2002), BRE (2003)). The potential for significant dust generation is also reliant on threshold wind speeds of greater than 10 m/s (19.4 knots) (at 7m above ground) to release loose material from storage piles and other exposed materials (USEPA, 1986). Particular care should be taken during periods of high winds (gales) as these are periods where the potential for significant dust emissions are highest. The prevailing meteorological conditions near the site are favourable in general for the suppression of dust for a significant period of the year. Nevertheless, there will be infrequent periods were care will be needed to ensure that dust nuisance does not occur. The following measures shall be taken in order to avoid dust nuisance occurring under unfavourable meteorological conditions:

- The Principal Contractor or equivalent must monitor the contractors' performance to ensure that the proposed mitigation measures are implemented and that dust impacts and nuisance are minimised;
- During working hours, dust control methods will be monitored as appropriate, depending on the prevailing meteorological conditions;
- The name and contact details of a person to contact regarding air quality and dust issues shall be displayed on the site boundary, this notice board should also include head/regional office contact details;

- It is recommended that community engagement be undertaken before works commence on site explaining the nature and duration of the works to local residents and businesses;
- A complaints register will be kept on site detailing all telephone calls and letters of complaint received in connection with dust nuisance or air quality concerns, together with details of any remedial actions carried out;
- It is the responsibility of the contractor at all times to demonstrate full compliance with the dust control conditions herein;
- At all times, the procedures put in place will be strictly monitored and assessed.

The dust minimisation measures shall be reviewed at regular intervals during the works to ensure the effectiveness of the procedures in place and to maintain the goal of minimisation of dust through the use of best practice and procedures. In the event of dust nuisance occurring outside the site boundary, site activities will be reviewed and satisfactory procedures implemented to rectify the problem. Specific dust control measures to be employed are described below.

*8.6.1.2 Demolition*

- Prior to demolition blocks should be soft striped inside buildings (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).
- During the demolition process, water suppression should be used, preferably with a hand-held spray. Only the use of cutting, grinding or sawing equipment fitted or used in conjunction with a suitable dust suppression technique such as water sprays/local extraction should be used.
- Drop heights from conveyors, loading shovels, hoppers and other loading equipment should be minimised, if necessary fine water sprays should be employed.

*8.6.1.3 Site Roads / Haulage Routes*

Movement of construction trucks along site roads (particularly unpaved roads) can be a significant source of fugitive dust if control measures are not in place. The most effective means of suppressing dust emissions from unpaved roads is to apply speed restrictions. Studies show that these measures can have a control efficiency ranging from 25 to 80% (UK Office of Deputy Prime Minister, 2002).

- A speed restriction of 20 km/hr will be applied as an effective control measure for dust for on-site vehicles using unpaved site roads;
- Access gates to the site will be located at least 10m from sensitive receptors where possible;
- Bowsers or suitable watering equipment will be available during periods of dry weather throughout the construction period. Research has found that watering can reduce dust emissions by 50% (USEPA, 1997). Watering will be conducted during sustained dry periods to ensure that unpaved areas are kept moist. The required application frequency will vary according to soil type, weather conditions and vehicular use;
- Any hard surface roads will be swept to remove mud and aggregate materials from their surface while any unsurfaced roads shall be restricted to essential site traffic only.

*8.6.1.4 Land Clearing / Earth Moving*

Land clearing / earth-moving works during periods of high winds and dry weather conditions can be a significant source of dust.

- During dry and windy periods, and when there is a likelihood of dust nuisance,

watering will be conducted to ensure moisture content of materials being moved is high enough to increase the stability of the soil and thus suppress dust;
- During periods of very high winds (gales), activities likely to generate significant dust emissions will be postponed until the gale has subsided.

*8.6.1.5 Storage Piles*

The location and moisture content of storage piles are important factors which determine their potential for dust emissions.

- Overburden material will be protected from exposure to wind by storing the material in sheltered regions of the site. Where possible storage piles will be located downwind of sensitive receptors;
- Regular watering will take place to ensure the moisture content is high enough to increase the stability of the soil and thus suppress dust. The regular watering of stockpiles has been found to have an 80% control efficiency (UK Office of Deputy Prime Minister, 2002);
- Where feasible, hoarding will be erected around site boundaries to reduce visual impact. This will also have an added benefit of preventing larger particles from impacting on nearby sensitive receptors.

*8.6.1.6 Site Traffic on Public Roads*

Spillage and blow-off of debris, aggregates and fine material onto public roads will be reduced to a minimum by employing the following measures:

- Vehicles delivering or collecting material with potential for dust emissions shall be enclosed or covered with tarpaulin at all times to restrict the escape of dust;
- At the main site traffic exits, a wheel wash facility will be installed. All trucks leaving the site must pass through the wheel wash. In addition, public roads outside the site shall be regularly inspected for cleanliness, as a minimum on a daily basis, and cleaned as necessary.

*8.6.1.7 Summary of Dust Mitigation Measures*

The pro-active control of fugitive dust will ensure that the prevention of significant emissions, rather than an inefficient attempt to control them once they have been released, will contribute towards the satisfactory performance of the contractor. The key features with respect to control of dust will be:

- The specification of a site policy on dust and the identification of the site management responsibilities for dust issues;
- The development of a documented system for managing site practices with regard to dust control;
- The development of a means by which the performance of the dust minimisation plan can be regularly monitored and assessed; and
- The specification of effective measures to deal with any complaints received.

### 8.6.2 Operational Phase

Apart from an emission from a single 1MW backup generator which will be imperceptible, there are no predicted impacts for the operational phase of the Proposed Development and therefore, no additional mitigation measures are proposed.

## 8.7 RESIDUAL IMPACTS OF THE PROPOSED DEVELOPMENT

### 8.7.1 Construction Phase

*8.7.1.1 Air Quality*

When the dust mitigation measures detailed in the mitigation section (section 8.6.1) of this report are implemented, fugitive emissions of dust and particulate matter from the site will be ***short term***, ***negative***, ***localised*** and ***imperceptible*** in nature, posing no nuisance at nearby receptors.

*8.7.1.2 Climate*

Based on the scale and temporary nature of the construction works and the intermittent use of equipment, the potential impact on climate change and transboundary pollution from the Proposed Development is deemed to be ***short term***, ***negative*** and ***imperceptible*** in relation to Ireland's obligations under the EU 2020 and 2030 targets.

*8.7.1.3 Human Health*

The surrounding area is considered of low sensitivity to dust related human health impacts and there is an overall low risk of dust related human health impact associated with the Proposed Development. Best practice mitigation measures are proposed for the construction phase of the Proposed Development which will focus on the pro-active control of dust and other air pollutants to minimise generation of emissions at source. The mitigation measures that will be put in place during construction of the Proposed Development will ensure that the impact of the development complies with all EU ambient air quality legislative limit values which are based on the protection of human health. Therefore, the impact of construction of the Proposed Development is likely to be ***short term, negative, localised*** and ***imperceptible*** with respect to human health.

### 8.7.2 Operational Phase

*8.7.2.1 Air Quality & Climate*

Impacts associated with maintenance vehicles accessing the site are predicted to be imperceptible. In addition, emissions associated with the emergency back-up generator will be imperceptible due to its small scale and infrequent use. The operational phase is considered ***long-term*** and ***imperceptible*** in terms of air quality and climate.

If the mitigation measures outlined in Section 8.6 are implemented, there will be no residual impacts of significance on air quality or climate from the construction or operational phases of the Proposed Development.

## 8.8 CUMULATIVE IMPACTS

### 8.8.1 Construction Phase

According to the IAQM guidance (2014) there is the potential for cumulative construction dust impacts to nearby sensitive receptors if the construction of the Proposed Development coincides with the construction phase of other developments within 350m of the site. The proposed data storage facility adjacent to the site is likely to be undergoing construction concurrently with the Proposed Development. Therefore, there is the potential for cumulative dust impacts. Cumulative dust impacts will also occur if the construction of the Proposed Development overlaps with the construction of the grid connection for the site. However, the dust mitigation

measures outlined in Section 8.6.1 will be applied throughout the construction phase of the Proposed Development which will avoid significant cumulative impacts on air quality.

Due to the relatively small scale of the Proposed Development and the short-term construction stage significant cumulative impacts to climate are not predicted.

With appropriate mitigation measures in place, the predicted cumulative impacts on air quality and climate associated with the construction phase of the Proposed Development are deemed ***short-term***, ***negative***, ***localised*** and ***imperceptible***.

### 8.8.2 Operational Phase

Operational phase direct impacts on air quality and climate associated with the Proposed Development are predicted to be imperceptible. Emissions from the small back-up generator in the substation have been screened out of further assessment due to its small size and infrequent use. Cumulative traffic emissions associated with site maintenance vehicles and vehicles on the local road network have the potential to impact air quality and climate. However, as the number of vehicles required for maintenance activities is low and infrequent in nature cumulative impacts are considered ***imperceptible*** and ***long-term***.

As there are no emissions to atmosphere associated with the cables in the proposed future grid connection, there are no potential cumulative impacts to air quality or climate associated with this aspect of the development.

Emissions associated with the adjacent data centre development were assessed to be insignificant in relation to air quality and climate as part of the EIAR produced by AECOM for that development. Cumulative impacts associated with the substation and the data centre development are predicted to be imperceptible as there are no significant emissions from the Proposed Development.

## 8.9 REFERENCES

BRE (2003) Controlling Particles, Vapours & Noise Pollution From Construction Sites

Environmental Protection Agency (2019) GHG Emissions Projections Report - Ireland's Greenhouse Gas Emissions Projections 2018 - 2040

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Environmental Protection Agency (2020c) Air Dispersion Modelling from Industrial Installations Guidance Note (AG4)

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German VDI (2002) Technical Guidelines on Air Quality Control – TA Luft

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UK Office of Deputy Prime Minister (2002) Controlling the Environmental Effects of Recycled and Secondary Aggregates Production Good Practice Guidance

USEPA (1997) Fugitive Dust Technical Information Document for the Best Available Control Measures

# 9.0 ARCHAEOLOGICAL, ARCHITECTURAL AND CULTURAL HERITAGE

## 9.1 INTRODUCTION

The following chapter assesses the predicted impacts of the Proposed Development on archaeological, architectural and cultural heritage. The development is located in the townland of Shelton Abbey, in the Electoral Division of Kilbride, in Civil Parish of Kilbride, in the Barony of Arklow, in the County of Wicklow (ITM 722601 675086).

## 9.2 METHODOLOGY

A comprehensive desk-top study of available sources was undertaken. A study are area of approximately 1.5km radius from the Proposed Development was assessed, comprising the following townlands: Ballyarthur, Ballyraine Lower, Glenart, Kilbride, Kilcarra East, Kilcarra West, Killeagh, Marsh, Raheen, Sheepwalk, Shelton and Shelton Abbey.

### 9.2.1 Record of Monuments and Places

The Record of Monuments and Places (RMP), comprising the results of the Archaeological Survey of Ireland, is a statutory list of all recorded archaeological monuments known to the National Monuments Service. The relevant files for these sites contain details of documentary sources and aerial photographs, early maps, OS memoirs, the field notes of the Archaeological Survey of Ireland and other relevant publications. Sites recorded on the Record of Monuments and Places all receive statutory protection under the National Monuments Act 1994. The information contained within the RMP is derived from the earlier non-statutory Sites and Monuments Record (SMR); some entries, however, were not transferred to the statutory record as they refer to features that on inspection by the Archaeological Survey were found not to merit inclusion in that record or could not be located with sufficient accuracy to be included. Such sites however remain part of the SMR. The record is a dynamic one and is updated so as to take account of on-going research. The Record of Monuments and Places was consulted in the Archives of the Department of Culture, Heritage and the Gaeltacht. There are no recorded archaeological monuments located within the site boundary. There are eleven (of which three have been excavated and are not to be included in the next revision) recorded archaeological monuments within the study area which comprises a distance of c. 1.5km from the proposed development (see Figure 9.1 and Appendix 9.1).

### 9.2.2 Record Archaeological Finds

The National Museum of Ireland's topographical files are a national archive of all known archaeological finds from Ireland. They relate primarily to artefacts but also include references to monuments and contain a unique archive of records of previous excavations. The topographical files were not available for consultation at the time of the study due to Covid19 restrictions. Other published catalogues of prehistoric material were studied: Raftery (1983 - Iron Age antiquities), Eogan (1965; 1993; 1994 - bronze swords, Bronze Age hoards and goldwork), Harbison (1968; 1969a; 1969b - bronze axes, halberds and daggers) and the Irish Stone Axe Project database, UCD, to determine if any archaeological artefacts had been recorded from the area. The townlands within the study area were assessed (see Appendix 9.2). It is important to

note that numerous archaeological finds would have been recorded during the excavation of sites in the vicinity (see below).

### 9.2.3 Record Archaeological Excavations

The excavation bulletin website (www.excavations.ie) was consulted to identify previous excavations that have been carried out within the study area. This database contains summary accounts of excavations carried out in Ireland from 1970 to 2019. The townlands within the study area were assessed (see Appendix 9.3).

### 9.2.4 Cartographic Sources

Cartographic sources were used to identify additional potential archaeological and cultural heritage constraints. Primary cartographic sources consulted consisted of the John Speed's Map of Wicklow (1610; see Figure 9.2), the Down Survey 'Barony Map of Arklow' 1655-6 (see Figure 9.3) and the Ordnance Survey 6" and 25" maps, first and subsequent editions (T.C.D. Map Library, www.osi.ie; see Figures 9.4 and 9.5).

### 9.2.5 Recorded Architectural Heritage Sites

The National Inventory of Architectural Heritage (NIAH) is a systematic programme of identification, classification and evaluation of the architectural heritage of the State. The Minister for Arts, Heritage and the Gaeltacht is currently using the Inventory as the basis for making recommendations for the NIAH. There are three structures included in the NIAH within c. 1km of the proposed development (see Figure 9.1 and Appendix 9.4). None of the structures will be directly impacted by the proposed development and none are visible from the site due to intervening vegetation and commercial, residential and industrial development.

### 9.2.6 County Development Plan

The Wicklow County Development Plan 2016 – 2022 was also consulted. The plan includes policy objectives for the protection of the County's archaeological, architectural and cultural heritage (see Appendix 9.5). The Record of Protected Structures (RPS) contained within the plan includes every structure which is of special architectural, archaeological, artistic, cultural, scientific, social or technical interest within the county boundaries. There are no structures included in the RPS within c. 1.5km of the proposed development.

### 9.2.7 Aerial Photography

Modern Ordnance Survey aerial photographic coverage dating from 1999, 2000 and 2005 available on the Ordnance Survey of Ireland (www.osi.ie) were assessed. These indicate that the site has been substantially developed in the recent past (see Figure 9.6).

### 9.2.8 Historical Research

A review of online sources for the townland of Shelton Abbey and the inhabitants of the townland in the 19th and early 20th century was undertaken, using the following sources:

- Griffiths Valuation was the first full-scale valuation of property in Ireland, overseen by Richard Griffith and published between 1847 and 1864. It is one of the most

important surviving 19th century genealogical sources (http://www.askaboutireland.ie/griffith-valuation/; see Appendix 9.6)

- The National Archives comprises the files of the former State Paper Office (SPO) and the Public Record Office of Ireland (PROI). The SPO was established in 1702 as a repository for records relating to the administrations of the various Lords Lieutenant (the English monarch's representative in Ireland). The PROI was established under the Public Records (Ireland) Act, 1867 to acquire administrative, court and probate records over twenty years old (http://www.census.nationalarchives.ie/search/; see Appendix 9.7).

The baseline historical research utilised sources including Lewis' Topographical Dictionary of Ireland (Lewis 1837), the Proceedings of the Royal Irish Academy and the Journal of the Royal Society of Antiquaries. See Bibliography for full list of references used (Appendix 9.8).

## 9.3 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

The Proposed Development consists of the development of a 110 kV GIS substation, MV Control Building, Transformers, associated dropdown 110 kV transmission lines, along with associated and ancillary works and is described as follows:(hereafter referred to as the 'Proposed Development').

The Proposed Development is described in further detail in Chapter 2 (Description of the Proposed Development).

## 9.4 RECEIVING ENVIRONMENT

The following assessment is based on the data gathered through a baseline survey as described in Section 9.2 above, including a review of recorded archaeological monuments (see Figure 9.1 and Appendix 191), finds (see Appendix 9.2), excavations (see Appendix 9.3), cartographic sources (see Figures 9.2 – 9.5), architectural heritage sites (see Figure 9.1 and Appendix 9.4), aerial photography (see Figure 9.6) and historical research (see Appendices 9.6 – 9.8).

### 9.4.1 Prehistory

There are no upstanding prehistoric monuments within the study area, however recent development led archaeological excavations and the recovery of stray archaeological finds indicate that prehistoric people may have occupied or moved through the landscape during this period. A stone axehead is recorded from the townland of Kilcarra West (see Appendix 9.2). Stone axeheads are the single most numerous artefact type surviving from prehistory in Ireland, where they have long been regarded as one of the characteristic objects of the Mesolithic and Neolithic periods (e.g. Woodman 1978; 1987; Cooney and Grogan 1994). More than 21,000 have been recorded by the Irish Stone Axehead Project (ISAP) since 1991 (Cooney and Mandal 1998).

Evidence of Bronze Age settlement was found during monitoring of topsoil-stripping during the construction of a motorway for Wicklow County Council at Kilbride (Excavations No. 1997:616; see Appendix 9.3; see also RMP No. WI40-48; Figure 9.1; and Appendix 9.1). The settlement site comprised an oval trench with a maximum diameter of 7.5m. Flints and pottery were found. The flints were mostly flakes struck from poor-quality flint. The pottery consisted of decorated sherds of late developed

Beaker, Cordoned Urn and Vase. A small quantity of cremated human bone was found at the side of one of the post-holes.

Three adjacent spreads of burnt mound material were excavated in advance of the Arklow bypass road scheme (Excavations No. 1998:683; see Appendix 9.3**;** see also RMP WI40-51; Appendix 9.1; Figure 9.1). The burnt material was present in shallow pits/depressions and the only finds recovered were some pieces of unworked flint and fragments of burnt bone.

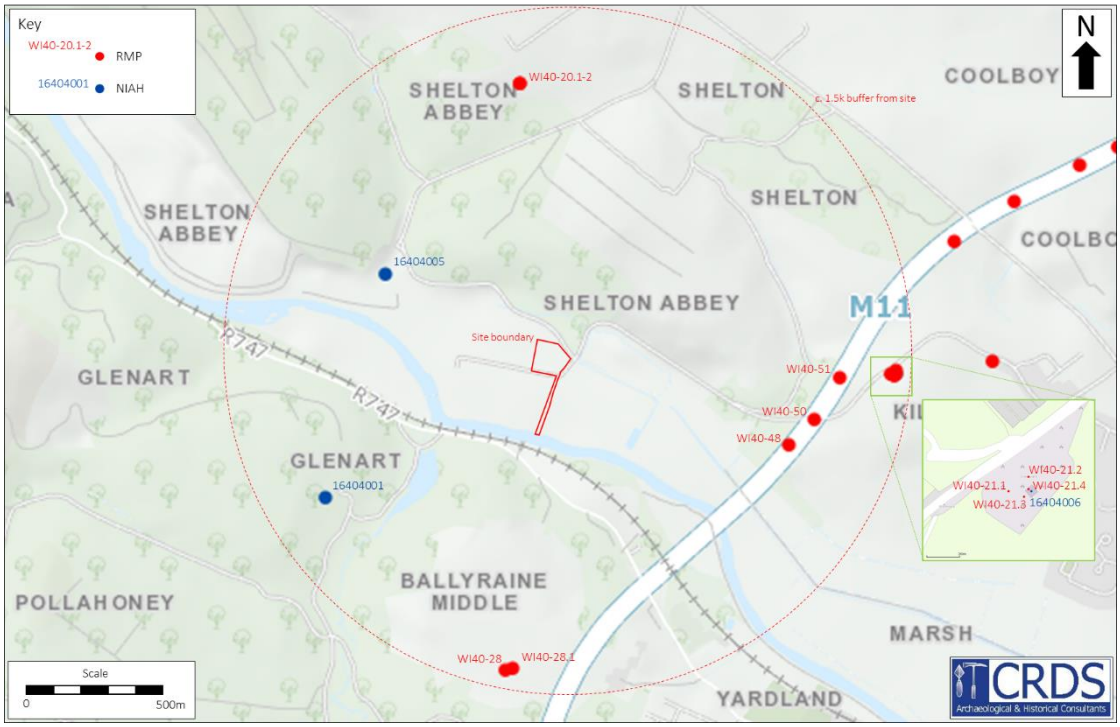



***Figure 9.1*** Recorded archaeological monuments within c. 1.5km of the proposed development (source www.archaeology.ie).

Fulacht Fiadh or burnt mounds are the most common surviving archaeological site from the Bronze Age. Fulacht Fiadh have been interpreted in a number of different ways, mainly as cooking troughs but secondary interpretations include places for washing, ritual initiations, bathing, tanning and even brewing (Burnt offerings 2001, Glasnevin; Buckley V.M, 1990; Ó Drisceoil, D.A. 1988; O'Kelly 1954; Quinn and Moore 2009). 'Burnt mounds', often termed 'fulachta fiadh' are assumed to be the most common prehistoric site type in Ireland. The most consistent elements of the site have been described as:

*'a mound of heat-fractured stones, a trough and traces of fires – sometimes a formal hearth'* (Waddell 2000, 174, 177)

In its classic form, unexcavated and undisturbed, this site type can be identified as a low crescent or kidney shaped mound, generally exposed in low-lying areas adjacent to a water source. Under the sod the mound consists largely of burnt or heat-shattered stone mixed with a lesser proportion of charcoal rich soils and ash. The dimensions of the mounds vary, with an average height of 1-2m, and diameters of up to 30m from recorded Irish examples (Waddell 2000, 174).

Brindley and Lanting argued that the term 'fulacht fiadh' should be used only with reference to sites with mounds of burnt stone and troughs, and have argued that

'fulachta fiadh' have no connection with historical descriptions of practises involving cooking with fire-heated stone (Brindley and Lanting 1990, 56). The majority of excavated sites, exposed through development led archaeology, have been heavily disturbed prior to their identification; ploughing and field clearance has frequently levelled the upper portions of the mound and dispersed sub-surface remains. Many survive simply as a 'trough' cut into subsoil with fragmented spreads of burnt stone and charcoal beneath the sod or scattered into the ploughzone.

Archaeological evidence of the Iron Age is comparatively limited in southeast Ireland. Ptolemy's map 'Menapia' dating to c. the 2nd century AD shows a tribe known as the 'Brigantes' as occupying an area between the Slaney River and the southern and eastern coastline (Culleton 1999). The Brigantes were a well-travelled sea-faring people known in coastal Britain, the Humber and Firth regions and even as far abroad as the Netherlands. This may explain why the few recorded Iron Age monuments are concentrated on the southern coast; promontory forts are located at Pollshone, Nook, Baginbun and Templetown and Saltee Island Great (Moore 1996). Two of these were excavated by Westropp in the early 20th century. A large hilltop enclosure at Ballyliegh and a ring barrow at Hook Head may also date to this period. However, the results of development-led excavations are gradually providing additional evidence for the Iron Age in Wexford. In 1999, during monitoring on the Ferns Sewerage Scheme a small Iron Age ring-ditch was uncovered. As yet there is no surviving evidence for the Iron Age around Pollahoney.

### 9.4.2 The Early Medieval Period

Early medieval Ireland was essentially a farming landscape characterised by the basic territorial unit known as a túath. it is estimated that at this time the country was divided into approximately 150 of these territories, each with its own king (Byrne 1973). During this period, defensive enclosures known as ringforts were constructed to protect farmsteads. These are one of the most frequently recorded archaeological site types and c. 50,000 examples are recorded in the Irish landscape. Ringforts are regarded as defended family homesteads and the dating evidence to date suggests they were primarily built between the 7th and 9th centuries AD (Stout 1997, 22–31).

There is little evidence of settlement dating to the Early Medieval Period in the study area. Ringforts are strongly associated with agricultural land and, as such, are rarely situated at higher altitudes. The closest examples are approximately 3km to the south of the site at Barnacleagh East and Ballygriffin.

The furnace recorded during archaeological excavations in advance of the Arklow bypass road scheme (RMP No. WI40-50; see Appendix 9.1). Although it did not contain definitive dating evidence, it is interpreted as dating to the Early Medieval Period.

### 9.4.3 The Late Medieval Period

The south east of the country is rich in Late Medieval sites associated with Anglo-Norman settlement: moated sites, motte-and-baileys, churches, earthwork castles, stone castles, and medieval towns. These date from the later 12th century after the arrival of the first Normans who landed at Bannow Bay Co. Wexford in 1169.

Mottes were among the first fortifications constructed by the Anglo-Normans on their arrival in Ireland. In their original form they consisted of steep-sided earthen mounds, topped with a wooden lookout tower or bretesche, the surviving remains generally consist of a flat-topped conical mound. The mottes are often associated with a rectangular enclosure, known as a bailey, which would have housed buildings. Mottes

were usually located at easily defensible strategic sites. Moated sites, in comparison, represent the remains of defended farmsteads dating from a secondary phase of colonisation/settlement, during the thirteenth and fourteenth centuries. They are usually square or rectangular areas, defined by banks and external ditches. An example in the vicinity is the moated site in Ballyraine Middle (RMP No. WI40-28), in the south of the study area.

### 9.4.4 The Post-Medieval Period

John Speed (1551–1629) was an English cartographer and historian. He drew historical maps in 1601 and 1627 depicting the invasion of England and Ireland. His map of the southeast of Ireland (see Figure 9.2) shows Arklow town as 'Arcklo' and includes what appears to be the River Avoca, and the and land in which the study area is located is listed as under the control of the Earl of Ormond.




***Figure 9.2*** Extract from John Speed's 1610 map of county Wicklow (source https://libguides.ucd.ie/findingmaps/mapshistIreland).

The Down Survey of Ireland, undertaken in the years 1656-1658, was the first ever detailed land survey on a national scale anywhere in the world. The survey sought to measure all the land to be forfeited by the Catholic Irish in order to facilitate its redistribution to Merchant Adventurers and English soldiers. Profitable and unprofitable land were distinguished, and there were abbreviated captions for arable, meadow, bog, woodland, mountain and several kinds of pasture, with area figures for each of these categories. Coverage of other subjects was uneven. In the parish maps, dwelling houses with the owners' names are entered in each townland. As noted

above, generally speaking, it was a survey of confiscated land. As a result of the re-distribution, approximately 7,500 New Model Army veterans settled in Ireland, in what became known as the Cromwellian Plantation. Interestingly, the Barony of Arklow, within which is Bogland is located, was not included in the survey (see Figure 9.3), with the exception of Arklow town, including Arklow Castle, Abby and Abbyland.

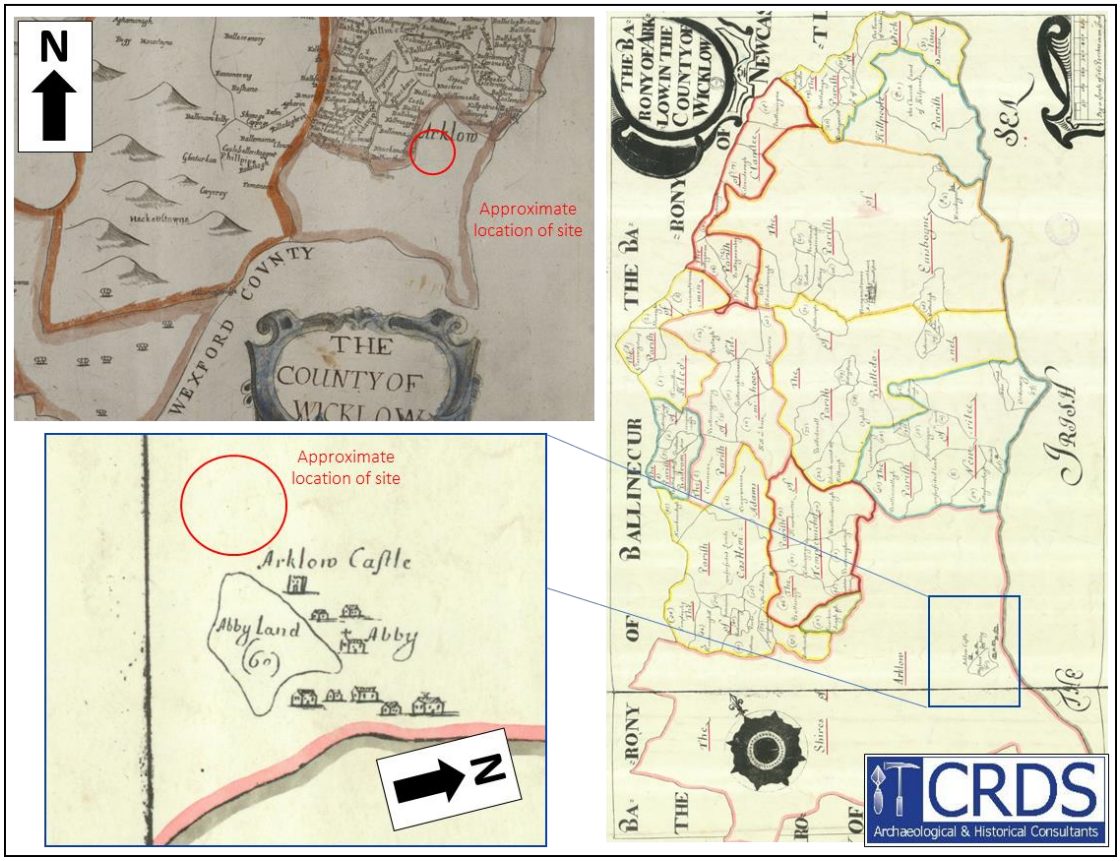



***Figure 9.3*** Extracts from the Down Survey Map of the 'Barony of Arklow, in the County of Wicklow' showing Arklow (source TCD Historical Maps online).

The above-mentioned moated site at Ballyraine Middle is shown as a T-shaped house on the first edition Ordnance Survey map and has been interpreted as a medieval manor house (RMP No. WI40:28.1; see Appendix 9.1).

The proposed development site is located within the demesne landscape of Shelton Abbey, a designated demesne landscape in the National Inventory of Architectural Heritage (NIAH Site ID 4251). The demesne was created in 1658 when the estate of Arklow was acquired by Robert Hassels from the Countess of Dromard. He built a small estate house on the lands along with a church and graveyard (RMP No. WI40:20.1 & 20.2; see Appendix 9.1).

By the time of the first edition Ordnance Survey (1830s; see Figure 9.4), the demesne landscape has matured and the current Shelton Abbey, built in 1770, is visible. Shelton Abbey House was in the ownership of the Howards, Earls of Wicklow, who erected the family Mausoleum (RMP No. WI40:21.4; see Appendix 9.1; NIAH No. 16404006; see Appendix 9.4) at Kilbride. This was built within the grounds of the aforementioned church and graveyard (RMP No. WI40:20.1 & 20.2).

There is relatively little change in the landscape between the first (1830s) and second (1910s; see Figure 9.5) edition Ordnance Survey Maps. Shelby Abbey and Demesne

is virtually unchanged; though there is a notable change in the course of the Avoca River.

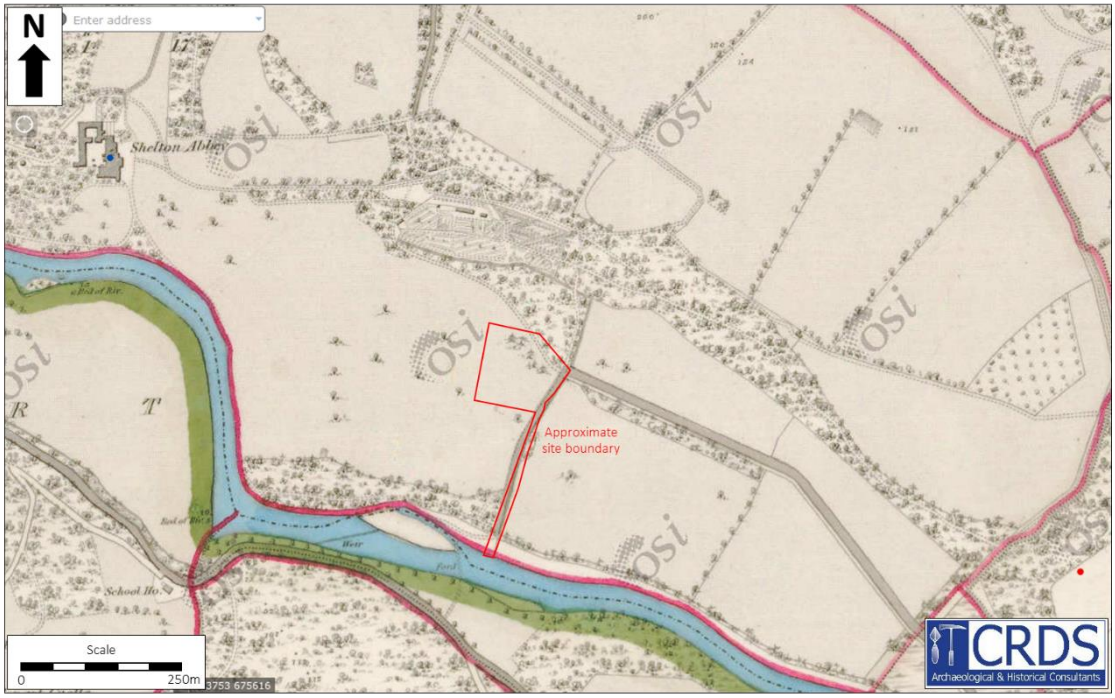



***Figure 9.4*** Extract from the first edition Ordnance Survey Map of the site (source www.archaeology.ie).




***Figure 9.5*** Extract from the second edition Ordnance Survey Map of the site (source www.archaeology.ie).

Shelton Abbey and Demesne is one of two manor houses / planned demesne landscapes in the study area; the other two are Glenart Castle (NIAH No. 16404001; RPS Ref. 40-02) and Demesne (NIAH Site ID: 4417). A third, Ballyraine House and Gardens are located immediately to the south of the study area. These landscapes

indicate the influence of the wealthy landowners in the area from the 17th through 19th centuries.

A review of available aerial photography of the study area indicates that the site of the Proposed Development has been significantly developed in the recent past and is now part of the Avoca River Park industrial complex (see Figure 9.6; see also Figure 9.7). Only the southern portion of the proposed storm outlet to the Avoca River has not been subjected to development.

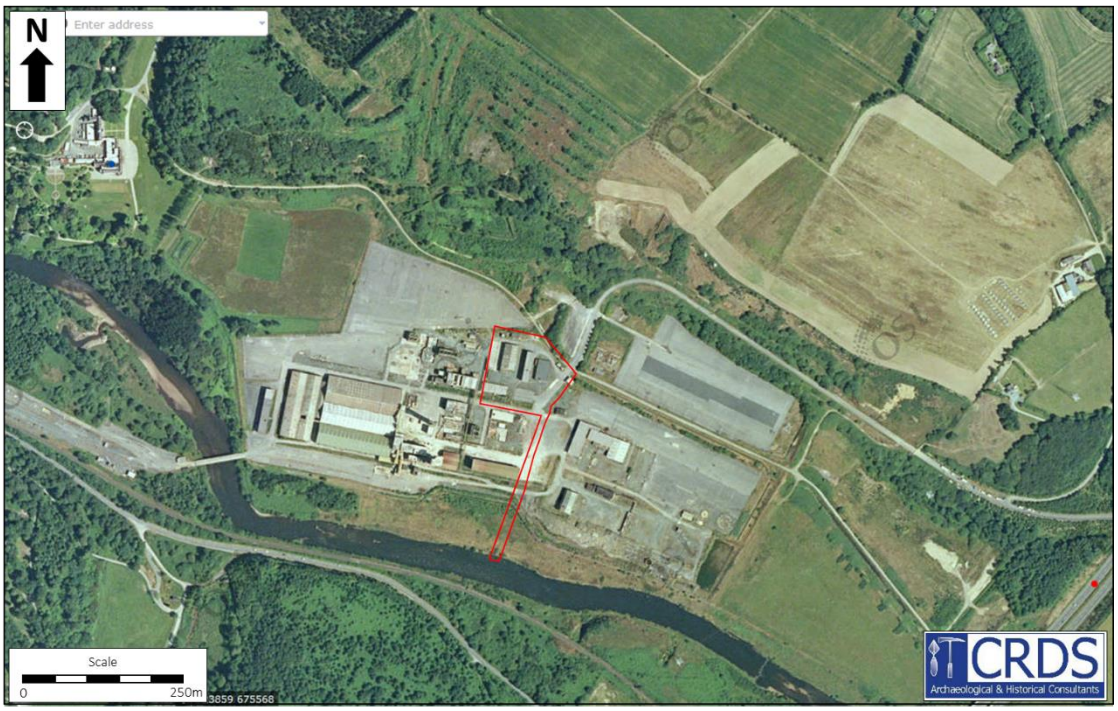



***Figure 9.6*** Extract from the Ordnance Survey Aerial Photograph of the site (source www.archaeology.ie).

## 9.5 POTENTIAL IMPACTS OF THE PROPOSED DEVELOPMENT

### 9.5.1 Construction Phase

The construction phase of the proposed development will not impact directly on any sites included in the Record of Monuments and Places, the National Inventory of Architectural Heritage, or the Register of Protected Structures for the county. Furthermore, the assessment did not identify any potential sites or features within the Proposed Development lands.

Although sited within the grounds of the Shelton Abbey Demesne, recent development relating to the Avoca River Park has significantly altered the demesne landscape and if previously unrecorded sub-surface archaeological features had existed, they would have been removed during the course of groundworks relating to previous development.

The exception is the proposed storm water run-off, a portion of which traverses previously undeveloped land (see Figure 9.8). As noted above, no features of archaeological, architectural or cultural heritage were identified during the assessment. However, there is the potential that sub-surface features archaeological features may

survive. Should such features survive, they may be negatively impacted by groundworks relating to the Proposed Development in this area.

Overall, the impact of the proposed development on the archaeological, architectural and cultural heritage is deemed to be ***neutral*** and ***imperceptible***.



***Figure 9.7*** View of Avoca River Park facing southwest towards the Avoca River.

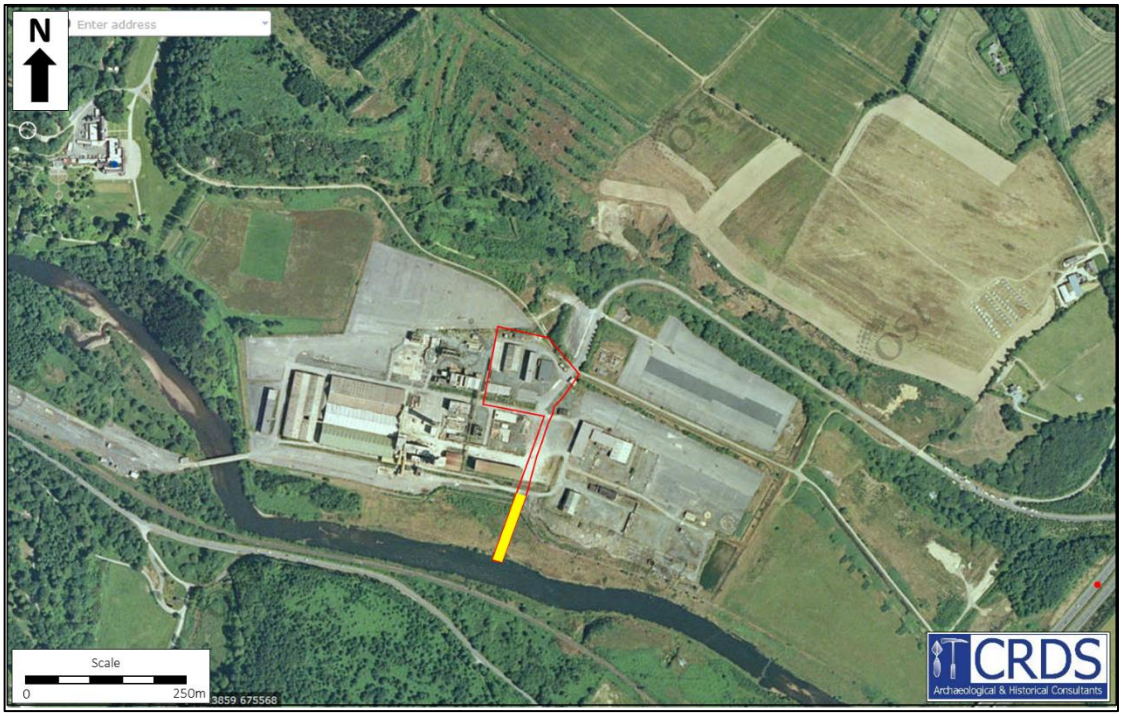



***Figure 9.8*** Extract from the Ordnance Survey Aerial Photograph of the site showing portion of Proposed Development located on previously undeveloped ground (in yellow; source www.archaeology.ie).

### 9.5.2 Operational Phase

No impacts on archaeological, architectural and cultural heritage are expected as a result of the operational phase of the proposed development.

## 9.6 REMEDIAL AND MITIGATION MEASURES

### 9.6.1 Construction Phase

As noted above, the majority of the site has been subject to significant previous development which would have removed sub-surface archaeological features, should they have existed. Therefore, the risk of encountering archaeology on site has been removed.

However, the portion of the Proposed Development comprising the storm water runoff, which traverses previously undeveloped land as depicted in Figure 9.8, should be archaeologically monitored under license to the National Monuments Service of the Department of Culture, Heritage and the Gaeltacht. Should archaeological features be encountered, provision should be made for works to cease until the archaeological team has assessed these features and agreed a strategy for their excavation with the National Monuments Service.

An underwater assessment should be carried out in the area of the Avoca River that will be impacted by construction works relating to the Proposed Development. The assessment should be undertaken by a suitably qualified underwater archaeologist licensed by the Department of Culture, Heritage and the Gaeltacht. The assessment report should also include a detailed impact assessment and be accompanied by a metal detection survey.

### 9.6.2 Operational Phase

No mitigation measures are required for archaeological, architectural and cultural heritage during the operational phase of the proposed development.

## 9.7 RESIDUAL IMPACTS OF THE PROPOSED DEVELOPMENT

### 9.7.1 Construction Phase

The construction phase of the proposed development is not predicted to have any impact on archaeological, architectural and cultural heritage.

### 9.7.2 Operational Phase

The operational phase of the proposed development is not predicted to have any impact on archaeological, architectural and cultural heritage.

## 9.8 MONITORING OR REINSTATEMENT

### 9.8.1 Construction Phase

There are no ongoing monitoring or reinstatement requirements during the construction phase relating to archaeological, architectural and cultural heritage.

### 9.8.2 Operational Phase

There are no ongoing monitoring or reinstatement requirements during the operational phase relating to archaeological, architectural and cultural heritage.

## 9.9 CUMULATIVE IMPACTS OF THE PROPOSED DEVELOPMENT

The development context is provided in Chapter 3.

### 9.9.1 Construction Phase

Previous developments in the area, notably during the construction of the Arklow Bypass, have identified previously unrecorded archaeological features. These sub-surface features would not have been known had development not occurred and the excavation of these features, although resulting in their removal, has added to the academic understanding of the history of the area through archaeological research and reporting. Therefore, the cumulative impact of the Proposed Development and surrounding developments on the archaeological heritage is deemed to be ***neutral*** and ***not significant***.

Previous developments in the area, in particular the construction of the Avoca River Park, has altered the Shelton Abbey Demesne landscape, as listed in the National Inventory of Architectural Heritage. Therefore, the cumulative impact of the Proposed Development and surrounding developments on the architectural and cultural heritage is deemed to be ***negative*** and ***moderate.***

### 9.9.2 Operational Phase

No cumulative impacts on archaeological, architectural and cultural heritage are expected as a result of the operational phase of the proposed development.

# APPENDIX 9.1

# RECORDED ARCHAEOLOGICAL MONUMENTS

## PREPARED BY CRDS LTD.

Recorded Archaeological Monuments located within c. 1.5km of the proposed development are listed below (source Record of Monuments and Places for Co. Wicklow, www.archaeology.ie).

| | |
|---|---|
| **RMP No.:** | **WI040-020----** |
| **Class:** | Church |
| **Townland:** | SHELTON ABBEY |
| **Description:** | Situated on a gentle S-facing slope overlooking a steep drop immediately to the S. There is no visible indication of the 'Site of Grave Yard' marked on the 1838 OS 6-inch map as a rectangular enclosure (dims. c. 60m x 25m). Price (1967, 474-5) states that the area was leased to Robert Hassells in 1685. His house was called Shelton, which became the townland name. Price also mentions that the graveyard was on a hill named Whitson hill on a Shelton estate map, and suggests that this was also the site of a church.<br>The above description is derived from the published 'Archaeological Inventory of County Wicklow' (Dublin: Stationery Office, 1997). In certain instances the entries have been revised and updated in the light of recent research. |
| **Date of revision:** | 17 December 2008<br>Scheduled for inclusion in the next revision of the RMP |

| | |
|---|---|
| **RMP No.:** | **WI040-020001-** |
| **Class:** | Graveyard |
| **Townland:** | SHELTON ABBEY |
| **Description:** | Situated on a gentle S-facing slope overlooking a steep drop immediately to the S. There is no visible indication of the 'Site of Grave Yard' marked on the 1838 OS 6-inch map as a rectangular enclosure (dims. c. 60m x 25m). Price (1967, 474-5) states that the area was leased to Robert Hassells in 1685. His house was called Shelton, which became the townland name. Price also mentions that the graveyard was on a hill named Whitson hill on a Shelton estate map, and suggests that this was also the site of a church.<br>The above description is derived from the published 'Archaeological Inventory of County Wicklow' (Dublin: Stationery Office, 1997). In certain instances the entries have been revised and updated in the light of recent research. |
| **Date of revision:** | 19 September 2013 |
| **References:** | Price, L. 1967 The place-names of Co. Wicklow. VII - The baronies of Newcastle and Arklow. The Dublin Institute of Advanced Studies (382-532).<br>Scheduled for inclusion in the next revision of the RMP |

| | |
|---|---|
| **RMP No.:** | **WI040-021001-** |
| **Class:** | Church |
| **Townland:** | KILBRIDE (Arklow By., Kilbride ED) |
| **Description:** | Situated on a level area on a very gentle SW-facing slope overlooking the Avoca River. No trace of the church remains described in the OS Letters (O'Flanagan 1928, 133) nor of any other early features other than some eighteenth-century headstones in the heavily overgrown graveyard. The mausoleum named on the map is dedicated to Frances Parnell. |

| | |
|---|---|
| | The above description is derived from the published 'Archaeological Inventory of County Wicklow' (Dublin: Stationery Office, 1997). In certain instances the entries have been revised and updated in the light of recent research. |
| **Date of revision:** | 19 September 2013 |
| **References:** | O'Flanagan, Rev. M. (Compiler) 1928 Letters containing information relative to the antiquities of the county of Wicklow collected during the progress of the Ordnance Survey in 1838. Bray.<br>Scheduled for inclusion in the next revision of the RMP |

| | |
|---|---|
| **RMP No.:** | **WI040-021002-** |
| **Class:** | Graveyard |
| **Townland:** | KILBRIDE (Arklow By., Kilbride ED) |
| **Description:** | Situated on a level area on a very gentle SW-facing slope overlooking the Avoca River. No trace of the church remains described in the OS Letters (O'Flanagan 1928, 133) nor of any other early features other than some eighteenth-century headstones in the heavily overgrown graveyard. The mausoleum named on the map is dedicated to Frances Parnell.<br>The above description is derived from the published 'Archaeological Inventory of County Wicklow' (Dublin: Stationery Office, 1997). In certain instances the entries have been revised and updated in the light of recent research. |
| **Date of revision:** | 19 September 2013 |
| **References:** | O'Flanagan, Rev. M. (Compiler) 1928 Letters containing information relative to the antiquities of the county of Wicklow collected during the progress of the Ordnance Survey in 1838. Bray.<br>Scheduled for inclusion in the next revision of the RMP |

| | |
|---|---|
| **RMP No.:** | **WI040-021003-** |
| **Class:** | Redundant record |
| **Townland:** | KILBRIDE (Arklow By., Kilbride ED) |
| **Description:** | This record was previously classed as a possible ecclesiastical enclosure, however there is currently no evidence for its existence. |
| **Compiled by:** | Claire Breen |
| **Date of upload:** | 19 September 2013<br>Not scheduled for inclusion in the next revision of the RMP |

| | |
|---|---|
| **RMP No.:** | **WI040-021004-** |
| **Class:** | Mausoleum |
| **Townland:** | KILBRIDE (Arklow By., Kilbride ED) |
| **Description:** | At the centre of a graveyard (WI040-021002-). A rectangular structure with a colonnaded façade on its N face and built into a low hillside at S. A partially legible inscription records its dedication, 'To the memory of Frances Parnell'. A second mausoleum, erected in 1785 by Ralph, Viscount of Wicklow, (according to the inscription it bears) stands to the NE of the former and is in the form of a low, rectangular structure supporting a pyramid. |
| **Compiled by:** | Claire Breen |
| **Date of upload:** | 19 September 2013<br>Not scheduled for inclusion in the next revision of the RMP |

| | |
|---|---|
| **RMP No.:** | **WI040-028----** |
| **Class:** | Moated site |
| **Townland:** | BALLYRAINE MIDDLE |
| **Description:** | Situated on fairly level ground c. 400m W of Ballyraine House. A large square enclosure shown on the 1909 OS 6-inch map (max. dims. c. 100m x 100m). It is described by Price (1936, 46) as having an earthen bank with stone facing, and a deep wide fosse, fed by a stream. It is shown on the first edition OS 6-inch map with a large house towards the E side, marked 'Site of a Building' (WI040-028001-). It was destroyed in 1971 (Information T. Barry; OPW and NMI Correspondence).<br>The above description is derived from the published 'Archaeological Inventory of County Wicklow' (Dublin: Stationery Office, 1997). In certain instances the entries have been revised and updated in the light of recent research. |
| **Date of revision:** | 17 December 2008<br>This monument is subject to a preservation order made under the National Monuments Acts 1930 to 2014 (PO no. 103/1940).<br>Scheduled for inclusion in the next revision of the RMP |

| | |
|---|---|
| **RMP No.:** | **WI040-028001-** |
| **Class:** | House - 16th/17th century |
| **Townland:** | BALLYRAINE MIDDLE |
| **Description:** | A large moated site (WI040-028----) is shown on the 1838 OS 6-inch map, with a large T-shaped house towards the E side, marked 'Site of a Building'. The moated site was destroyed in 1971. Barry suggested it may have been a medieval manor house (OPW and NMI Correspondence).<br>The above description is derived from the published 'Archaeological Inventory of County Wicklow' (Dublin: Stationery Office, 1997). In certain instances the entries have been revised and updated in the light of recent research. |
| **Date of revision:** | 17 December 2008<br>This monument is subject to a preservation order made under the National Monuments Acts 1930 to 2014 (PO no. 103/1940).<br>Scheduled for inclusion in the next revision of the RMP |

| | |
|---|---|
| **RMP No.:** | **WI040-048----** |
| **Class:** | Habitation site |
| **Townland:** | KILBRIDE (Arklow By., Kilbride ED) |
| **Description:** | This is the record for the Bronze Age settlement site excavated by Thaddeus Breen (97E0324) on the Arklow bypass road scheme. The site consisted postholes representing an oval structure (diam. 7.5m) and an assortment of other postholes forming no discernible pattern. No hearth was found but the site had been heavily truncated. Associated with these postholes were struck flakes of poor-quality flint and pottery sherds from Beaker, Cordoned Urn and Vast vessels, dating the site to the Bronze Age.<br>(http://www.excavations.ie/Pages/Details.php?Year=&County=Wicklow&id=4126) |
| **Compiled by:** | Denis Power<br>Not scheduled for inclusion in the next revision of the RMP |

| | |
|---|---|
| **RMP No.:** | **WI040-050----** |
| **Class:** | Furnace |
| **Townland:** | KILBRIDE (Arklow By., Kilbride ED) |
| **Description:** | This is the record for the furnace excavated by Breandán Ó Ríordáin (97E0083) on the Arklow bypass road scheme. The remains occupied a space of 1.1m x 0.85m with a max. depth of 0.5m. The furnace had a lining of two stones, one on either side, and a crescent wall of solid iron slag. No finds other than fragments of slag and waste iron were recovered. |
| **Compiled by:** | Denis Power |
| **Date of upload:** | 25 January 2013 |
| | Not scheduled for inclusion in the next revision of the RMP |

| | |
|---|---|
| **RMP No.:** | **WI040-051----** |
| **Class:** | Burnt spread |
| **Townland:** | KILBRIDE (Arklow By., Kilbride ED) |
| **Description:** | This is the record for three adjacent spreads of burnt mound material excavated by Brendán Ó Riordáin (97E0083) on the Arklow bypass road scheme. The burnt material was present in shallow pits/depressions and the only finds recovered were some pieces of unworked flint and fragments of burnt bone. |
| **Compiled by:** | Denis Power |
| **Date of upload:** | 25 January 2013 |
| | Not scheduled for inclusion in the next revision of the RMP |

# APPENDIX 9.2

# ARCHAEOLOGICAL FINDS

# PREPARED BY CRDS LTD.

Published catalogues of prehistoric material were also studied: Raftery (1983 - Iron Age antiquities), Eogan (1965; 1993; 1994 - bronze swords, Bronze Age hoards and goldwork), Harbison (1968; 1969a; 1969b - bronze axes, halberds and daggers) were assessed. Of these, the only record is from the Irish Stone Axe Project Database, UCD.

| ISAP No | NMI No | NMI Location | Townland | Object type |
|---|---|---|---|---|
| 5063 | Private possession 006 | OC7:2 | KILCARRA WEST | Stone axehead |

# APPENDIX 9.3

# EXCAVATIONS

## PREPARED BY CRDS LTD.

The excavation bulletin website (www.excavations.ie) was consulted to identify previous excavations that have been carried out within the study area. This database contains summary accounts of excavations carried out in Ireland from 1970 to 2019.

**1997:616 - KILBRIDE, Wicklow**

County: Wicklow
Site name: KILBRIDE
SMR No.: N/A
Licence No.: 97E0324
Author: Thaddeus C. Breen, 13 Wainsfort Crescent, Dublin 6W, for Valerie J. Keeley Ltd.
Site type: Bronze Age settlement site
ITM: E 726923m, N 687384m
Lat, Long: 52.922272, -6.112449
Description: This site was found during monitoring of topsoil-stripping during the construction of a motorway for Wicklow County Council.
An oval foundation trench with a maximum diameter of 7.5m was found. A number of post-holes were found at what appeared to be the entrance, and a few more along the circumference. At one side was a further group of post-holes with no obvious pattern, and nearby were two straight shallow ditches, the longest 3.5m in length, arranged radially. Flints and pottery were found in all of these features. The flints were mostly flakes struck from poor-quality flint. The pottery consisted of decorated sherds of late developed Beaker, Cordoned Urn and Vase. All of it was weathered and found in secondary contexts. A small quantity of cremated human bone was found at the side of one of the post-holes.

**1998:683 - ARKLOW BYPASS, Wicklow**

County: Wicklow
Site name: ARKLOW BYPASS
SMR No.: N/A
Licence No.: 97E0083
Author: Breandán Ó Riordáin, Burgage More, Blessington, Co. Wicklow, for Valerie J Keeley Ltd.
Site type: Various
ITM: E 724942m, N 676256m
Lat, Long: 52.822771, -6.146166
Description: Archaeological monitoring of topsoil-stripping on the route of the Arklow Bypass in former tillage fields north of Arklow resulted in the discovery of three sites.

*Site 1, N176223*
A small area of dark, charcoal-like material that lay 0.23m below the original surface of the ground in sandy, red-brown soil. No other material was associated with this deposit.

*Site 2, N176155*
This consisted of a deposit of charcoal associated with a scatter of cremated bone. It was in a layer of sandy, brown and reddish brown soil and appeared to have been partially protected by three relatively small field stones. The main deposit measures 0.5m north-south by 0.44m and is a maximum of 0.2m deep. It was apparent that this material, which originally lay c. 0.3m below the original ground surface, has suffered interference as a result of soil-stripping machines moving

over the site as some of the charcoal and cremated bone had been spread northwards over a distance of some 4.5m.

*Site 3, N176075*
This was initially identified as an area of light grey soil within which were sherds of decorated pottery. Cleaning showed that there were three separate pits present, as well as a larger, linear spread.
Pit A (diameter 0.9m, maximum depth 0.3m) contained a circular deposit of black clay and numerous sherds of pottery, charcoal and a fragment of bone. Six large stones were set around the north-eastern edge of the pit.
Pit B (0.9m north–south, 1m east–west, 0.35m deep) contained numerous sherds of pottery and charcoal and some flints.
Pit C (diameter 0.7m, depth 0.4m) contained sherds of pottery, charcoal and flint as well as fragments of burnt bone in the upper levels. At a lower level were found sherds of pottery and charcoal, but no flint fragments. Five large stones were set around the edge of this feature.
Pit D (diameter 0.48m, depth 0.2m) had a matrix of mid-brown/yellow redeposited sand containing two fragments of flint and occasional fragments of charcoal. A suggestion has been made that this may have been dug to hold a form of marker by which to locate the other three pits.
In excess of fifty sherds of pottery and over thirty flakes of flint, half of which were worked, were found in Pits A, B and C. Examination of the deposits in the pits suggests that there were two separate deposits in each. It was clear from the position of the pottery fragments that the vessels had been broken in antiquity; the potsherds are identifiable as being of Beaker and Food Vessel type. As there was no evidence to suggest the former presence of an associated earthwork, the site may be regarded as a flat cemetery.

**2010:837 - Glenart Demesne, Wicklow**

| | |
|---|---|
| County: | Wicklow |
| Site name: | Glenart Demesne |
| SMR No.: | N/A |
| Licence No.: | 10E0083 |
| Author: | Gill McLoughlin, Irish Archaeological Consultancy Ltd, 120b Greenpark Road, Bray, Co. Wicklow. |
| Site type: | No archaeological significance |
| ITM: | E 721911m, N 674434m |
| Lat, Long: | 52.807099, -6.191788 |
| Description: | Monitoring was carried out in Glenart Demesne, Arklow, Co. Wicklow, between April and September 2010. Monitoring was required during the construction works associated with the Arklow water supply scheme due to the vicinity of Glenart Castle, 100m north-west of the pipeline route. The scheme traversed the townlands of Glenart, Pollahoney and Ballyfuff North in County Wicklow. This section of the pipeline had a total length of c. 2.5km and travelled through the demesne lands and woodland originally associated with Glenart Castle.<br>Evidence for the raising of the ground level was identified along the old Arklow to Woodenbridge road, where a pre-existing road surface was identified c. 1m below the current ground level. This artificial raising of the surrounding surface was probably undertaken to combat |

flooding by the nearby river and is probably contemporary with the construction of a stone bridge.
Although numerous features were investigated, nothing of archaeological significance was uncovered during the course of works.

**2020:109 - Arklow Town Marsh, Tiknock, Ferrybank, Arklow, Wicklow**

| | |
|---|---|
| County: | Wicklow |
| Site name: | Arklow Town Marsh, Tiknock, Ferrybank, Arklow |
| SMR No.: | WI040-029 |
| Licence No.: | 18E0263 |
| Author: | Siobhan Deery |
| Site type: | No archaeology found |
| ITM: | E 724311m, N 673926m |
| Lat, Long: | 52.801987, -6.156409 |
| Description: | Archaeological assessment took place in advance of proposed flood alleviation works at the Arklow Town Marsh, Ferrybank, Arklow, County Wicklow. The location of this embankment lies partly within the Zone of Archaeological Potential associated with the historic town of Arklow (WI040-029) and lies in the vicinity of the site of a graveyard (WI040-029008-). Also of historic interest in the vicinity of the proposed works is the site of the 'Ovoca Brewery' which is shown on the six-inch 1st edition Ordnance Survey map. However this area has experienced significant disturbance in recent years.<br>The assessment incorporated a desk study and the results of archaeological monitoring of site investigation works.<br>Site investigations were initially to take the form of test pits approximately 2m x 2m, however, due to the wet ground conditions experienced in the marsh area, window sampling in 12 locations took place. No archaeological features, finds or soils were encountered as a result of the on-site archaeological monitoring programme.<br>Test excavation along the location of a proposed flood embankment was initially proposed, however due to waterlogged ground conditions, the presence of electricity wires and pylons as well as some areas being inaccessible due to overgrown vegetation, it was not possible to carry out this exercise as planned. An alternative archaeological strategy as part of the site enabling works for the project was devised.<br>Courtney Deery Heritage Consultancy, Lynwood House, Ballinteer Road, Dublin 16 |

# APPENDIX 9.4

# NATIONAL INVENTORY OF ARCHITECTURAL HERITAGE

# PREPARED BY CRDS LTD.

The recorded archaeological sites within c. 1km of the development are listed below, all noted in the National Inventory of Architectural Heritage (NIAH) for Co. Wicklow (www.archaeology.ie).

**Glenart Castle Hotel, GLENART, Arklow, County Wicklow**
**Reg No: 16404001**



| | |
|---|---|
| **Rating:** | Regional |
| **Interest:** | Architectural |
| **Original Use:** | Country house |
| **In Use As:** | Hotel |
| **Date:** | 1810 - 1830 |
| **Coordinates:** | 321830, 174543 |
| **Date Recorded:** | 13/08/2003 |
| **Date Updated:** | --/--/-- |
| **Description:** | Detached multiple-bay part two part three and part four-storey toy castle style former mansion, built c.1820 with mid 19th century additions. It is now in use as a hotel. The house is built around the fabric of a hunting lodge. The building is a large sprawling complex comprising of mainly long two-storey wings, projecting canted bays, a porte-cochere and a tall tower. Parapets are all castellated and details include hooded mouldings and bartizans. It is constructed in ashlar granite with later wings finished in render. The window openings are largely flat-headed and filled with timber sash frames, mostly six over six. There are also many windows with double sash and tripartite frames. The building is set within a large wooded demesne with the remains of garden terraces close to the house. At the roadside there are two small matching picturesque gate lodges. |
| Appraisal: | A large and imposing early 19th-century country house which has been converted to commercial use with minimal loss of character. |

**Shelton Abbey, SHELTON ABBEY, Arklow, County Wicklow**
**Reg No: 16404005**



| | |
|---|---|
| **Rating:** | National |
| **Interest:** | Architectural Artistic Historical |
| **Original Use:** | Country house |
| **In Use As:** | Prison/jail |
| **Date:** | 1770 - 1775 |
| **Coordinates:** | 322051, 175358 |
| **Date Recorded:** | 12/08/2003 |
| **Date Updated:** | --/--/-- |
| **Description:** | Detached eleven-bay two storey former mansion, built in 1770 but remodelled in gothic style to designs by Sir Richard Morrison in 1819. The building is finished with lined render and granite dressings. The decorative panelled front door has a blind fanlight and is set within a pointed-arched opening. This is recessed within a projecting triple arched flat-roofed porch. Window openings are generally set within flat-headed openings; there are some mullioned and transomed arrangements. The front is lavishly embellished with reducing buttresses with tall pinnacles. To the north and rear large two storeys wings were later added. The mainly pitched roof is finished with natural slate and has cast-iron rainwater goods. The building is set within a large wooded demesne. Internally the elaborate plasterwork is still intact. |
| Appraisal: | An important early 19th century country house which has been very well preserved. At that time the 'Abbey style' was considered appropriate to secluded settings such as this. It has been converted to institutional use with no loss of character. |

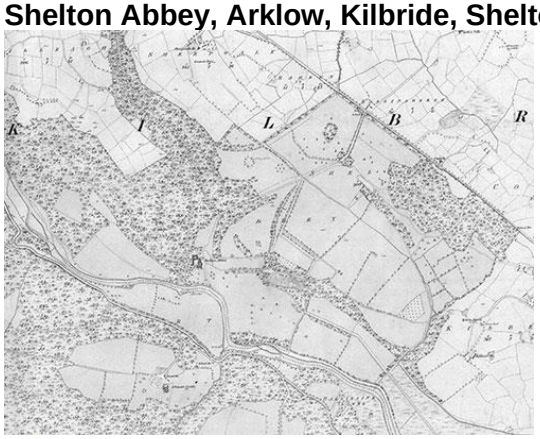
**KILBRIDE (AR. BY.) KILBRIDE ED, Arklow, County Wicklow**
**Reg No: 16404006**





| | |
|---|---|
| **Rating:** | Regional |
| **Interest:** | Architectural |
| **Original Use:** | Mausoleum |
| **In Use As:** | Mausoleum |
| **Date:** | 1780 - 1790 |
| **Coordinates:** | 323911, 174988 |
| **Date Recorded:** | 12/08/2003 |
| **Date Updated:** | --/--/-- |
| **Description:** | Freestanding single-bay single-stage mausoleum, dated 1785, on a square plan. Granite ashlar pyramidal roof centred on inscribed sarcophagus ("1785"). Rusticated granite ashlar walls on overgrown plinth with cut-granite stringcourse. Set in landscaped grounds of a slightly elevated site. |
| **Appraisal:** | A mausoleum erected by Ralph Howard (1726-86), first Viscount Wicklow of Shelton Abbey (see 16404005), representing an important component of the later eighteenth-century built heritage of County Wicklow with the architectural value of the composition, one attributed to Simon Vierpyl (c.1725-1810) of Dublin and London, confirmed by such attributes as the compact square plan form; the construction in a silver-grey granite demonstrating good quality workmanship; and the eye-catching pyramidal silhouette recalling the later Aldborough Mausoleum (1832) in Baltinglass (see 16316022). NOTE: A sarcophagus is inscribed: "Within the walls of the adjoining Church lie interr'd the Remains of M. Dorothea Howard otherwise Hassels Relict of John Howard Esq. Who Departed this Life at Shelton in December 1684 to Whose Memory and that of their Descendants and as a place of Burial for his Family Ralph Viscount Wicklow has caused this Monument to be Erected in the year of our Lord 1785". |

## Shelton Abbey, Arklow, Kilbride, Shelton Abbey



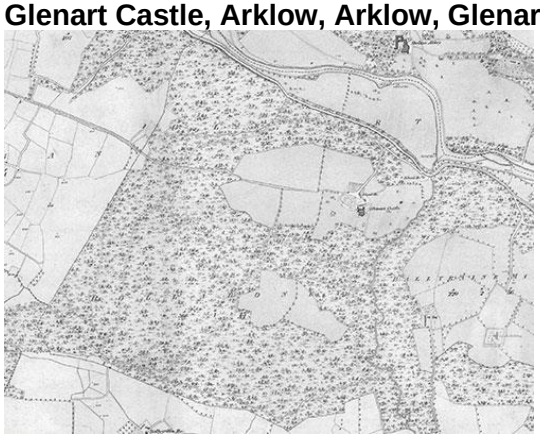


| | |
|---|---|
| **Site ID:** | **4251** |
| Barony / Municipal Borough: | Arklow |
| Parish: | Kilbride |
| County: | 26 |
| Former County: | Wicklow |
| Townland: | Shelton Abbey |
| *Present on Ordnance Survey* | |
| First Edition: | yes, sheet 139 |
| Second Edition: | yes |
| Revised Edition: | yes |
| *Present on Ordnance Survey First Edition 6" Series* | |
| [1836 to 1846]: | Yes |
| *Location on Ordnance Survey 1:50,000* | |
| Sheet No: | 62 |
| Grid Letter: | T |
| Grid Reference: | 221754 |

**Initial Overview**

| | |
|---|---|
| Site Footprint Visible | Yes |
| Boundary Defined | Yes |
| Significant Development | Yes |
| General Comments | A factory complex now dominates this site. |
| *Architectural Features* | |
| Principal Building | Yes |
| Garden Structures | No |
| Gateways and Gatehouses | No |
| Buildings of Indeterminate Purpose | No |
| *Movement Within Site* | |
| Entrances have changed | No |
| Drive position has changed | Yes |
| Avenues | No |
| Woodland Drives or Walks | Yes |
| *Landscape Features* | |
| Woodlands | Yes |
| Woodland Footprint Changed | Yes |
| Orchards | No |
| Parkland | No |
| Formal Garden | Yes |
| Kitchen / Walled and Productive Gardens | No |
| Vistas | No |
| Allees | No |
| Natural and Naturalistic Water Features | No |
| Artifical Water Features | No |
| Other Features | No |
| Section Comments | No |

## Glenart Castle, Arklow, Arklow, Glenart





| | |
|---|---|
| **Site ID:** | **4417** |
| Barony / Municipal Borough: | Arklow |
| Parish: | Arklow |
| County: | 26 |
| Former County: | Wicklow |
| Townland: | Glenart |
| Present on Ordnance Survey | |
| First Edition: | yes, sheet 139 |
| Second Edition: | yes |
| Revised Edition: | yes |
| Present on Ordnance Survey First Edition 6" Series [1836 to 1846]: | Yes |
| Location on Ordnance Survey 1:50,000 | |
| Sheet No:: | 62 |
| Grid Letter:: | T |
| Grid Reference: | 218745 |

**Initial Overview**

| | |
|---|---|
| Site Footprint Visible | Yes |
| Boundary Defined | Yes |
| Significant Development | No |
| *Architectural Features* | |
| Principal Building | Yes |
| Garden Structures | No |
| Gateways and Gatehouses | No |
| Buildings of Indeterminate Purpose | No |
| *Movement Within Site* | |
| Entrances have changed | Yes |
| Drive position has changed | Yes |
| Avenues | No |
| Woodland Drives or Walks | Yes |
| *Landscape Features* | |
| Woodlands | Yes |
| Woodland Footprint Changed | No |
| Orchards | No |
| Parkland | Yes |
| Formal Garden | No |
| Kitchen / Walled and Productive Gardens | Yes |
| Vistas | No |
| Allees | No |
| Natural and Naturalistic Water Features | No |
| Artifical Water Features | No |
| Other Features | No |

# APPENDIX 9.5

## WICKLOW COUNTY COUNCIL DEVELOPMENT PLAN

## RECORD OF PROTECTED STRUCTURES

## PREPARED BY CRDS LTD.

Extracts from the Wicklow County Development Plan 2016-2022 are given below.

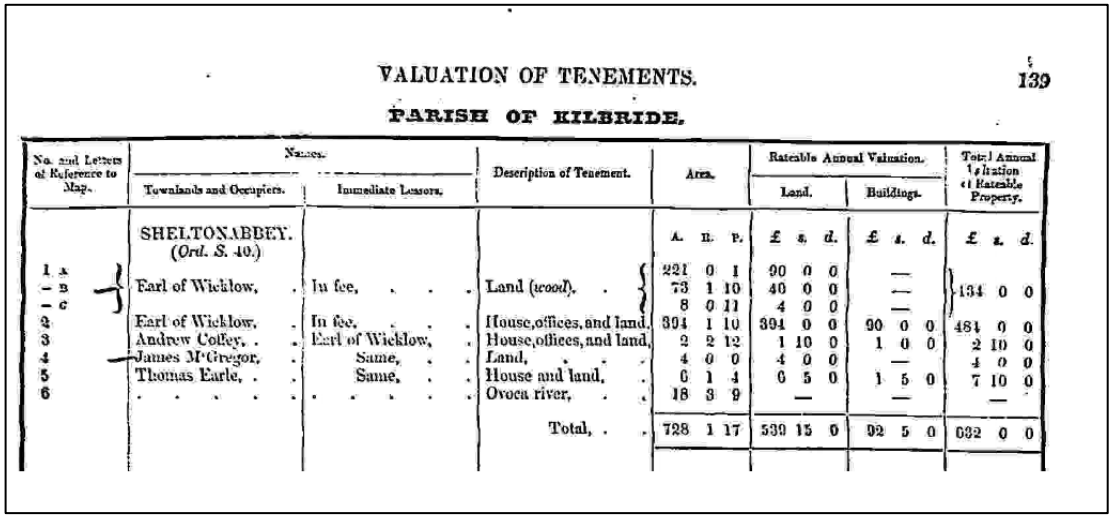
| REF. NO. | OTHER REF | BUILDING ADDRESS | STRUCTURE | TOWNLAND | DESCRIPTION | PHOTO |
|---|---|---|---|---|---|---|
| 40-02 | 40 | Glenart Castle | Country House | Glenart Td | Large, late-19th Century gothic-revival house of various dates. At the rear is a rectangular-plan tower of opus incertum while in front is a cement-rendered, two-storey range with English crenellations and a full-height-half-octagon bow. There is a long range at right-angles which is a later addition. |  |
| 40-05 | 40 | Shelton Abbey | Country House | Shelton Abbey Td | An extensive house designed by William Vitruvius Morrison to resemble a romantic abbey. The façade is of eight bays and two storeys with a two-bay breakfront, porte cochaire, buttresses and pinnacles. The building is highly decorative externally and internally. |  |
| 40-07 | | Howard Mausoleum, Kilbride , Arklow | Mausoleum | | Freestanding mausoleum erected 1785 by Ralph Howard Viscount of Wicklow. The structure is constructed in ashlar granite. It comprises a tall square-based pyramid set on a high square base. At the base of the rise is a small Egyptian style structure with a temple front and tetrastyle in-antis portico. The mausoleum is set within a small graveyard and is of historic and architectural interest. NIAH 16404006 |  |

# APPENDIX 9.6

# GRIFFITH'S VALUATION

# PREPARED BY CRDS LTD.

Griffiths Valuation was the first full-scale valuation of property in Ireland, overseen by Richard Griffith and published between 1847 and 1864. It is one of the most important surviving 19th century genealogical sources (http://www.askaboutireland.ie/griffith-valuation/).



VALUATION OF TENEMENTS. 139

PARISH OF KILBRIDE.

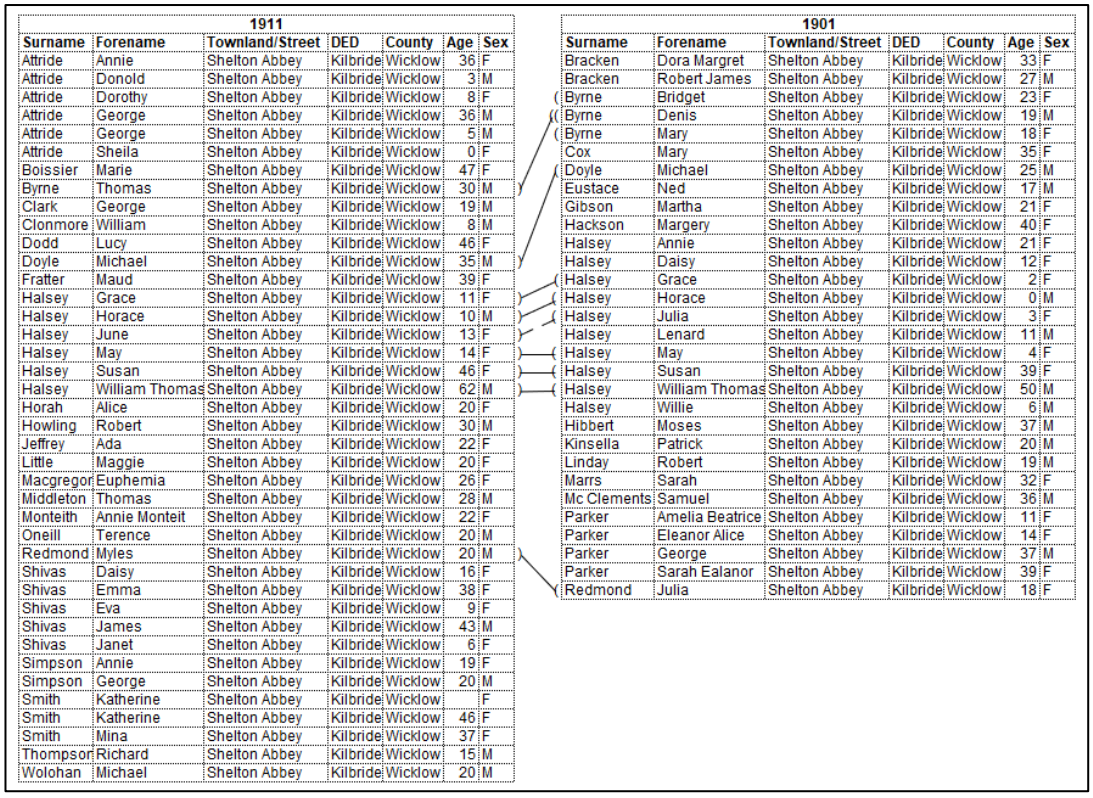
| No. and Letters of Reference to Map. | Names. Townlands and Occupiers. | Names. Immediate Lessors. | Description of Tenement. | Area. A. | Area. R. | Area. P. | Rateable Annual Valuation. Land. £ | Land. s. | Land. d. | Buildings. £ | Buildings. s. | Buildings. d. | Total Annual Valuation of Rateable Property. £ | s. | d. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SHELTONABBEY. (*Ord. S.* 40.) | | | | | | | | | | | | | | |
| 1 a | Earl of Wicklow, | In fee, | Land (*wood*), | 221 | 0 | 1 | 90 | 0 | 0 | — | | | 134 | 0 | 0 |
| – b | | | | 73 | 1 | 10 | 40 | 0 | 0 | — | | | | | |
| – c | | | | 8 | 0 | 11 | 4 | 0 | 0 | — | | | | | |
| 2 | Earl of Wicklow, | In fee, | House, offices, and land, | 394 | 1 | 10 | 394 | 0 | 0 | 90 | 0 | 0 | 484 | 0 | 0 |
| 3 | Andrew Coffey, | Earl of Wicklow, | House, offices, and land, | 2 | 2 | 12 | 1 | 10 | 0 | 1 | 0 | 0 | 2 | 10 | 0 |
| 4 | James M'Gregor, | Same, | Land, | 4 | 0 | 0 | 4 | 0 | 0 | — | | | 4 | 0 | 0 |
| 5 | Thomas Earle, | Same, | House and land, | 0 | 1 | 4 | 0 | 5 | 0 | 1 | 5 | 0 | 7 | 10 | 0 |
| 6 | . . . . . | . . . . . | Ovoca river, | 18 | 3 | 9 | — | | | — | | | — | | |
| | | | Total, | 728 | 1 | 17 | 539 | 15 | 0 | 92 | 5 | 0 | 632 | 0 | 0 |

# APPENDIX 9.7

# NATIONAL CENSUS

# PREPARED BY CRDS LTD.

The National Archives comprises the files of the former State Paper Office (SPO) and the Public Record Office of Ireland (PROI). The SPO was established in 1702 as a repository for records relating to the administrations of the various Lords Lieutenant (the English monarch's representative in Ireland). The PROI was established under the Public Records (Ireland) Act, 1867 to acquire administrative, court and probate records over twenty years old (http://www.census.nationalarchives.ie/search/).



**1911**

| Surname | Forename | Townland/Street | DED | County | Age | Sex |
|---|---|---|---|---|---|---|
| Attride | Annie | Shelton Abbey | Kilbride | Wicklow | 36 | F |
| Attride | Donold | Shelton Abbey | Kilbride | Wicklow | 3 | M |
| Attride | Dorothy | Shelton Abbey | Kilbride | Wicklow | 8 | F |
| Attride | George | Shelton Abbey | Kilbride | Wicklow | 36 | M |
| Attride | George | Shelton Abbey | Kilbride | Wicklow | 5 | M |
| Attride | Sheila | Shelton Abbey | Kilbride | Wicklow | 0 | F |
| Boissier | Marie | Shelton Abbey | Kilbride | Wicklow | 47 | F |
| Byrne | Thomas | Shelton Abbey | Kilbride | Wicklow | 30 | M |
| Clark | George | Shelton Abbey | Kilbride | Wicklow | 19 | M |
| Clonmore | William | Shelton Abbey | Kilbride | Wicklow | 8 | M |
| Dodd | Lucy | Shelton Abbey | Kilbride | Wicklow | 46 | F |
| Doyle | Michael | Shelton Abbey | Kilbride | Wicklow | 35 | M |
| Fratter | Maud | Shelton Abbey | Kilbride | Wicklow | 39 | F |
| Halsey | Grace | Shelton Abbey | Kilbride | Wicklow | 11 | F |
| Halsey | Horace | Shelton Abbey | Kilbride | Wicklow | 10 | M |
| Halsey | June | Shelton Abbey | Kilbride | Wicklow | 13 | F |
| Halsey | May | Shelton Abbey | Kilbride | Wicklow | 14 | F |
| Halsey | Susan | Shelton Abbey | Kilbride | Wicklow | 46 | F |
| Halsey | William Thomas | Shelton Abbey | Kilbride | Wicklow | 62 | M |
| Horah | Alice | Shelton Abbey | Kilbride | Wicklow | 20 | F |
| Howling | Robert | Shelton Abbey | Kilbride | Wicklow | 30 | M |
| Jeffrey | Ada | Shelton Abbey | Kilbride | Wicklow | 22 | F |
| Little | Maggie | Shelton Abbey | Kilbride | Wicklow | 20 | F |
| Macgregor | Euphemia | Shelton Abbey | Kilbride | Wicklow | 26 | F |
| Middleton | Thomas | Shelton Abbey | Kilbride | Wicklow | 28 | M |
| Monteith | Annie Monteit | Shelton Abbey | Kilbride | Wicklow | 22 | F |
| Oneill | Terence | Shelton Abbey | Kilbride | Wicklow | 20 | M |
| Redmond | Myles | Shelton Abbey | Kilbride | Wicklow | 20 | M |
| Shivas | Daisy | Shelton Abbey | Kilbride | Wicklow | 16 | F |
| Shivas | Emma | Shelton Abbey | Kilbride | Wicklow | 38 | F |
| Shivas | Eva | Shelton Abbey | Kilbride | Wicklow | 9 | F |
| Shivas | James | Shelton Abbey | Kilbride | Wicklow | 43 | M |
| Shivas | Janet | Shelton Abbey | Kilbride | Wicklow | 6 | F |
| Simpson | Annie | Shelton Abbey | Kilbride | Wicklow | 19 | F |
| Simpson | George | Shelton Abbey | Kilbride | Wicklow | 20 | M |
| Smith | Katherine | Shelton Abbey | Kilbride | Wicklow | | F |
| Smith | Katherine | Shelton Abbey | Kilbride | Wicklow | 46 | F |
| Smith | Mina | Shelton Abbey | Kilbride | Wicklow | 37 | F |
| Thompsor | Richard | Shelton Abbey | Kilbride | Wicklow | 15 | M |
| Wolohan | Michael | Shelton Abbey | Kilbride | Wicklow | 20 | M |

**1901**

| Surname | Forename | Townland/Street | DED | County | Age | Sex |
|---|---|---|---|---|---|---|
| Bracken | Dora Margret | Shelton Abbey | Kilbride | Wicklow | 33 | F |
| Bracken | Robert James | Shelton Abbey | Kilbride | Wicklow | 27 | M |
| Byrne | Bridget | Shelton Abbey | Kilbride | Wicklow | 23 | F |
| Byrne | Denis | Shelton Abbey | Kilbride | Wicklow | 19 | M |
| Byrne | Mary | Shelton Abbey | Kilbride | Wicklow | 18 | F |
| Cox | Mary | Shelton Abbey | Kilbride | Wicklow | 35 | F |
| Doyle | Michael | Shelton Abbey | Kilbride | Wicklow | 25 | M |
| Eustace | Ned | Shelton Abbey | Kilbride | Wicklow | 17 | M |
| Gibson | Martha | Shelton Abbey | Kilbride | Wicklow | 21 | F |
| Hackson | Margery | Shelton Abbey | Kilbride | Wicklow | 40 | F |
| Halsey | Annie | Shelton Abbey | Kilbride | Wicklow | 21 | F |
| Halsey | Daisy | Shelton Abbey | Kilbride | Wicklow | 12 | F |
| Halsey | Grace | Shelton Abbey | Kilbride | Wicklow | 2 | F |
| Halsey | Horace | Shelton Abbey | Kilbride | Wicklow | 0 | M |
| Halsey | Julia | Shelton Abbey | Kilbride | Wicklow | 3 | F |
| Halsey | Lenard | Shelton Abbey | Kilbride | Wicklow | 11 | M |
| Halsey | May | Shelton Abbey | Kilbride | Wicklow | 4 | F |
| Halsey | Susan | Shelton Abbey | Kilbride | Wicklow | 39 | F |
| Halsey | William Thomas | Shelton Abbey | Kilbride | Wicklow | 50 | M |
| Halsey | Willie | Shelton Abbey | Kilbride | Wicklow | 6 | M |
| Hibbert | Moses | Shelton Abbey | Kilbride | Wicklow | 37 | M |
| Kinsella | Patrick | Shelton Abbey | Kilbride | Wicklow | 20 | M |
| Linday | Robert | Shelton Abbey | Kilbride | Wicklow | 19 | M |
| Marrs | Sarah | Shelton Abbey | Kilbride | Wicklow | 32 | F |
| Mc Clements | Samuel | Shelton Abbey | Kilbride | Wicklow | 36 | M |
| Parker | Amelia Beatrice | Shelton Abbey | Kilbride | Wicklow | 11 | F |
| Parker | Eleanor Alice | Shelton Abbey | Kilbride | Wicklow | 14 | F |
| Parker | George | Shelton Abbey | Kilbride | Wicklow | 37 | M |
| Parker | Sarah Ealanor | Shelton Abbey | Kilbride | Wicklow | 39 | F |
| Redmond | Julia | Shelton Abbey | Kilbride | Wicklow | 18 | F |

# APPENDIX 9.8

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# 10.0 NOISE & VIBRATION

## 10.1 INTRODUCTION

As described in Chapter 1 (Introduction), the Applicant is applying to ABP for planning permission for the provision of a 110 kV GIS substation, MV Control Building, Transformers, associated dropdown 110 kV transmission lines, along with associated and ancillary works hereafter referred to as the 'proposed development'). The subject site is illustrated in Figure 10.1 below.

Residential noise sensitive locations are located to the north, south, east and west of the site typically consisting of single residence ribbon development along secondary local roads.

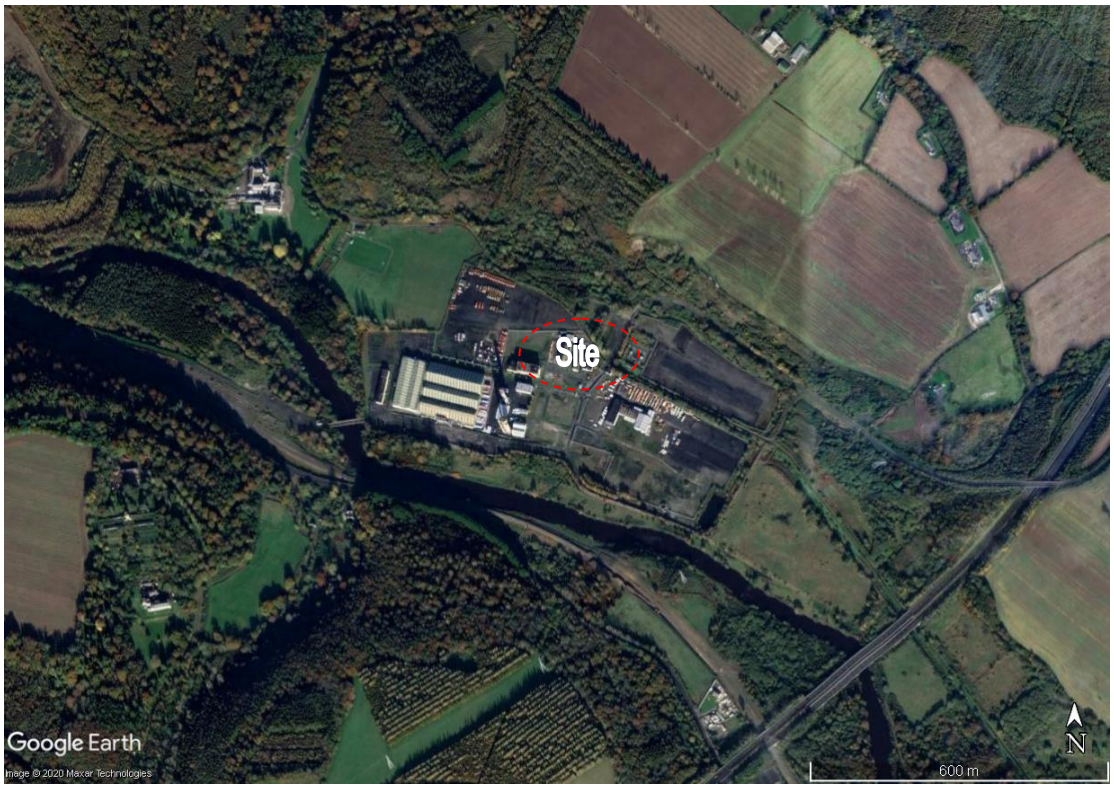



***Figure 10.1*** Site Location and Context

This proposed development has been assessed and discussed in terms of potential noise and vibration impacts on the surrounding environment.

## 10.2 METHODOLOGY

### 10.2.1 Proposed Approach

The following methodology has been adopted for this assessment:

- review appropriate guidance, typical local authority/An Bord Pleanála (ABP) planning conditions, etc. in order to identify appropriate noise criteria for the site operations;
- review of noise monitoring at a number of locations (e.g. in the vicinity of nearest sensitive properties/boundaries) to identify existing levels of noise in the vicinity of the development;
- prepare construction noise calculations associated with the key construction activities to consider the potential noise impact of the proposed development; and
- comment on predicted noise levels against the appropriate criteria and existing noise levels and outline required mitigation measures (if any).

Appendix 10.1 of this document presents a glossary of the acoustic terminology used throughout this document. In the first instance it is considered appropriate to review some basic fundamentals of acoustics.

### 10.2.2 Fundamentals of Acoustics

In order to provide a broader understanding of some of the technical discussion in this report, this section provides a brief overview of the fundamentals of acoustics and the basis for the preparation of this noise assessment.

A sound wave travelling through the air is a regular disturbance of the atmospheric pressure. These pressure fluctuations are detected by the human ear, producing the sensation of hearing. In order to take account of the vast range of pressure levels that can be detected by the ear, it is convenient to measure sound in terms of a logarithmic ratio of sound pressures. These values are expressed as Sound Pressure Levels (SPL) in decibels (dB).

The audible range of sounds expressed in terms of Sound Pressure Levels is 0 dB (for the threshold of hearing) to 120 dB (for the threshold of pain). In general, a subjective impression of doubling of loudness corresponds to a tenfold increase in sound energy which conveniently equates to a 10 dB increase in SPL. It should be noted that a doubling in sound energy (such as may be caused by a doubling of traffic flows) increases the SPL by 3 dB.

The frequency of sound is the rate at which a sound wave oscillates and is expressed in Hertz (Hz). The sensitivity of the human ear to different frequencies in the audible range is not uniform. For example, hearing sensitivity decreases markedly as frequency falls below 250 Hz. In order to rank the SPL of various noise sources, the measured level has to be adjusted to give comparatively more weight to the frequencies that are readily detected by the human ear. Several weighting mechanisms have been proposed but the ‘A-weighting’ system has been found to provide one of the best correlations with perceived loudness. SPLs measured using ‘A-weighting’ are expressed in terms of dB(A). An indication of the level of some common sounds on the dB(A) scale is presented in Figure 10.2.

The ‘A’ subscript denotes that the sound levels have been A-weighted. The established prediction and measurement techniques for this parameter are well

developed and widely applied. For a more detailed introduction to the basic principles of acoustics, reference should be made to an appropriate standard text.

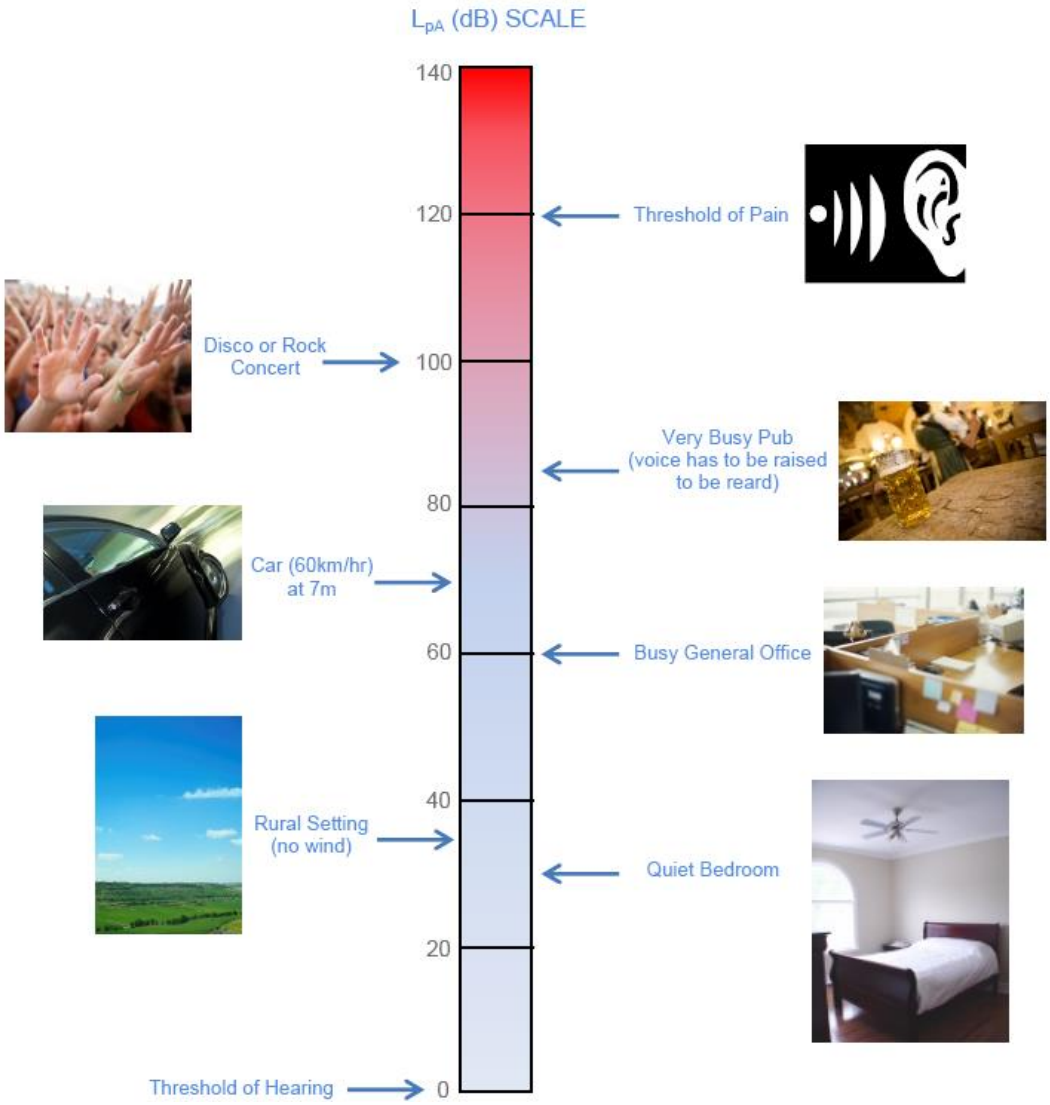



***Figure 10.2*** dB(A) Scale & Indicative Noise Levels – (EPA: Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4 – 2012))

### 10.2.3 Significance of Impacts

The significance of noise and vibration impacts has been assessed in accordance with the EPA's *Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports* 2017 and the EPA's Draft *Advice Notes for Preparing Environmental Impact Statements* 2015, see Tables 10.1 to 10.3 below. As these guidelines do not quantify the impacts in decibel terms, further reference has been made to the '*Guidelines for Environmental Noise Impact Assessment*' produced by the Institute of Environmental Management and Assessment (IEMA) (2014).

With regard to the quality of the impact, ratings may have positive, neutral or negative applications where:

***Table 10.1*** Quality of Potential Effects

| Quality of Effects | Definition |
|---|---|
| Negative | A change which reduces the quality of the environment (e.g. by causing a nuisance). |
| Neutral | No effects or effects that are imperceptible, within the normal bounds of variation or within the margin of forecasting error. |
| Positive | A change that improves the quality of the environment (e.g. by removing a nuisance). |

The significance of an effect on the receiving environment are described as follows:

***Table 10.2*** Significance of Effects

| Significance of Effects on the Receiving Environment | Description of Potential Effects |
|---|---|
| Imperceptible | An effect capable of measurement but without significant consequences. |
| Not Significant | An effect which causes noticeable changes in the character of the environment but without significant consequences. |
| Slight | An effect which causes noticeable changes in the character of the environment without affecting its sensitivities. |
| Moderate | An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends. |
| Significant | An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment. |
| Very Significant | An effect which, by its character, magnitude, duration or intensity significantly alters a sensitive aspect of the environment. |
| Profound | An effect which obliterates sensitive characteristics. |

The duration of effects as described in the Draft EPA Guidelines are:

***Table 10.3*** Duration of Effects

| Duration of Impact | Definition |
|---|---|
| Momentary | Effects lasting from seconds to minutes |
| Brief | Effects lasting less than a day |
| Temporary | Effects lasting one year or less |
| Short-term | Effects lasting one to seven years |
| Medium-term | Effects lasting seven to fifteen years |
| Long-term | Effects lasting fifteen to sixty years |
| Permanent | Effects lasting over sixty years |
| Reversible | Effects that can be undone, for example through remediation or restoration |

### 10.2.4 Construction Phase Guidance

*Criteria for Rating Noise Impacts*

There is no published statutory Irish guidance relating to the maximum permissible noise level that may be generated during the construction phase of a project. Local authorities normally control construction activities by imposing limits on the hours of operation and consider noise limits at their discretion.

In the absence of specific noise limits, appropriate criteria relating to permissible construction noise levels for a development of this scale may be found in the *British*

*Standard BS 5228 – 1: 2009+A1:2014: Code of practice for noise and vibration control on construction and open sites – Noise*.

The approach adopted in BS5228 – 1 calls for the designation of a noise sensitive location into a specific category (A, B or C) based on existing ambient noise levels in the absence of construction noise. This then sets a threshold noise value that, if exceeded at this location, indicates a significant noise impact is associated with the construction activities.

BS5228 – 1 sets out guidance on permissible noise levels relative to the existing noise environment. Table 10.4 sets out the values which, when exceeded, signify a significant effect at the facades of residential receptors as recommended by BS 5228 – 1. These are construction noise levels only and not the cumulative noise level due to construction plus existing ambient noise.

***Table 10.4*** Example Threshold of Significant Effect at Dwellings

| Assessment category and threshold value period ($L_{Aeq}$) | Threshold value, in decibels (dB) | | |
|---|---|---|---|
| | Category A Note A | Category B Note B | Category C Note C |
| Night-time (23:00 to 07:00hrs) | 45 | 50 | 55 |
| Evenings and weekends Note D | 55 | 60 | 65 |
| Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00) | 65 | 70 | 75 |

Note A) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values.
Note B) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.
Note C) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category A values.
Note D) 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays.

It should be noted that this assessment method is only valid for residential properties.

For the appropriate periods (i.e. daytime, evening and night-time) the ambient noise level is determined and rounded to the nearest 5 dB. Baseline monitoring carried out as part of this assessment would indicate that the categories detailed in Table 10.5 are appropriate in terms of the nearest noise sensitive locations being considered in this instance.

***Table 10.5*** Rounded Baseline Noise Levels and Associated Categories

| Period | Baseline Noise Category | Construction Noise Threshold Value $L_{Aeq,1hr}$ (dB) |
|---|---|---|
| Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00) | B | 65 |
| Evening (19:00 to 23:00hrs) | B | 55 |
| Night-time (23:00 to 07:00hrs) | B | 45 |

See Section 10.5.1 for the assessment in relation to this site. If the construction noise level exceeds the appropriate category value, then a significant effect is deemed to occur.

This assessment process determines whether a significant construction noise impact is likely. Notwithstanding the outcome of this assessment, the overall acceptable levels of construction noise are set out in the Transport Infrastructure Ireland (TII) publication *Guidelines for the Treatment of Noise and Vibration in National Road*

*Schemes*[1], which should not be exceeded at noise sensitive locations during the construction phase of the development. Table 10.6 sets out these levels.

***Table 10.6*** Maximum Permissible Noise Levels at the Facade of Dwellings during Construction

| Days and Times | Noise Levels (dB re. $2x10^{-5}$ Pa) | |
|---|---|---|
| | $L_{Aeq(1hr)}$ | $L_{Amax}$ |
| Monday to Friday 07:00 to 19:00hrs | 70 | 80 |
| Monday to Friday 19:00 to 22:00hrs | 60* | 65* |
| Saturdays 08:00 to 16:30hrs | 65 | 75 |
| Sundays & Bank Holidays 08:00 to 16:30hrs | 60* | 65* |

Note * Construction activity at these times, other than that required for emergency works, will normally require the explicit permission of the relevant local authority.

Therefore, based on the above the following construction noise criteria are proposed for the site in relation to day to day works during the stated construction hours:

*70 dB $L_{Aeq,1hr}$ at noise sensitive location*
*75 dB $L_{Aeq,1hr}$ at commercial property*

In exceptional circumstances there may be a requirement that certain construction works are carried out during night-time periods. In these instances, the relevant evening (60 dB $L_{Aeq,1hr}$) and night-time (50 dB $L_{Aeq,1hr}$) will apply.

*Criteria for Rating Vibration Impacts*

Vibration standards come in two varieties: those dealing with human comfort and those dealing with cosmetic or structural damage to buildings. In both instances, it is appropriate to consider the magnitude of vibration in terms of Peak Particle Velocity (PPV).

It is acknowledged that humans are particularly sensitive to vibration stimuli and that any perception of vibration may lead to concern. In the case of road traffic, vibration is perceptible at around 0.5 mm/s and may become disturbing or annoying at higher magnitudes. However, higher levels of vibration are typically tolerated for single events or events of short duration. For example, rock breaking and piling, two of the primary sources of vibration during construction, are typically tolerated at vibration levels up to 12 mm/s and 5 mm/s respectively. This guidance is applicable to the daytime only; it is unreasonable to expect people to be tolerant of such activities during the night.

Guidance relevant to acceptable vibration within buildings is contained in the following documents:

- British Standard BS 7385: 1993: *Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration*, and;
- British Standard BS 5228-2: 2009+A1:2014: *Code of practice for noise and vibration control on construction and open sites – Vibration*.

BS 7385 states that there should typically be no cosmetic damage if transient vibration does not exceed 15mm/s at low frequencies rising to 20 mm/s at 15 Hz and 50 mm/s at 40 Hz and above. These guidelines relate to relatively modern buildings and should be reduced to 50% or less for more critical buildings.

[1] *Guidelines for the Treatment of Noise and Vibration in National Road Schemes, Revision 1, 25 October 2004*, Transport Infrastructure Ireland

BS 5228 recommends that, for soundly constructed residential property and similar structures that are generally in good repair, a threshold for minor or cosmetic (i.e. non-structural) damage should be taken as a peak component particle velocity (in frequency range of predominant pulse) of 15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz and 50 mm/s at 40 Hz and above. Below these values minor damage is unlikely. Where continuous vibration is such as to give rise to dynamic magnification due to resonance, the guide values may need to be reduced by up to 50%. BS 5288-2 also comments that important buildings which are difficult to repair might require special consideration on a case by case basis.

The TII document *Guidelines for the Treatment of Noise and Vibration in National Road Schemes* also contains information on the permissible construction vibration levels as follows:

***Table 10.7*** Allowable Vibration during Construction Phase

| Allowable vibration (in terms of peak particle velocity) at the closest part of sensitive property to the source of vibration, at a frequency of | | |
|---|---|---|
| Less than 10 Hz | 10 to 50 Hz | 50 to 10 Hz (and above) |
| 8 mm/s | 12.5 mm/s | 20 mm/s |

### 10.2.5 Operational Phase – Noise Guidance

*Relevant Planning Condition Review*

ABP have granted[2] permission for the development of a datacentre facility on the lands that the proposed substation will support. It is important to consider the noise conditions contained within this decision to grant.

The main data centre development that the proposed development will support has the following day to day operational noise criteria condition associated with it:

> *"16. (a) The noise level arising from the operation of the proposed development shall be in accordance with the predicted noise limits for daytime, evening and night time detailed in the Environmental Impact Assessment Report and in any case shall not exceed ambient noise levels by more than 5 dB(A) ($L_{eq,15min}$) at noise sensitive receptors."*

It is proposed to adopt these criteria for the cumulative noise levels associated with the permitted data centre and the proposed development under consideration here. Review of the EIAR associated with the adjoining project confirms the following noise criteria were put forward:

> *"the applicable noise limit criteria are as provided in Table 10-6.*

**Table 10-6: Noise Limit Criteria**

| | Daytime | Evening | Night-time |
|---|---|---|---|
| Noise Limit Criterion ($L_{Ar,T}$) | 55 | 50 | 45 |

*Source: 'Guidance Note for Noise: License Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4)' (January 2016).*

*Given the continuous nature of the operation of the proposed development and the fact that any tonal issues associated with external plant would be*

[2] ABP-303938-19 - PA Reg Ref: 181940

*addressed during the detailed design, it is judged that no adjustments are appropriate and the $L_{Ar,T}$, is equal to the $L_{Aeq}$ value.*

*The proposed development would operate 24 hours per day. Consequently, it is the night-time noise limit which would drive the specification of any required mitigation.*

*In the event of loss of grid power, emergency generators, located externally, would come into operation. As this is a highly unlikely emergency scenario, it is not bound by the noise limit values for Standard Operation, as agreed with WCC (of course the generators would be tested according to a defined programme during the daytime period only).*

*A night-time noise limit of 55 dB $L_{Aeq}$ at noise sensitive receptors is judged to be appropriate for the emergency operation, providing reasonable internal noise levels with windows closed."*

*Assessment of Significance*

The '*Guidelines for Environmental Noise Impact Assessment*' produced by the Institute of Environmental Management and Assessment (IEMA) (2014) have been referenced in order to categorise the potential effect of changes in the ambient noise levels during the operational phases of the proposed development.

The guidelines state that for any assessment, the potential significance should be determined by the assessor, based upon the specific evidence and likely subjective response to noise. Due to varying factors which effect human response to environmental noise (prevailing environment, noise characteristics, time periods, duration and level etc.) assigning a subjective response must take account of these factors.

The scale adopted in this assessment is shown in Table 10.8 below is based on an example scale within the IEMA guidelines. The corresponding significance of impact presented in the Draft '*Guidelines on the Information to be Contained in Environmental Impact Assessment Reports*' (EPA, 2017) is also presented.

***Table 10.8*** Noise Impact Scale – Operational Noise Sources

| Noise Level Change dB(A) | Subjective Response | Long Term Impact Classification (IEMA, 2014) | Impact Guidelines on the Information to be contained in EIA Reports (EPA) |
|---|---|---|---|
| ≥ 0 | No change | Negligible | Imperceptible |
| ≥ 0 and < 3 | Barely perceptible | | Not Significant |
| ≥ 3 and < 5 | Noticeable | Minor | Slight – Moderate |
| ≥ 5 and < 10 | Up to a doubling or halving of loudness | Moderate | Moderate – Significant |
| ≥10 | More than a doubling or halving of loudness | Major | Significant – Profound |

The significance table reflects the key benchmarks that relate to human perception of sound. A change of 3 dB(A) is generally considered to be the smallest change in environmental noise that is perceptible to the human ear. A 10 dB(A) change in noise represents a doubling or halving of the noise level. The difference between the minimum perceptible change and the doubling or halving of the noise level is split to provide greater definition to the assessment of changes in noise level.

It is considered that the ratings specified in the above table provide a good indication as to the likely significance of changes on noise levels in this case and have been used to assess the impact of operational noise.

*Commercial Properties*

A number of commercial / industrial properties are located in the vicinity of the site. In terms of noise emissions from the site it is considered that an appropriate noise criterion at these locations is 55 dB $L_{Aeq,15min}$. This criterion has been derived with consideration of BS 8233:2014 *Guidance on sound insulation and noise reduction for buildings* which recommends that for *Study and work requiring concentrations* in an *Executive office* a design range of 35 to 40 dB $L_{Aeq}$ is desirable internally. Arriving at an external noise level of 55 dB $L_{Aeq,15min}$ would ensure that this range of internal noise levels will be achieved.

*Recommended Criteria*

Following review of relevant guidance, the following noise criteria are proposed for the development:

*55dB $L_{Aeq,15min}$ (daytime)*
*50dB $L_{Aeq,15min}$ (evening)*
*45dB $L_{Aeq,15min}$ (night-time)*

Note plant noise emissions are to be designed and plant selected such that they are not tonal and do not have impulsive characteristics at the nearest noise sensitive locations.

### 10.2.6 Operational Phase – Vibration Guidance

*Criteria for Rating Vibration Impacts*

There are no vibration emissions associated with the operation of the proposed development. Consequently, there is no requirement to set operational vibration criteria.

### 10.2.7 Forecasting Methods

Construction noise calculations have been conducted generally in accordance with BS 5228: 2009+A1:2014: *Code of practice for noise control on construction and open sites - Noise.*

Prediction calculations for operational building services noise, car park activity and vehicle movements on site have been conducted generally in accordance with ISO 9613 (1996): *Acoustics – Attenuation of sound outdoors – Part 2: General method of calculation.*

Changes in road traffic noise on the local road network have been considered using prediction guidance contained within *Calculation of Road Traffic Noise (CRTN)* issued by the Department of Transport in 1988.

## 10.3 RECEIVING ENVIRONMENT

A review of noise surveys completed in the immediate area has been completed. Table 10.10 reviews the findings of these surveys.[3]

### 10.3.1 Survey & Review Locations

Figure 10.3 illustrates the noise sensitive locations in the vicinity of the proposed development site at which noise monitoring was undertaken as part of the assessment prepared for the permitted data centre.




***Figure 10.3*** Noise Sensitive Locations

*Location N1* Private residence on Vale Road (L747)

*Location N2* Monitoring point on Private road to Shelton Abbey

### 10.3.2 Comment on Noise Levels

Table 10.9 reviews the typical ambient and background noise levels at the monitoring locations discussed above.

[3] Source: Avoca River Park Proposed Data Centre Development – Environmental Impact Assessment Report – Volume 2: Main Report – Crag Digital Avoca Limited – Project number: PR-289532 – August 2020

***Table 10.9*** Review of Typical Noise Levels

| Location | Period | Start Time | Measured Noise Levels (dB re. $2x10^{-5}$ Pa) | | Comments |
|---|---|---|---|---|---|
| | | | $L_{Aeq}$ (Ambient) | $L_{AF90}$ (Background) | |
| N1 | Day | 16:25 | 72 | 51 | Busy traffic on R747 and continuous on M11, foliage noise and birdsong in lulls |
| | Evening | 22:07 | 66 | 39 | Local passing traffic and continuous noise from M11, factory noise audible with whine perceptible. Foliage noise in lulls |
| | Night | 23:00 | 62 | 37 | M11 traffic audible throughout, Whine from factory audible as per evening survey, vehicle reversing warning audible form factory site. |
| N2 | Day | 15:30 | 67 | 47 | Continuous road traffic noise form M11, occasional local passing traffic, birdsong in trees |
| | Evening | 21:18 | 55 | 48 | Continuous road traffic noise form M11, occasional local passing traffic, birdsong in trees |
| | Night | 23:44 | 66 | 41 | Continuous noise from M11, occasional local traffic, automatic gates ban each time a vehicle enters leaves Shelton Abbey |

Traffic noise from the M11 and other local roads in the study area dictated noise levels at the two locations during the survey periods in question. These typical noise levels were considered when discussing appropriate noise criteria in relation to the permitted data centre as discussed in Section 10.2.5. As noted above, the same criteria adopted for the cumulative noise levels associated with the permitted data centre and the proposed development under consideration here ensures robust criteria for the overall development.

## 10.4 CHARACTERISTICS OF THE DEVELOPMENT

A variety of items of plant will be in use for the purposes of site preparation, construction and site works. Construction activities will mostly be carried out during normal daytime working hours. Normal construction hours will be specified by planning conditions of a grant of permission for the proposed development, or by the local authority.

Once operational, there will be no significant off-site noise emissions from the operation of the cable installations or the 110 kV substation and associated cable bays.

These issues are discussed in detailed in the following sections.

## 10.5 POTENTIAL IMPACTS OF THE DEVELOPMENT

### 10.5.1 Construction Phase

Construction noise predictions have been carried out using guidance set out in British Standard *BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise*. Construction works associated with the works will be temporary in duration. Table 10.10 outlines typical plant items and associated noise levels that are anticipated for various phases of the construction programme. For the purposes of the assessment we have assumed that standard good practice measures for the control of noise from construction sites will be implemented. These issues are commented upon in further detail in the mitigation section of this report.

***Table 10.10*** Typical Noise Levels associated with Construction Plant Items (BS5228-1)

| Phase | Item of Plant (BS 5228-1 Ref.) | Construction Noise Level at 10m Distance (dB $L_{Aeq,1hr}$) |
|---|---|---|
| 1 – Site Preparation | Pneumatic Breaker (C5.6) | 95 |
| | Rock Breaker (C9.12) | 85 |
| | Wheeled Loader Lorry (C2 28) | 74 |
| | Tracked Semi-Mobile Crusher (C9.14) | 90 |
| | Track Excavator (C2 22) | 72 |
| | Dozer (C2.13) | 78 |
| | Dump Truck (C4.2) | 78 |
| 2 – Foundations | Large Rotary Bored Piling Rig – Cast In-Situ (C3.14) | 83 |
| | Tracked Excavator (C3.24) | 74 |
| | Concrete Pump (C3.25) | 78 |
| | Compressor (C3 19) | 75 |
| | Poker Vibrator (C4 33) | 78 |
| 3 – Steel Erection | Tower Crane (C4.48) | 76 |
| | Sarens SCG 120 Crane | 86 |
| | Articulated lorry (C11.10) | 77 |
| 4 – General Construction | Hand tools | 81 |
| | Pneumatic Circular Saw (D7.79) | 75 |
| | Internal fit – out | 70 |
| 5 - Landscaping | Dozer (C2.13) | 78 |
| | Dump Truck (C4.2) | 78 |
| | Surfacing (D8.25) | 68 |

A number of representative noise sensitive locations have been considered in relation to the proposed development as illustrated in Figure 10.4.

Table 10.11 presents the predicted daytime noise levels from an indicative construction period on site. Note construction noise sources are assumed to be running 66% of the time.

***Table 10.11*** Review of Potential Daytime Construction Noise Impact

| Location | Construction Phase (dB $L_{Aeq,1hr}$) | | | | |
|---|---|---|---|---|---|
| | Site Preparation | Foundations | Steel Erection | General Construction | Landscaping |
| R01 | 50 | 40 | 41 | 36 | 35 |
| R02 | 49 | 38 | 39 | 35 | 34 |
| R03 | 49 | 38 | 39 | 35 | 33 |
| R04 | 49 | 39 | 40 | 35 | 34 |
| R05 | 49 | 38 | 39 | 35 | 33 |
| R06 | 49 | 38 | 39 | 35 | 34 |
| R07 | 50 | 39 | 40 | 36 | 35 |
| R08 | 51 | 40 | 41 | 36 | 35 |
| R09 | 53 | 42 | 44 | 39 | 38 |
| R10 | 50 | 39 | 40 | 36 | 35 |

The predicted external construction noise levels are within the relevant noise criteria over the construction phase.

There is no item of plant that would be expected to give rise to noise levels that would be considered out of the ordinary or in exceedance of the levels outlined. The impact on the noise environment due to construction activities will be transient in nature and mitigation measures will be implemented to minimise the impact of construction activities on the noise environment.

It is anticipated that the construction of the facility will be completed during normal construction hours i.e. 07:00 to 18:00hrs Monday to Friday and 08:00 to 14:00hrs on Saturdays. However, it is possible that the contractor may wish to carry out certain operations outside these hours i.e. evening hours during long summer days etc. Such occurrences will be kept to a minimum and take place over a short timeframe and as such are unlikely to cause excessive disturbance. More stringent construction noise criteria (as per Table 10.6) will be applicable during any evening works that may be required.

### 10.5.2 Construction Traffic

In terms of the additional construction traffic on local roads that will be generated as a result of this development the following comment is presented. In order to increase traffic noise levels by 1 dB traffic volumes would need to increase by the order of 25% along the local road network. As outlined in the relevant sections of Chapter 13 relating to traffic, additional traffic introduced onto the local road network due to the construction phase of the proposed development will not result in a significant noise impact.

### 10.5.3 Review of Construction Impacts

In terms of noise associated with these construction activities the associated effect is stated to be:

| ***Quality*** | ***Significance*** | ***Duration*** |
|---|---|---|
| Negative | Minor | Temporary |

In terms of vibration, due to the distance of activities from the site to the nearest sensitive locations and controlling vibration levels to those detailed in 10.7 the associated effect is stated to be:

| ***Quality*** | ***Significance*** | ***Duration*** |
|---|---|---|
| Neutral | Imperceptible | Temporary |




***Figure 10.4*** Noise Sensitive Locations Considered for Assessment

### 10.5.4 Operational Phase

As part of this review the cumulative impact of the permitted data centre and the proposed substation/transformers have been assessed. The predicted noise levels associated with the datacentre have been obtained from the submitted EIAR associated with the development[4]. Two scenarios have been developed to consider the noise impact of the proposed operations. These are as follows:

- Scenario A – Proposed Development – Day to Day
- Scenario B – Proposed Development – Emergency

Scenario A would be considered to be the most representative of the day to day operation including the substation/transformers. Scenario B is representative of emergency situation when a power outage or issue with supply from the national grid has occurred. It should be noted that such an event is an extremely rare occurrence.

Figure 10.4 highlights the nearest noise sensitive locations at which predictions have been carried out. Various noise contours are also presented for scenarios A and B in order to demonstrate the noise impact of the proposed development over a wider area.

The following are considered the significant noise sources associated with the operation of the proposed development:

***Table 10.12*** $L_{wA}$ levels Utilised for proposed development

| Source | $L_{wA}$ - Octave Band Centre Frequency | | | | | | | | dB (A) |
|---|---|---|---|---|---|---|---|---|---|
| | 63 | 125 | 250 | 500 | 1k | 2k | 4k | 8k | |
| Generator Intake Note A | 88 | 90 | 82 | 83 | 83 | 80 | 78 | 76 | 94 |
| Generator Exhaust Note A | 88 | 90 | 82 | 83 | 83 | 80 | 78 | 76 | 94 |
| Generator Stack Note B | 84 | 77 | 77 | 73 | 69 | 74 | 71 | 71 | 86 |
| Transformers | 64 | 66 | 69 | 74 | 72 | 68 | 63 | 53 | 78 |

*Note A* Data based on CAT data supplied in relation to previous sites. Generator located internally.

*Note B* Additional attenuation due to stack and additional bends assumed.

*Note C* The following extract from *the "EirGrid Evidence Based Environmental Studies Study 8: Noise – Literature review and evidence-based field study on the noise effects of high voltage transmission development (May 2016)* states the following in relation to noise impacts associated with 110KvA transformer installations:

*"The survey on the 110kV substation at Dunfirth indicated that measured noise levels ($L_{Aeq}$) were less than 40dB(A) at 5m from each of the boundaries of the substation. This is below the WHO night-time free-field threshold limit of 42dB for preventing effects on sleep and well below the WHO daytime threshold limits for serious and moderate annoyance in outdoor living areas (i.e. 55dB and 50dB respectively). Spectral analysis of the data recorded at this site demonstrated that there were no distinct tonal elements to the recorded noise level. To avoid any noise impacts from 110kV substations at sensitive receptors, it is recommended that a minimum distance of 5m is maintained between 110kV substations and the land boundary of any noise sensitive property."*

[4] Avoca River Park Proposed Data Centre Development – Environmental Impact Assessment Report – Volume 2: Main Report – Crag Digital Avoca Limited – Project number: PR-289532 – August 2020. The levels reported in Table 10.8 have been corrected considering the mitigation outlined in Section 10.5.2. These levels have been assumed for the datacentre operations.

Assuming the proposed substation installation has comparable noise emissions to the 110kV unit discussed above and considering the distance between the 110kV substation and the nearest off site locations (i.e. >250m) noise from this installation is not predicted to be an issue off site.

Considering the above, it is concluded that there will be no significant noise emissions from the operation of the cable installations or substation. Consequently, there is no requirement to assess any operational noise emissions.

The results of the noise calculations are presented in Table 10.13. Note all plant will be selected such that no tonal noise emissions are evident at noise sensitive locations.

***Table 10.13*** Predicted Plant Noise Levels for Various Scenarios

| Location | Predicted dB $L_{Aeq,T}$ | | | | | |
|---|---|---|---|---|---|---|
| | Scenario A | | | Scenario B | | |
| | Proposed Development | Permitted Development | Cumulative | Proposed Development | Permitted Development | Cumulative |
| R01 | 19 | 45 | 45 | 32 | 55 | 55 |
| R02 | 18 | 42 | 42 | 31 | 51 | 51 |
| R03 | 18 | 41 | 41 | 31 | 52 | 52 |
| R04 | 18 | 41 | 41 | 31 | 52 | 52 |
| R05 | 18 | 41 | 41 | 31 | 50 | 50 |
| R06 | 18 | 41 | 41 | 31 | 50 | 50 |
| R07 | 19 | 39 | 39 | 32 | 48 | 48 |
| R08 | 19 | 40 | 40 | 33 | 50 | 50 |
| R09 | 21 | 43 | 43 | 35 | 53 | 53 |
| R10 | 19 | 45 | 45 | 32 | 55 | 55 |

The above predicted levels are based on a situation where the receiver is downwind of all noise sources. For the purposes of the assessment against the adopted criteria this is a robust worst-case assumption. Review of Table 10.13 confirms that noise associated with the operation of the proposed development does not have a material effect on the predicted noise levels associated with the permitted data centre.

*Comment on Adopted Noise Criteria Day to Day Operations*

The predicted noise levels presented in Table 10.13 have been compared to the relevant daytime, evening and night noise criteria as adopted for this assessment.

***Table 10.14*** Comparison of Predicted Noise Levels vs. Adopted Noise Criteria

| Location | Scenario A | | | Scenario B | | |
|---|---|---|---|---|---|---|
| | Predicted dB $L_{Aeq,T}$ | Criterion dB $L_{Aeq,T}$ | Complies? | Predicted dB $L_{Aeq,T}$ | Criterion dB $L_{Aeq,T}$ | Complies? |
| R01 | 45 | 55 (Day) | ✓ | 55 | 55 | ✓ |
| | | 50 (Evening) | ✓ | | | |
| | | 45 (Night) | ✓ | | | |
| R02 | 42 | 55 (Day) | ✓ | 51 | | ✓ |
| | | 50 (Evening) | ✓ | | | |
| | | 45 (Night) | ✓ | | | |
| R03 | 41 | 55 (Day) | ✓ | 52 | | ✓ |
| | | 50 (Evening) | ✓ | | | |
| | | 45 (Night) | ✓ | | | |
| R04 | 41 | 55 (Day) | ✓ | 52 | | ✓ |
| | | 50 (Evening) | ✓ | | | |
| | | 45 (Night) | ✓ | | | |
| R05 | 41 | 55 (Day) | ✓ | 50 | | ✓ |
| | | 50 (Evening) | ✓ | | | |
| | | 45 (Night) | ✓ | | | |
| R06 | 41 | 55 (Day) | ✓ | 50 | | ✓ |
| | | 50 (Evening) | ✓ | | | |
| | | 45 (Night) | ✓ | | | |
| R07 | 39 | 55 (Day) | ✓ | 48 | | ✓ |
| | | 50 (Evening) | ✓ | | | |
| | | 45 (Night) | ✓ | | | |
| R08 | 40 | 55 (Day) | ✓ | 50 | | ✓ |
| | | 50 (Evening) | ✓ | | | |
| | | 45 (Night) | ✓ | | | |
| R09 | 43 | 55 (Day) | ✓ | 53 | | ✓ |
| | | 50 (Evening) | ✓ | | | |
| | | 45 (Night) | ✓ | | | |
| R10 | 45 | 55 (Day) | ✓ | 55 | | ✓ |
| | | 50 (Evening) | ✓ | | | |
| | | 45 (Night) | ✓ | | | |

Scenario A All locations are within the relevant adopted daytime, evening and night-time limits.

Scenario B All locations are within the relevant adopted emergency operation limit in the rare event that a power loss to the site occurs.

*Summary*

Scenario A is representative of the typical day to day operations envisioned for the site. Review of the predicted noise levels confirms that the site-specific levels comply with the noise criterion adopted for this assessment.

Scenario B is representative of emergency situations such as a power outage on the national grid. Review of the predicted noise levels confirm that the site-specific levels comply with the noise criterion that has been adopted for these situations following review of relevant guidance.

*Review of Increases in Noise Level*

Table 10.15 presents the predicted changes in noise level associated with the proposed development at the nearest noise sensitive locations to the site.

***Table 10.15*** Review of Predicted Changes in Existing Noise Levels

| Loc. | Scenario A – Typical Operation – Night | | | | |
|---|---|---|---|---|---|
| | Predicted dB $L_{Aeq,T}$ | Background Level dB $L_{A90,T}$ | Cumulative Noise Level (dB(A)) | Change in Noise Level (dB) | EPA Glossary of Impacts |
| R01 | 19 | 41 Note A | 41 | 0 | Imperceptible |
| R02 | 18 | 41 Note A | 41 | 0 | Imperceptible |
| R03 | 18 | 41 Note A | 41 | 0 | Imperceptible |
| R04 | 18 | 41 Note A | 41 | 0 | Imperceptible |
| R05 | 18 | 41 Note A | 41 | 0 | Imperceptible |
| R06 | 18 | 41 Note A | 41 | 0 | Imperceptible |
| R07 | 19 | 41 Note A | 41 | 0 | Imperceptible |
| R08 | 19 | 37 Note B | 37 | 0 | Imperceptible |
| R09 | 21 | 37 Note B | 37 | 0 | Imperceptible |
| R10 | 19 | 37 Note B | 37 | 0 | Imperceptible |

*Note A* Night time background level at Location N2 assumed.
*Note B* Night time background level at Location N1 assumed.

Review of the predicted increases in noise level at the nearest noise sensitive locations conclude that the associated impact is '*imperceptible'* at all locations for Scenario A – Typical Operation night-time periods.

In terms of noise associated with day to day activities the associated effect is stated to be as follows:

| *Quality* | *Significance* | *Duration* |
|---|---|---|
| *Negative* | *Not Significant* | *Long Term* |

*Additional Vehicular Traffic on Public Roads*

In terms of the additional traffic on local roads that will be generated as a result of this development the following comment is presented: Considering that in order to increase traffic noise levels by 1dB traffic volumes would need to increase by the order of 25% it is considered that additional traffic introduced onto the local road network due to this development will not result in a significant noise impact. The resultant noise impact is ***neutral, imperceptible*** and ***long-term***.

*Vibration*

There is no source of vibration associated with the day to day operation of the development that will give rise to impacts at nearby sensitive locations. In terms of these the operational phase of the development the associated effect is stated to be:

| *Quality* | *Significance* | *Duration* |
|---|---|---|
| *Neutral* | *Imperceptible* | *Long Term* |

## 10.6 REMEDIAL AND MITIGATION MEASURES

In order to sufficiently ameliorate the likely noise impact, a schedule of noise control measures has been formulated for both construction and operational phases associated with the proposed development.

### 10.6.1 Construction Phase

With regard to construction activities, reference has been made to BS5228 Parts 1 and 2, which offer detailed guidance on the control of noise and vibration from demolition and construction activities. Various mitigation measures will be considered and applied during the construction of the proposed development. As an example, the following measures will be implemented on site:

- limiting the hours during which site activities likely to create high levels of noise or vibration are permitted;
- establishing channels of communication between the contractor/developer, Local Authority and residents;
- appointing a site representative responsible for matters relating to noise and vibration;
- monitoring levels of noise and/or vibration during critical periods and at critical sensitive locations; and
- all site access roads will be kept even so as to mitigate the potential for vibration from lorries.

Furthermore, a variety of practicable noise control measures will be employed, such as:

- selection of plant with low inherent potential for generation of noise and/ or vibration;
- erection of barriers as necessary around items such as generators or high duty compressors;
- situate any noisy plant as far away from sensitive properties as permitted by site constraints and the use of vibration isolated support structures where necessary.

It is recommended that vibration from construction activities to off-site residences be limited to the values set out in Table 10.7. It should be noted that these limits are not absolute but provide guidance as to magnitudes of vibration that are very unlikely to cause cosmetic damage. Magnitudes of vibration slightly greater than those in the table are normally unlikely to cause cosmetic damage, but construction work creating such magnitudes should proceed with caution. Where there is existing damage these limits may need to be reduced by up to 50%.

Note Appendix 10.2 presents an indicative construction noise and vibration management plan that will be implemented in terms of the day to day operation of the site. This will focus on opening up and maintaining lines of communication with the local community to address issues in relation to noise and/or vibration and to advise the community of periods where specific activities take place (e.g. rock breaking) that have an increased potential in giving rise to issues off site (Note: no rock breaking is anticipated as part of the proposed development).

### 10.6.2 Operational Phase

*Building Services Noise / Emergency Site Operation*

Once operational, there are no noise or vibration mitigation measures required.

With due consideration as part of the detailed design process, this approach will result in the site operating well within the constraints of the best practice guidance noise limits that have been adopted as part of this detailed assessment.

*Additional Vehicular Traffic on Public Roads*

The noise impact assessment outlined previously has demonstrated that mitigation measures are not required.

## 10.7 PREDICTED IMPACTS OF THE DEVELOPMENT

This section summarises the likely noise and vibration impact associated with the proposed development, taking into account the mitigation measures.

### 10.7.1 Construction Phase

During the construction phase of the proposed development there will be some impact on nearby noise sensitive properties due to noise emissions from site traffic and other activities. The application of noise limits and hours of operation (i.e. as per Table 10.5, 10.6 and Section 10.2.4), along with implementation of appropriate noise and vibration control measures (as summarised in Section 10.6.1), will ensure that noise and vibration impact is kept to a minimum. Also, it is reiterated that any construction noise impacts will be ***slight, negative*** and ***temporary*** in nature. Also, it is considered that as the proposed development progresses from initial ground works that construction noise impacts will reduce from slight to ***not significant.***

### 10.7.2 Operational Phase

*Building Services Noise / Emergency Site Operation*

Proprietary noise and vibration control measures will be employed in order to ensure that noise emissions from building services plant do not exceed the adopted criterion at the façade of any nearby noise sensitive locations. In addition, noise emissions should be broadband in nature and should not contain any tonal or impulsive elements. The resultant noise impact is ***negative***, ***not significant*** and ***long-term***.

*Additional Vehicular Traffic on Public Roads*

Any change in noise levels associated with vehicles at road junctions in the vicinity of the proposed development is expected to be ***imperceptible*.** The resultant noise impact is ***neutral, imperceptible*** and ***long-term.***

### 10.7.3 Cumulative Impact

During construction of the proposed development it is anticipated that noise and vibration associated with construction work will typically be lower than those generated by existing traffic movements on the local road network that are in closer proximity to the nearest noise sensitive locations. The noise environments at the nearest noise sensitive locations to the proposed works are and will continue to be dominated by road traffic noise.

Construction being completed on the permitted datacentre on the site and associated with ESB works on construction of new overhead lines/towers that will serve the proposed development, whilst potentially significant at locations in close proximity will effectively be masked by the existing traffic noise at the nearest noise sensitive locations identified in this assessment. This is primarily due to the distance between the various construction works and noise sensitive locations (i.e. at least 500m distant). Such works would not be expected to increase ambient noise levels in the vicinity of the noise sensitive locations that are in the proximity of the works under consideration here. All sites will be expected to work within conditioned and/or best practice noise and vibration limits such that the associated noise and vibration impacts are controlled. Based on this, it is reiterated that any construction noise impacts will be ***slight, negative*** and ***temporary*** in nature.

Once the mitigation measures outlined above are implemented there should be no significant cumulative impact as a result of the proposed development.

The cumulative noise impacts of the proposed development and the permitted data centre have been outlined in the assessment presented here. The resultant noise impact is ***negative***, ***not significant*** and ***long-term***.

There are no operational vibration impacts associated with the proposed development or the permitted data centre, hence cumulative impacts do not arise in this instance.

## 10.8 RESIDUAL IMPACTS

The construction noise assessment has shown that in accordance with the 'significance' thresholds presented in the *British Standard BS 5228 – 1: 2009+A1:2014: Code of practice for noise and vibration control on construction and open sites – Noise* there is not a significant impact at residential locations, subject to the implementation of the mitigation measures outlined in Section 10.6.1.

The robust analysis of potential operational phase plant has shown that in accordance with the scale in the EPA Draft EIA Report Guidelines 2017 there will be a ***not significant, negative, long term*** impact at the closest residences identified on Figure 10.4. The predicted change in background noise level due to current application is the order of 1dB during night-time periods. Ambient noise levels are, and will continue to be, dictated by road traffic noise in the area while a low level of plant noise is expected to be audible during lulls in other sources (e.g. distant traffic noise).

In terms of the nearest commercial properties ***not significant, negative, long-term*** impacts are predicted as the character of the noise environment in the vicinity of this location will not be altered.

The operational noise assessment of vehicle movements associated with the site has shown that in accordance with the scale in the EPA Draft EIA Report Guidelines 2017 there will be an ***imperceptible, neutral, long-term*** impact at off-site noise sensitive locations considering existing traffic volumes on the local road network.

The cumulative impact assessment is addressed Chapter 16 of this EIA Report.

## 10.9 INTERACTIONS

Interactions are addressed in Chapter 16 of this EIA Report.

## 10.10 REFERENCES


- EPA Draft Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIA Reports) (2017) and draft revised Guidelines on information to be contained in Environmental Impact Statements; and Advice Notes for preparing EIS (2015).
- '*Guidelines for Environmental Noise Impact Assessment*' produced by the Institute of Environmental Management and Assessment (IEMA) (2014).
- *British Standard BS 5228 – 1: 2009+A1:2014: Code of practice for noise and vibration control on construction and open sites – Noise*.
- Transport Infrastructure Ireland (TII) publication *Guidelines for the Treatment of Noise and Vibration in National Road Schemes.*
- British Standard BS 7385: 1993: *Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration*.
- British Standard BS 5228-2: 2009+A1:2014: *Code of practice for noise and vibration control on construction and open sites – Vibration*.
- British Standard BS 4142:2014+A1:2019: *Methods for rating and assessing industrial and commercial sound.*
- BS 8233:2014: *Guidance on sound insulation and noise reduction for buildings.*
- Environmental Protection Agencies *Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4)* (January 2016).
- ISO 1996-2:2017 *Acoustics - Description, measurement and assessment of environmental noise – Part 2: Determination of environmental noise levels.*
- British Standard *BS 6472 (1992): Guide to Evaluation of human exposure to vibration in buildings (1Hz to 80Hz).*
- ISO 9613 (1996): *Acoustics – Attenuation of sound outdoors – Part 2: General method of calculation.*
- *Calculation of Road Traffic Noise (CRTN)* issued by the Department of Transport in 1988.

# APPENDIX 10.1

# GLOSSARY OF ACOUSTIC TERMINOLOGY

# PREPARED BY AWN CONSULTING LIMITED

| | |
|---|---|
| **ambient noise** | The totally encompassing sound in a given situation at a given time, usually composed of sound from many sources, near and far. |
| **background noise** | The steady existing noise level present without contribution from any intermittent sources. The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90 per cent of a given time interval, T ($L_{AF90,T}$). |
| **broadband** | Sounds that contain energy distributed across a wide range of frequencies. |
| **dB** | Decibel - The scale in which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the RMS pressure of the sound field and the reference pressure of 20 micro-pascals (20 μPa). |
| **dB $L_{pA}$** | An 'A-weighted decibel' - a measure of the overall noise level of sound across the audible frequency range (20 Hz – 20 kHz) with A-frequency weighting (i.e. 'A'-weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies. |
| **Hertz (Hz)** | The unit of sound frequency in cycles per second. |
| **impulsive noise** | A noise that is of short duration (typically less than one second), the sound pressure level of which is significantly higher than the background. |
| **$L_{Aeq,T}$** | This is the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period (T). The closer the $L_{Aeq}$ value is to either the $L_{AF10}$ or $L_{AF90}$ value indicates the relative impact of the intermittent sources and their contribution. The relative spread between the values determines the impact of intermittent sources such as traffic on the background. |
| **$L_{AFN}$** | The A-weighted noise level exceeded for N% of the sampling interval. Measured using the "Fast" time weighting. |
| **$L_{AFmax}$** | is the instantaneous slow time weighted maximum sound level measured during the sample period (usually referred to in relation to construction noise levels). |
| **$L_{Ar,T}$** | The Rated Noise Level, equal to the $L_{Aeq}$ during a specified time interval (T), plus specified adjustments for tonal character and impulsiveness of the sound. |
| **$L_{AF90}$** | Refers to those A-weighted noise levels in the lower 90 percentile of the sampling interval; it is the level which is exceeded for 90% of the measurement period. It will therefore exclude the intermittent features of traffic and is used to estimate a background level. Measured using the "Fast" time weighting. |
| **$L_{AT}$(DW)** | equivalent continuous downwind sound pressure level. |

**$L_{fT}$(DW)** equivalent continuous downwind octave-band sound pressure level.

**$L_{day}$** $L_{day}$ is the average noise level during the daytime period of 07:00hrs to 19:00hrs

**$L_{night}$** $L_{night}$ is the average noise level during the night-time period of 23:00hrs to 07:00hrs.

**low frequency noise** LFN - noise which is dominated by frequency components towards the lower end of the frequency spectrum.

**noise** Any sound, that has the potential to cause disturbance, discomfort or psychological stress to a person exposed to it, or any sound that could cause actual physiological harm to a person exposed to it, or physical damage to any structure exposed to it, is known as noise.

**noise sensitive location** NSL – Any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or other area of high amenity which for its proper enjoyment requires the absence of noise at nuisance levels.

**octave band** A frequency interval, the upper limit of which is twice that of the lower limit. For example, the 1,000Hz octave band contains acoustical energy between 707Hz and 1,414Hz. The centre frequencies used for the designation of octave bands are defined in ISO and ANSI standards.

**rating level** See $L_{Ar,T}$.

**sound power level** The logarithmic measure of sound power in comparison to a referenced sound intensity level of one picowatt (1pW) per $m^2$ where:

$$Lw = 10Log\frac{P}{P_0} \text{ dB}$$

Where: p is the rms value of sound power in pascals; and
$P_0$ is 1 pW.

**sound pressure level** The sound pressure level at a point is defined as:

$$Lp = 20Log\frac{P}{P_0} \text{ dB}$$

**specific noise level** A component of the ambient noise which can be specifically identified by acoustical means and may be associated with a specific source. In BS 4142, there is a more precise definition as follows: ‘the equivalent continuous A-weighted sound pressure level at the assessment position produced by the specific noise source over a given reference time interval ($L_{Aeq, T}$)’.

| | |
|---|---|
| **tonal** | Sounds which cover a range of only a few Hz which contains a clearly audible tone i.e. distinguishable, discrete or continuous noise (whine, hiss, screech, or hum etc.) are referred to as being 'tonal'. |
| **$^1/_3$ octave analysis** | Frequency analysis of sound such that the frequency spectrum is subdivided into bands of one-third of an octave each. |

# APPENDIX 10.2

# INDICATIVE CONSTRUCTION NOISE & VIBRATION MANAGEMENT PLAN

# PREPARED BY AWN CONSULTING LIMITED

This Noise and Vibration Management Plan (NVMP) details a *'Best Practice'* approach to dealing with potential noise and vibration emissions during the construction phase of the development. The Plan should be adopted by all contractors and sub-contractors involved in construction activities on the site. The Site Manager should ensure that adequate instruction is provided to contractors regarding the noise and vibration control measures contained within this document.

The environmental impact assessment (EIA) Report conducted for the construction activity has highlighted that the construction noise and vibration levels can be controlled to within the adopted criteria. However, mitigation measures should be implemented, where necessary, in order to control impacts to nearby sensitive areas within acceptable levels.

Nearby sensitive properties in the vicinity of the proposed development are summarised in Figure 10.2.1 below:

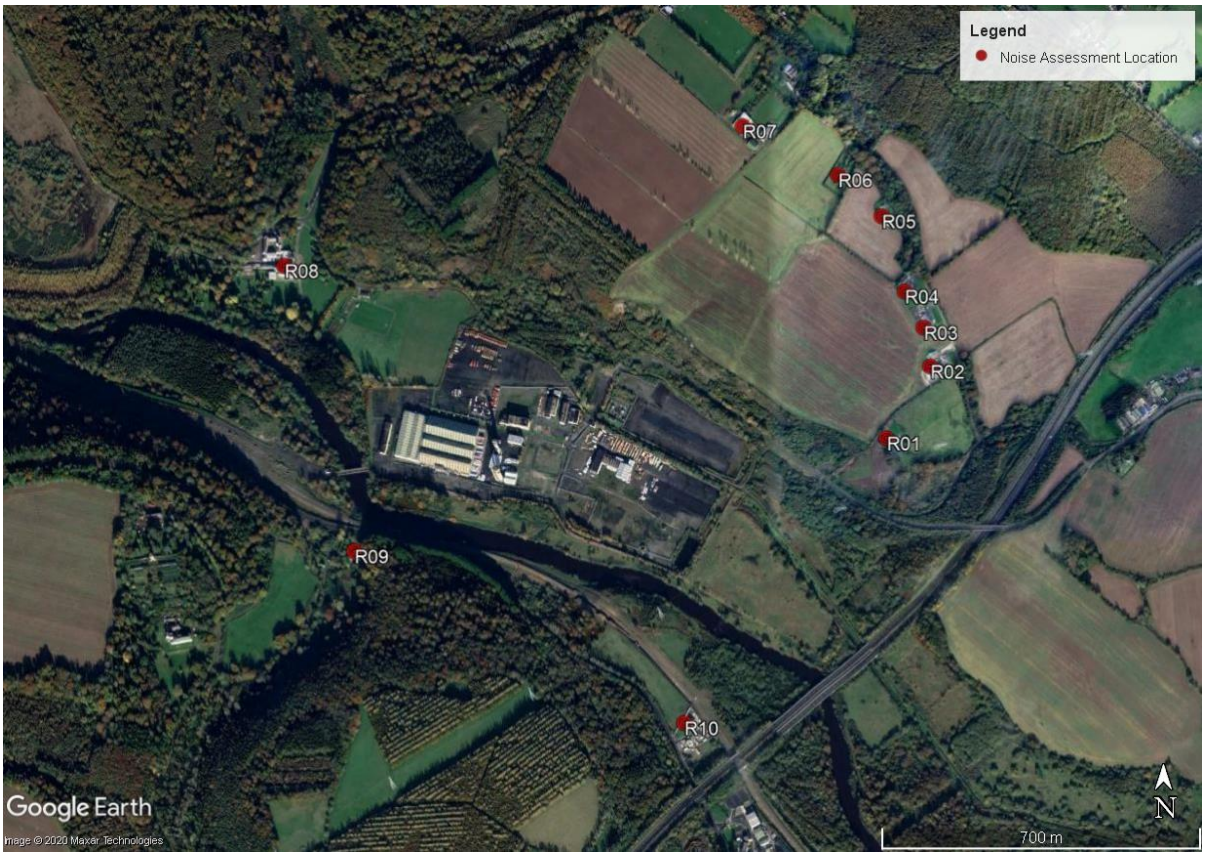



***Figure 10.2.1*** Sensitive Receptors

## Construction Noise Criteria

As referenced in the EIA Report prepared for the proposed development, appropriate criteria relating to permissible construction noise levels for a development of this scale may be found in the Transport Infrastructure Ireland (TII) publication *Guidelines for the Treatment of Noise and Vibration in National Road Schemes*[5] which indicates the following criteria and hours of operation.

[5] *Guidelines for the Treatment of Noise and Vibration in National Road Schemes, Revision 1, 25 October 2004*, Transport Infrastructure Ireland

***Table 10.2.1*** Construction Noise Limit Values

| Days and Times | Noise Levels (dB re. 2x10-5 Pa) | |
|---|---|---|
| | $L_{Aeq(1hr)}$ | $L_{Amax}$ |
| Monday to Friday 07:00hrs to 19:00hrs | 70 | 80 |
| Monday to Friday 19:00 to 22:00hrs | 60* | 65* |
| Saturdays 08:00hrs to 13:00hrs | 65 | 75 |

Note * Construction activity at these times, other than that required for emergency works, will normally require the explicit permission of the relevant local authority.

Construction Vibration Criteria

It is recommended in this EIA Report that vibration from construction activities to off-site residences be limited to the values set out in Table 10.2.2. It should be noted that these limits are not absolute, but provide guidance as to magnitudes of vibration that are very unlikely to cause cosmetic damage. Magnitudes of vibration slightly greater than those in the table are normally unlikely to cause cosmetic damage, but construction work creating such magnitudes should proceed with caution. Where there is existing damage these limits may need to be reduced by up to 50%.

***Table 10.2.2*** Construction Vibration Limit Values

| Allowable vibration (in terms of peak particle velocity) at the closest part of sensitive property to the source of vibration, at a frequency of | | |
|---|---|---|
| Less than 10Hz | 10 to 50Hz | 50 to 100Hz (and above) |
| 8 mm/s | 12.5 mm/s | 20 mm/s |

Hours of Work

The proposed general construction hours are 07:00 to 18:00hrs, Monday to Friday and 08:00 to 14:00 on Saturdays. However, weekday evening works may also be required from time to time.

Weekday evening activities should be significantly reduced and generally only involve internal activities and concrete pouring which will be required during certain phases of the development. As a result, noise emissions from evening activities are expected to be significantly lower than for other general daytime activities.

Best Practice Guidelines for the Control of Noise & Vibration

BS5228 includes guidance on several aspects of construction site mitigation measures, including, but not limited to:

- selection of quiet plant;
- control of noise sources;
- screening;
- hours of work;
- liaison with the public, and;
- monitoring.

Detailed comment is offered on these items in the following paragraphs. Noise and vibration control measures that will be considered include the selection of suitable plant, enclosures and screens around noise sources, limiting the hours of work and monitoring.

*Selection of Quiet Plant*

This practice is recommended in relation to sites with static plant such as compressors and generators. It is recommended that these units be supplied with manufacturers' proprietary acoustic enclosures where possible. The potential for any item of plant to generate noise will be assessed prior to the item being brought onto the site. The least noisy item should be selected wherever possible. Should a particular item of plant already on the site be found to generate high noise levels, the first action should be to identify whether or not said item can be replaced with a quieter alternative.

*General Comments on Noise Control at Source*

If replacing a noisy item of plant is not a viable or practical option, consideration should be given to noise control "at source". This refers to the modification of an item of plant or the application of improved sound reduction methods in consultation with the supplier. For example, resonance effects in panel work or cover plates can be reduced through stiffening or application of damping compounds; rattling and grinding noises can often be controlled by fixing resilient materials in between the surfaces in contact.

BS5228 states that *"as far as reasonably practicable sources of significant noise should be enclosed"*. In applying this guidance, constraints such as mobility, ventilation, access and safety must be taken into account. Items suitable for enclosure include pumps and generators. Demountable enclosures will also be used to screen operatives using hand tools and will be moved around site as necessary.

In practice, a balance may need to be struck between the use of all available techniques and the resulting costs of doing so. As with Ireland's Environmental Protection Act legislation, we propose that the concept of *"best available techniques not entailing excessive cost"* (BATNEEC) be adopted. Furthermore, proposed noise control techniques should be evaluated in light of their potential effect on occupational safety etc.

BS5228 makes a number of recommendations in relation to "use and siting of equipment". These are all directly relevant and hence are reproduced in full. These recommendations will be adopted on site.

> *"Plant should always be used in accordance with manufacturers' instructions. Care should be taken to site equipment away from noise-sensitive areas. Where possible, loading and unloading should also be carried out away from such areas. Special care will be necessary when work has to be carried out at night.*
>
> *Circumstances can arise when night-time working is unavoidable. Bearing in mind the special constraints under which such work has to be carried out, steps should be taken to minimise disturbance to occupants of nearby premises.*
>
> *Machines such as cranes that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum. Machines should not be left running unnecessarily, as this can be noisy and waste energy.*
>
> *Plant known to emit noise strongly in one direction should, when possible, be orientated so that the noise is directed away from noise-sensitive areas. Attendant operators of the plant can also benefit from this acoustical phenomenon by sheltering, when possible, in the area with reduced noise levels.*
>
> *Acoustic covers to engines should be kept closed when the engines are in use and idling. The use of compressors that have effective acoustic enclosures and are designed to operate when their access panels are closed is recommended.*

*Materials should be lowered whenever practicable and should not be dropped. The surfaces on to which the materials are being moved could be covered by resilient material."*

All items of plant should be subject to regular maintenance. Such maintenance can prevent unnecessary increases in plant noise and can serve to prolong the effectiveness of noise control measures.

*Screening*

Typically, screening is an effective method of reducing the noise level at a receiver location and can be used successfully as an additional measure to all other forms of noise control. The effectiveness of a noise screen will depend on the height and length of the screen and its position relative to both the source and receiver.

The length of the screen should in practice be at least five times the height, however, if shorter sections are necessary then the ends of the screen should be bent around the source. The height of any screen should be such that there is no direct line of sight between the source and the receiver.

BS5228 states that on level sites the screen should be placed as close as possible to either the source or the receiver. The construction of the barrier should be such that there are no gaps or openings at joints in the screen material. In most practical situations the effectiveness of the screen is limited by the sound transmission over the top of the barrier rather than the transmission through the barrier itself. In practice screens constructed of materials with a mass per unit of surface area greater than 7 kg/m$^2$ will give adequate sound insulation performance.

In addition, careful planning of the site layout should also be considered. The placement of site buildings such as offices and stores and in some instances, materials such as topsoil or aggregate can provide a degree of noise screening if placed between the source and the receiver.

*Vibration*

The vibration from construction activities will be limited to the values set out in Table 2. It should be noted that these limits are not absolute but provide guidance as to magnitudes of vibration that are very unlikely to cause cosmetic damage. Magnitudes of vibration slightly greater than those in the table are normally unlikely to cause cosmetic damage, but construction work creating such magnitudes should proceed with caution. Where there is existing damage, these limits may need to be reduced by up to 50%.

*Liaison with the Public*

The Contractor will provide proactive community relations and will notify the public and sensitive premises before the commencement of any works forecast to generate appreciable levels of noise or vibration, explaining the nature and duration of the works. The Contractor will distribute information circulars informing people of the progress of works and any likely periods of significant noise and vibration.

A designated noise liaison should be appointed to site during construction works. Any complaints should be logged and followed up in a prompt fashion. In addition, prior to particularly noisy construction activity, e.g. rock breaking, piling, etc., the site contact should inform the nearest noise sensitive locations of the time and expected duration of the works.

*Noise Monitoring*

During the construction phase consideration should be given to noise monitoring at the nearest sensitive locations.

Noise monitoring should be conducted in accordance with the International Standard ISO 1996: 2017: *Acoustics – Description, measurement and assessment of environmental noise* and be located a distance of greater than 3.5m away from any reflective surfaces, e.g. walls, in order to ensure a free-field measurement without any influence from reflected noise sources.

*Vibration Monitoring*

During the construction phase consideration should be given to vibration monitoring at the nearest sensitive locations.

Vibration monitoring should be conducted in accordance with BS7385-1 (1990) *Evaluation and measurement for vibration in buildings — Part 1: Guide for measurement of vibrations and evaluation of their effects on buildings* or BS6841 (1987) *Guide to measurement and evaluation of human exposure to whole-body mechanical vibration and repeated shock*.

The mounting of the transducer to the vibrating structure should comply with BS ISO 5348:1998 *Mechanical vibration and shock – Mechanical mounting of accelerometers*. In summary, the following ideal mounting conditions apply:

- the transducer and its mountings are as rigid as possible;
- the mounting surfaces should be as clean and flat as possible;
- simple symmetric mountings are best, and;
- the mass of the mounting should be small in comparison to that of the structure under test.

In general, the transducer will be fixed to the floor of a building or concrete base on the ground using expansion bolts. In instances where the vibration monitor will be placed outside of a building a flat and level concrete base with dimensions of approximately 1 m x 1 m x 0.1 m will be required.

# 11.0 LANDSCAPE AND VISUAL

## 11.1 INTRODUCTION

This chapter of the EIA Report has been prepared by Brady Shipman Martin on behalf of Crag Digital Avoca Ltd and provides an assessment of the landscape and visual impacts of the proposed Pollahoney 110 kV GIS substation along with associated and ancillary works (hereafter the 'proposed development').

The proposed development comprises two distinct but related parts, including:

- A two storey 110kV GIS substation building within a compound enclosed by a 2.6m high security fence;
- 4 No. transformers; 18m high lighting protection masts; and a single storey client control building enclosed within an adjoining compound enclosed by a 2.6m high security fence; and,
- Associated site development works including access paths and roads, parking, landscaping, a 1.4m high property fence and ancillary works.

The detailed description of the proposed development is provided in Chapter 2 of this EIAR and the accompanying design drawings.

The following aspects are particularly relevant to the landscape and visual assessment:

- Design:
  - Form and massing of the proposed development;
  - Façade on all above ground structures; and
  - Cognisance of how design elements impact on Views of the proposed development and any effects on the receiving environment, including landscape character.
- Operation:
  - Views of the proposed development and any effects on the receiving environment, including landscape character.
- Construction:
  - Views of the proposed development and any effects on the receiving environment, including landscape character; and
  - Loss or change of existing features that contribute to the receiving environment.

## 11.2 METHODOLOGY

### 11.2.1 Relevant Legislation, Policy and Guidelines

The assessment has been carried out with reference to the following legalisation, policy and guidelines:

Legislation

- Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment;

- Planning and Development Act 2000, as amended;
- Planning and Development Regulations 2001, as amended; and
- European Landscape Convention 2000.

Policy

- Wicklow County Development Plan 2016-2022;
- Arklow Local Area Plan 2018-2024

Guidelines

- Environmental Protection Agency (EPA, 2017). Guidelines on the Information to be contained in Environmental Impact Assessment Reports. Draft;
- Environmental Protection Agency (EPA, 2015). Advice Notes for preparing Environmental Impact Statements. Draft;
- Landscape Institute and the Institute of Environmental Management and Assessment (LI/IEMA, 2013) Guidelines for Landscape and Visual Impact Assessment, 3rd edition, (GLVIA);
- Landscape Institute (LI, 2018) Technical Information Note 05/2017 (Revised 2018) on Townscape Character Assessment; (TCA)
- Department of Housing, Planning and Local Government (DHPLG, 2018) Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (GEIA).
- Landscape Institute (LI, 2019) Technical Guidance Note 06/2019 on Visual Representation of Development Proposals, (VPDP).

### 11.2.2 Site and Context Appraisal

The assessment of landscape and visual impacts has had regard to the Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports prepared by the Environmental Protection Agency (2017) and to the EIA Directive 2011/92/EU (as amended by Directive 2014/52/EU) on the assessment of the effects of certain public and private projects on the environment.

Assessment of landscape effects and visual effects are two separate but closely related aspects, where:

- Landscape effects relate to the effects of a proposed development on the physical characteristics of the landscape and its resulting character and quality; and
- Visual effects relate to the effects on views experienced by visual receptors (e.g. residents, footpath users, tourists etc.) and on the visual amenity experienced by those people.

Assessment of potential landscape and visual effects is a two-stage process that involves:

- classifying the sensitivity of the receiving environment, and
- describing and classifying the magnitude of change in the environment resulting from the proposed development.

These factors are combined to provide a classification of significance of effects for the impact assessment.

### 11.2.3 Landscape Effects

Landscape effects describe the impact on the fabric or structure of a landscape or landscape character. The assessment of landscape effects firstly requires the identification of the components of the landscape.

The landscape components are also described as landscape receptors and comprise the following:

- Individual landscape elements or features;
- Specific aesthetic or perceptual aspects; and
- Landscape character, or the distinct, recognisable and consistent pattern of elements (natural and manmade) in the landscape that makes one landscape different from another.

The assessment will identify the interaction between these components and the proposed development during construction and operation. The condition of the landscape and any trends of change and relevant policy framework will also be taken into account.

#### Sensitivity of Landscape Receptors

The sensitivity of a landscape receptor is determined by employing professional judgment to consider and assess the identified value of the landscape and its susceptibility to the type of change or development proposed.

***Table 11.1*** Landscape Sensitivity

| Sensitivity | Susceptibility | Value |
|---|---|---|
| Very High | Exceptional landscape quality, no or limited potential for substitution. Key elements/features well known to the wider public. The landscape receptor is of very high susceptibility to the Project and has little or no tolerance to change. | Nationally/internationally designated/valued landscape, or key elements or features of national/internationally designated landscapes. |
| High | Strong/distinctive landscape character; absence of landscape detractors. The landscape receptor is of high susceptibility to the Project and has low tolerance to change. | Regionally/nationally designated/valued countryside and landscape features or landscapes judged to be of equivalent value using clearly stated and recognised criteria. |
| Medium | Some distinctive landscape characteristics; few landscape detractors. The landscape receptor is of medium susceptibility to the Project and has medium tolerance to change. | Locally or regionally designated/valued countryside and landscape features or landscapes judged to be of equivalent value using clearly stated and recognised criteria |
| Low | Absence of distinctive landscape characteristics; presence of landscape detractors. The landscape receptor is of low susceptibility to the Project and has high tolerance to change. | Undesignated landscapes and landscape features which have little value to local communities. |
| Negligible | Absence of positive landscape characteristics. Significant presence of landscape detractors. The landscape receptor is of negligible susceptibility to the Project and has very high tolerance to change. | Undesignated landscapes and landscape features which have no particular scenic qualities or are in poor condition or altered by presence of intrusive manmade structures. |

**Magnitude of Change to the Landscape**

Magnitude of change is an expression of the size or scale of change in the landscape, the geographical extent of the area influenced, and the duration and reversibility of the resultant effect.

The duration of the effects are short-term lasting 0-5 years; medium term lasting 5-10 years, long-term lasting 10-20 years; and permanent lasting more than 20 years.

***Table 11.2*** Magnitude of Change

| Magnitude of impact | Definition |
|---|---|
| Large | Total loss or addition or very substantial loss or addition of key elements/features/patterns of the baseline (i.e. pre-development landscape) and/or introduction of dominant elements which are uncharacteristic with the attributes of the receiving landscape. |
| Medium | Partial loss or addition of or moderate alteration to one or more key elements/features/patterns of the baseline (i.e. pre-development landscape) and/or introduction of elements that may be prominent but may not necessarily be substantially uncharacteristic with the attributes of the receiving landscape. |
| Small | Minor loss or addition of or alteration to one or more key elements/features/patterns of the baseline (i.e. pre-development landscape) and or introduction of elements that may not be uncharacteristic with the surrounding landscape. |
| Negligible | Very minor loss or addition of or alteration to one or more key elements/features/patterns of the baseline (i.e. pre-development landscape) and/or introduction of elements that are not uncharacteristic with the surrounding landscape approximating to a 'no-change' situation. |
| None | No loss, alteration or addition to the receiving landscape resource. |

### 11.2.4 Visual Effects

Visual effects relate to how a development will be seen within the landscape, and whether the development is integrated, balanced or incongruous within the visual setting and context. Visual effects can be adverse, neutral or beneficial.

Visual effects are experienced by people, or visual receptors, and the degree to which they will be affected by changes as a result of the proposed development depends on many factors including:

- The importance of the location as may be reflected by designations or by the numbers of people who experience the view;
- The nature of receptors, who may be residents, workers, passing through, or visiting, and who may experience the view momentarily, for longer periods, or frequently;
- The nature and extent of changes that may be viewed openly or intermittently in the local or wider context; and,
- Accessibility of the viewpoint.

**Sensitivity of Visual Receptors**

The sensitivity of a landscape receptor is determined by combining judgments in relation to the susceptibility of the receptor to the type of change, and to the value attached to particular views.

***Table 11.3*** Sensitivity of Visual Receptors

| Sensitivity | Viewer susceptibility | Value of views |
|---|---|---|
| Very High | Visitors drawn to a particular view (usually a designated landscape), including those who have travelled to experience the views. These viewers have very high susceptibility. | Views of internationally designated landscape, or in a countryside/land or widely known/famous views. |
| High | Residents.<br>People engaged in quiet outdoor recreation where landscape is an important part of the experience.<br>These viewers have high susceptibility. | Views of nationally designated countryside/land. |
| Medium | Observers enjoying the countryside from vehicles on quiet/promoted routes.<br>People engaged in outdoor sport or recreation which may involve appreciation of views (e.g. cyclists, golfers).<br>These viewers have medium susceptibility. | Views of designated countryside/land. |
| Low | People engaged in outdoor sport or recreation which does not involve appreciation of views.<br>These viewers have low susceptibility. | Views of undesignated countryside/land. |
| Negligible | People at work where the setting is not important to the quality of working life.<br>Road users (commuters) where the view is incidental to the journey.<br>These viewers have negligible susceptibility. | Undesignated landscapes and landscape features which have no particular scenic qualities or are in poor condition or altered by presence of intrusive manmade structures. |

## Magnitude of Visual Impact

The criteria for defining magnitude of impact on visual receptors are defined in Table 11.4.

***Table 11.4*** Magnitude of Visual Impact

| Magnitude of impact | Definition |
|---|---|
| Large | Complete or very substantial change in view. Change dominant involving complete or very substantial obstruction of existing view or complete change in character and composition of baseline, e.g. through removal of key elements. |
| Medium | Moderate change in view which may involve partial obstruction of existing view or partial change in character and composition of baseline (i.e. pre-development view) through the introduction of new elements or removal of existing elements. Change may be prominent but would not substantially alter scale and character of the surroundings and the wider setting. Composition of the view would alter. View character may be partially changed through the introduction of features which, though uncharacteristic, may not necessarily be visually discordant. |
| Small | Minor change in baseline (i.e. pre-development view). Change would be distinguishable from the surroundings whilst composition and character would be similar to the pre change circumstances. |

| Magnitude of impact | Definition |
|---|---|
| Negligible | Very slight change in baseline (i.e. pre-development view). Change barely distinguishable from the surroundings. Composition and character of view substantially unaltered. |
| None | No alteration to the existing view. |

### 11.2.5 Significance of Effects

The significance of the effect upon landscape and visual receptors is arrived at by combining judgements in relation to the sensitivity of the receptor to change and to the magnitude of the impact and is presented in Table 11.5 below.

***Table 11.5*** Matrix for the assessment of the significance of the effect

| | **Magnitude of Impact** | | | | | |
|---|---|---|---|---|---|---|
| **Sensitivity of receptor** | | No Change | Negligible | Small | Medium | Large |
| | Negligible | None | Negligible | Negligible or Minor | Negligible or Minor | Minor |
| | Low | None | Negligible or Minor | Negligible or Minor | Minor | Minor or Moderate |
| | Medium | None | Negligible or Minor | Minor | Moderate | Moderate or Major |
| | High | None | Minor | Minor or Moderate | Moderate or Major | Major or Profound |
| | Very High | None | Minor | Moderate or Major | Major or Profound | Profound |

***Table 11.6*** Significance of effect criteria.

| Significance | Landscape Resource | Visual Resource |
|---|---|---|
| Profound | Where proposed changes would be uncharacteristic and/or would significantly alter a landscape of exceptional landscape quality (e.g. internationally designated landscapes), or key elements known to the wider public of nationally designated landscapes (where there is no or limited potential for substitution nationally). | Where proposed changes would be uncharacteristic and/or would significantly alter a view of remarkable scenic quality, within internationally designated landscapes or key features or elements of nationally designated landscapes that are well known to the wider public. |
| Major | Where proposed changes would be uncharacteristic and/or would significantly alter a valued aspect of (or a high quality) landscape. | Where proposed changes would be uncharacteristic and/or would significantly alter a valued view or a view of high scenic quality. |
| Moderate | Where proposed changes would be noticeably out of scale or at odds with the character of an area. | Where proposed changes to views would be noticeably out of scale or at odds with the existing view. |
| Minor | Where proposed changes would be at slight variance with the character of an area. | Where proposed changes to views, although discernible, would only be at slight variance with the existing view. |

| Significance | Landscape Resource | Visual Resource |
|---|---|---|
| Negligible | Where proposed changes would have an indiscernible effect on the character of an area. | Where proposed changes would have a barely noticeable effect on views/visual amenity. |
| None | Where the project would not alter the landscape character of the area. | Where the project would retain existing views. |

## 11.3 RECEIVING ENVIRONMENT

The site of the proposed Pollahoney 110kV substation is located west of the M11 and just north of the Avoca River, the R747 and the Dublin-Rosslare railway line.




***Figure 11.1*** Site Location Context

The site of the proposed development is part of the former Shelton Abbey Demesne that occupied the low lying (3.0 to 6.0m OD) floor of the Avoca River valley, and on the northern side of the river corridor.

Shelton Abbey is a late 18th century mansion and protected structure (RPS No. 16404005). It is located towards the western extent of the former demesne that originally extended eastwards along the Avoca River as far as the Arklow Town Marsh where a pathway continued through the marsh to Arklow town.

Shelton Abbey Demesne was sold in the early 1950's and NET Irish Fertiliser Industries developed a substantial fertiliser manufacturing facility on the flat and low lying eastern part of the demesne. Shelton Abbey became an open prison.

The facility was closed in 2003 and was mostly dismantled, leaving the prilling and drying towers and a number of smaller structures together with extensive areas of flat tarmac marshalling and storage areas. Today, the western portion of these lands comprises a range of high ridged industrial sheds associated with Holfeld Plastics. A wood processing facility operates in the eastern portion of the lands, and the Shelton Abbey substation is located centrally along the northern side of the lands. Shelton Abbey continues to operate as an open prison.

The Avoca River, the R747 Vale Road, and the Dublin to Rosslare railway line run along the southern side of the valley. There are two dwellings c. 450m to the west, and a halting site to the southeast just before the motorway.

The site is accessed from Kilbride and over the M11 motorway along the L6179 to the entrance of industrial area just west of the Shelton Abbey substation.

Terrain to the immediate north of the industrial lands comprises the steep northern side of the valley, rising to c. 40m OD and mostly in mature woodland. The landscape then levels out to become a more gently sloping agricultural landscape. The southern side of the valley is also characterised by steeply sloping woodlands. A secondary wooded valley leads southwards from the Avoca River valley to Glenart Castle which is an early 19th century country house and gardens in private ownership and is a protected structure (RPS No. 16404001).

To the west, leading towards Woodenbridge, the valley narrows considerably and the richly wooded valley slopes rise to 100m OD and more creating a strong sense of enclosure to the valley. To the east, towards Arklow town and the coast, the landscape opens up and becomes much flatter, with the Arklow Town Marsh and Arklow town on the northern and southern sides of the river.

The elevated M11 motorway spans the Avoca River valley just east of the industrial lands. Overhead powerlines and pylons are also noticeable in the landscape, with the larger 220 kV line crossing the valley just west of the motorway via a series of tall pylon support towers.

The proposed development site occupies an area of the industrial lands just west of the Shelton Abbey substation and currently comprising a number of older industrial buildings standing on service yards. The site is located centrally along the northern portion of the industrial lands and set against the base of the steep northern face of the valley, c. 600m east of Shelton Abbey.

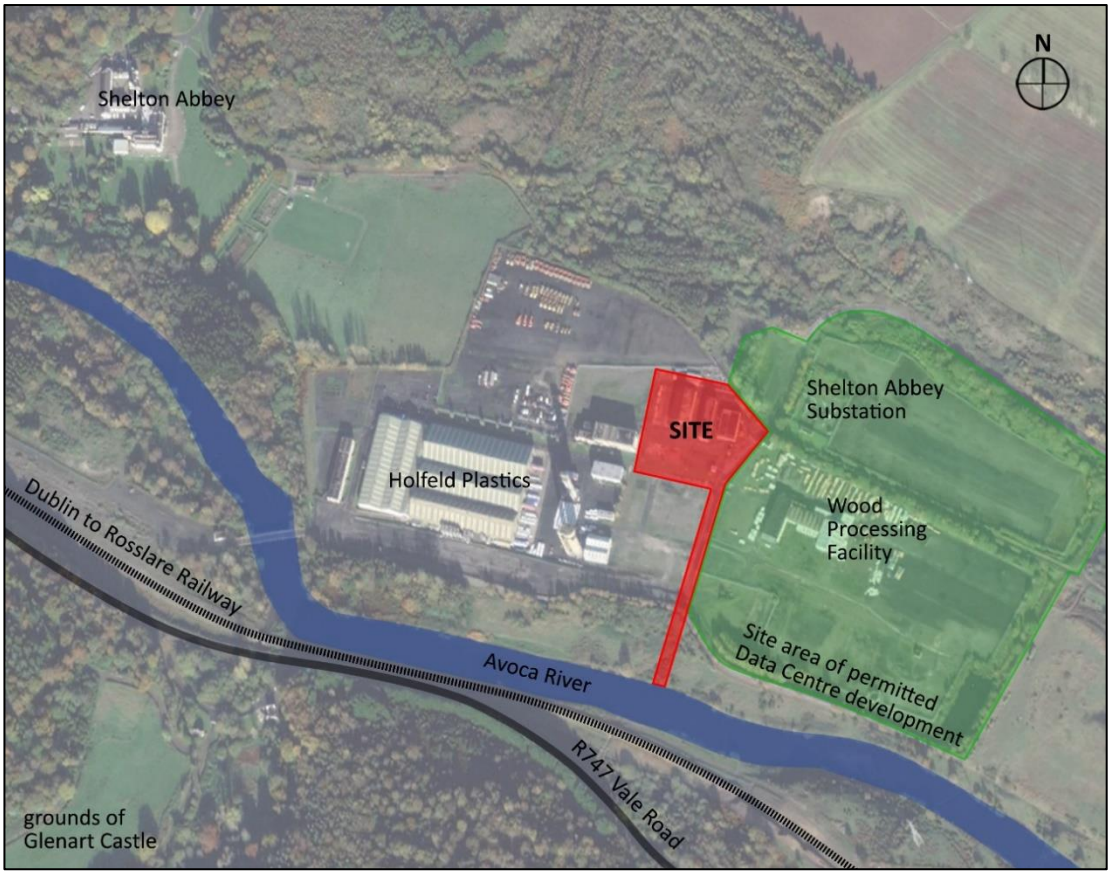



***Figure 11.2*** Site Area

A pair of 110 kV power lines run from the Shelton Abbey substation in a north-easterly direction to the main Arklow substation close to the Kilbride Industrial Estate on the northern side of Arklow town. There is an existing planning permission for the development of a data centre facility on the eastern part of the industrial lands, Reg. Ref: 18/940.

### 11.3.1 Landscape Planning Context

The proposed development is within the administrative area of Wicklow County Council, and development is guided by the *Wicklow County Development Plan 2016-2022*, (WCCDP). The WCCDP identifies and describes the Landscape Character Areas (LCAs) of the county in Appendix 5, Landscape Character Assessment.

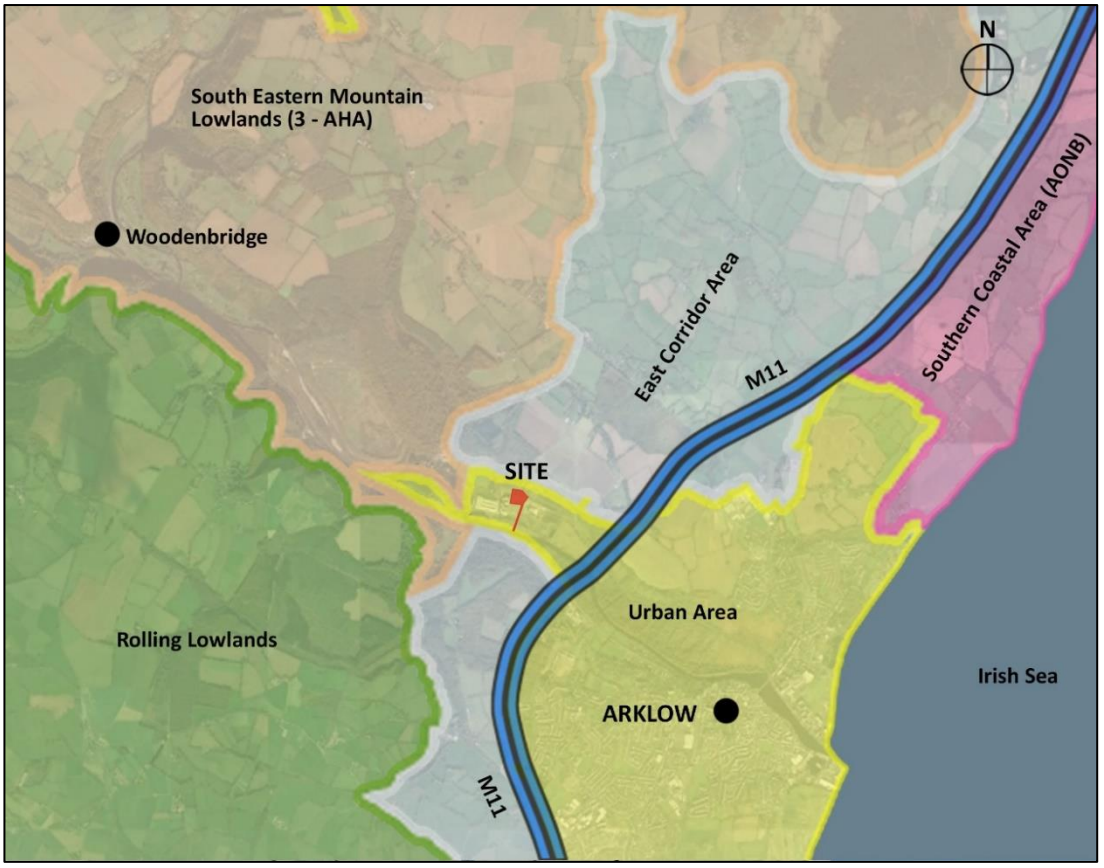



***Figure 11.3*** Landscape Character Areas, WCCDP 2016-2022, Map 10.13

The proposed development falls within a number of defined LCAs. The proposed development site is within *Urban Area LCA* and bordering the *East Corridor Area LCA.*

The settlement hierarchy of the WCCDP designates Arklow town as a Level 3 settlement, or large Growth Town II. All settlements in the County settlement hierarchy falling within Levels 1-6 are *'considered Urban Areas for the purpose of landscape classification. In terms of landscape classification, these settlements have already been deemed suitable for development (of the type allowed by the settlement strategy and the development standards of this plan) and the impacts on the wider landscape of such development has already been deemed acceptable'. Urban Areas are described as being of Low Vulnerability.*

The Arklow Local Area plan 2018-2024 identifies the former IFI factory site at Shelton Abbey as on 'Employment Opportunity Site' given its strategic infrastructure assets.

The *East Corridor Area LCA* comprises the M11 corridor and for the most part runs through the lower lying and accessible tracts of land and is the main connection between the major towns along the east coast of the County, and is considered to be of *Medium Vulnerability.*

It is noted that the eastern boundary of the *South Eastern Mountain Lowlands LCA* Area of high Amenity is at Shelton Abbey and this area extends to the west and north to include the undulating mountain lowlands and valleys at Woodenbridge, and Avoca, and beyond to Aughrim and Rathdrum.

### 11.3.2 Views and Prospects

The *WCCDP*, *Figure 10.14, Views of Special Amenity of Special Interest,* identifies 48 specific view locations throughout the County that are of special amenity or interest.

The closest one to the proposed development is VP No. 62 from the Vale Road approaching the site area from Woodenbridge. From Woodenbridge eastwards, the valley is enclosed by the wooded valley sides. The designation terminates where the valley opens up and the existing industrial site area becomes part of the character of the Avoca River Valley. The next closest is VP No. 63 along the L2180 Beech Road c. 1.5km to the north of the site and are identified on *Figure 11.4* below.

| No. | Description |
|---|---|
| 62 | R747 Vale of Avoca east of Woodenbridge. Prospect of both sets of Vale of Avoca including Avoca River Valley |
| 63 | L-2180-48 from Raheen to Sheepwalk. Prospect of Vale of Avoca |




***Figure 11.4*** Prospects of Special Amenity Value or Special Interest (WCCDP Map 10.15)

The other VPs shown above are substantially further from the proposed development site and the industrial area is set low in the valley and not visible from these routes.

### 11.3.3 Other Designations

There are no Tree Protection Orders (TPOs), proposed Natural Heritage Areas (pNHAs), Special Areas of Conservation (SAC) or Special Protection Areas (SPAs) directly pertaining to the proposed development area.

Shelton Abbey Demesne is an historic designated landscape, NIAH Site ID No. 4251. The majority of the lands have been substantially modified, and the NIAH survey notes that *'a factory complex now dominates this site'*.

### 11.3.4 Landscape and Visual Significance and Sensitivity

The proposed development will be located on lands within the eastern part of an established brownfield industrial facility. The substation development will be located centrally along the northern part of this facility and set against the steep wooden terrain of the valley behind it.

The existing site levels range from 2.0m to 2.8m OD and formation level of the proposed development site is c. 2.9m OD with finished floor levels at 3.1m OD. The face of the valley behind it rises to 40m OD with substantial woodland cover and the terrain then continues to rise gently to over 50m OD. The southern side of the valley rises to similar levels. It is more heavily modelled and undulating that the northern side but has more expansive and dense woodland cover.

To the west, the valley quickly becomes more enclosed and remote from the industrial area, and to the east, the elevated motorway and overhead power line infrastructure clearly signal the transition from the mountain and rolling lowlands to the urban area of Arklow.

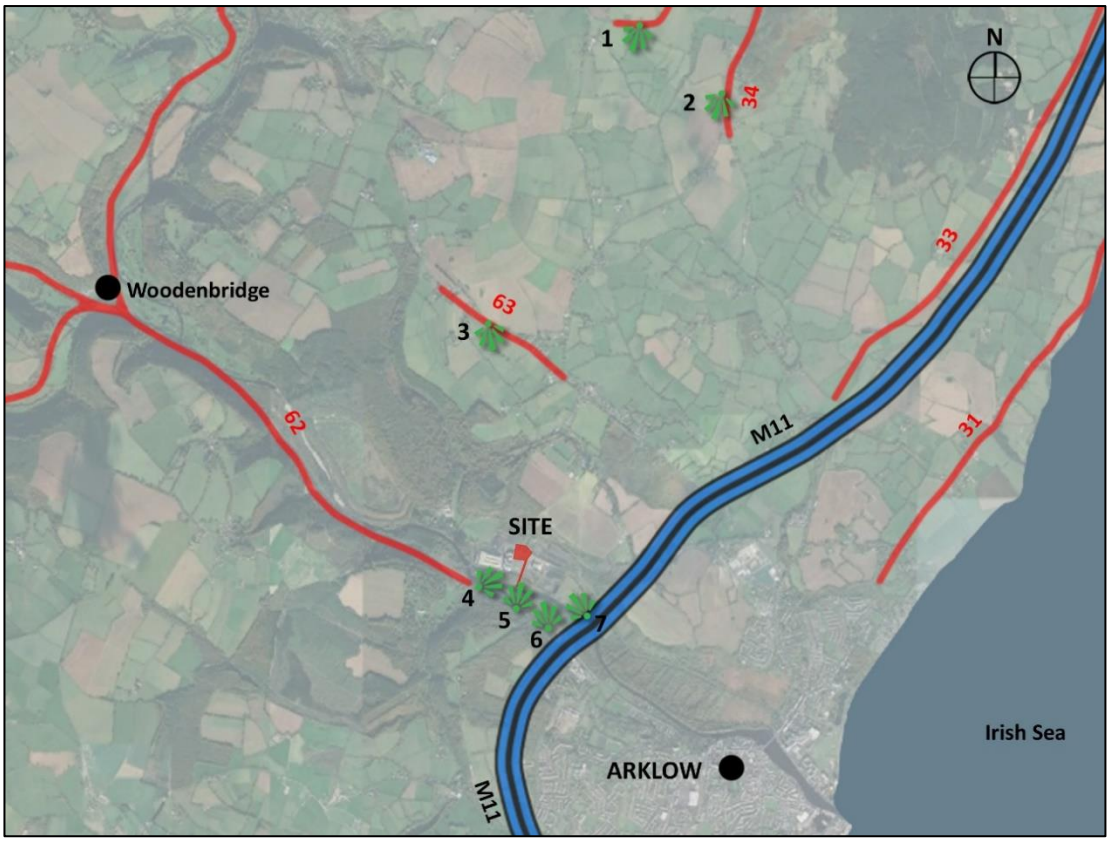
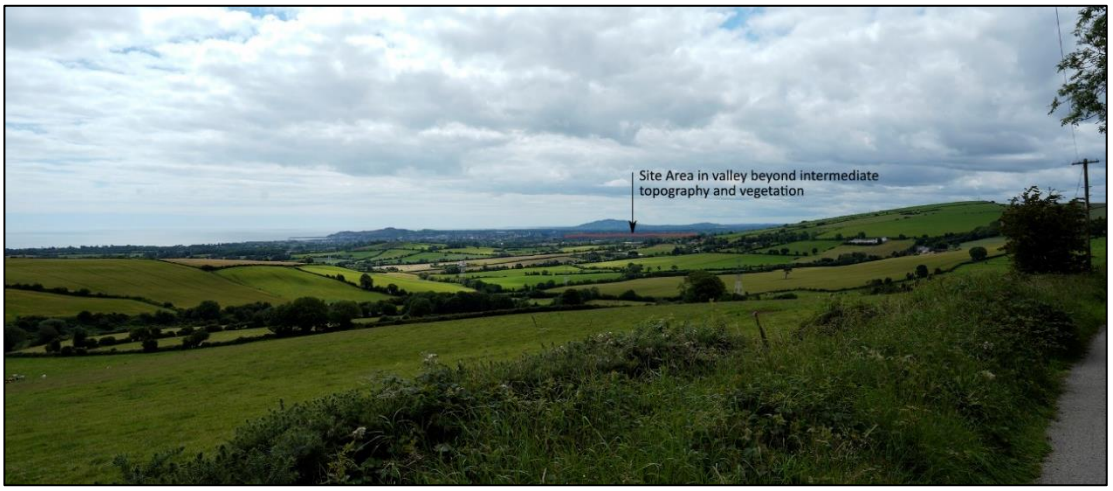



***Figure 11.4*** Photoview location Map

By virtue of its low setting within the valley, the proposed site is substantially secluded from the wider and more elevated landscape to the north and south and the Avoca River Valley leading westwards is quickly enclosed by a combination of wooded valley faces and the twisting nature of the river and road leading through it. See *Photoviews 1 to 3* below.




***Photoview 1*** View from local road southwest of Barriniskey looking south




***Photoview 2*** View from local road south of Barriniskey looking south




***Photoview 3*** View from L2180 Beech Road looking south

The Vale Road and the Dublin to Rosslare railway line run along the southern side of the valley past the industrial lands, and the presence of the lands does become apparent as the Vale Road approaches the lands as taller structures, pylons and the motorway overbridge start coming into view. The industrial lands are more visible from the elevated M11 motorway to the east and particularly from the northbound carriageway, however the open portion of the bridge span is less than 300m and observers are normally travelling at motorway speeds. Additionally, the proposed site

area including the existing industrial buildings is located behind intervening industrial sheds associated with the existing processing facility and is not prominent from this location. See *Photoviews 4 to 7* above.

The site of the proposed development is within the *Urban Area LCA* and has established industrial uses and is considered to be of low landscape sensitivity and low to medium visual significance.




***Photoview 4*** View from R747 Vale Road looking northeast




***Photoview 5*** View from R747 Vale Road looking north




***Photoview 6*** View from R747 Vale Road looking northwest




***Photoview 7*** View from M11 motorway looking west

## 11.4 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

The proposed 220 kV substation will occupy approximately a site area of c. 1.65 ha. along the northern part of the existing industrial facility. Development will include:

- A two storey 110kV GIS substation building, c. 51.5m x 15.75m wide and 15.0m high at 3.1m OD within a c. 40m x 89m compound enclosed by a 2.6m high security fence;
- An underground attenuation tank and associated interceptor and drainage infrastructure;
- A vented foul waste holding tank;
- 3 No. short underground cable connections for later connection to the grid
- A second compound c. 58m x 89m comprising 4 No. transformers, 2 No. 18m high lighting protection masts and a single storey c. 37m x 12m x 6.65m high client control building enclosed by a 2.6m high security fence; and,
- Associated site development works including access paths and roads, parking, landscaping, a 1.4m high property fence and ancillary works.

Full details of the proposed substation are included in Chapter 2 of this EIAR and the accompanying design drawings.

## 11.5 LIKELY SIGNIFICANT EFFECTS

New development has the potential to impact on the immediate site environs or the surrounding site context, or both. The quality of impacts can be positive, neutral or negative, and the significance of impacts is determined by the particular characteristics of the development and the existing context.

The proposed development will involve the construction of a 110 kV substation within an established industrial context. Landscape and visual effects are discussed below, during construction and in operation.

### 11.5.1 Do-Nothing Scenario

In the scenario that the proposed development was not permitted, the existing older industrial buildings on the site would remain in place in the short term, however, given the existing permission on adjacent lands for the development of a data centre facility, it is likely that an alternative application would be made to provide the necessary grid connection infrastructure.

### 11.5.2 Construction Phase

Construction of the proposed development is anticipated commence in Q2 2021 and complete in end Q3 2021. Construction activity that may give rise to landscape or visual impacts will include:

- Site establishment including contractors compound, security fencing together with associated welfare and administration facilities, storage compounds, lighting, vehicle parking and associated access tracks;
- Demolition of existing industrial structures on the site area;
- Site clearance, excavations and levelling;
- Export of excavated materials to an appropriate licenced facility
- Import of fill material to establish a site formation level of 2.9m OD for the compounds and 3.1m OD for the buildings;
- Construction of foundations;
- Erection of structural frame for the GIS substation building;
- Construction of the client control building using conventional insulated blockwork;
- Cladding and roofing the GIS substation building with profiled metal cladding;
- Installation of equipment in buildings and compound areas;
- Operation of construction machinery including cranes;
- Construction vehicle movements associated with import and export of materials;
- General construction activity including personnel and vehicles;
- Associated site development works including perimeter security fencing and lighting and CCTV; and,
- Commissioning and testing.

**Effects on Landscape Character**

Construction of the proposed development will give rise to short term and substantially localised effects on landscape character.

Within the local context of an established industrial facility, the magnitude of development is considered small. Construction activity including movement of construction vehicles and gradual emergence of structures will result in localised disturbance, however, effects on landscape character are considered negligible/minor and neutral/negative.

In the wider landscape setting, and by virtue of the site area being substantially secluded within the Avoca River Valley, effects on landscape character are considered negligible and neutral. There will be no effects on the character of identified the *South Eastern Mountain Lowlands AHA*, *Southern Coastal Area (AONB)* or *Rolling Lowlands* in the Wicklow County Landscape Character Assessment.

**Effects on Views**

Construction of the proposed development will give rise to localised, short term, minor and negative effects on views along the Vale Road to the south of the site area. The site area is partly visible from Shelton Abbey however the view has already been substantially modified. In the wider landscape, the secluded nature of the site is such that visual effects will be negligible and neutral.

### 11.5.3 Operation Phase

**Effects on Landscape Character**

The proposed development will occupy part of an established industrial facility. The development will represent an intensification of the industrial character of the site area as may be perceived from the local site context including the portion of the Avoca River Valley to the west and east of the site area.

The GIS substation building will be the largest built structure, however, will be smaller in volume and consistent in character to the existing Holfeld Plastics sheds.

The site is considered to be of low sensitivity, and the development of small magnitude, and will give rise to minor effects on landscape character. There will be no effects on the character of identified the *South Eastern Mountain Lowlands AHA*, *Southern Coastal Area (AONB)* or *Rolling Lowlands* in the Wicklow County Landscape Character Assessment.

**Effects on Views**

The proposed development will give rise to localised, minor and negative effects on views along the Vale Road to the south of the site area. The site area is partly visible from Shelton Abbey however the view has already been substantially modified. In the wider landscape, the secluded nature of the site is such that visual effects will be negligible and neutral.

## 11.6 MITIGATION MEASURES AND MONITORING

The proposed development is designed to meet the specific technical specification requirements for infrastructure of this nature.

The site selected for the substation is a brownfield site within an established industrial facility and enjoys substantial screening from the wider landscape setting by virtue of being set low within the valley. The specific site area is also towards the northern part of the industrial lands and behind the Dublin to Rosslare railway line when viewed from the Vale Road.

Building elements are designed as simple industrial forms and the GIS substation building will be finished with metal panel cladding panels that are matt dark green/grey in colour and will be visually absorbed by the mixed woodland backdrop on the northern valley face. Perimeter security fencing will also be a dark grey/green finish. Site lighting will be provided using 6.0m high lamp standards fitted with high cut-off LED luminaires so as to minimise light spill.

### 11.6.1 Mitigation During Construction

The substation site and contractors' compound should be managed in an orderly manner, with security fencing and hoarding kept in good condition, and vehicular access and delivery schedules managed to avoid congestion outside the development site. All vehicular traffic leaving work areas should be clean, and the local road network kept clean in accordance with the CEMP.

### 11.6.2 Mitigation During Operation

The design of the proposed development has been developed in order to meet the specific technical requirements of the infrastructure while minimising adverse landscape and visual effects as described above. Management and maintenance of mitigation features thereafter will ensure their effectiveness in the medium and longer term. Maintenance of site lighting, incorporating horizontal cut-off light fittings, is also important to ensure light spill is minimised.

### 11.6.3 Monitoring During Construction

During construction, the contractor will ensure that the site area and compound are managed and maintained in an orderly manner and in accordance with the CEMP

### 11.6.4 Monitoring During Operation

Orderly operation and maintenance of the substation site area will ensure the facility remains as built, any defects repaired promptly, and lighting fixtures maintained to ensure minimal light spill.

## 11.7 CUMULATIVE EFFECTS

The proposed development is designed to support power demand for the permitted data storage development Reg. Ref: 18/940 to the immediate east of the proposed development. Additionally, consideration is given to the likely works for the future off site connections between the proposed development and the National Electricity Transmission Network (NETN) which will be undertaken by EirGrid.

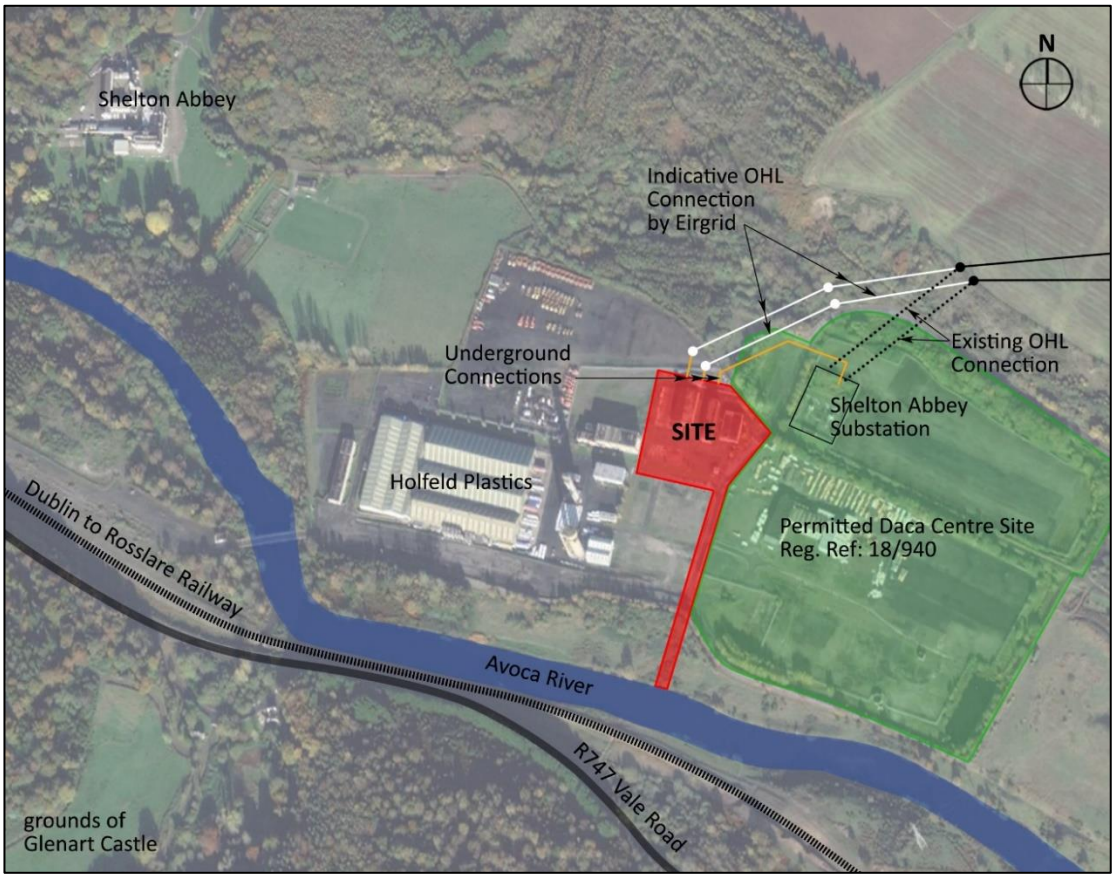



***Figure 11.5*** Cumulative developments, shown in green and in black/white/yellow

The permitted data centre development will occupy the eastern half of the existing industrial lands and comprise three large scale high tech industrial buildings that will be similar in height to the existing Holfeld Plastics facility on the western part of the lands. As such, the permitted data centre development is likely to be more readily visible from the R747 Vale Road and from the M11 motorway that the proposed development. The proposed development will be substantially screened by the permitted data centre development.

Connection of the proposed development to the NETN is likely to include realignment of existing 110 kV overhead power lines as well as an underground connection to the Shelton Abbey substation and will have negligible or minor effects on landscape character or visual aspects.

Cumulative landscape and visual effects of the proposed development in combination with the permitted data centre and associated NETN connection will not be significant

## 11.8 RESIDUAL EFFECTS

By virtue of its modest scale and low lying site area within the Avoca River Valley, the proposed development will be substantially or completely screened from the wider landscape with only partial localised visibility from the R747 Vale Road and M11 motorway in the context of both existing and emerging industrial developments within the *Urban Area LCA*.

Residual landscape and visual effects will be localised, negligible/minor and neutral/negative.

There will be no effects on the character of identified the *South Eastern Mountain Lowlands AHA*, *Southern Coastal Area (AONB)* or *Rolling Lowlands* in the Wicklow County Landscape Character Assessment.

## 11.9 REFERENCES


- Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment;
- Planning and Development Act 2000, as amended;
- Planning and Development Regulations 2001, as amended; and
- European Landscape Convention 2000.
- Wicklow County Development Plan 2016-2022;
- Arklow Local Area Plan 2018-2024
- Environmental Protection Agency (EPA, 2017). Guidelines on the Information to be contained in Environmental Impact Assessment Reports. Draft;
- Environmental Protection Agency (EPA, 2015). Advice Notes for preparing Environmental Impact Statements. Draft;
- Landscape Institute and the Institute of Environmental Management and Assessment (LI/IEMA, 2013) Guidelines for Landscape and Visual Impact Assessment, 3rd edition, (GLVIA);
- Landscape Institute (LI, 2018) Technical Information Note 05/2017 (Revised 2018) on Townscape Character Assessment; (TCA)
- Department of Housing, Planning and Local Government (DHPLG, 2018) Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (GEIA).
- Landscape Institute (LI, 2019) Technical Guidance Note 06/2019 on Visual Representation of Development Proposals, (VPDP).

# 12.0 MATERIAL ASSETS

## 12.1 INTRODUCTION

This chapter evaluates the impacts, if any, which the proposed development may have on Material Assets as defined in Directive 2014/52/EU, the EPA Draft EIA Report Guidelines 2017 and EPA Draft Advice Notes for EIS 2015.

This chapter has also been prepared to address the issues associated with waste management during the construction and operational phases of the proposed development as described in Chapter 2.

A site-specific Construction & Demolition Waste Management Plan (C&D WMP) has been prepared to deal with waste generation during the construction phase of the proposed development and is included as Appendix 12.1. The C&D WMP has been prepared in accordance with the '*Best Practice Guidelines for the Preparation of Waste Management Plans for Construction and Demolition Projects'* document produced by the National Construction and Demolition Waste Council (NCDWC) in conjunction with the Department of the Environment, Heritage and Local Government in July 2006. This document will be implemented by the contractor for all site works.

## 12.2 METHODOLOGY

In 2011 EIA Directive (2011/92/EU) material assets included architectural and archaeological heritage. In accordance with the 2014 EIA Directive, those heritage aspects are dealt with as components of cultural heritage (which are addressed in Chapter 12 Archaeological, Architectural and Cultural Heritage of this EIA Report).

The EPA Draft EIA Report Guidelines 2017 state that material assets are now taken to mean built services and infrastructure, roads and traffic and waste management. The EPA Draft Advice Notes for EIS 2015 also give the following examples of material assets; assimilative capacity of air, ownership and access and tourism.

In this EIA Report, the impacts on some of the material assets described above have been considered in the following chapters of this EIA Report as follows:

- Chapter 4 Population and Human Health;
- Chapter 8 Air Quality & Climate, and;
- Chapter 13 Traffic & Transportation

The European Commission Guidance on the preparation of the Environmental Impact Assessment Report has been considered in the preparation of the EIA report refers to a number of examples of material assets including buildings, other structures, mineral resources and water resources. The proposed development will not impact on any other structures or buildings. The impacts on mineral resources and water resources have been considered in the following chapters of this EIA Report as follows:

- Chapter 5 Land, Soils, Geology & Hydrogeology; and
- Chapter 6 Hydrology.

This chapter assesses ownership and access, built services and infrastructure, which have not already been addressed elsewhere in this EIA Report. Section 14.3 addresses ownership and access. The subsequent sections address built services and infrastructure.

The potential impacts on built services and infrastructure, if any, are assessed in terms of the following:

- Power and Electrical Supply;
- Telecommunications;
- Surface water infrastructure;
- Foul drainage infrastructure; and
- Water supply.

Assessment of impact on utilities has been undertaken by confirmation of supply with the various utility suppliers including Eirgrid, ESB Networks and Irish Water (IW). Mitigation measures are proposed where required.

## 12.3 OWNERSHIP AND ACCESS

The EPA Draft Advice Notes 2015 refer to the need to consider the ownership and accessibility of the site. This section addresses ownership and accessibility of the site for the proposed development.

The site of the proposed development as described in Chapter 2 Description of the proposed development is owned by the Applicant.

The main site access is along the northern boundary of the Avoca River Park. Construction traffic will enter and exit the site via the access for Avoca River Park (the R772 via Beech Road, Kilbride Road and Shelton Abbey). The site access would be located to the west of the site. A maximum speed limit of 20km/hour will be in place on the access road. Site security will be put in place adjacent to the entrance and will be in place for all phases of work.

## 12.4 RECEIVING ENVIRONMENT

The proposed drainage infrastructure has been described in Chapter 2 (Description of the proposed development) and Chapter 6 (Hydrology). Detailed water supply and drainage design information is provided in the Water and Sewage Design Report prepared by Malachy Walsh & Partners (October 2020), which accompanies the planning application. The associated built services and infrastructure in the vicinity of the site are summarised in the following sections.

### 12.4.1 Power and Electrical Supply

The substation will be powered by a 49 kVA domestic supply to service the substation. This supply will be taken from an existing ESB Networks medium voltage substation within the industrial estate.

In a separate future development, ESB networks will undertake works to run a 110kV cable to the proposed development. This is illustrated in Figure 3.4 of Chapter 3.

### 12.4.2 Telecommunications

A telecommunications distribution network is in place in the area. The requirement for telecoms is minor for this proposed development and there is sufficient capacity in the network.

### 12.4.3 Surface Water Infrastructure

There is existing surface water infrastructure within the Avoca River Park. There exists a channel on the permitted development site which runs west-east and flows to the eastern boundary of the permitted development site, before flowing south into an attenuation basin. Surface water from this attenuation basin is then pumped over a flood defence embankment and into the Avoca River. The proposed development will have no additional impact on off-site surface water infrastructure or potential for off-site flooding. This is further discussed in Section 6.4.3.

### 12.4.4 Foul Drainage Infrastructure

There are no public foul drainage systems on or near the site. Foul discharge the proposed development site currently discharges into septic tanks. Treated effluent from the septic tanks discharges into the drainage channel (described in Section 14.4.3). It is proposed to construct a new surface water drainage network to intercept, attenuate and discharge surface water generated by the proposed development on our site. The system will consist of a piped network, underground attenuation system, petrol interceptor and a hydrobrake. The hydrobrake will limit the rate of discharge from the site to a suitable outflow rate.

The demand from the proposed development on wastewater infrastructure will not affect the ability of any existing or future developments in the area to access wastewater discharge.

### 12.4.5 Water Supply

It is proposed to install a rainwater harvesting unit to supply non-potable water that is suitable for flushing toilets and washing hands. The rainwater harvesting unit is to be Molloy Environmental Systems H+ Tank or similarly approved. The tank is to supply a minimum volume of 3500 litres capacity catering for 5 users (reserve supply for 10 days for 5 people). The system is to be installed in accordance with the manufacturer's requirements and is to be fitted with a UV bulb, pressure vessel with and an overflow to the storm network. Refer to the Water and Sewerage Design Report (Malachy Walsh and Partners, October 2020) for further details.

The demand from the proposed development on water supply will not affect the ability of any existing or future developments in the area to access water through this water supply.

## 12.5 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

### 12.5.1 Construction Phase

*Power and Electrical Supply*
During construction, contractors will require power for heating and lighting of the site and their onsite construction compound. The power requirements will be relatively minor. It is proposed that a temporary power supply be established for the construction phase.

*Surface Water and Foul Drainage Infrastructure and Water Supply*
Welfare facilities (canteens, toilets etc.) will be required for the construction staff. It is proposed to import water by tanker to the site for the duration of the construction phase. A temporary enclosed wastewater management system, including a wastewater

holding tank, will be established at the temporary site construction compounds capable of handling the demand during the construction phase.

### 12.5.2 Operational Phase

*Power and Electrical Supply*
The proposed development will supply the permanent power supply to the adjacent extant permitted data centre development. The proposed development includes a 49kVA house supply which will supply the GIS substation.

*Surface Water Infrastructure*
It is proposed to construct a new surface water drainage network to intercept, attenuate and discharge surface water generated by the proposed development on our site. The system will consist of a piped network, underground attenuation system, petrol interceptor and a hydrobrake. The hydrobrake will limit the rate of discharge from the site to a suitable outflow rate. Controlled discharge to the Avoca River will be via a pumping system. Separate attenuation systems are proposed for the MV Control Building and GIS Substation Building as these will be operated and maintained by separate entities in the future scenario. A hydrobrake will be installed at the outlet of each respected attenuation tank. Further details of the surface water drainage system can be found in the Water and Sewerage Design Report (Malachy Walsh and Partners, October 2020) and in Chapter 6 (Hydrology) of this EIA Report.

*Foul Drainage Infrastructure*
The proposed substation will be served by a single 150mm diameter foul sewer which will discharge into a storage tank on site. The storage tank is to be designed for 5 maintenance personnel being present on site 6-8 times per month with the system emptied approximately twice per annum.

*Sewer System*
The flow rate assumed for the design is what is advised for an industrial office/factory type setting without a canteen given the nature and usage which is advised as being which is 50l/person/day within Irish Water's Code of Practice. This equates to 250l/day for the substation. As a result, the peak flow will be below 2.5l/s. Therefore the drains are proposed to be laid at the minimum recommended gradient of 1 in 60.

*Holding Tank System*
The volume of effluent that would be generated by the flow rates is estimated to be 2.0$m^3$/month which equates to 12$m^3$ every six months. The proposed volume of the holding tank is 15$m^3$ which has spare capacity of 3$m^3$.

Further details of the foul water drainage system can be found in the Water and Sewerage Design Report (Malachy Walsh and Partners, October 2020)

*Water Supply*
Water is required for general potable supply for drinking and sanitary facilities.

It is proposed to install a rainwater harvesting unit to supply non-potable water that is suitable for flushing toilets and washing hands. The rainwater harvesting unit is to be Molloy Environmental Systems H+ Tank or similarly approved. The tank is to supply a minimum volume of 3,500 litres capacity catering for 5 users (reserve supply for 10 days for 5 people). Potable water for consumption during the operational phase will be supplied in bottled form when required.

## 12.6 POTENTIAL IMPACTS OF THE PROPOSED DEVELOPMENT

### 12.6.1 Construction Phase

*Power and Electrical Supply*
During construction, contractors will require power for heating and lighting of the site and their onsite accommodation. In addition, some on site equipment/plant will require power. A construction compound and temporary power supply will be installed for the construction the proposed development. The power requirements for the construction phase will be relatively minor and therefore the power demand for the construction phase will have a potential short-term imperceptible impact.

Excavations within the vicinity of existing electrical services will be carried out in consultation with EBS Networks to ensure there is no impact on existing users.

The potential impact associated with power and electrical supply for the construction phase will be a ***short-term, neutral imperceptible***.

*Surface Water Infrastructure*
During the construction phase, a site drainage system will be constructed on the site so as to attenuate run-off, guard against soil erosion and safeguard downstream water quality. The drainage system will be implemented along the substation compound, internal access road and site construction temporary compound. The drainage system will be excavated and constructed in conjunction with the construction works. The surface water run-off drainage system will be implemented along all areas to be developed in order to separate and collect 'dirty water' run-off from the roads and compound, and to intercept clean over land surface water flows from upslope areas.

The site drainage system is designed as a measure to ensure that the design will not change the existing flow regime across the site, will not deteriorate water quality and will safeguard existing water quality status of the catchment from sediment runoff. To achieve separation, clean water drains will be positioned around the upslope areas of the substation compound, internal access road and site construction temporary compound while dirty water drains will be positioned on the downslope sides, with road surfaces and compounds sloped towards dirty drains.

As the surface water connection works are entirely within red line boundary, these works would have any potential offsite impact.

As detailed in Chapter 6, there are no likely perceptible impacts associated with surface water management for the proposed development for the construction phase as there is no direct pathway to surface water.

The potential impact associated with surface water for the construction phase is ***short-term, neutral*** and ***imperceptible***.

*Foul Drainage Infrastructure*
Welfare facilities (canteens, toilets etc.) will be required for the construction crew. A temporary wastewater management system, including a wastewater holding tank, will be installed at the construction compound for the duration of the construction phase.

The potential impact associated with foul drainage for the construction phase is ***short-term, neutral*** and ***imperceptible***.

*Water Supply*
Welfare facilities (canteens, toilets etc.) will be required for the construction staff. It is proposed to import potable water by tanker to the site for the duration of the construction phase.
The potential impact associated with water supply for the construction phase is ***short-term, neutral*** and ***imperceptible***.

### 12.6.2 Operational Phase

*Power and Electrical Supply*
The proposed development has been designed in accordance with the requirements of ESB Networks. Eirgrid has confirmed that there is sufficient power available from the existing area network for the proposed development.

The proposed development has been designed in accordance with ESB Networks requirements. The nature of the proposed development ensures that rather than utilising electricity, the proposed development will facilitate continuity of supply of electricity to the permitted development. The proposed substation will only use a minimal amount of electricity provided by the 49kVa cable connection.

*Surface water, foul water and water supply Infrastructure*
The proposed development will not increase the foul water discharge in the public sewer as the proposed substation will be served by an internal foul sewer which will discharge into a storage tank on site. The tank is to be fitted with an alarm which will advise when emptying is required thereby avoiding potential for overflow.

The proposed development will not increase the demand for water from the public water supply system as it is considered to install a rainwater harvesting unit to supply non-potable water that is suitable for flushing toilets and washing hands.

Potable water, when required, will be supplied in bottle form.

The potential impact associated with foul and surface water drainage and water supply for the operational phase is ***long-term, neutral*** and ***imperceptible***.

## 12.7 REMEDIAL AND MITIGATION MEASURES

### 12.7.1 Construction Phase

Construction of the proposed development will require power, drainage infrastructure and water supply connections but will not require any connections outside the red line boundary of the proposed development site.

Ongoing consultation with Eirgrid, ESB Networks and other relevant service providers within the locality and compliance with any requirements or guidelines they may have will ensure a smooth construction schedule without disruption to local and business community.

*Power and Electricity Supply*
The power demand for the construction phase will be relatively minor and the temporary connection works are entirely within the red line boundary and will not have any potential offsite impact.

The excavation of trenches within the vicinity of existing electrical services will be carried out in consultation with ESB Networks to ensure there is no impact on existing users.

There is no requirement for bulk chemical storage.

*Surface Water Infrastructure*
Run-off water containing silt will be contained on site and treated (using a siltbuster or temporary on-site settlement ponds/tanks) to ensure adequate silt removal.

The construction works will not require any interruptions to service in existing surface water sewers.

*Foul Drainage Infrastructure*
A temporary wastewater management system, including a wastewater holding tank, will be installed at the construction compound.

*Water Supply*
Welfare facilities (canteens, toilets etc.) will be required for the construction staff. It is proposed to import water by tanker to the site for the duration of the construction phase. There will be no offsite impact.

### 12.7.2 Operational Phase

*Power, Electricity Supply*
The proposed development has been designed in accordance with ESB Networks requirements. Eirgrid's All-Island Generation Capacity Statement 2020-2029 sets out that Eirgrid has the capacity to provide for such developments.

The nature of the proposed development ensures that it will facilitate continuity of supply of electricity to the permitted development. The proposed substation will only use a minimal amount of electricity provided by the 49kVa connection.

No remedial or mitigation measures are required in relation to power and electricity supply.

*Telecommunications*
There is sufficient capacity available in the area network for the proposed development. Therefore, no remedial or mitigation measures are required in relation to telecommunications.

*Surface Water Infrastructure*
The surface water drainage system for the proposed development incorporates runoff control in the form of attenuation, which will restrict discharge from the proposed development to the allowable greenfield runoff rate of 7.82 l/s, which is the equivalent greenfield runoff rate for the area of the permitted development site catchment area. The attenuation storage is provided via attenuation tanks. Separate attenuation systems are proposed for the MV Control Building and GIS Substation Building as these will be operated and maintained by separate entities in the future scenario. A hydrobrake will be installed at the outlet of each respected attenuation tank. In addition, SuDS measures will control surface water runoff offsite. The allowable greenfield runoff rate has been established by the project engineers, Malachy Walsh and Partners (October 2020), using the methodology set out in the Water and Sewerage Design Report which is included with the proposed development planning submission.

It is proposed to install approximately 250m of rising main to pump storm water to a discharge manhole and subsequently discharge stormwater directly to the Avoca River. All surface water from the proposed site will discharge via a class 1 hydrocarbon interceptor to capture any potential hydrocarbon contamination prior to discharge into the attenuation system and the Avoca River.

*Foul Drainage Infrastructure*
The proposed development will not increase the foul water discharge in the public sewer as the proposed substation will be served by an internal foul sewer which will discharge into a storage tank on site. The tank is to be fitted with an alarm which will advise when emptying is required thereby avoiding potential for overflow. No remedial or mitigation measures are required in relation to foul drainage infrastructure.

*Water Supply*
It is proposed to install a rainwater harvesting unit to supply non-potable water that is suitable for flushing toilets and washing hands. The rainwater harvesting unit is to be Molloy Environmental Systems H+ Tank or similarly approved. The tank is to supply a minimum volume of 3,500 litres capacity catering for 5 users (reserve supply for 10 days for 5 people). The system is to be installed in accordance with the manufacturer's requirements and is to be fitted with a UV bulb, pressure vessel with and an overflow to the storm network. Signage will be incorporated in the relevant areas to highlight the water is non-potable. Potable water for consumption during the operational phase will be supplied in bottled form when required.

No remedial or mitigation measures are required in relation to water supply infrastructure.

## 12.8 PREDICTED IMPACTS OF THE PROPOSED DEVELOPMENT

### 12.8.1 Construction Phase

The implementation of mitigation measures detailed above will ensure that the predicted impacts on the material assets assessed in this chapter will be ***short-term, neutral*** and ***imperceptible*** for the construction phase.

### 12.8.2 Operational Phase

*Power, Electrical Supply and Telecommunications*
The proposed development has been designed in accordance with the requirements of ESB Networks. Eirgrid has confirmed that there is sufficient power available from the existing area network for the proposed development.

There are no predicted impacts associated with power and electrical supply, and telecommunications for the proposed development for the operational phase.

*Surface Water and Foul Drainage Infrastructure and Water Supply*
There are no predicted impacts on water supply, surface water infrastructure and foul drainage infrastructure post construction.

*Predicted Impact – Operational Phase*
The predicted impacts on power and electrical supply, telecommunications, surface water infrastructure, foul drainage infrastructure and water supply will be ***long-term, neutral*** and ***imperceptible.***

## 12.9 RESIDUAL IMPACTS

The proposed development entails minimal use of material assets examined in this chapter (i.e. power and electrical supply, telecommunications, surface water infrastructure, foul drainage infrastructure and water supply) during construction. Once operation, the proposed development entails moderate power usage however Eirgrid have confirmed the availability of supply and there will therefore be no significant impact on material assets to the wider economy. The overall predicted residual impact of the proposed development can be classed as ***long-term*** and ***not significant*** with respect to material assets.

## 12.10 CUMULATIVE IMPACTS

The proposed development entails minimal use of material assets during construction. Once operational, the proposed development will result in minimal impact on surface water, foul drainage and water infrastructure. The proposed development will connect to the surface water, foul drainage and water supply infrastructure for the permitted development and the requirements for the proposed development has already been considered in terms of the design of the infrastructure for the permitted development.

The proposed development will have a negligible demand on power and the permitted development will have a maximum import capacity of 105MW. As stated in, Eirgrid's All-Island Generation Capacity Statement 2019-2028 sets out that Eirgrid has the capacity to provide for such developments.

Based on this, it is predicted that the cumulative impact of the proposed development with other permitted and planned developments is considered to be ***imperceptible*** during the construction and operational phases.

Interactions are addressed in Chapter 15 of this EIA Report.

# 13.0 TRAFFIC AND TRANSPORTATION

## 13.1 INTRODUCTION

The Applicant is applying to ABP for planning permission for the provision of a 110 kV GIS substation, MV Control Building, Transformers, associated dropdown 110 kV transmission lines, along with associated and ancillary works within the Avoca River Park approximately 2.5 km northwest of Arklow town centre.

The subject site is located to the north of the Avoca River, in Avoca River Park, The wider landholding comprises a large primarily brownfield site which is served by existing roads infrastructure implemented as part of the setting out of the Industrial Park. The site of the proposed development comprises approximately 1.17 hectares of land. The wider landholding is subject to an extant permission (Planning Application No. 18940) for a data storage facility and ancillary development. There is also a concurrent application which updates the extant proposals which is under consideration by Wicklow County Council. The site is currently occupied by derelict buildings on lands formerly used for an industrial plant.

**Error! Reference source not found.** below and red line boundary presents the lands subject to this planning application.

## 13.2 METHODOLOGY

This chapter has been prepared taking the following documents into account:

- 'Wicklow County Development Plan 2016 – 2022' (Wicklow County Council, December 2016); and
- Arklow Environs and Local Area Plan (2018 – 2024);
- TII Traffic and Transport Assessment Guidelines (PE-PDV-02045) (May 2014);
- TII Project Appraisal Guidelines for National Roads Unit 5.3 – Travel Demand Projects (PE-PAG-02017) – May 2019
- Avoca River Park Proposed Data Centre Development Environmental Impact Assessment Report - Crag Digital Avoca Limited Aecom - PR-289532 August 2020
- Infrastructure Report Echelon Data Centres Aecom – PR-60568620 July 2020

The methodology used to conduct the assessment includes:

- Establishing baseline conditions – The existing conditions will be recorded including existing site location and use, surrounding road network, public transport services;
- Defining the development – This includes size, use, parking, staffing, trip distribution for the construction and operational stages of the development;
- Assess the potential impact of the development on the existing local transport network and its ability to carry the development traffic;
- Mitigation measures will then be proposed to offset any impacts that may result from the development.

## 13.3 RECEIVING ENVIRONMENT

### 13.3.1 Existing Road Access

*Avoca River Park Access Road*

The Avoca River Park Access Road is a 2-lane private single carriageway providing access to Avoca River Park. The carriageway width is approximately 7.0 m with no existing footways or cycle lanes.

*Kilbride Road*

Kilbride is a single lane carriageway Regional Road running in a west to east direction, and vice versa. Kilbride connects to Beech Road from the east with a priority junction.

The carriageway width is approximately 7.0 m with no existing footpaths or cycle lanes. Double yellow lines are situated on the both sides of the carriageway. The speed limit on Kilbride Road is 50km/h.

*Beech Road*

Beech Road is a single carriageway with width of approximately 7.0 m with a footway provided on the northern side of the carriageway. The speed limit on Beech Road is 50 km/h between the junction with R772 Dublin Road and Kilbride Road. Beyond Kilbride Road the road is subject to an 80 km/h speed limit.

Beech Road is well utilised during the morning and evening peak hours by commuters travelling towards Kilbride Industrial Estate in the morning peak, and vehicles departing Kilbride Industrial Estate in the evening peak.

*R772*

The R772 is a 2-lane single carriageway Regional Road running in a north south direction between M11 Junction 20 and Arklow.

The section north of Beech Road is subject to an 80 km/h speed limit. A pedestrian footway is provided on the eastern side of the carriageway with an on-road cycle lane provided on the western side of the carriageway which ends 400 m to the north of the junction of Beech Road. Frontage development on the north section of the R772 is limited to a few residential properties though these are well set back from the carriageway.

The section of the R772 south of Beech Road is subject to a 50 km/h speed limit. The road is suburban in nature with footways provided on either side of the carriageway and is street lit. Along the route, the road passes Templerainey Church, St Joseph's National School and a local convenience store in addition to residential properties on either side of the carriageway.

*M11 Motorway*

The M11 motorway connects Ashford with Enniscorthy, running in a southerly direction and vice versa. Access to the proposed site from the motorway is achieved via Junction 20. The on-slip – off-slip arrangements at Junction 20, M11 are summarised as follows:

- M11 Southbound Off-Slip R772 / Southbound On-Slip Roundabout Junction;
- M11 Northbound Off-Slip L2172/ Northbound On-slip Roundabout Junction;




***Figure 13.1*** *Location Plan* *© Openstreetmap Contributors*

### 13.3.2 Existing Public Transport

The closest bus stops to the site are located along the R772 at Ferrybank approximately 5km east of the site. These bus stops are operated by Bus Éireann and private companies. These services travel towards Dublin and Wexford Town. Services operate at up to one hour intervals during the day.

Wexford Bus also operates the 740 service with several services per day between Wexford and Dublin Airport. The nearest bus stop to Arklow is outside the Town by Junction 20 of the M11 motorway approximately 3.8 km from the site.

The closest railway station to the site is Arklow Train Station, located 7km to the south east of the development. It provides commuter rail services north to Dublin Connolly and south towards Rosslare Eurosport.

Given the distance to the nearest railway station, it is unlikely that travelling to work by train would be a feasible mode of transport for workers.

### 13.3.3 Road Safety

As part of the completion of this chapter, an assessment of collision statistics as published by the Road Safety Authority (RSA) was conducted. Collision statistics for 2005-2016 were reviewed. The collision statistics give information for fatal, serious or minor collisions.

Inspection shows there has been one minor collision recorded within the vicinity of the subject site. The results of the analysis identify one incident at the Avoca River Park Access Road/Shelton Abbey junction, the collision was recorded as a minor vehicle collision but does not indicate any reoccurring collision hotspots or traffic concerns with the existing road network.

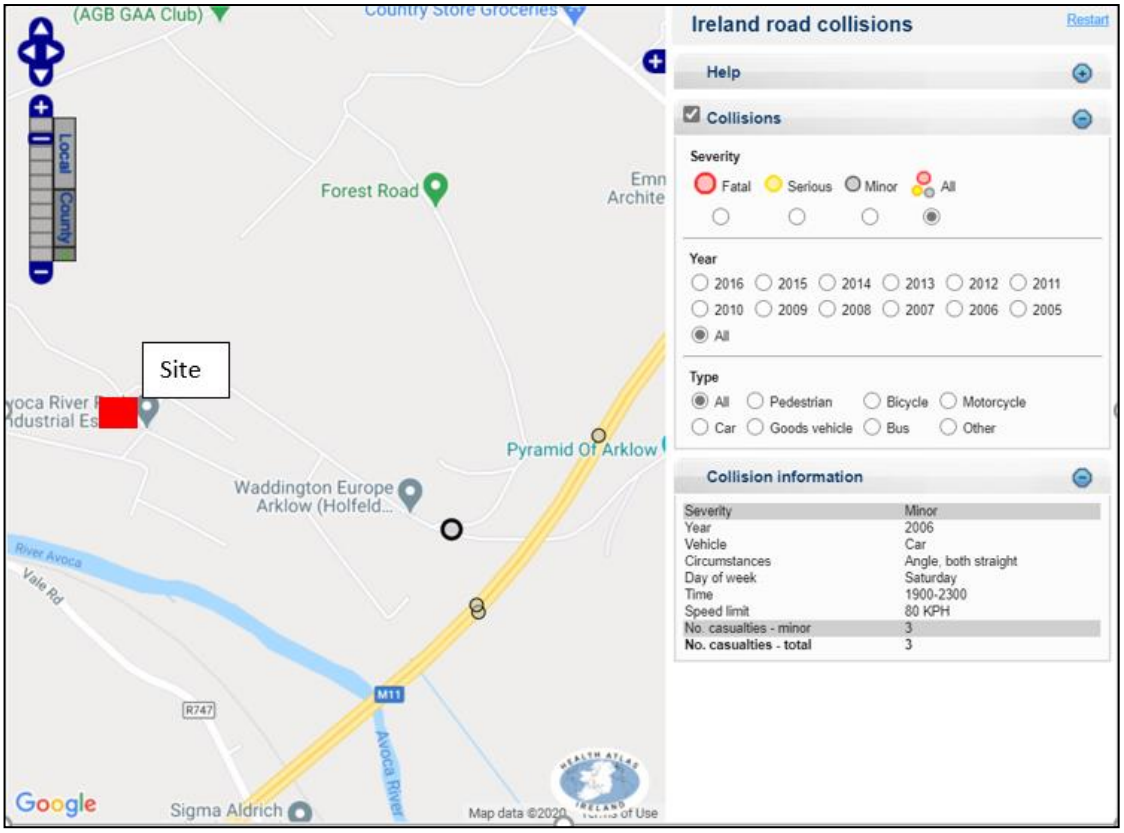



***Figure 13. 2*** *Collision Locations*

### 13.3.4 Existing Traffic Flow

In order to establish the existing local road network's traffic characteristics and subsequently enable the identification of the potential impact of the proposed development, traffic surveys (weekday classified junction turning counts) were conducted on Tuesday the 1st of May 2018 at the following locations:

- Junction 1: R772 / Beech Road Priority Junction; and
- Junction 2: Beech Road / Kilbride Road Priority Junction.



Baseline flows (PCU's) for the junctions for 2018 are set out in Table 13.1 below:

***Table 13.1*** *2018 Baseline Flows*

| Junction | AM Peak (PCU's) | PM Peak (PCU's) |
|---|---|---|
| J1: R772 / Beech Road | 951 | 978 |
| J2: Beech Road / Kilbride Road | 382 | 440 |

Traffic growth rates from TII Project Appraisal Guidelines for National Roads Unit 5.3 – Travel Demand Projects (PE-PAG-02017) – May 2019 are used to forecast future flows. Table 6.2 Central Growth Figures for Wicklow (LV) are used. Construction is to commence in 2021 and is programmed to be completed within a six-month time frame. Therefore, for both construction and opening year the growth rate to be applied will be:

$$2018\text{-}2021 \qquad 1.0157^3 = 1.048$$

## 13.4 CHARACTERISTICS OF THE DEVELOPMENT

### 13.4.1 Construction Phase

The development site comprises existing brownfield lands. Construction activities will be contained within the boundary of the site. There will be a requirement for haulage of soil from the site, however this will be minimised through optimisation of site levels. Construction materials will need to be brought to the site as will specialist plant. It is anticipated that these deliveries will occur throughout the day.

The number of construction operatives attending the site by vehicular means will result in a maximum of 25 vehicles per day accessing the site. It is anticipated that the majority of site operatives (75%) will arrive at the proposed construction site prior to the morning peak hour (08:00 – 09:00) on the surrounding road network. Furthermore in the evening peak hour, 50% of the site operatives are projected to depart outside of the evening peak hour (17:00 – 18:00) on the surrounding road network.

It is estimated that the peak number of construction deliveries to the site will be during the importation of stone, which will comprise 350 HGV's over a one-week period. These deliveries would be spread over a 10-hour working day, equating to 7 HGV's per hour.

Construction phase work will occur over a period of approximately six months.

### 13.4.2 Operational Phase

The site is located within the Avoca River Park and includes provision of a 110 kV GIS substation, MV Control Building, Transformers and associated dropdown 110 kV transmission lines. The proposed development also includes signage and boundary treatments; and all necessary site works above and below ground level.

Two accesses to the site will be constructed connecting to the Avoca River Park Access Road. The accesses will be for dedicated ESB/operator compounds. The accesses are a minimum of 4.9m wide to facilitate one-way flow.

The internal layout of the site has been designed to give clear, legible routes for pedestrians and motorists to enter and exit the development.

The proposed development does not require any full time staff to operate it on a daily basis. It is forecast that there will be 10 van movements per week to the site for site maintenance purposes, together with some additional infrequent site visits for infrastructure maintenance. The number of visits equates to 2 vans per day – or 4 trips. For the purposes of this assessment it is conservatively assumed that these will occur at the peak hour of the surrounding road network.

*Car Parking*

The site has access hard stand areas surrounding the substation equipment and housings. As access is only for maintenance, vans will park on the hardstand areas adjacent to areas of work.

*Cycle Parking*

No additional cycle parking spaces are proposed as part of the Proposed Development as all maintenance personnel servicing it shall access the site via Light Vehicles (LV).

## 13.5 POTENTIAL IMPACTS OF THE DEVELOPMENT

### 13.5.1 Construction Phase

The delivery to site of materials will be spread throughout the day and its impact on the existing road infrastructure is considered to be negligible. All vehicles will have sufficient space within the site to manoeuvre and turn around.

Parking for construction operatives will be within the site.

The impacts of site operative and construction vehicles on the peak hours on the surrounding road network will be reduced by the offset nature of trips from that of the receiving road network.

***Table 13. 2*** Percentage Impact on the adjacent road network construction year - 2021

| Junction | | AM Peak (PCU's) | PM Peak (PCU's) |
|---|---|---|---|
| J1: R772 / Beech Road | Base Flow at Junction | 996 | 1025 |
| | Development | 38 | 13 |
| | % additional traffic | **3.8** | **1.3** |
| J2: Beech Road / Kilbride Road | Base Flow at Junction | 400 | 462 |
| | Development | 38 | 13 |
| | % additional traffic | **9.8** | **2.8** |

The maximum additional traffic for each of the Junctions 1 and 2 will be 3.8% and 9.6% respectively. On the basis of the TII Traffic and Transport Guidelines (May 2014), if the impact on a junction does not exceed 10% of the existing two-way traffic flow, modelling is not required for the junctions.

It is noted that the flows at Junction 2 are below the threshold necessitating further analysis. However, in the interests of robustness reference to the junction assessment carried out in the *Avoca River Park Proposed Data Centre Development Environmental Impact Assessment Report (*Aecom 2020) Table 13-13 concluded that the Ratio of Flow to Capacity (RFC) for the junction during the AM peak hour with committed development and Data Centre construction traffic would be 0.13. It is generally accepted that RFC values of 0.85 (85%) and less are indicators that a junction is operating within capacity. As the existing junction is operating considerably below capacity it can be concluded that junction would operate well within capacity even with the construction phase traffic associated with this development.

From the above assessment it can be seen that there will negligible impact due to the construction phase works.

### 13.5.2 Operational Phase

The resultant number of peak hour trips due to the development are set out in the table below.

***Table 13.3*** Percentage Impact on the adjacent road network during the Opening Year 2021

| Junction | | AM Peak (PCU's) | PM Peak (PCU's) |
|---|---|---|---|
| J1: R772 / Beech Road | Base Flow at Junction | 996 | 1025 |
| | Development | 2 | 2 |
| J2: Beech Road / Kilbride Road | Base Flow at Junction | 400 | 462 |
| | Development | 2 | 2 |

The maximum additional traffic for each of the Junctions 1 and 2 will be 0.2% and 0.4% respectively. On the basis of the TII Traffic and Transport Guidelines (May 2014), if the impact on a junction does not exceed 10% of the existing two-way traffic flow, modelling is not required for the junctions.

## 13.6 REMEDIAL AND MITIGATION MEASURES

### 13.6.1 Construction Phase

A draft Construction Environmental Management Plan (CEMP) has been submitted as part of this application. The Contractor will develop this further for the construction phase. The plan will include measures to minimise the impacts associated with the construction phase upon the peak periods on the surrounding road network. The measures will include; use of site wheel wash, road sweeping of local roads and agreed routing of vehicles.

HGV trips are anticipated to arrive and depart the site at a uniform rate throughout the day, to avoid pressure on the morning and evening peak hour periods.

All contractors' vehicles will park within the development site area, it is recommended that as part of the Construction Environmental Management Plan (CEMP) the contractor will be required to designate an area within the confines of the site dedicated

to operative car parking. There will be no parking permitted on the surrounding road network by the contractor or site operatives.

### 13.6.2 Operational Phase

The traffic impact estimated for this are significantly below the thresholds stated in the TII Guidelines for *Traffic and Transport Assessments, 2014* for junction analysis. Therefore, no junction modifications are recommended on the public road to facilitate the Proposed Development.

## 13.7 PREDICTED IMPACTS OF THE DEVELOPMENT

### 13.7.1 Construction Phase

Construction works will include site levelling works at the site, and these will largely be contained within the site. There will be materials required for the building works, and deliveries will spread throughout the working day. Construction operatives will travel to and from the site, but the anticipated timings of trips will largely be offset from the peak times on the local road network. Based on the assessment of the network junctions there will be insignificant impacts on the receiving traffic and transportation environments. The impact of construction works will be ***short term, not significant and neutral***.

### 13.7.2 Operational Phase

The proposed development will have an imperceptible impact on the road network, in particular the junctions in the proximity of the development. Overall the impact of the development will be ***long term*** in duration of ***imperceptible neutral*** effect. The proportional traffic increase through the relevant junctions with the Proposed Development are significantly below the thresholds stated in the *TII Guidelines for Traffic and Transport Assessments, 2014* for junction analysis.

## 13.8 RESIDUAL IMPACTS

The volumes of traffic generated from the proposed development will have an insignificant effect on the road network traffic volumes and can be considered within the norms for development in such zoned lands. The residual traffic impacts of the development will be ***imperceptible.***

## 13.9 CUMULATIVE IMPACTS OF THE DEVELOPMENT

### 13.9.1 Construction Phase

The potential for impact on transportation during construction primarily arises from additional trips due to the works associated with the development. The construction of the adjacent data centre will comprise the primary significant development. However it is proposed that the works will largely not run concurrently with the construction of the development within the stated timeline.

Given the short term nature of the peak construction phase, the overall impact of the construction phase involving both developments is considered **not significant** and will not affect the performance of the junctions under study.

Contractors for the proposed development will be contractually required to operate in compliance with a Construction Environmental Management Plan CEMP which will include the mitigation measures outlined in this EIA report. As a result, there will be a minimal impact on the receiving environment. The cumulative impact is considered to be ***short term, neutral and not significant.***

### 13.9.2 Operational Phase

The proposed development will necessitate a negligible number of additional movements of vehicles on the local road network. The construction of the adjacent data centre will result in additional traffic within the local environment. The development will have a cumulative impact on the broader transportation environment. Even accounting for background traffic growth the development will not have a significant impact capacity of the local network. The operation of the proposed development is concluded to have a ***long*** term, ***not significant*** significance with a ***neutral*** impact on traffic and transportation quality in the local environment.

# 14.0 WASTE MANAGEMENT

## 14.1 INTRODUCTION

This chapter has been prepared to address the issues associated with waste management during the construction and operational phases of the proposed development as described in Chapter 2.

A site-specific Construction & Demolition Waste Management Plan (C&D WMP) has been prepared to deal with waste generation during the construction phase of the proposed development and is included as Appendix 14.1. The C&D WMP has been prepared in accordance with the '*Best Practice Guidelines for the Preparation of Waste Management Plans for Construction and Demolition Projects'* document produced by the National Construction and Demolition Waste Council (NCDWC) in conjunction with the Department of the Environment, Heritage and Local Government in July 2006. This document will be implemented by the contractor for all site works.

## 14.2 METHODOLOGY

The assessment of the impacts of the proposed development arising from the consumption of resources and the generation of waste materials, was carried out taking into account the methodology specified in relevant guidance documents (as set out in Section 14.2.1), along with an extensive document review to assist in identifying current and future requirements for waste management including national and regional waste policy, waste strategies, management plans, legislative requirements and relevant reports. A summary of the documents reviewed, and the relevant legislation is provided in Appendix 14.1 C&D WMP.

This Chapter is based on the proposed development, as described in Chapter 2 (Description of the proposed development) and considers the following aspects:

- Legislative context;
- Construction phase (including site preparation, excavation and levelling); and
- Operational phase.

A desk study was carried out which includes the following tasks:

- Review of applicable policy and legislation which creates the legal framework for resource and waste management in Ireland;
- Description of the typical waste materials that will be generated during the construction and operational phases; and
- Identification of mitigation measures to prevent waste generation and promote management of waste in accordance with the waste hierarchy.

Estimates of surplus made ground and soils and stones generated during the construction phase of the proposed development have been calculated by the project engineers Clifton Scannell Emerson Associates (CSEA) and are outlined in section 14.4.1 below.

There will be a very small amount of waste generated during the operational phase. This will be minimal based on the fact that there will be no full-time staff using the site and only interim use by maintenance staff.

Mitigation measures are proposed to minimise the effect of the proposed development on the environment during the construction and operational phases, to promote

efficient waste segregation and to reduce the quantity of waste requiring disposal. This information is presented in Section 14.6.

A detailed review of the existing ground conditions on a regional, local and site-specific scale are presented in Chapter 5 Land, Soils, Geology and Hydrogeology. Chapter 5 of the EIA Report also discusses the environmental quality of soils which will have to be excavated to facilitate construction of the proposed development.

### 14.2.1 Legislation and Guidance

Waste management in Ireland is subject to EU, national and regional waste legislation which defines how waste materials must be managed, transported and treated. The overarching EU legislation is the Waste Framework Directive (2008/98/EC) which is transposed into national legislation in Ireland. The cornerstone of Irish waste legislation is the Waste Management Act 1996 (as amended).

In addition, the Irish government issues policy documents which outline measures aimed to improve waste management practices in Ireland and help the country to achieve EU targets in respect of recycling and disposal of waste. The recent policy document A Resource Opportunity – Waste Management Policy in Ireland was published in 2012 and stresses the environmental and economic benefits of better waste management, particularly in relation to waste prevention.

In September 2020 the government released a new policy document outlining a new action plan for Ireland to cover the period of 2020-2025. This plan 'A Waste Action Plan for a Circular Economy' was prepared in response to the 'European Green Deal' which sets a roadmap for a transition to a new economy, where climate and environmental challenges are turned into opportunities.

The strategy for the management of waste from the demolition and construction phase is in line with the requirements of the Best Practice Guidelines for the Preparation of Waste Management Plans for Construction and Demolition Projects published in 2006. The guidance document Construction and Demolition Waste Management: A handbook for Contractors and Site Managers was also consulted in the preparation of this assessment.

There are currently no Irish guidelines on the assessment of operational waste generation and guidance is taken from current waste statistics from the operating phases of the development, industry guidelines, plans and reports including the EMR Waste Management Plan 2015 – 2021, BS 5906:2005 Waste Management in Buildings – Code of Practice, the EPA National Waste Database Reports 1998 – 2016, National Waste Statistics Summary Report 2018 and the EPA National Waste Statistics Web Resource.

## 14.3 RECEIVING ENVIRONMENT

In terms of waste management, the receiving environment is largely defined by Wicklow Council (WCC) as the local authority responsible for setting and administering waste management activities in the area. This is governed by the requirements set out in the Eastern-Midlands Region (EMR) Waste Management Plan 2015-2021.

The waste management plan sets out the following targets for waste management in the region:

- A 1% reduction per annum in the quantity of household waste generated per capita over the period of the plan;
- Achieve a recycling rate of 50% of managed municipal waste by 2020; and

- Reduce to 0% the direct disposal of unprocessed residual municipal waste to landfill (from 2016 onwards) in favour of higher value pre-treatment processes and indigenous recovery practices.

The Regional Plan sets out the strategic targets for waste management in the region and sets a specific target for C&D waste of "70% preparing for reuse, recycling and other recovery of construction and demolition waste" (excluding natural soils and stones and hazardous wastes) to be achieved by 2020.

The National Waste Statistics update published by the EPA in October 2019 identifies that Ireland's current progress against this C&D waste target is at 71% and our progress against 'Preparing for reuse and recycling of 50% by weight of household derived paper, metal, plastic & glass (includes metal and plastic estimates from household WEEE)' is at 45%. Both of these targets are required to be met by 12 December 2020 in accordance with the requirements of the Waste Framework Directive.

The Wicklow County Council Development Plan 2016 – 2022 also sets policies and objectives for the WCC area which reflect those set out in the regional waste management plan.

In terms of physical waste infrastructure, WCC no longer operates any municipal waste landfill in the area. There are a number of waste permitted and licensed facilities located in the Eastern-Midlands Waste Region for management of waste from the construction industry as well as municipal sources. These include soil recovery facilities, inert C&D waste facilities, hazardous waste treatment facilities, municipal waste landfills, material recovery facilities, waste transfer stations and two waste-to-energy facilities.

## 14.4 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

The proposed development is described in detail in Chapter 2 (Description of the proposed development) of this EIA Report. The aspects relevant to this chapter are described in the following sections.

### 14.4.1 Construction Phase

The construction of foundations for the 110kV GIS substation, the installation of ducting for the 110kV underground transmission lines, the installation of the 49kVA electricity connection and associated ancillary development (as described in detail in Chapter 2) will require the excavation of topsoil and subsoil.

The optimum depth of excavation required to facilitate installation of the 110kV ducting for the transmission line is 1.2m below ground level (bgl) but may increase to up to c. 1.5m at utility crossings. The optimum width of each trench is 1.0m, however this may vary depending on ground conditions and existing services.

The optimum depth of excavation required to facilitate installation of the ducting for the 49kVA cable installation is c. 0.95-1m below ground level (bgl) but may increase to up to c. 1.5m at utility crossings. The optimum width of each trench is c.0.6m, however this may vary depending on ground conditions and existing services to up to c. 1m.

Suitable topsoil and subsoil will be reused on site as backfill, where possible. However, it is currently envisaged that c. 8,500m$^3$ will require removal offsite (as advised by the project engineers, Malachy Walsh and Partners (MWP)).

The importation of fill materials will be required for construction of foundations and to reinstate the trenches. The project engineers, MWP, have estimated that the importation of up to 10,000m$^3$ of fill material will be required.

The surplus excavated material will be removed off-site either as a waste or, where appropriate, as a by-product. Where the material is to be reused on another site as a by-product (and not as a waste), this will be done in accordance with Article 27 of the *European Communities (Waste Directive) Regulations 2011*. A formal documented EPA approval will be obtained before re-using the material as a by-product.

If the material is deemed to be a waste, removal and reuse/recycling/recovery/disposal of the material will be carried out in accordance with the *Waste Management Act 1996* (as amended), the *Waste Management (Collection Permit) Regulations 2007* (as amended) and the *Waste Management (Facility Permit & Registration) Regulations 2007* (as amended). The volume of waste requiring recovery/disposal will dictate whether a Certificate of Registration (COR), permit or licence is required by the receiving facility.

A site investigation was carried out at the site by Ground Investigations Ireland (GII) in 2020 which included trial pitting and boreholes on a site immediately adjacent to the east of the proposed development site. Soil samples were collected from 30 no. trial pits for soil analysis and were tested for the RILTA suite including asbestos.

The soil samples were compared to a Generic Assessment Criteria (GAC) derived to be protective of human health, water bodies (including groundwater) and also ecology for a commercial/industrial end use (LQM/CIEH S4Uls GACs). The level of arsenic detected in the samples from 2 no. trial pits, TP08 at 1.5mbgl and TP13 at 1.5mbgl, exceeded the commercial S4UL threshold value. TP13 was the nearest trial pit to the subject site.

The soil analysis results were also compared to the landfill acceptance criteria as specified in the European Communities (EC) *Council Decision 2003/33/EC* which identifies the maximum concentration of selected key contaminants permitted for acceptance at authorised waste facilities. The WAC criterion sets threshold concentrations for contaminants to classify the material under three categories; inert, non-hazardous and hazardous. None of the soils analysed showed any exceedances of inert WAC thresholds.

The authorised waste facilities may also require the soil to be classified as Hazardous or Non-Hazardous in accordance with the EPA publication *Waste Classification – List of Waste & Determining if Waste is Hazardous or Non-Hazardous* using the HazWasteOnline classification tool (or similar approved methodology). This can be done based on the soil analysis data obtained from the GII site investigation.

Trial pit TP13 presented hazardous materials at 1.5 mbgl, the sample was classified as 17 05 13 (Soil and stones containing hazardous substances) due to the high concentrations of Arsenic, Copper, Lead and Zinc. It is believed that these results are product of the previous fertiliser production process existing at the adjacent site. Appendix 5.2 (Chapter 5) further details with regard to these results and the respective laboratory reports.

It is expected that wastes generated (other than excavated material) from other construction activities will be negligible and will generally comprise waste generated from construction workers. These wastes would generally be organic/food waste, dry mixed recyclables (waste paper, newspaper, plastic bottles, packaging, aluminium cans, tins and Tetra Pak cartons), mixed non-recyclables and potentially sewage sludge from temporary welfare facilities provided at the site compound during the construction phase. Waste printer/toner cartridges, waste electrical and electronic equipment (WEEE) and waste batteries may also be generated infrequently from site offices. A temporary site construction compound will be set up upon commencement of the construction phase of the GIS building and MV Control Building within the site boundary. The compound will be used as a secure storage area for construction materials and excess spoil and also contain temporary site units to provide welfare facilities for site personnel. Facilities will include office space, meeting rooms, canteen area, a drying room and sanitary provisions.

Further detail on the waste materials likely to be generated during the excavation and construction works are presented in the project-specific C&D WMP included as Appendix 14.1.

It should be noted that until final materials and detailed construction methodologies have been confirmed it is difficult to predict with a high level of accuracy the construction waste that will be generated from the construction of the proposed development as the exact materials and quantities may be subject to some degree of change and variation during the detailed design and construction process.

An outline Construction Environmental Management Plan (CEMP) and C&D WMP has been prepared to accompany the planning application. The main contractor will be required to prepare a detailed CEMP prior to commencement of construction which may refine the above waste estimates.

### 14.4.2 Operational Phase

Once operational, it is anticipated that very small amount of waste will be generated at the GIS substation from ESB networks staff during their inspections and maintenance works.

These wastes may include organic/food waste, dry mixed recyclables (waste paper, newspaper, plastic bottles, packaging, aluminium cans, tins and Tetra Pak cartons) and non-recyclable waste. Waste fuels/oils, waste electrical and electronic equipment (WEEE) and waste batteries may also be generated infrequently.

## 14.5 POTENTIAL IMPACTS OF THE PROPOSED DEVELOPMENT

This section details the potential waste impacts associated with the proposed development.

### 14.5.1 Construction Phase

As detailed in Section 14.4.1, the proposed development will generate surplus excavated material, as well as waste from the welfare facilities and site office at the site compound.

Surplus excavated material classified as waste (as opposed to a by-product) will be segregated at source and transferred directly from site by a suitably permitted waste contractor(s) to suitably authorised receiving facilities.

Waste materials generated at the site compound from the welfare facilities and site office will be temporarily stored in dedicated receptacles at the site compound pending collection by a suitably permitted waste contractor(s). The waste storage area will be easily accessible to waste collection vehicles.

If waste material is not managed and stored correctly on the site or at the site compound, it is likely to lead to litter or pollution issues at site, site compound and/or on adjacent properties. The knock-on effect of litter issues is the presence of vermin on the site, site compound and the surrounding areas. Waste material will be appropriately managed on site so as to avoid these issues.

The use of non-permitted waste contractors for transportation or unauthorised receiving facilities could give rise to inappropriate management of waste and result in negative environmental impacts or pollution. Removal and reuse/recycling/recovery/disposal of waste material from site will be carried out in accordance with the *Waste Management Act 1996* (as amended), the *Waste Management (Collection Permit) Regulations 2007* (as amended) and the *Waste Management (Facility Permit & Registration) Regulations 2007* (as amended). It is essential that all waste materials are dealt with in accordance with regional and national legislation, as outlined previously, and that time and resources are dedicated to ensuring efficient waste management practices.

Wastes will be collected by a suitably permitted contractor(s) and be transferred to suitably registered/permitted/licenced waste facilities for processing and segregation, reuse, recycling, recovery and/or disposal. There are numerous authorised waste facilities in the Leinster region which can accept non-hazardous and hazardous waste materials and acceptance of waste from the proposed development would be in line with daily activities at these facilities. At present, there is sufficient capacity for the acceptance of the predicted construction waste materials at facilities in the region.

Where offsite reuse of the wastes generated is not feasible, recycling and/or recovery of the waste will be carried where possible. Recovery and recycling of construction waste has a positive impact on sustainable resource consumption. The use of recycled materials, where suitable, reduces the consumption of natural resources.

There is a quantity of material (topsoil and subsoil) which will need to be excavated to facilitate the proposed development. Clean inert soils and stones excavated will be reused on site as backfill, where practical. In the event that potentially contaminated material is encountered, correct classification and segregation of the excavated material is required to ensure that any potentially contaminated materials are identified and handled in a way that will not impact negatively on the health and safety of workers as well as on the receiving environment, both on and off-site. Contaminated material will need to be removed off-site for appropriate treatment and/or disposal.

Reuse of suitable clean inert excavated material onsite, where practical, will reduce consumption of natural quarry resources.

The potential effect of construction waste generated from the proposed development is considered to be ***short-term*** and ***not significant.***

### 14.5.2 Operational Phase

No waste will be generated from the operation of the proposed 110kV transmission cable ducting or 49kVA cable installation.

Small volumes of waste will be generated at the proposed 110kV GIS substation. The potential impacts on the environment of improper, or a lack of, waste management during the operational phase would be a diversion from the priorities of the waste hierarchy which would lead to small volumes of waste being sent unnecessarily to landfill.

The nature of the proposed development means the generation of waste materials during the operational phase is an unavoidable impact. Networks of waste collection, treatment, recovery and disposal infrastructure are in place in the region to manage waste efficiently from this type of development. Waste which is not suitable for recycling is typically sent for energy recovery. There are also facilities in the region for segregation of municipal recyclables which is typically exported for conversion into recycled products (e.g. paper mills and glass recycling).

The waste materials generated on a weekly basis will require site storage within the substation prior to collection by an authorised waste contractor. Waste collection vehicles will be required to service the proposed development on a regular basis to remove waste.

If waste material is not managed and stored correctly, it is likely to lead to litter or pollution issues at the proposed development and on adjacent developments. The knock-on effect of litter issues is the presence of vermin within the proposed development and the surrounding areas.

The use of non-permitted waste contractors or unlicensed facilities could give rise to inappropriate management of waste and result in negative environmental impacts or pollution. It is essential that all waste materials are dealt with in accordance with regional and national legislation, as outlined previously, and that time and resources are dedicated to ensuring efficient waste management practices.

The potential impact of operational waste generation from the proposed development is considered to be ***long-term, negative*** and ***not significant***.

### 14.5.3 Do Nothing Scenario

If the proposed development was not to go ahead there would be no additional construction or operational waste generation at the site until such time as an alternative development to facilitate provision of permanent power supply to the site is granted permission and constructed.

## 14.6 REMEDIAL AND MITIGATION MEASURES

This section outlines the measures that will be employed in order to reduce the amount of waste produced, manage the wastes generated responsibly and handle the waste in such a manner as to minimise the effects on the environment.

### 14.6.1 Construction Phase

A project specific C&D WMP has been prepared in line with the requirements of the *Best Practice Guidelines for the Preparation of Waste Management Plans for Construction and Demolition Projects* published in 2006 by the Department of Environment Heritage and Local Government (DoEHLG). Adherence to the high level strategy presented in this C&D WMP will ensure effective waste management and minimisation, reuse, recycling, recovery and disposal of waste material generated during the construction phase of the proposed development. Prior to commencement

of construction, the main contractor will be required to refine/update this document to detail specific measures to minimise waste generation and resource consumption and provide details of the proposed waste contractors and destinations of each waste stream.

Suitable topsoil and subsoil will be reused on site as backfill, where possible. However, it is currently envisaged that c. 8,500m$^3$ will require removal offsite (as advised by the project engineers, MWP). It will be reused offsite where practical and where it cannot be reused, it will be recycled/recovered.

In addition, the following mitigation measures will be implemented:

- On-site segregation of waste materials will be carried out to increase opportunities for off-site reuse, recycling and recovery – it is anticipated that the following waste types, at a minimum, will be segregated:
    - Soils and stones
    - In addition, the following wastes will be segregated at the site compound:
        - Organic (food) waste
        - Packaging (paper/card/plastic)
        - Mixed dry recyclables
        - Mixed non-recyclable waste
- All excavations will be carefully monitored by a suitably qualified person to ensure that potentially contaminated soil is identified and segregated, if encountered. In the event that any potentially contaminated material is encountered, it will be segregated from clean/inert material, tested and classified as either non-hazardous or hazardous and further classified as clean, inert, non-hazardous or hazardous in accordance with the *EC Council Decision 2003/33/EC*, which establishes the criteria for the acceptance of waste at landfills.
- Waste materials generated at the site compound will be stored in suitable receptacles in designated areas of the site compound;
- Any hazardous wastes generated (such as chemicals, solvents, glues, fuels, oils) will also be segregated and will be stored in appropriate receptacles (in suitably bunded areas, where required);
- A waste manager will be appointed by the main contractor to ensure effective management of waste during the excavation and construction works;
- All construction staff will be provided with training regarding the waste management procedures;
- All waste leaving site will be reused, recycled or recovered where possible to avoid material designated for disposal;
- All waste leaving the site will be transported by suitable permitted contractors and taken to suitably registered, permitted or licenced facilities; and
- All waste leaving the site will be recorded and copies of relevant documentation maintained.

As surplus soils and stones will require removal from site, any nearby sites requiring clean fill material will be contacted to investigate reuse opportunities for clean and inert material, which requires removal off-site. If any of the material is to be reused on another site as by-product (and not as a waste), this will be done in accordance with Article 27 of the *EC (Waste Directive) Regulations (2011)* as previously referred to Section 14.4 and detailed in the C&D WMP (Appendix 14.1).

These mitigation measures will ensure that the waste arising from the construction phase of the proposed development is dealt with in compliance with the provisions of the *Waste Management Act 1996*, as amended, associated Regulations, the *Litter*

*Pollution Act 1997 – 2009* and the *EMR Waste Management Plan (2015 - 2021)*. It will also ensure optimum levels of waste reduction, reuse, recycling and recovery are achieved and will encourage sustainable consumption of resources.

### 14.6.2 Operational Phase

Small volumes of waste may be generated at the proposed 110kV GIS substation. No waste will be generated from the operation of the proposed 110kV transmission cable ducting or 49kVA cable installation.

Any waste materials will be segregated into appropriate categories and will be temporarily stored in appropriate bins or other suitable receptacles in a designated, easily accessible areas of the substation.

In addition, the following mitigation measures will be implemented:

- On-site segregation of all waste materials into appropriate categories including (but not limited to):
  - Dry Mixed Recyclables;
  - Organic food/green waste;
  - Mixed Non-Recyclable Waste;
  - Batteries (non-hazardous and hazardous);
  - Waste electrical and electronic equipment (WEEE) including computers, printers and other ICT equipment; and
  - Cleaning chemicals (solvents, pesticides, paints, adhesives, resins, detergents, etc.).
- All waste materials will be stored in colour coded bins or other suitable receptacles in a designated, easily accessible location. Bins will be clearly labelled with the approved waste type to ensure there is no cross contamination of waste materials;
- All waste collected from the proposed development will be reused, recycled or recovered where possible, with the exception of those waste streams where appropriate facilities are currently not available;
- All waste leaving the site will be transported by suitable permitted contractors and taken to suitably registered, permitted or licensed facilities; and
- All waste leaving the site will be recorded and copies of relevant documentation maintained.

These mitigation measures will ensure the waste arising from the proposed development is dealt with in compliance with the provisions of the *Waste Management Act 1996*, as amended, associated Regulations, the *Litter Pollution Act 1997* and the *EMR Waste Management Plan (2015 - 2021)*. It will also ensure optimum levels of waste reduction, reuse, recycling and recovery are achieved.

## 14.7 PREDICTED IMPACTS OF THE PROPOSED DEVELOPMENT

The implementation of the mitigation measures outlined in Sections 14.6.1 and 14.6.2 will ensure that a high rate of reuse, recovery and recycling is achieved at the proposed development during the construction phase of the project. It will also ensure that European, National and Regional legislative waste requirements with regard to waste are met and that associated targets for the management of waste are achieved.

### 14.7.1 Construction Phase

A carefully planned approach to waste management as set out in Section 14.6.1 and adherence to the C&D WMP during the construction and demolition phase will ensure that the impact on the environment will be ***short-term, neutral*** and ***imperceptible***.

### 14.7.2 Operational Phase

During the operational phase, a structured approach to waste management as set out in Section 14.6.2 will promote resource efficiency and waste minimisation. Provided the mitigation measures are implemented and a high rate of reuse, recycling and recovery is achieved, the predicted impact of the operational phase on the environment will be ***long-term, neutral*** and ***imperceptible***.

## 14.8 RESIDUAL IMPACTS

Adherence to the mitigation measures outlined in Section 14.6.1 and 14.6.2 will ensure that there are no significant impacts on resource or waste management from the proposed development. The management of waste during the construction phase in accordance with the Construction & Demolition Waste Management Plan (C&D WMP) and during the operational phase in accordance with the mitigation measures in Section 14.6.2 will meet the requirements of regional and national waste legislation and promote the management of waste in line with the priorities of the waste hierarchy. The residual impact will be ***neutral*** and ***imperceptible***.

## 14.9 CUMULATIVE IMPACTS

The construction of the proposed development and the Permitted Development within the overall landholding will require site clearance, excavations and levelling which will generate waste. Mitigation measures will be carried out for the proposed development, and provided that mitigation measures set out in the EIA Reports for all proposed permitted and planned developments are implemented during construction of the proposed development, the cumulative impact will be ***short term*** and ***imperceptible***.

The waste quantities which will be generated from the operation of the Proposed and Permitted developments within the overall landholding are anticipated to be relatively small. As such, the predicted impact of the build out of the site on waste management will be ***long term*** and ***imperceptible***.

Other developments in the area will be required to manage waste in compliance with national and local legislation, policies and plans which will minimise/mitigate any potential cumulative impacts associated with waste generation and waste management. As such it is considered that the cumulative impact will be ***long-term*** and ***imperceptible***.

## 14.10 REFERENCES


1. Department of Environment, Heritage and Local Government, *Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects* (2006).
2. Environmental Protection Agency (EPA), *National Waste Database Reports 1998 – 2012*.
3. Waste Management Act 1996 (No. 10 of 1996) as amended. Sub-ordinate and associated legislation includes:
    a. European Communities (Waste Directive) Regulations 2011 (S.I. No. 126 of 2011) as amended.
    b. Waste Management (Collection Permit) Regulations 2007 (S.I. No. 820 of 2007) as amended.
    c. Waste Management (Facility Permit and Registration) Regulations 2007 (S.I No. 821 of 2007) as amended.
    d. Waste Management (Licensing) Regulations 2000 (S.I No. 185 of 2000) as amended.
    e. European Union (Packaging) Regulations 2014 (S.I. No. 282 of 2014) as amended.
    f. Waste Management (Planning) Regulations 1997 (S.I. No. 137 of 1997) as amended.
    g. Waste Management (Landfill Levy) Regulations 2015 (S.I. No. 189 of 2015)
    h. European Union (Waste Electrical and Electronic Equipment) Regulations 2014 (S.I. No. 149 of 2014)
    i. European Union (Batteries and Accumulators) Regulations 2014 (S.I. No. 283 of 2014) as amended.
    j. Waste Management (Food Waste) Regulations 2009 (S.I. No. 508 of 2009) as amended.
    k. European Union (Household Food Waste and Bio-waste) Regulations 2015 (S.I. No. 430 of 2015)
    l. Waste Management (Hazardous Waste) Regulations 1998 (S.I. No. 163 of 1998) as amended.
    m. Waste Management (Shipments of Waste) Regulations 2007 (S.I. No. 419 of 2007) as amended.
    n. European Communities (Transfrontier Shipment of Waste) Regulations 1994 (SI 121 of 1994)
    o. European Communities (Shipments of Hazardous Waste exclusively within Ireland) Regulations 2011 (S.I. No. 324 of 2011)
    p. European Union (Properties of Waste which Render it Hazardous) Regulations 2015 (S.I. No. 233 of 2015) as amended.
4. Department of Environment, Communities and Local Government (DoECLG), *A Resource Opportunity - Waste Management Policy in Ireland* (2012).
5. Department of Communications, Climate Action and Environment (DCCAE), Waste Action Plan for the Circular Economy - Ireland's National Waste Policy 2020-2025 (Sept 2020)
6. FÁS and the Construction Industry Federation (CIF), *Construction and Demolition Waste Management – a handbook for Contractors and Site Managers* (2002).
7. BS 5906:2005 Waste Management in Buildings – Code of Practice
8. Eastern-Midlands Region Waste Management Plan 2015 – 2021 (2015).
9. Environmental Protection Agency (EPA), *National Waste Statistics Web Resource – Progress to EU Targets* (October 2018)
10. Wicklow County Council (WCC)*, Wicklow County Develoment Plan 2016-2022*
11. EPA, *Waste Classification – List of Waste & Determining if Waste is Hazardous or Non-Hazardous* (2015)

12. Council Decision 2003/33/EC, establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC.
13. Litter Pollution Act 1997 (S.I. No. 12 of 1997) as amended.
14. Protection of the Environment Act 2003, (No. 27 of 2003) as amended.

# APPENDIX 14.1

# CONSTRUCTION & DEMOLITION WASTE MANAGEMENT PLAN

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# APPENDIX 14.1

# CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT PLAN

# PROPOSED 110KV GIS SUBSTATION, AVOCA RIVER PARK, ARKLOW, CO. WICKLOW

Technical Report Prepared By

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Environmental Consultant

Our Reference

EC/20/11844WMR01

Date of Issue

24 November 2020

## Document History

| Document Reference | | Original Issue Date | |
|---|---|---|---|
| EC/20/11844WMR01 | | 14 December 2020 | |
| Revision Level | Revision Date | Description | Sections Affected |
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# 1.0 INTRODUCTION

AWN Consulting Ltd. (AWN) has prepared this Construction and Demolition (C&D) Waste Management Plan (WMP) for a proposed development within the Avoca River Park, Arklow, Co Wicklow. The site is currently developed, and demolition works will be required for site clearance.

The purpose of this C&D WMP is to provide information necessary to ensure that the management of C&D waste at the site is undertaken in accordance with current legal and industry standards including the *Waste Management Acts 1996-2011* and associated Regulations [1], *Protection of the Environment Act 2003* as amended [2], *Litter Pollution Act 1997* as amended [3] and the *Eastern-Midlands Region Waste Management Plan 2015-2021* [4]. In particular, this C&D WMP aims to ensure maximum recycling, re-use and recovery of waste with diversion from landfill, where possible. It also seeks to provide guidance on the appropriate collection and transport of waste to prevent issues associated with litter or more serious environmental pollution (e.g. contamination of soil or water resources).

In the preparation of the C&D WMP consideration has been given to the requirements of National and Regional waste policy, legislation and other guidelines (referred to in Section 2.0). However, in determining the structure and content of the document, the following two publications have been referenced in particular:

- Department of the Environment, Heritage and Local Government (DoEHLG), *Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects* (2006) [5].
- FÁS and the Construction Industry Federation (CIF), *Construction and Demolition Waste Management – a handbook for Contractors and Site Managers,* (2002) [6].

These Guidance Documents are considered to define best practice for C&D projects in Ireland and describe how C&D projects are to be undertaken such that environmental impacts and risks are minimised and maximum levels of waste recycling are achieved.

# 2.0 OVERVIEW OF WASTE MANAGEMENT IN IRELAND

## 2.1 National Level

The Government issued a policy statement in September 1998 titled as *'Changing Our Ways'* [7] which identified objectives for the prevention, minimisation, reuse, recycling, recovery and disposal of waste in Ireland [7]. The target for C&D waste in this Strategy was to recycle at least 50% of C&D waste within a five-year period (by 2003), with a progressive increase to at least 82% over fifteen years (by 2013) [7].

In response to the *Changing Our Ways* report, a task force (Task Force B4) representing the waste sector of the already established Forum for the Construction Industry, released a report titled *Recycling of Construction and Demolition Waste* [8] concerning the development and implementation of a voluntary construction industry programme to meet the governments objectives for the recovery of construction and demolition waste.

A number of additional National and Regional Waste Policies, Strategies and Reports have been issued in previous years including:

- Department of the Environment, Heritage and Local Government (DoEHLG), *Preventing and Recycling Waste - Delivering Change* (2002);
- DoEHLG, *Making Ireland's Development Sustainable – Review, Assessment and Future Action, World Summit on Sustainable Development* (2002);
- DoEHLG, *Taking Stock and Moving Forward* (2004);
- DoEHLG, *National Strategy on Biodegradable* Waste (2006); and
- DoEHLG, *A Resource Opportunity* (2012).

The most recent national policy document was published in July 2012, entitled *A Resource Opportunity - Waste Management Policy in Ireland* [9]. This document stresses the environmental and economic benefits of better waste management, particularly in relation to waste prevention. The document sets out a number of actions in relation to C&D waste - it commits to undertake a review of specific producer responsibility requirements for C&D projects over a certain threshold.

In September 2020, the government released a new action plan for Ireland to cover the period of 2020-2025. This plan '*A Waste Action Plan for a Circular Economy'* [10] was prepared in response to the 'European Green Deal' which sets a roadmap for a transition to a new economy, where climate and environmental challenges are turned into opportunities. The plan identifies opportunities for the application of circular economy principles across a range of areas such as food, end-of-waste and by-products, where improvements in the regulatory regime can divert material from waste to beneficial reuse. It also gives full effect to many of the commitments in the Programme for Government, including the introduction of a deposit and return scheme for plastic bottles, and measures to support the development of indigenous treatment capacity, supporting national economic recovery.

The National Construction and Demolition Waste Council (NCDWC) was launched in June 2002, as one of the recommendations of the Forum for the Construction Industry, in the Task Force B4 final report. The NCDWC subsequently produced *Best Practice Guidelines for the Preparation of Waste Management Plans for Construction and Demolition Projects* in July 2006 in conjunction with the Department of the Environment, Heritage and Local Government (DoEHLG).

The guidelines outline the issues that need to be addressed at the pre-planning stage of a development all the way through to its completion. These guidelines have been followed in the preparation of this document and include the following elements:

- Predicted construction and demolition wastes;
- Procedures to prevent and minimise wastes;
- Options for reuse/recycling/recovery/disposal of construction and demolition wastes;
- Provision of training for Waste Manager and site crew;
- Details of proposed record keeping system;
- Details of waste audit procedures and plan; and
- Details of proposed consultation with relevant bodies i.e. waste recycling companies, Meath County Council, etc.

## 2.2 Regional Level

In terms of waste management, the receiving environment is largely defined by Wicklow Council (WCC) as the local authority responsible for setting and administering waste management activities in the area. This is governed by the requirements set out in the Eastern-Midlands Region (EMR) Waste Management Plan 2015-2021.

The waste management plan sets out the following targets for waste management in the region:

- A 1% reduction per annum in the quantity of household waste generated per capita over the period of the plan;
- Achieve a recycling rate of 50% of managed municipal waste by 2020; and
- Reduce to 0% the direct disposal of unprocessed residual municipal waste to landfill (from 2016 onwards) in favour of higher value pre-treatment processes and indigenous recovery practices.

The Regional Plan sets out the strategic targets for waste management in the region and sets a specific target for C&D waste of "70% preparing for reuse, recycling and other recovery of construction and demolition waste" (excluding natural soils and stones and hazardous wastes) to be achieved by 2020.

The National Waste Statistics update published by the EPA in October 2019 identifies that Ireland's current progress against this C&D waste target is at 71% and our progress against 'Preparing for reuse and recycling of 50% by weight of household derived paper, metal, plastic & glass (includes metal and plastic estimates from household WEEE)' is at 45%. Both of these targets are required to be met by 12 December 2020 in accordance with the requirements of the Waste Framework Directive.

The Wicklow County Council Development Plan 2016 – 2022 [11] also sets policies and objectives for the WCC area which reflect those set out in the regional waste management plan.

In terms of physical waste infrastructure, WCC no longer operates any municipal waste landfill in the area. There are a number of waste permitted and licensed facilities located in the Eastern-Midlands Waste Region for management of waste from the construction industry as well as municipal sources. These include soil recovery facilities, inert C&D waste facilities, hazardous waste treatment facilities, municipal waste landfills, material recovery facilities, waste transfer stations and two waste-to-energy facilities.

## 2.3 Legislative Requirements

The primary legislative instruments that govern waste management in Ireland and applicable to the project are:

- Waste Management Act 1996 (No. 10 of 1996) as amended. Sub-ordinate legislation includes:
  - European Communities (Waste Directive) Regulations 2011 (SI 126 of 2011) as amended
  - Waste Management (Collection Permit) Regulations (S.I No. 820 of 2007) as amended
  - Waste Management (Facility Permit and Registration) Regulations 2007, (S.I No. 821 of 2007) as amended
  - Waste Management (Licensing) Regulations 2004 (S.I. No. 395 of 2004) as amended
  - Waste Management (Packaging) Regulations 2014 (S.I. 282 of 2014) as amended
  - Waste Management (Planning) Regulations 1997 (S.I. No. 137 of 1997)

  - Waste Management (Landfill Levy) Regulations 2015 (S.I. No. 189 of 2015)
  - European Union (Waste Electrical and Electronic Equipment) Regulations 2014 (S.I. No. 149 of 2014)
  - European Union (Batteries and Accumulators) Regulations 2014 (S.I. No. 283 of 2014) as amended
  - Waste Management (Food Waste) Regulations 2009 (S.I. 508 of 2009), as amended
  - European Union (Household Food Waste and Bio-waste) Regulation 2015 (S.I. No. 430 of 2015)
  - Waste Management (Hazardous Waste) Regulations, 1998 (S.I. No. 163 of 1998) as amended
  - Waste Management (Shipments of Waste) Regulations, 2007 (S.I. No. 419 of 2007) as amended
  - Waste Management (Movement of Hazardous Waste) Regulations, 1998 (S.I. No. 147 of 1998)
  - European Communities (Transfrontier Shipment of Waste) Regulations 1994 (SI 121 of 1994)
  - European Union (Properties of Waste which Render it Hazardous) Regulations 2015 (S.I. No. 233 of 2015) as amended.
- Environmental Protection Act 1992 (No. 7 of 1992) as amended.
- Litter Pollution Act 1997 (No. 12 of 1997) as amended.
- Planning and Development Act 2000 (No. 30 of 2000) as amended.

These Acts and subordinate Regulations enable the transposition of relevant European Union Policy and Directives into Irish law.

One of the guiding principles of European waste legislation, which has in turn been incorporated into the Waste Management Acts 1996 – 2011 and subsequent Irish legislation, is the principle of *"Duty of Care"*. This implies that the waste producer is responsible for waste from the time it is generated through until its legal reuse, recycling, recovery and/or disposal (including its method of reuse, recycling, recovery and/or disposal). As it is not practical in most cases for the waste producer to physically transfer all waste from where it is produced to the final destination, waste contractors will be employed to physically transport waste to the final waste reuse, recycling, recovery and/or disposal site. Following on from this is the concept of *"Polluter Pays"* whereby the waste producer is liable to be prosecuted for pollution incidents, which may arise from the incorrect management of waste produced, including the actions of any contractors engaged (e.g. for transportation and disposal/recovery/recycling of waste).

It is therefore imperative that the appointed construction contractor(s) are legally compliant with respect to waste transportation, reuse, recycling, recovery and disposal. This includes the requirement that a contractor handle, transport and reuse/recycle/recover/dispose of waste in a manner that ensures that no adverse environmental impacts occur as a result of any of these activities.

A collection permit to transport waste must be held by each waste contractor which is issued by the National Waste Collection Permit Office (NWCPO). Waste receiving facilities must also be appropriately permitted or licensed. Operators of such facilities cannot receive any waste, unless in possession of a Certificate of Registration (COR) or waste permit granted by the relevant Local Authority under the *Waste Management (Facility Permit & Registration) Regulations 2007* as amended, or a waste or Industrial Emissions (IE) licence granted by the EPA. The COR/permit/licence held will specify

the type and quantity of waste able to be received, stored, sorted, recycled, recovered and/or disposed of at the specified site.

## 3.0 DESCRIPTION OF THE PROJECT

### 3.1 Location, Size and Scale of the Development

The proposed development consists of the provision of a 110kV GIS substation and along with associated and ancillary works. within the Avoca River Business Park, Arklow, Co.Wicklow.

A detailed description of the development is provided in Chapter 2 (Description of the Proposed Development) of this EIA Report. A description of the characteristics of the development relevant to waste are described in Section 14.4 of Chapter 14 (Waste Management).

### 3.2 Overview of the Non-Hazardous Wastes to be produced

The construction of foundations for the 110kV GIS substation, the installation of ducting for the 110kV underground transmission lines, the installation of the 49kVA electricity connection and associated ancillary development (as described in detail in Chapter 2) will require the excavation of topsoil and subsoil.

The optimum depth of excavation required to facilitate installation of the 110kV ducting for the transmission line is 1.21m below ground level (bgl) but may increase to up to c. 1.5m at utility crossings. The optimum width of each trench is 1.02m, however this may vary depending on ground conditions and existing services.

The optimum depth of excavation required to facilitate installation of the ducting for the 49kVA cable installation is c . 0.95-1m below ground level (bgl) but may increase to up to c. 1.5m at utility crossings. The optimum width of each trench is c.0.6m, however this may vary depending on ground conditions and existing services to up to c. 1m.

Suitable topsoil and subsoil will be reused on site as backfill, where possible. However, it is currently envisaged that c. 8,500$m^3$ will require removal offsite (as advised by the project engineers, Malachy Walsh & Partners (MWP)) for offsite reuse, recovery and/or disposal.

The importation of fill materials will be required for construction of foundations and to reinstate the trenches. The project engineers, MWP, have estimated that the importation of up to 10,000$m^3$ of fill material will be required.

During the construction phase of the proposed GIS substation and unit substation, waste produced will include surplus steel and other metal materials and broken/off-cuts of timber, plasterboard, concrete etc. Waste from packaging (cardboard, plastic, timber) and oversupply of materials are also likely to be generated.

Waste will also be generated by construction workers. These wastes would generally be organic/food waste, dry mixed recyclables (waste paper, newspaper, plastic bottles, packaging, aluminium cans, tins and Tetra Pak cartons), mixed non-recyclables and potentially sewage sludge from temporary welfare facilities provided at the site compound during the construction phase. Waste printer/toner cartridges, waste electrical and electronic equipment (WEEE) and waste batteries may also be

generated infrequently from site offices. A temporary site construction compound will be set up upon commencement of the construction phase of the GIS building and MV Control Building within the site boundary. The compound will be used as a secure storage area for construction materials and excess spoil and also contain temporary site units to provide welfare facilities for site personnel. Facilities will include office space, meeting rooms, canteen area, a drying room and sanitary provisions.

The contractor will be required to ensure that oversupply of materials is kept to a minimum and opportunities for reuse of suitable materials is maximised.

## 3.3 Potentially Hazardous Waste

### 3.3.1 Contaminated Soil

A site investigation was carried out at the site by Ground Investigations Ireland (GII) in 2020 which included trial pitting and boreholes on a site immediately adjacent to the east of the proposed development site. Soil samples were collected from 30 no. trial pits for soil analysis and were tested for the RILTA suite including asbestos.

The soil samples were compared to a Generic Assessment Criteria (GAC) derived to be protective of human health, water bodies (including groundwater) and also ecology for a commercial/industrial end use (LQM/CIEH S4Uls GACs). The level of arsenic detected in the samples from 2 no. trial pits, TP08 at 1.5mbgl and TP13 at 1.5mbgl, exceeded the commercial S4UL threshold value. TP13 was the nearest trial pit to the subject site.

The soil analysis results were also compared to the landfill acceptance criteria as specified in the European Communities (EC) Council Decision 2003/33/EC which identifies the maximum concentration of selected key contaminants permitted for acceptance at authorised waste facilities. The WAC criterion sets threshold concentrations for contaminants to classify the material under three categories; inert, non-hazardous and hazardous. None of the soils analysed showed any exceedances of inert WAC thresholds.

The authorised waste facilities may also require the soil to be classified as Hazardous or Non-Hazardous in accordance with the EPA publication Waste Classification – List of Waste & Determining if Waste is Hazardous or Non-Hazardous using the HazWasteOnline classification tool (or similar approved methodology). This can be done based on the soil analysis data obtained from the GII site investigation.

Trial pit TP13 presented hazardous materials at 1.5 mbgl, the sample was classified as 17 05 13 (Soil and stones containing hazardous substances) due to the high concentrations of Arsenic, Copper, Lead and Zinc. It is believed that these results are product of the previous fertiliser production process existing at the adjacent site. Appendix 5.2 (Chapter 5) further details with regard to these results and the respective laboratory reports.

Any potentially contaminated material, should be segregated, tested and classified as either non-hazardous or hazardous in accordance with the EPA publication entitled *'Waste Classification: List of Waste & Determining if Waste is Hazardous or Non-Hazardous'* using the *HazWasteOnline* application (or similar approved classification method). If the material is to be disposed of to landfill, it will then need to be classified as clean, inert, non-hazardous or hazardous in accordance with the *EC Council Decision 2003/33/EC* and landfill specific criteria. This legislation sets limit values on

landfills for acceptance of waste material based on properties of the waste including potential pollutant concentrations and leachability.

Excavation works will be carefully monitored by a suitably qualified person to ensure any potentially contaminated soil is identified and segregated in accordance with the above procedure.

Further details on the soil quality at the site is provided in Chapter 5 (Land, Soils, Geology and Hydrogeology).

### 3.3.2 Fuel/Oils

As fuels and oils are classed as hazardous materials, any on-site storage of fuel/oil, all storage tanks and all draw-off points will be bunded and located in a dedicated, secure area of the site. Provided that these requirements are adhered to and the site crew are trained in the appropriate refuelling techniques, it is not expected that there will be any fuel/oil waste generated at the site.

### 3.3.3 Other Known Hazardous Substances

Paints, glues, adhesives and other known hazardous substances will be stored in designated areas. They will generally be present in small volumes only and associated waste volumes generated will be kept to a minimum. Wastes will be stored in appropriate receptacles pending collection by an authorised waste contractor.

In addition, waste electrical and electronic equipment (WEEE) containing hazardous components, printer/toner cartridges and batteries (Lead, Ni-Cd or Mercury) may be generated from the temporary site offices during construction works. These wastes will be stored in appropriate receptacles in designated areas of the site pending collection by an authorised waste contractor.

## 3.4 Main Construction and Demolition Waste Categories

The main non-hazardous and hazardous waste streams that may typically be generated by the construction activities at the proposed site are presented in Table 3.1. The List of Waste code (also referred to as the European Waste code or EWC) for each waste stream is also shown.

***Table 3.1.*** Typical waste types generated, and List of Waste Codes (* individual waste type may contain hazardous materials)

| Waste Material | List of Waste Code |
|---|---|
| Soil and stones | 17 05 |
| Concrete, bricks, tiles, ceramics | 17 01 |
| Wood, glass and plastic | 17 02 |
| Bituminous mixtures* | 17 03 01/02 |
| Metals (including their alloys) | 17 04 |
| Gypsum-based construction material | 17 08 |
| Paper and cardboard | 20 01 01 |
| Mixed construction and demolition waste | 17 09 04 |
| Electrical and electronic components | 20 01 35 |
| Biodegradable Kitchen Waste and Canteen Waste | 20 01 08 |
| Green waste | 20 02 01 |
| Sewage Sludge | 20 03 04/06 |

| Waste Material | List of Waste Code |
|---|---|
| Batteries and accumulators* | 20 01 33-34 |
| Wood preservatives* | 03 02 |
| Liquid fuels* | 13 07 |
| Chemicals (solvents, pesticides, paints, adhesives, detergents etc.) * | 20 01 13-19, 27-30 |
| Soil and stones containing dangerous substances (if encountered) * | 17 05 03 |
| Other construction and demolition wastes containing dangerous substances* | 17 09 03 |

## 4.0 ESTIMATED WASTE ARISINGS

### 4.1 Demolition Waste Generation

It is proposed to demolish the existing building onsite as part of the enabling works for this project. The total ground floor area of structures to be demolished is approximately 2,200m$^2$. Table 4.1 presents the estimated construction waste quantities based on the gross floor area of the buildings to be demolished.

***Table 4.1*** Estimated on and off-site reuse, recycling and disposal rates for construction waste (based on floor size)

| Waste Type | Tonnes | Reuse/Recovery | | Recycle | | Disposal | |
|---|---|---|---|---|---|---|---|
| | | % | Tonnes | % | Tonnes | % | Tonnes |
| Concrete, Bricks, Tiles, Ceramics, Plasterboard | 5.8 | 20 | 1.2 | 75 | 4.4 | 5 | 0.3 |
| Metals | 2.9 | 5 | 0.1 | 80 | 2.3 | 15 | 0.4 |
| Other | 4.7 | 10 | 0.5 | 40 | 1.9 | 50 | 2.3 |
| **Total** | **13.4** | | **1.8** | | **8.6** | | **3.1** |

The appointed demolition contractor will be required to prepare a detailed demolition management plan prior to work commencing which should refine the above estimated waste figures.

### 4.2 Construction Waste Generation

The quantity of surplus excavated material that will be generated has been estimated by the project engineers, Malachy Walsh and Partners, to be c. 8,500m$^3$ which will be removed off site for reuse and/or recycle/recovery.

An assessment has been undertaken to estimate the quantity of other construction wastes likely to be generated from the construction of the GIS substation, client control building and unit substation building.

Table 4.2 presents the estimated construction waste quantities based on the gross floor area of the buildings to be constructed and includes indicative targets for off-site reuse, recycling and recovery.

***Table 4.2*** Estimated on and off-site reuse, recycling and disposal rates for construction waste (based on floor size)

| Waste Type | Tonnes | Reuse/Recovery | | Recycle | | Disposal | |
|---|---|---|---|---|---|---|---|
| | | % | Tonnes | % | Tonnes | % | Tonnes |
| Concrete, Bricks, Tiles, Ceramics, Plasterboard | 5.8 | 20 | 1.2 | 75 | 4.4 | 5 | 0.3 |
| Metals | 2.9 | 5 | 0.1 | 80 | 2.3 | 15 | 0.4 |
| Other | 4.7 | 10 | 0.5 | 40 | 1.9 | 50 | 2.3 |
| Total | 13.4 | | 1.8 | | 8.6 | | 3.1 |

It is expected that wastes generated (other than excavated material) from other construction activities will be negligible and will generally comprise waste generated from construction workers. These wastes would generally be organic/food waste, dry mixed recyclables (waste paper, newspaper, plastic bottles, packaging, aluminium cans, tins and Tetra Pak cartons), mixed non-recyclables and potentially sewage sludge from temporary welfare facilities provided at the site compound during the construction phase. Waste printer/toner cartridges, waste electrical and electronic equipment (WEEE) and waste batteries may also be generated infrequently from the site office.

A temporary site construction compound will be set up upon commencement of the construction phase of the GIS building and MV Control Building within the site boundary. The compound will be used as a secure storage area for construction materials and excess spoil and also contain temporary site units to provide welfare facilities for site personnel. Facilities will include office space, meeting rooms, canteen area, a drying room and sanitary provisions.

It should be noted that until final materials and detailed construction methodologies have been confirmed, it is difficult to predict with a high level of accuracy the construction waste that will be generated from the proposed works as the exact materials and quantities may be subject to some degree of change and variation during the construction process.

An outline Construction Environmental Management Plan (CEMP) has been prepared to accompany the planning application. The appointed main contractor will be required to prepare a detailed CEMP prior to commencement of construction which may refine the above waste estimates.

## 4.2 Proposed Waste Management Options

### 4.2.1 Waste Management Options for Excavated Materials

The Waste Management Hierarchy states that the preferred option for waste management is prevention and minimisation of waste, followed by preparing for reuse and recycling/recovery, energy recovery (i.e. incineration) and, least favoured of all, disposal. Any excavations carried out will be required to facilitate construction works so the preferred option of prevention will not be applicable. However, the volume of material removed from site will be minimised where possible. It is currently proposed that c. 8,500m$^3$ of excavated material will require removal from site.

In the event that any excavated material is removed off-site for reuse as a by-product (and not as a waste), it will be done in accordance with Article 27 of the *European*

*Communities (Waste Directive) Regulations 2011*. Article 27 requires that certain conditions are met and that by-product decisions are made to the EPA via their online notification form.
Similarly, if any soils/stones are imported onto the site from another construction site as a by-product, this will also be done in accordance with Article 27. However, it is not currently anticipated that any excavated material will be removed offsite or imported onto the site for reuse as a by-product.

If any excavated material requires removal from site and is deemed to be a waste, then removal and reuse/recycling/ recovery/disposal of the material will be carried out in accordance with the *Waste Management Acts 1996 – 2011* as amended, the *Waste Management (Collection Permit) Regulations 2007* as amended and the *Waste Management (Facility Permit & Registration) Regulations 2007* as amended. The volume of waste removed will dictate whether a COR, permit or licence is required by the receiving waste facility. Once all available beneficial reuse options have been exhausted, the options of recycling and recovery at waste permitted and licensed sites will be considered.

In the unlikely event that contaminated material is encountered and subsequently classified as hazardous, this material will be stored separately to any non-hazardous material. It will require off-site treatment at a suitable facility or disposal abroad via Transfrontier Shipment of Wastes (TFS).

### 4.2.2 Waste Management Options for other Construction Wastes

Waste materials generated will be segregated on-site, where it is practical. Where the on-site segregation of certain wastes types is not practical, off-site segregation will be carried out. There will be skips and receptacles provided to facilitate segregation at source. All waste receptacles leaving site will be covered or enclosed. The appointed waste contractor will collect and transfer the wastes as receptacles are filled.

All waste arisings will be handled by an approved waste contractor holding a current waste collection permit. All waste arisings requiring reuse, recycling, recovery or disposal off-site will be transferred to a facility holding the appropriate COR, permit or licence, as required.

Mixed C&D waste (classified under the List of Waste code 17 09 04) is permitted for acceptance at a number of waste facilities in the region including Integrated Material Solutions landfill in north Dublin and a number of waste transfer stations.

Written records will be maintained by the contractor detailing the waste arising throughout the construction phase, the classification of each waste type, the contact details and waste collection permit number of all waste contractors who collect waste from the site and the end destination details for all waste removed and disposed offsite.

Dedicated storage containers will be provided for hazardous wastes which may arise such as batteries, paints, oils, chemicals etc., as required. The containers used for storing hazardous liquids will be appropriately bunded or will be stored on suitably sized spill pallets.

The management of the main construction waste streams are detailed as follows:

<u>Concrete</u>
Concrete will be segregated and transferred off site for appropriate reuse, recycling, recovery and/or disposal.

Hard Plastic
As hard plastic is a highly recyclable material, much of the plastic generated will be primarily from material off-cuts. All recyclable plastic will be segregated and recycled, where possible.

Timber
Timber that is uncontaminated, i.e. free from paints, preservatives, glues etc., will be placed into a dedicated skip and recycled off-site. Clean timber is typically recycled as chipboard.

Metal
Metals will be segregated and stored in skips. Metal is highly recyclable and there are numerous companies that will accept these materials.

Plasterboard
Plasterboard from the construction phase will be stored in a separate skip, pending collection for recycling. The site manager and project engineers will ensure that oversupply of new plasterboard is carefully monitored to minimise waste.

Glass
Glass materials will be segregated for recycling, where possible.

Waste Electrical and Electronic Equipment
Waste electrical and electronic equipment (WEEE) will be stored in dedicated covered cages/receptacles/pallets pending collection for recycling off site.

Other Recyclables
Where any other recyclable wastes such as cardboard and soft plastic are generated, these will be segregated at source into dedicated skips and removed offsite.

Non-Recyclable Waste
Construction waste which is not suitable for reuse or recovery, such as polystyrene, some plastics and some cardboards, will be placed in separate skips or other receptacles. Prior to removal from site, the non-recyclable waste skip/receptacle will be examined by a member of the waste team (see Section 6.0) to determine if recyclable materials have been placed in there by mistake. If this is the case, efforts will be made to determine the cause of the waste not being segregated correctly and recyclable waste will be removed and placed into the appropriate receptacle.

Hazardous Wastes
On-site storage of any hazardous wastes produced (i.e. contaminated soil in the unlikely event that it is encountered and/or waste fuels) will be kept to a minimum, with removal off-site organised on a regular basis. Storage of all hazardous wastes on-site will be undertaken so as to minimise exposure to on-site personnel and the public and to also minimise potential for environmental impacts. Hazardous wastes will be recovered, wherever possible, and failing this, disposed of appropriately.

It should be noted that until the main contractor is appointed, it is not possible to provide information on the specific destinations of each waste stream. Prior to commencement construction of each data storage facility and removal of any waste off-site, details of the proposed destination of each waste stream will be provided to MCC.

### 4.3 Tracking and Documentation Procedures for Off-Site Waste

All waste will be documented prior to leaving the site. Waste will be weighed by the waste contractor, either by weighing mechanism on the truck or at the receiving facility. These waste records will be maintained on site by the contractor.

All movement of waste and the use of waste contractors will be undertaken in accordance with the *Waste Management Acts 1996 – 2011* as amended, *Waste Management (Collection Permit) Regulations 2007* as amended and *Waste Management (Facility Permit & Registration) Regulations 2007* as amended. This includes the requirement for all waste contractors to have a waste collection permit issued by the NWCPO. The nominated project Waste Manager (see Section 6.0) will maintain a copy of all waste collection permits on-site.

If the waste is being transported to another site, a copy of the Local Authority COR, waste permit or EPA Waste/IE Licence for that site will be provided to the nominated project Waste Manager. If the waste is being shipped abroad, a copy of the TFS document will be obtained from Dublin City Council (as the relevant authority on behalf of all local authorities in Ireland) and kept on-site along with details of the final destination (permits, licences etc.). A receipt from the final destination of the material will be kept as part of the on-site waste management records.

If any surplus soil or stone is being removed from the site for reuse on another construction site as a by-product, this will need to be done in accordance with Article 27 of the *EC (Waste Directive) Regulations, 2011*. Similarly, if any soil or stone are imported onto the site from another construction site as a by-product, this will also be done in accordance with Article 27.

All information will be entered in a waste management recording system to be maintained on site.

## 5.0 ESTIMATED COST OF WASTE MANAGEMENT

An outline of the costs associated with different aspects of waste management is provided below. The total cost of construction waste management will be measured and will take into account handling costs, storage costs, transportation costs, revenue from rebates and disposal costs.

### 5.1 Reuse

By reusing materials on site, there will be a reduction in the transport and offsite recycling/recovery/disposal costs associated with the requirement for a waste contractor to take the material away to landfill.

Clean and inert excavated material which cannot be reused on site may be used as capping material for landfill sites, or for the reinstatement of quarries, etc. as previously discussed. This material is often taken free of charge for such purposes, reducing final waste disposal costs.

### 5.2 Recycling

Salvageable metals will earn a rebate which can be offset against the costs of collection and transportation of the skips. Clean uncontaminated cardboard and certain hard plastics can also be recycled. Waste contractors will typically charge less to take segregated wastes, such as recyclable waste, from a site than mixed waste streams.

## 5.3 Disposal

Landfill charges in the Eastern-Midlands region are currently at around €130-150 per tonne (which includes a €75 per tonne landfill levy specified in the *Waste Management (Landfill Levy) Regulations 2015*. In addition to disposal costs, waste contractors will also charge a fee for provision and collection of skips.

Collection of segregated construction waste usually costs less than municipal waste. Specific C&D waste contractors take the waste off-site to a registered, permitted or licensed facility and, where possible, remove salvageable items from the waste stream before disposing of the remainder to landfill.

# 6.0 TRAINING PROVISIONS

A member of the construction team will be appointed as the Waste Manager to ensure commitment, operational efficiency and accountability during the construction phase of the project.

## 6.1 Waste Manager Training and Responsibilities

The nominated Waste Manager will be given responsibility and authority to select a waste team if required, i.e. members of the site crew that will aid him/her in the organisation, operation and recording of the waste management system implemented on site. The Waste Manager will have overall responsibility to oversee, record and provide feedback to the Project Manager on everyday waste management at the site. Authority will be given to the Waste Manager to delegate responsibility to subcontractors, where necessary, and to coordinate with suppliers, service providers and sub-contractors to prioritise waste prevention and material salvage.

The Waste Manager will be trained in how to set up and maintain a record keeping system, how to perform an audit and how to establish targets for waste management on site. The Waste Manager will also be trained in the best methods for segregation and storage of recyclable materials, have information on the materials that can be reused on site and be knowledgeable in how to implement this C&D WMP.

## 6.2 Site Crew Training

Training of the site crew is the responsibility of the Waste Manager and, as such, a waste training program should be organised. A basic awareness course will be held for all site crew to outline the C&D WMP and to detail the segregation of waste materials at source. This may be incorporated with other site training needs such as general site induction, health and safety awareness and manual handling.

This basic course will describe the materials to be segregated, the storage methods and the location of the waste storage areas. A sub-section on hazardous wastes will be incorporated into the training program and the particular dangers of each hazardous waste will be explained.

# 7.0 RECORD KEEPING

Records should be kept for all waste material which leaves the site, either for reuse on another site, recycling or disposal. A recording system will be put in place to record the waste arising's on site.

A waste tracking log should be used to track each waste movement from the site. On exit from the site the waste collection vehicle driver should stop at the site office/security hut and sign out as a visitor and provide the security personnel or waste manager with a waste docket (or WTF for hazardous waste) for the waste load collected. At this time, the security personnel should complete and sign the Waste Tracking Register with the following information:

- Date
- Time
- Waste Contractor
- Company waste contractor appointed by e.g. Contractor or subcontractor name
- Collection Permit No.
- Vehicle Reg.
- Driver Name
- Docket No.
- Waste Type
- EWC/LoW

The waste transfer dockets will be transferred to the site waste manager on a weekly basis and can be placed in the Waste Tracking Log file. This information will be forwarded onto the SDCC Waste Regulation Unit when requested.

Alternatively, each subcontractor that has engaged their own waste contractor will be required to maintain a similar waste tracking log with the waste dockets/WTF maintained on file and available for inspection on site by the main contractor as required.

A copy of the Waste Collection Permits, CORs, Waste Facility Permits and Waste Licences will be maintained on site at all times. Subcontractors who have engaged their own waste contractors, should provide the main contractor with a copy of the waste collection permits and COR/permit/licence for the receiving waste facilities and maintain a copy on file available for inspection on site as required.

## 8.0 OUTLINE WASTE AUDIT PROCEDURE

### 8.1 Responsibility for Waste Audit

The appointed Waste Manager will be responsible for auditing the site during the construction and demolition phases of the project.

### 8.2 Review of Records and Identification of Corrective Actions

A review of all the records for the waste generated and transported on or off-site should be undertaken mid-way through the project. If waste movements are not accounted for, the reasons for this should be established in order to see if and why the record keeping system has not been maintained. The waste records will be compared with the established reuse/recovery/recycling/disposal targets for the site.

Each material type will be examined, in order to see where the largest percentage waste generation is occurring. The waste management methods for each material type will be reviewed in order to highlight how the targets can be achieved. Waste management costs will also be reviewed.

Upon completion of the construction phase, a final report will be prepared, summarising the outcomes of waste management processes adopted and the total reuse, recycling, recovery and disposal figures for the development.

## 9.0 CONSULTATION WITH RELEVANT BODIES

### 9.1 Local Authority

Once the main contractor has been appointed and prior to removal of any waste materials offsite, details of the proposed destination of each waste stream will be provided to MCC for their approval.

MCC will also be consulted, as required, throughout the construction phase in order to ensure that all available waste reduction, reuse and recycling opportunities are identified and utilised and that compliant waste management practices are carried out.

### 9.2 Recycling/Salvage Companies

Companies that specialise in C&D waste management will be contacted to determine their suitability for engagement. Where a waste contractor is engaged, each company will be audited in order to ensure that relevant and up-to-date waste collection permits and facility COR/permits/licences are held. In addition, information regarding individual construction materials will be obtained, including the feasibility of recycling each material, the costs of recycling/reclamation, the means by which the wastes will be collected and transported off-site and the recycling/reclamation process each material will undergo off site.

## 10.0 REFERENCES


1. Waste Management Act 1996 (No. 10 of 1996) as amended 2001 (No. 36 of 2001), 2003 (No. 27 of 2003) and 2011 (No. 20 of 2011). Subordinate and associated legislation includes:
    - European Communities (Waste Directive) Regulations 2011 (S.I. No. 126 of 2011) as amended 2011 (S.I. No. 323 of 2011)
    - Waste Management (Collection Permit) Regulations 2007 (S.I No. 820 of 2007) as amended 2008 (S.I. No. 87 of 2008) and 2016 (S.I. No. 24 of 2016)
    - Waste Management (Facility Permit and Registration) Regulations 2007 (S.I. No. 821 of 2007) as amended 2008 (S.I. No. 86 of 2008), 2014 (S.I. No. 310 and S.I. No. 546 of 2014) and 2015 (S.I. No. 198 of 2015)
    - Waste Management (Licensing) Regulations 2000 (S.I. No. 185 of 2000) as amended 2004 (S.I. No. 395 of 2004) and 2010 (S.I. No. 350 of 2010)
    - Waste Management (Planning) Regulations 1997 (S.I. No. 137 of 1997) as amended 1998 (S.I. No. 164 of 1998), 2001 (S.I. No. 356 of 2002) and 2011 (S.I. No. 126 and No. 192 of 2011)
    - Waste Management (Landfill Levy) Regulations 2015 (S.I. No. 189 of 2015)
    - European Communities (Waste Electrical and Electronic Equipment) Regulations 2014 (S.I. No. 149 of 2014)
    - Waste Management (Food Waste) Regulations 2009 (S.I. No. 508 of 2009) as amended 2015 (S.I. No. 190 of 2015)
    - European Union (Household Food Waste and Bio-waste) Regulations 2015 (S.I. No. 191 of 2015)
    - European Union (Packaging) Regulations 2014 (S.I. No. 282 of 2014) as amended 2015 (S.I. No. 542 of 2015)
    - European Union (Waste Electrical and Electronic Equipment) Regulations 2014 (S.I. No. 149 of 2014)
    - European Union (Batteries and Accumulators) Regulations 2014 (S.I. No. 283 of 2014) as amended 2014 (S.I. No. 349 of 2014) and 2015 (S.I. No. 347 of 2015)
    - Waste Management (Hazardous Waste) Regulations 1998 (S.I. No. 163 of 1998) as amended 2000 (S.I. No. 73 of 2000)
    - Waste Management (Shipments of Waste) Regulations 2007 (S.I. No. 419 of 2007) as amended by European Communities (Shipments of Hazardous Waste exclusively within Ireland) Regulations 2011 (S.I. No. 324 of 2011)
    - The European Communities (Trans frontier Shipment of Hazardous Waste) Regulations 1988 (S.I. No. 248 of 1988) ○ European Union (Properties of Waste Which Render It Hazardous) Regulations 2015 (S.I. No. 233 of 2015)
2. Environmental Protection Act 1992 (Act No. 7 of 1992) as amended by the Protection of the Environment Act 2003 (Act No. 27 and S.I. No. 413 of 2003) and amended by the Planning and Development Act 2000 (Act No. 30 of 2000) as amended.
3. Litter Pollution Act 1997 (Act No. 12 of 1997) as amended by the Litter Pollution Regulations 1999 (S.I. No. 359 of 1999) and Protection of the Environment Act 2003, as amended.
4. Eastern-Midlands Waste Region, *Eastern-Midlands Region Waste Management Plan 2015 – 2021* (2015).

5. Department of the Environment, Heritage and Local Government (DoEHLG), *Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects*, (2006).
6. FÁS and the Construction Industry Federation (CIF), *Construction and Demolition Waste Management – a handbook for Contractors and Site Managers*, (2002).
7. Department of Environment and Local Government (DoELG) *Waste Management – Changing Our Ways, A Policy Statement* (1998).
8. Forum for the Construction Industry, *Recycling of Construction and Demolition Waste* (1999).
9. Department of Environment, Communities and Local Government (DoECLG), *A Resource Opportunity - Waste Management Policy in Ireland* (2012).
10. Department of Communications, Climate Action and Environment (DCCAE), Waste Action Plan for the Circular Economy - Ireland's National Waste Policy 2020-2025 (Sept 2020)
11. Wicklow County Council (WCC), *Wicklow County Development Plan 2016-2022* (2016).
12. Environmental Protection Agency (EPA), *Waste Classification – List of Waste & Determining if Waste is Hazardous or Non-Hazardous* (2015).
13. EPA, *National Waste Database Reports 1998 – 2012*.

# 15.0 INTERACTIONS

## 15.1 INTRODUCTION

This chapter of the EIA Report addresses potential interactions and inter-relationships between the environmental factors discussed in the preceding chapters. This covers both the construction and operational phase of the proposed development.

This chapter has been produced following the guidance within, the EIA Directive, the *Planning and Development Act 2000* (as amended), the EPA *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports* 2017 and EPA Draft *Advice Notes for Preparing Environmental Impact Statements* 2015.

In accordance with the guidance not only are the individual significant impacts required to be considered when assessing the impact of a development on the environment, but so must the interrelationships between these factors be identified and assessed.

The majority of the EIA Report chapters have already included and described assessments of potential interactions between aspects, considered by the various specialists contributing to this impact assessment. The quality, magnitude and duration of potential impacts are defined in accordance with the criteria provided in the EPA 2017 Guidance as outlined in Chapter 1. This section of the assessment presents a summary and assessment of the identified interactions.

These interactions have been identified and considered by the various specialists contributing to this impact assessment.

## 15.2 DISCUSSION – POSITIVE IMPACTS

The reasoning behind the interactions that are considered to have a positive effect (i.e. a change which improves the quality of the environment) is outlined in this section.

***Planning and Alternatives on:***

**Population and Human Health**
The proposed development will be designed to provide a permanent power supply for permitted development and future growth within the Arklow area.

The proposed development will create up to 75 temporary jobs during the construction phase, which will have a short term, positive, imperceptible effect on employment and business in the Arklow area.

## 15.3 DISCUSSION – NEUTRAL IMPACTS

The reasoning behind the interactions that are considered to have a neutral effect (i.e., no effects or effects that are imperceptible, within the normal bounds of variation or within the margin of forecasting error) is outlined in this section.

***Land, Soils, Geology and Hydrogeology on:***

**Population and Human Health**

**Hydrology**
The main potential impact of the construction works proposed is on surface water quality (due to sediment laden run-off, material spillages) and groundwater quality (due to removal of protective soil for construction of the GIS substation); however, the implementation of a CEMP as detailed in Section 6.7.1 of Chapter 6 (Hydrology) will ensure the effect will be ***short-term, imperceptible*** and ***neutral***.

**Air Quality and Climate**
There is a potential for the construction activity to impact on air quality in terms of dust generated but mitigation measures outlined in Chapter 8 (Air Quality & Climate) of this EIA Report, implemented through the CEMP will ensure a ***short term, imperceptible*** and ***neutral*** effect. There are no predicted perceptible impact during operation.

**Waste Management**
As detailed in Chapter 14 (Waste Management), c. 8,500m$^3$ of excavated material may be generated during construction. The majority of the excavated material will need to be removed off-site either as a waste or, where appropriate, as a by-product. The management of waste during the construction phase in accordance with the Construction & Demolition Waste Management Plan (C&D WMP) will meet the requirements of regional and national waste legislation and promote the management of waste in line with the priorities of the waste hierarchy. Therefore, the effect of generation of soils/stones in terms of waste management will be ***neutral***.

***Hydrology on:***

**Land, Soils, Geology and Hydrogeology**
There is a potential impact on soil through poorly managed surface water run-off during the construction phase of the proposed development; however, this will be managed through the implementation of a Construction and Environmental Management Plan (CEMP) to ensure management of any accidental discharges to ground. Any interactions between hydrology and land and soils will be ***short-term, imperceptible*** and ***neutral.***

**Biodiversity**
Surface water will be discharged to a new surface water drainage network. The system will consist of a piped network, underground attenuation system, petrol interceptor and a hydrobrake. The hydrobrake will limit the rate of discharge from the site to a suitable outflow rate. Controlled discharge to the Avoca River will be via a pumping system. Separate attenuation systems are proposed for the MV Control Building and GIS Substation Building as these will be operated and maintained by separate entities in the future scenario. A hydrobrake will be installed at the outlet of each respected attenuation tank.

There is no formal designation on the proposed development lands and the development area may be considered of Low Local Ecological Value. The predicted effect will be ***long-term, imperceptible*** and ***neutral***.

**Waste Management**
Hydrocarbon sludge waste and rubbish/debris will be generated in the hydrocarbon interceptors which will treat the surface water run-off from the proposed development during the operational phase. This waste stream will be managed in accordance with the

relevant legislation identified in Chapter 14 such that the effect of the waste generation will be ***long-term, imperceptible*** and ***neutral***.

***Air Quality and Climate on:***

**Hydrology**
Mitigation measures implemented during the construction phase will ensure that the deposition of dust is minimised and therefore the predicted effect from air (including dust) on the water environment during construction is ***short-term, imperceptible*** and ***neutral***.

**Biodiversity**
Mitigation measures during the construction phase of the proposed development will ensure that dust generation is minimised and the effect on biodiversity will be ***short term***, ***imperceptible*** and ***neutral***.

**Population and Human Health**
The mitigation measures that will be put in place at the proposed development for the construction phase will ensure that the impact of construction dust emissions in the form of nuisance dust are ***short-term*** and ***imperceptible***. Further detail on human health and air quality is presented in Chapter 4.

***Noise and Vibration on:***

**Population and Human Health**
The potential impact of noise and vibration on the local population is discussed in Chapter 4 (Population and Human Health) and Chapter 9 (Noise & Vibration). Noise emissions associated with the construction phase of the development are expected to be less than the prevailing ambient noise level at the nearest sensitive locations. In addition, due to the distance between the site and the nearest sensitive locations, vibration impacts generated during construction are expected to be ***negligible***. There are no predicted noise impacts once operational and therefore there will be not be a significant impact on human health as a result of noise emissions.

***Landscape and Visual on:***

**Population and Human Health**
The predicted impact of the proposed development on the landscape is described in Chapter 10. The proposed development is well-sited on brownfield lands, and has been designed to ensure that it will be integrated into its setting. Residual landscape and visual effects from the wider locality will be ***not significant*** or ***imperceptible***, will be ***long-term***.

***Material Assets on:***

**Population and Human Health**
The proposed development will not have a significant impact on material assets such as surface water drainage, water supply, wastewater drainage, power supply and road infrastructure. The individual chapters of this EIA Report (Chapter 12 Traffic and Transportation and Chapter 13 Material Assets) have assessed the capacities of the available infrastructure to accommodate the proposed development and the implementation of the mitigation measures proposed will ensure there are no negative impacts on the local population. The predicted effect is therefore ***imperceptible*** and ***neutral***.

**Hydrology**
The proposed development will result in minor changes to surface water drainage, water supply and wastewater networks. However, a combination of mitigation measures to be implemented as detailed in Section 6.7 of Chapter 6 (Hydrology), as well as the capacity already built into these networks, will ensure that these changes will result in a ***long-term, imperceptible*** and ***neutral*** impact.

## 15.4 DISCUSSION – NEGATIVE IMPACTS

The reasoning behind the interactions that are considered to have a negative effect (i.e. a change which reduces the quality of the environment) is outlined in this section.

***Noise on:***

**Biodiversity**
Noise generated during the construction phase of the proposed development will have a short-term negative impact on fauna which are likely to be displaced during construction works. As the majority of the area is already industrial in nature the overall operational noise levels will not change significantly.

**Population and Human Health**

The mitigation measures that will be put in place at the proposed development for the construction phase will ensure that the impact of construction noise and vibration emissions are ***slight, negative*** and ***temporary***.

The mitigation measures that will be put in place at the proposed development for the operational phase will ensure that the impact of construction noise and vibration emissions are ***negative, not significant*** and ***long-term***.

***Land, Soils, Geology and Hydrogeology on:***

**Noise and Vibration**
Impacts associated with excavation works will be transient in nature and have a short-term impact on the noise environment, which will be mitigated by the implementation of the CEMP, in particular during any excavation works. The effect will be ***slight, negative temporary*** and ***short term.***

***Landscape and Visual on:***

**Traffic and Transportation**
The establishment of site enclosures, construction traffic access routes, construction vehicular activity, site lighting and temporary traffic management regimes will cause disruption during the construction of the proposed development. Effects on landscape character during construction will be ***temporary*** to ***short term*** and will generally vary from ***slight/not significant*** to ***significant/moderate***, and from ***neutral to negative.*** Effects on views during construction will be ***temporary*** to ***short-term***, and will vary from ***moderate*** to ***imperceptible***, and from ***neutral*** to ***negative***. Residual impacts on landscape and visual effects from the wider locality will be not significant or imperceptible.

## 15.5 SUMMARY

In summary, the interactions between the environmental factors and impacts discussed in this EIA Report have been assessed and the majority of interactions are ***neutral***.