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# 12.0 WATER ENVIRONMENT

## 12.1 Introduction

12.1.1 This chapter of the Environmental Impact Assessment Report (EIAR) presents the findings of the likely significant effects on the water environment and flood risk as a result of the Proposed Development as described in Chapter 5: The Proposed Development.

12.1.2 The water environment in this chapter includes surface water quality, hydrogeology, water resources, hydromorphology, flood risk, and drainage.

12.1.3 The impact assessment has been undertaken in accordance with the following broad stages:

- Reviewing the planning and legislative context;
- Establishing the baseline;
- Appraisal of potential impacts and determining the classification and significance of effects; and
- Identification of potential mitigation and enhancement measures.

12.1.4 Environmental effects have been assessed for the construction, operational and decommissioning phases of the Proposed Development. The residual effects reported at the end of this chapter take account of embedded mitigation and the implementation of additional mitigation measures as described in this chapter.

12.1.5 The chapter is supported by information in the following chapters, figures and appendices:

- EIAR Chapter 9: Biodiversity;
- EIAR Chapter 13: Soils and Geology;
- Figure 12.1: Surface Water Features and their Attributes;
- Figure 12.2: Aquifer Designations;
- Figure 12.3: Groundwater Vulnerability; and
- EIAR Appendix 12A: Flood Risk and Drainage Assessment.

## 12.2 Methodology

Introduction

12.2.1 The following sources of information that define the Proposed Development have been reviewed and form the basis of this assessment:

- EIAR Volume I Chapter 4: Existing Site and Conditions;
- EIAR Volume I Chapter 5: The Proposed Development;
- EIAR Volume III Figures 12.1 – 12.3; and
- Flood Risk and Drainage Assessment for the Site (EIAR Volume II Appendix 12A).

Baseline Data Collection

12.2.2 For the purposes of the water quality assessment, a study area of 1km radius around the Site has been considered based on professional judgment in order to identify surface water and groundwater bodies that could reasonably be affected by the Proposed Development. Downstream waterbodies and protected areas within 5km have also been considered. As flood risk impact can also impact upstream and downstream, the assessment also considers a wider study area, where relevant.

Desk Study

12.2.3 Desk based research has been undertaken as part of this assessment to identify the waterbodies within and adjacent to the Site, and to gather and critically evaluate relevant data and information on their condition and attributes.

12.2.4 The key background reports, websites and data used include the websites and documents listed in Section 12.9.

Site Surveys

12.2.5 A site walkover was undertaken by AECOM on 29 June 2021 in dry and fair conditions. The walkover included inspections of surface waterbodies in the study area, observing their current character and condition, the presence of existing risks and any potential pathways for construction and operational impacts from the Site to these waterbodies.

12.2.6 Baseline surface water quality monitoring has also been undertaken to inform the assessment. This consisted of collection of six surface water samples on 15 July 2021 from locations outside of the site on the Mill Stream (SW1 & SW6) and Kilcrow River (SW2 – SW5). The six surface water locations were sampled off-site for a comprehensive suite of determinands and are summarised later in this chapter (see Section 12.4).

Source-Pathway-Receptor Approach

12.2.7 The impact assessment is based on a source-pathway-receptor approach. For an impact on the water environment to exist, the following is required:

- An impact source (such as the release of polluting chemicals, particulate matter, or biological materials that cause harm or discomfort to humans or other living organisms, or the loss or damage to all or part of a water body);
- A receptor that is sensitive to that impact (i.e. water bodies and the services they support); and
- A pathway by which the two are linked.

12.2.8 The first stage in applying the Source-Pathway-Receptor model is to identify the causes or ‘sources’ of potential impact from a development. The sources have been identified through a review of the details of the Proposed Development, including the size and nature of the development, proposed construction methodologies and timescales. The next step in the model is to undertake a review of the potential receptors, that is, the water environment receptors that have the potential to be affected. Water bodies including their attributes have been identified through desk study and site surveys. The last stage of the model is, therefore, to determine if there is a viable exposure pathway or a ‘mechanism’ linking the source to the receptor. This has been undertaken in the context of local conditions relative to the water receptors

within the study area, such as topography, geology, climatic conditions and the nature of the impact (e.g. the mobility of a liquid pollutant or the proximity to works that may physically impact a water body).

12.2.9 The assessment of the likely significant effects is qualitative, and considers both construction, operational, and decommissioning phases, as well as cumulative effects with other developments. This assessment has considered the risk of pollution to surface water bodies and groundwater directly and indirectly from construction activities, particularly in relation to those water features which are within or close to the Site. The risk of pollution from runoff from the built environment has also been considered so that appropriate measures can be incorporated into the design of the Proposed Development.

Flood Risk Assessment

12.2.10 A Flood Risk and Drainage Assessment is provided in Appendix 12A (refer to EIAR Volume II) which assesses flood risk for the Site. Refer to the Flood Risk and Drainage Assessment for a full description of the flood risk baseline, which is also summarised in Section 12.4 of this chapter.

Determination of Sensitive Receptors

12.2.11 When undertaking the impact assessment following the source-pathway-receptor process, the following has been considered:

- Considering the existing (baseline) status of the water environment within the Site and relevant surrounds with respect to flood risk, surface water, ground water and foul drainage;
- Identifying likely impacts of the proposed scheme on the water environment during the operational, construction and decommissioning phases, based on a source-pathway-receptor approach;
- Proposing suitable mitigation measures to be incorporated into the development design, construction and operation to offset any adverse impacts (i.e. embedded mitigation); and
- Reviewing any residual impacts and presenting additional mitigation measures to limit their impacts should these be required.

12.2.12 A qualitative assessment has been used to assign a sensitivity rating from negligible to high, based on the EPA's EIAR guidance (EPA, 2022), and considers their likely adaptability, tolerance, and recoverability, as well as their designation.

Describing Potential Effects

12.2.13 The methodology used for describing the potential effects considers the "quality" of the effects (i.e. whether it is adverse or beneficial), the "probability" of the event occurring and the "duration" of the effects (i.e. whether it is short or long term), as per the EPA's guidance document 'Guidelines on the Information to be Contained in Environmental Impact Assessment Reports' (EPA, 2022).

Significance of Impact

12.2.14 Determining the significance of impact assessment involved:

- Assigning the receptor sensitivity;

- Identifying and characterising the magnitude and significance of potential impacts;
- Incorporating measures to mitigate, and avoid where possible, these impacts during the construction, operational and decommissioning phases of the Proposed Development; and
- Assessing the significance of any residual effects after mitigation.

12.2.15 A qualitative approach was used to determine the significance of impact as per the below diagram (Plate 12.1) from EPA's guidance document (EPA, 2022). Mitigation measures will be devised for each potential complete pollutant linkage (comprising a source, pathway and receptor), no matter how significant the impact. Additional mitigation measures have then been considered prior to determination of residual impacts.

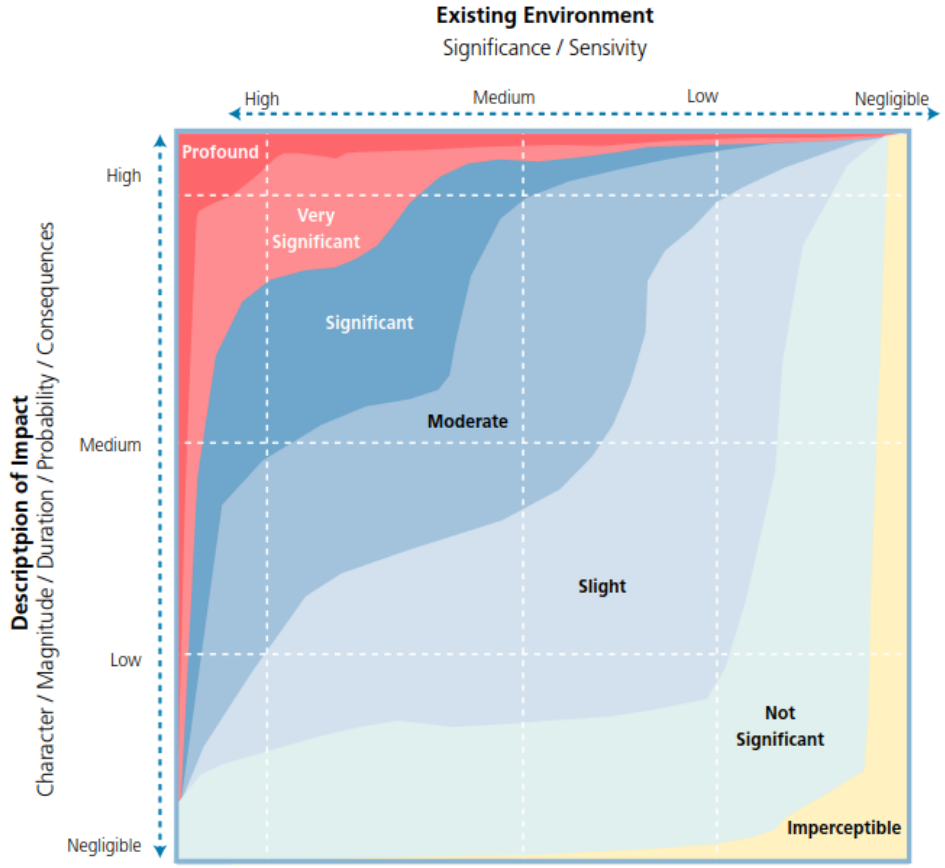


**Plate 12.1: Determination of Significance**

*Source: EPA, 2017*

Limitations and General Assumptions

12.2.16 The assessment has been based on the description of the Proposed Development detailed within Chapter 5: The Proposed Development of this EIAR.

12.2.17 The assessment has been undertaken using available data and Proposed Development design details. It is also based on understanding of flow pathways that were ground-truthed during the site walkover. However, some watercourses in the

power station area are in culverts and underground for significant sections, and so professional judgment has informed flow pathways and directions for these culverted sections, based on available mapping and available site information.

12.2.18 Assumptions and limitations relating to flood risk are outlined in the Flood Risk and Drainage Assessment (Appendix 12A, refer to EIAR Volume II).

12.2.19 Three ground investigations have been undertaken at the site and immediate surrounding area and the details are presented in EIAR Chapter 13: Soils & Geology, and in Appendix 13B Site Investigation Report (GQRA) (refer to EIAR Volume II). From a review of the proposals and for the purposes of the assessment, it is considered no site remediation is required to facilitate the Proposed Development.

12.2.20 While Construction Method Statements will be prepared by the Engineering and Construction (E&C) Contractor when appointed, all works will take place using best practice, as set out in an Outline Construction Environmental Management Plan (oCEMP) (refer to Appendix 5A, EIAR Volume II).

## 12.3 Regulatory and Policy Framework

12.3.1 A summary of the legislation and planning policy relevant to the assessment of impacts of the Proposed Development is provided in this section. These have been taken into account in the assessment, with particular regard given to potential impacts in relation to flood risk and water quality.

Legislation and Guidance

12.3.2 There are a number of key legislative and Guidance documents applicable to the Proposed Development including:

- European Union Water Framework Directive (WFD) (2000/60/EC). The following legislation in Ireland governs the shape of the WFD characterisation, monitoring and status assessment programmes in terms of monitoring different water categories, determining the quality elements and undertaking characterisation and classification assessments: The Board is respectfully asked to discharge its obligations under the Water Framework Directive and assess whether the Proposed Development will compromise the objectives of that Directive, in light of the pending CJEU reference by the High Court in Sweetman v An Bord Pleanála [2021] IEHC 16; [2021] IEHC 777.
- European Communities (Water Policy) Regulations, 2003 (S.I. No. 722 of 2003);
- European Communities Environmental Objectives (Surface Water) Regulations, 2009 ('S.I. No. 272 of 2009 as amended'), as amended in 2012 (by S.I. No. 327/2012), 2015 (by S.I. No. 386/2015) and 2019 (by S.I. No. 77/2019);
- European Communities Environmental Objectives (Groundwater) Regulations, 2010 (S.I. No. 9 of 2010 as amended), as amended in 2016 (S.I. No. 366 of 2016);
- European Communities, Environmental Impact Assessment of Projects – Guidance on Scoping (Directive 2011/92/EU as amended by 2014/52/EU) (EC, 2017);
- The EU Floods Directive 2007/60/EC;

- European Communities (Assessment and Management of Flood Risks) Regulations, 2010 (S.I. No. 122 of 2010);
- River Basin Management Plan 2018-2021 (DHPLG, 2018);
- EPA's 'Guidelines on the Information to be Contained in Environmental Impact Assessment Reports' (EPA, 2022);
- Advice Notes on Current Practice in the Preparation of Environmental Impact Statements' (EPA, 2003);
- EPA's 'Management of Contaminated Land and Groundwater at EPA Licensed Sites' (2013);
- The Institute of Geologists of Ireland (IGI) guidance document 'Guidelines for Preparation of Soils, Geology, Hydrogeology Chapters of Environmental Impact Statements' (IGI, 2013); and
- Galway County Development Plan (CDP) 2022 – 2028 (Galway County Council, 2021).

## 12.4 Baseline Environmental Conditions and Constraints

12.4.1 The relevant baseline physical characteristics of the study area and the water features present are described in this section (refer to Figure 12.1 throughout).

Land Use, Topography and Rainfall

12.4.2 The Site is located approximately 1.8km north-west of Tynagh and is located immediately to the north of the existing Tynagh CCGT Power Station Site, 11.5km east of Lough Rea. The Site is accessed through the existing Tynagh Power Station facility from LP4310 Gurtymadden (note - some public documents refer to this road as Gortymadden) to Tynagh Road, which joins with the N65 Loughrea to Portumna Road approximately 4km north of the site at Gurtymadden crossroads. To the south of the Site, the Gurtymadden to Tynagh Road intersects the Loughrea to Tynagh Road at Lisheen. The ground elevation is generally flat throughout the existing Tynagh Power Station Site, but there is a steep drop to the lands to the north and to the tailing ponds to the east. There is a mound of mining spoil which rises steeply along the southern boundary of the exisitng power station site and increases in elevation to the south-west. The southern part of the ProposedDevelopment Site is relatively flat, falling from 66.4m Above Ordnance Datum (AOD) in the west to 62.5m AOD in the east, however a large mound rises to 73.4m AOD in the north-western part of the Site.

12.4.3 The Site is industrial in character, with industrial buildings (Sperrin Galvanisers) to the west, existing Tynagh Power Plant directly to the south, flooded opencast and former mining tailings ponds and mine waste spoil heaps to the south and east. The residential area at Derryfrench is 330m to the south-west and the Milchem Equestrian Centre 260m north-east of the Site. There are also dispersed rural housing and several farms in the area surrounding the Site.

12.4.4 A watercourse known as the Lisduff Stream is 515m south of the Site, with the Cloonprask / Barnacullia Stream 13m east and the Mill Stream 250m north of the Site. These three watercourses flow east into the Lisduff (Kilcrow) watercourse ultimately flowing south to Lough Derg into the River Shannon (11.1km).

12.4.5 The nearest weather station on the MET Eireann website with available historical data is located at Loughrea (Rathruddy West) (Station No. 2721), approximately 13km north-west of the Site. Based on the average climate data (for the period 1998 to 2022) for this weather station, it is calculated that the Site experiences an average of 1193mm of rainfall per year, with it raining more than 1 mm per day on approximately 147 days per year.

12.4.6 Average monthly rainfall ranges from approximately 60.2mm to 132.4mm. April is the driest month with an average of approximately 60.2mm between 1998 and 2022, and December is the wettest month with an average of approximately 132.4mm between 1998 and 2022.

Surface Water Features

12.4.7 The Site is located within the Lisduff (Kilcrow)_020 WFD Sub-basin (IE_SH_25L060400) of the Lower Shannon surface water catchment (CATCH_ID 25C), as defined under the WFD. The location also falls within the Historic Mine (Tynagh) WFD Groundwater body (European Code IE_SH_G_237). WFD classifications for these waterbodies are discussed in Section 12.4.34. Surface water features in the area include:

- Minor streams approximately 515m to the south (Lisduff Stream) and 13m to the east (Cloonprask / Barnacullia Stream) of the Site, both entering the Kilcrow River approximately 4.6km to the east of the Site. The Kilcrow River enters Lough Derg close to Stoneyisland, approximately 11.6km to the south of the Site.
- It is understood a stream recorded on EPA online surface water feature mapping as Cloonprask may be culverted in close proximity to the east of the Site, before flowing into the Barnacullia Stream approximately 60m to the east of the Site.
- Mill Stream, approximately 250m to the north of the Site, flows into the Barnacullia Stream approximately 1.1km to the north-east of the Site.
- The former Tynagh Mine open pit mine has been allowed to re-flood and is an enclosed open water body (code 25_303) which is approximately 280m to the south-east of the Site at its closest point.
- The former Tynagh Mine tailings ponds remain and form open water bodies (code 25_300) which are approximately 40m to the east of the Site at their closest point.

12.4.8 Surface water features within the study area are shown in Figure 12.1. The only surface water feature within the Site (but outside the footprint of the Proposed Development) is a small c.12m$^2$ pond which supports a population of protected amphibians (as recorded in Section 9.4.32). Mitigation measures to protect this amphibian population are noted in Section 9.6.6.

12.4.9 Other surface waterbodies in the study area but outside the proposed development include:

- The eastern edge of the Cappagh (Galway)_020 WFD waterbody (IE_SH_25C030500) which is located 870m to the south-west of the Site; and
- The northern edge of the Kilcrow_070 WFD waterbody (IE_SH_25K010700) which is located 1.7km to the south of the Site.

Hydrogeology

12.4.10 The shallow and bedrock geology are summarised in Chapter 13: Soils and Geology.

12.4.11 The Lucan and Waulsortian Limestone fractured bedrock units are classified as Locally Important aquifers, but which are productive only in local zones. The Old Red Sandstone is classified as a Poor bedrock aquifer.

12.4.12 Karst features such as springs, swallow holes, enclosed depressions (dolines) and a turlough are mapped between 0.8km and 2.6km west of the Site, along the liner of the bedrock Fault zone. The flood-prone area at Bracklagh Grange is also aligned with the fault zone and is likely to be related to groundwater flooding.

12.4.13 Shallow groundwater was encountered at depths ranging from 1.5m to 3.0m below ground in shallow wells associated with the construction of the existing Tynagh Power Station, which abstracts and treats groundwater at a rate of up to 300$m^3$ per day for process use from a well in the east of the power station site.

12.4.14 Groundwater in the area has elevated concentration heavy metals as a result of the extensive mineralisation of the limestone bedrock in the vicinity of the Site.

Groundwater Vulnerability

12.4.15 The Lucan and Waulsortian Limestone fractured bedrock units are assigned High to Extreme vulnerability to contamination, due to thin or absent subsoil cover. The Old Red Sandstone is assigned similar vulnerability to contamination.

12.4.16 A borehole is recorded by the Geological Survey of Ireland (GSI) approximately 1.9km to the south of the Site for agricultural and domestic uses. The borehole is recorded to a depth of 51.8m bgl, with a 'Good' yield of 329 $m^3$ per day.

Existing Drainage

12.4.17 Based on the 2021 Annual Environmental Report for the existing Tynagh Power Station and existing drainage plans for the site, it is known that storm water is currently collected in a large outdoor collection chamber. This contains an inlet screen, oil adsorbent booms and some 'biobags' to digest any residual oil present. After settling in the large collection chamber, it is then pumped to an oil/ water separator unit, which then separates out any remaining oil present. Final storm water is then sent to a final discharge chamber. An oil in water detector here checks if there is any remaining oil present. Finally, it is discharged to the former open pit mine.

Discharge Consents

12.4.18 There are no Section 4 (of the Local Government (Water Pollution) Act 1977, as amended) Discharges recorded on site, based on EPA mapping. The existing Tynagh Power Station currently discharges treated process water and surface water into the former open pit mine under terms set out in its Industrial Emissions Licence (IEL) (P0700-02).

Abstraction Licences

12.4.19 Tynagh Power Station has a registered abstraction (Abstraction Point Code APR000425) permitted to abstract up to 300 $m^3$ per day from a groundwater well on the east side of the existing Tynagh Power Station Site.

Pollution Incidents

12.4.20 No water pollution incidents are known to have occurred at the Site or at the existing Tynagh Power Station Site. Water quality associated with the Site's geological setting and historical mining uses is summarised below.

Groundwater Quality

12.4.21 The WFD Status 2016-2021 of the Historic Mine (Tynagh) groundwater body underlying the Site is classified as 'Poor' by the EPA based on naturally occurring minerals and the previous mining history of the site and is not related to the current or future operation of the gas fired power station(s) on the site.

12.4.22 Groundwater monitoring is undertaken twice a year on three boreholes within the wider power station site, under the terms of the IEL. Samples are analysed for diesel range organics (DRO) and mineral oil, with field readings taken of pH, temperature and electrical conductivity. The 2021 AER reports that groundwater monitoring in 2021 was in line with the site's IEL requirements and showed no evidence of contamination related to the power station operations. Earlier groundwater data provided for review also reported that all DRO and mineral oil concentrations were below the laboratory's method detection limit.

12.4.23 Geoenvronmental ground investigation was undertaken in August and November 2021, and in February 2022 with geotechnical site investigation also undertaken in May 2022 which incorporated some geo-enviromental soils and groundwater sampling, the results of which are presented in the Generic Quantitative Risk Assessment (GQRA) included as Appendix 13B (referto EIAR Volume II).

12.4.24 The August 2021 site investigation phase included the installation of groundwater monitoring wells in boreholes BH02, BH05 and BH09, with shallower ground gas monitoring wells installed in the corresponding BH02A, BH05A and BH09A.

12.4.25 The May/June 2022 site investigation consisted of six boreholes (between 4.5 and 13.5m deep) and seven trial pits. Wells were installed in BH102 and BH104, which were used for both groundwater and soil gas sampling.

12.4.26 Groundwater levels were recorded in the installed boreholes in 2021 and confirmed previous findings that the groundwater flow is generally towards the northeast.

12.4.27 Groundwater samples were taken from boreholes BH02, BH02A, BH05 and BH09 on 23 August 2021 and from BH02, BH05 and BH09 on 15 September 2021. BH102 and BH104 were sampled on 12 July 2022 and 26 August 2022. The samples were all submitted by the contractor (Causeway Geotech Ltd.) to Chemtest for laboratory analysis.

12.4.28 As detailed in the 2021 GQRA (refer to Appendix 13B, EIAR Volume II), groundwater chemical results were screened against generic assessment criteria (GAC), for drinking water, surface water and groundwater receptors.

12.4.29 All volatile and semi-volatile organic compound (VOC and SVOC) concentrations were below the laboratory method detection limit (MDL).

12.4.30 Total petroleum hydrocarbon (TPH) concentrations were generally below the MDL, with the exception of in boreholes BH02A and BH09 on 23 August 2021. A number of banded hydrocarbons exceeded their respective GAC with respect to groundwater and drinking water, with total TPH concentrations of 7.9mg/L in BH02A and 1.8mg/L in BH09. It is noted the TPH concentrations in deeper bedrock well BH02, directly

adjacent to BH02A, was less than the MDL, suggesting the hydrocarbon contamination in BH02A may be representative of perched water. Additionally, concentrations in BH05 on the east of the site were below the MDL, as were concentrations in BH09 during a later round of sampling on 15 September 2021, indicating the elevated concentrations may be localised. Toluene was only reported in well BH-09, where it exceeded GAC by a factor of 5.5.

12.4.31 The low GAC exceedances reported for the petroleum hydrocarbons and toluene in groundwater sampled from beneath the Site in 2021 are likely related to the former use of the area as a mining site but are unlikely to affect the underlying bedrock aquifer water quality (as elevated heavy metals concentrations preclude its use as drinking water in the vicinity of the Site) or nearby fresh surface water courses, which show no exceedances of available Environmental Quality Standards (EQS) for any parameter, with the exception of EQS exceedances for zinc in samples SW1, SW4 and SW5, with the highest zinc concentration of 141µg/L reported in sample SW4, from the Kilcrow River downstream of the Barnacullia Stream (see section below on Surface Water Quality).

12.4.32 A number of heavy metal concentrations were elevated, particularly in boreholes BH05 and BH09 in 2021 and BH104 in 2022. Zinc concentrations in BH02A (4.5µg/L) and BH02 (48-50µg/L) were significantly lower than those in BH05 (740-1,100µg/L) and BH09 (700-3,100µg/L), BH102 (270-14,000µg/L) and BH104 (330-2,400µg/L). Lead and nickel concentrations were also higher in boreholes BH05 (lead: 9.7-29µg/L, nickel: 66-130µg/L), BH09 (lead: 16-20µg/L, nickel: 16-20µg/L), BH102 (lead: <0.5-22µg/L, nickel: 45-60µg/L) and BH104 (lead: 1.7-4.9µg/L, nickel: 20-49µg/L) than in BH02 (lead: 4.3-7.4µg/L, nickel: 8.4-14µg/L) or BH02A (lead: <0.5µg/L, nickel: 4.9µg/L).

Surface Water Quality

12.4.33 For the purposes of the water quality assessment, a study area of 1km radius around the Site has been considered, based on professional judgment, in order to identify surface water and groundwater bodies that could reasonably be affected by the Proposed Development. In addition, downstream features within 5km have been considered. As the Proposed Development is located close to water features related to the former Tynagh Mine development, all waterbodies that may be reasonably impacted are identified within this study area. Professional judgment has been applied to identify the extent to which such features are considered.

12.4.34 According to the EPA Catchments website, the Lisduff (Kilcrow)_020 WFD waterbody (which includes the Cloonprask, Barnacullia Stream, Mill Stream, Lisduff Stream and Kilcrow River) is assigned a ‘Poor’ surface water quality status under the WFD cycle 2016 to 2021 and is classified as an ‘At Risk’ surface water body under the WFD cycle 2027 objectives. The EPA’s monitoring programme for 2019-2021 includes six monitoring locations. The former open pit mine and tailings ponds are not assigned a Lake Waterbody WFD status.

12.4.35 The Cappagh (Galway)_020 WFD waterbody (IE_SH_25C030500) 1.5km to the south-west of the Site and the Kilcrow_070 WFD waterbody (IE_SH_25C010360) 1.7km to the south of the Site are both assigned a ‘Moderate’ surface water quality status and are classified as ‘At Risk’ surface water bodies under the WFD cycle 2013 to 2018.

12.4.36 The site's former use as a mine is known to have resulted in impacts to surface water features in the area. A 2003 EPA document, 'Report of the Investigation into the Presence of Lead & other Heavy Metals in the Tynagh Mines Area, Co. Galway', indicated heavy metal contamination, particularly in the west tailings pond (to the east of the Proposed Development), prior to the development of the existing Tynagh power station facility. Lead and zinc concentrations were also noted to be elevated in sediments within the Barnacullia Stream, north-east of the Site. However, it was also noted by the EPA that 'in general' surface water quality in the area downstream of the Site was 'satisfactory'.

12.4.37 A journal paper titled 'Contaminants in surface water and sediments around the Tynagh Mine, Galway, Ireland', was published by O'Neill et al. in 2015. It included surface water and sediment sampling in the tailings ponds and Barnacullia Stream. It found elevated concentrations of a number of heavy metals in both sediment and surface water samples.

12.4.38 Additional surface water quality monitoring of local surface water features has been undertaken to inform this baseline study. Samples were taken in July 2021 from locations upstream and downstream of the Site in Mill Stream and the Kilcrow River (Figure 12.1). Samples were despatched under chain of custody procedures to Element Materials Technology for laboratory analysis. The results are summarised in Table 12.1, and consist of a total of four samples from Kilcrow River, and two from the Mill Stream.

12.4.39 A summary of field parameters is presented below:

- pH concentrations were between 7.83 and 8.18;
- Temperature ranged from 17.2 to 20.3ºC;
- Dissolved oxygen values were between 0.26 and 0.43mg/L; and
- Redox ranged from 307 to 377mV.

12.4.40 Concentrations of all total petroleum hydrocarbons (TPHs); benzene, toluene, ethylbenzene and xylene (BTEX) compounds; and a number of heavy metals were below the laboratory method detection limit.

12.4.41 No exceedances of available EQS were noted, with the exception of the EQS for zinc in samples SW1, SW4 and SW5. Zinc is a major constituent of the Tynagh bedrock mineralisation. It is noted that the EQS for zinc is conservative, as it is based on the lowest hardness value stipulated in the regulations and is an annual average value. The highest zinc concentration of 141 µg/L was in sample SW4, which was from the Kilcrow River, downstream of the Barnacullia Stream.

**Table 12.1: Summary of Water Quality Monitoring**

| PARAMETER | UNIT | EQS | SW1 | SW2 | SW3 | SW4 | SW5 | SW6 |
|---|---|---|---|---|---|---|---|---|
| Arsenic | ug/l | 25 (AA) | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 |
| Barium | ug/l | | 13 | 14 | 14 | 18 | 21 | 19 |
| Beryllium | ug/l | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Boron | ug/l | | <12 | <12 | <12 | <12 | <12 | <12 |
| Cadmium | ug/l | 0.45 (MAC**) | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Hexavalent Chromium | ug/l | 3.4 (AA) | <6 | <6 | <6 | <6 | <6 | <6 |
| Trivalent Chromium | ug/l | 4.7 (AA) | <6 | <6 | <6 | <6 | <6 | <6 |
| Copper | ug/l | 5 (AA**) | <7 | <7 | <7 | <7 | <7 | <7 |
| Lead | ug/l | 7.2 (AA) | <5 | <5 | <5 | <5 | <5 | <5 |
| Mercury | ug/l | 0.07 (MAC) | <1 | <1 | <1 | <1 | <1 | <1 |
| Nickel | ug/l | 20 (AA) | 5 | 5 | 6 | 7 | 5 | 4 |
| Selenium | ug/l | | <3 | <3 | <3 | <3 | <3 | <3 |
| Vanadium | ug/l | | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 |
| Zinc | ug/l | 8 (AA**) | *9* | <3 | <3 | *141* | *23* | <3 |
| Fluoride | mg/l | | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 |
| Sulphate | mg/l | | 13.6 | 19.4 | 18.6 | 38.4 | 23.5 | 10.6 |
| Chloride | mg/l | | 17.2 | 18.6 | 18.4 | 18.6 | 17.1 | 18.5 |
| Nitrate | mg/l | | <0.2 | 0.9 | 0.5 | 0.5 | <0.2 | 0.9 |
| Total Cyanide | mg/l | 0.01 (AA) | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Ammoniacal Nitrogen as N | mg/l | | 0.03 | 0.04 | 0.03 | <0.03 | 0.03 | 0.13 |
| COD | mg/l | | <7 | 17 | 16 | 11 | 19 | 8 |
| MTBE | ug/l | | <5 | <5 | <5 | <5 | <5 | <5 |
| BTEX Compounds* | ug/l | | <25 | <25 | <25 | <25 | <25 | <25 |
| TPH (C5-C44)* | ug/l | | <10 | <10 | <10 | <10 | <10 | <10 |

* All individual BTEX compounds and TPH bands were below method detection limits in all samples
** EQS is hardness-dependent. In absence of hardness values, the most conservative value has been selected
AA: Annual Average
MAC: Maximum Allowable Concentration
___: Exceedance of EQS Generic Assessment Criteria

Ecologically Designated Sites

12.4.42 There are no recorded Special Areas of Conservation (SACs), Special Protected Areas (SPAs) or Natural Heritage Areas (NHAs) within 5km of the Site. A review of relevant European sites is presented in the Appropriate Assessment (AA) Screening report, included as Appendix 9D (referto EIAR Volume II).

Flood Risk

12.4.43 A Flood Risk and Drainage Assessment is provided for the Proposed Development in Appendix 12A (refer to EIAR Volume II). The below is a brief summary of baseline flood risk, based on Appendix 12A.

12.4.44 Draft mapping has been produced under the Catchment Flood Risk Assessment and Management (CFRAM) project by OPW. The CFRAM predictive mapping does not identify a direct risk to the Proposed Development from fluvial flooding from the Shannon River located approximately 17km to the east of the Site.

12.4.45 The Galway County Council Strategic Flood Risk Assessment (SFRA) which forms part of the Galway Development Plan 2022 – 2028 indicates the Site lies in Flood Zone C (i.e. at low risk of fluvial flooding). Additionally, the Stage 2 assessment revealed the Site is characterised as 'Highly Vulnerable', and therefore the application of the Justification Test would not be required. The evidence provided in the Stage 2 assessment (underpinned by the Stage 1 assessment and the topographic survey assessment) indicates the Site would not be at fluvial risk from the network of streams flowing nearby.

12.4.46 The OPW Flood Hazard Maps Website (www.floodmaps.ie) was consulted in relation to available historical or anecdotal information on any flooding incidences or occurrence in the vicinity of the Site. No flood events have been recorded within the Site boundary. There is one recurring flood event (ID: 1923) recorded approximately 1km south west of the Site.

12.4.47 The applicant has provided AECOM with information on previous minor flood events adjacent to the Site to the west (but there are no records of flooding on the Site) as a result of overland flow. They have occurred during periods of prolonged rainfall but flooding of the existing power station site was averted and electricity generation was not interrupted. It is considered that the topography of the area may result in overland flow being generated within the catchment upstream of the existing Tynagh Power Station Site which then uses the Derryfrench Road as a flow path. During the past flooding events, the existing power station onsite teams have deployed precautionary measures at the power station entrance to prevent the overland flows potentially reaching the existing Tynagh Power Station site. A land drain has also been constructed along the western site boundary of the Site that takes flows in a northerly direction which is expected to have alleviated the situation. The topography of the area is such that flows would have originally travelled in a north-easterly direction and so displacement of flows was not occurring without the development of this land drain. Additional pumping has also been deployed from the existing Tynagh Power Station existing water treatment facility to the adjacent lagoon due the volume of surface water being experienced overwhelming the storage available. Permission has been obtained from EPA prior to this pumping.

12.4.48 Given the above events that have occurred and the development of mitigation measures, AECOM are of the opinion that the risk of flooding from overland flow at the Proposed Development can be managed to a level that reduces the risk to low.

12.4.49 From the topography and site review, the tailings pond and historical boreholes are located below the level of the Site, therefore it is unlikely that groundwater flooding within the Site boundary will occur, with previous boreholes indicating ground water at 2.09m and 2.74m below the pre-Tynagh Power Station ground level and the 2022 site investigation indicating depth to groundwater of 2.05m to 2.48m below pre-development ground level on the Site and with ground level on the lower-lying areas of the Site proposed for development to be raised to 67.5m AOD from approximately 62-63 mAOD in the southeast.

12.4.50 An extract from the Galway County Council's SFRA, which forms part of the Galway Development Plan 2022-2028, identifies the areas to the north and south (i.e., the existing flooded mine pit) of the existing Tynagh Power Station Site to be possibly at risk of flooding from groundwater.

12.4.51 Groundwater flooding usually occurs in low lying areas underlain by permeable rock and aquifers that allow groundwater to rise to the surface through the permeable subsoil following long periods of wet weather. Low lying areas may be more susceptible to groundwater flooding because the water table is usually at a much shallower depth and groundwater paths tend to travel from high to low ground.

12.4.52 Previous boreholes located adjacent to the site have identified groundwater at depths of greater than 2.0m below ground level. These also confirmed the flow in a direction to the north-east, away from the Site towards the former mine tailings pond area.

12.4.53 The results of groundwater monitoring indicate that groundwater levels have remained below ground and have decreased in level across the Site over the 3No. rounds of monitoring undertaken in 2021. It also confirms previous groundwater depths and flow directions.

12.4.54 The Stage 1 assessment indicated the potential risk of flooding from groundwater sources in the vicinity of the Site. Upon further investigation of the groundwater flooding mapping provided, it appears that this area is referring to the lagoon, which is located outside of the Site boundary and to the south of the existing power station site. Furthermore, the topography of the Site and the immediate surrounds show that any flooding from this location would flow away from the Site. Previous boreholes located on and adjacent to the site have identified groundwater at depths of greater than 2.0m below ground level and confirmed they flow in a direction to the north-east, away from the Site. Therefore the risk of flooding from groundwater is very low.

Summary of Baseline Conditions

12.4.55 A summary of baseline conditions at the Site is presented in Table 12.2.

**Table 12.2: Summary of Baseline Conditions**

| ITEM | DESCRIPTION |
|---|---|
| Context | The Site comprises predominantly brown field land adjacent to and on an existing Tynagh Power Station Site.<br>Surface water from the existing Tynagh Power Station Site discharges under licence to a former open pit mine to the south.<br>A number of streams are present within 1km of the Site, which flow into the Kilcrow River.<br>The Site is not located in a fluvial floodplain.<br>Groundwater flooding is considered unlikely based on topography, groundwater depths and flow direction. |

| ITEM | DESCRIPTION |
|---|---|
| Character | Surface water and sediment within the area have been impacted by the site's historic use for mining. Previous site investigations, surface water and groundwater monitoring have identified elevated concentrations of heavy metals.<br>The Site overlies a 'Locally Important Aquifer'.<br>The status of the river sub-basin has been assessed under the WFD 2016-2021 as 'Poor'. |
| Significance | There are no recorded pNHAs, SACs or SPAs within the 5km radius study area.<br>Groundwater vulnerability is classified as 'High' to 'Extreme', with a small part of the Site coinciding with an area classified as 'Rock near surface or karst'. |
| Sensitivity | Given the 'Poor' quality assigned to the sub-basin and the known impact on local surface waters from historical contamination, the sensitivity of the surface water environment to contamination is considered to be medium.<br>Based on the groundwater vulnerability, its sensitivity is considered to be high.<br>With regards to flood risk, the sensitivity of receptors (infrastructure and site users) is considered to be high. |

## 12.5 Predicted Impacts

Do Nothing Scenario

12.5.1 Under a 'Do Nothing' scenario, there would be no anticipated changes to the water environment.

Construction Phase

12.5.2 During the construction phase the following potential surface water environment impacts may occur in the absence of mitigation:

- Impacts on surface and groundwater water quality due to deposition or spillage of soils, sediments, oils, fuels, or other construction chemicals/ wastewater, or through mobilisation of contamination following disturbance of contaminated ground, sediments, or groundwater, or through uncontrolled site run-off;
- Dewatering of excavations may increase discharges from the Site of potentially-contaminated construction site runoff;
- Increased risk of groundwater flooding or recharge as a result of any below ground excavations; and
- Alteration in fluvial and overland flow paths as a result of works associated with the Proposed Development.

12.5.3 Construction activities such as earthworks, excavations, site preparation, levelling, and grading operations result in the disturbance and excavation of soils. Exposed soil is more vulnerable to erosion during rainfall events due to loosening and removal of vegetation to bind it, compaction and increased runoff rates. Surface runoff from such areas can contain excessive quantities of fine sediment, which may eventually be

transported to watercourses where it can result in adverse impacts on water quality, flora, and fauna.

12.5.4 Other potential sources of fine sediment during construction works include water runoff from earth stockpiles, dewatering of excavations (surface and groundwater), mud deposited on site and local access roads, and that which is generated by the construction works themselves or from vehicle washing.

12.5.5 Sediment in runoff may affect the water environment through smothering river beds and plants, temporarily changing water quality (e.g., increased turbidity and reduced photosynthesis) and causing physical and physiological adverse impacts on aquatic organisms (such as abrasion and irritation). Given the location of the Proposed Development, there may be elevated metal concentrations in runoff, both in dissolved form or within suspended sediments.

12.5.6 The potential impacts relating to construction on the groundwater or surface water environments are greatest where works are undertaken in close proximity to waterbodies and involve disturbance of mining spoil. The Proposed Development is in closest proximity to the minor Cloonprask / Barnacullia Stream (13m to the east of the Site on the northern side of the former mine tailings), the Mill Stream (250m north) and Lisduff Stream (515m south of the Site, to the south of the enclosed former flooded mine lagoon), which flows east to the Lisduff (Kilcrow) River.

12.5.7 During construction, fuel, hydraulic fluids, solvents, grouts, detergents and other potentially polluting substances will be stored and/ or used on Site. Leaks and spillages of these substances could pollute groundwater beneath the Site or the nearby surface watercourses if their use or removal is not carefully controlled and spillages enter existing flow pathways or waterbodies directly. Like excessive fine sediment in construction site runoff, the risk is greatest where works occur close to and within waterbodies.

12.5.8 The Proposed Development Site, at a total area of 5.53 ha., some of which will be hard standing, will represent an in hardstanding cover. In the absence of mitigation, there exists the potential for this to lead to reduced infiltration of rainwater to groundwater and increased flows to surface waters.

12.5.9 Where excavations are undertaken as part of the Proposed Development, the temporary removal of shallow overburden/compacted cover could lead to increased rainwater infiltration to the aquifer, increasing the potential for groundwater flooding.

Operational Phase

12.5.10 During the operational phase the following potential water environment impacts may occur in the absence of mitigation:

- Impacts on receiving waterbodies from anthropogenic pollutants in surface water runoff (including accidental distillate fuel spillages from the proposed tanks and pipelines). This is considered in the context of a brownfield site that may be leaching contaminants to nearby waterbodies or that remains a risk of contamination under extreme conditions;
- Impacts on hydromorphology associated with any new drainage outfalls or other structures that may be installed or removed;
- Potential nutrient enrichment/ acidification of waterbodies located adjacent to the Site from atmospheric deposition of pollutants emitted from the generation

equipment. This will be considered through examination of air quality modelling data (refer to EIAR Chapter 7: Air Quality and Climate).

- Potential increase in volume and rate of surface water runoff from new impervious areas, leading to an impact on flood risk, upstream and downstream of the Site.

Decommissioning Phase

12.5.11 During the decommissioning phase the following potential water environment impacts may occur in the absence of mitigation:

- Temporary impacts on surface and groundwater quality due to deposition or spillage of soils, sediments, oils, fuels or other construction chemicals used in the decommissioning process, or through mobilisation of contamination following disturbance of contaminants in sediments, ground or groundwater, or through uncontrolled site run off.

## 12.6 Mitigation and Enhancement Measures

12.6.1 The following mitigation measures have either been incorporated into the design (i.e. embedded mitigation) or are standard construction or operational practices which will be included in the proposals. These measures have, therefore, been taken into account during the impact assessment.

Construction Phase

12.6.2 During the construction phase, water pollution could potentially occur directly from spillages of polluting substances into waterbodies, or indirectly by being conveyed in runoff from hard standing, other sealed surfaces or from construction machinery. Fine sediment may also be disturbed in waterbodies directly or also wash off working areas and hard standing (including approach roads) into waterbodies indirectly via existing drainage systems or overland. Due to past industrial activity of the Site, this sediment may potentially contain heavy metal or other contamination that could be harmful to the aquatic environment. However, potential impacts to the water environment during the construction phase would be temporary and short term.

12.6.3 Prior to construction commencing, a CEMP will be prepared by the Contractor, to be approved by the planning authority. The CEMP will detail the measures necessary to avoid, prevent and reduce adverse effects, where possible, upon the local surface water (and groundwater) environment. An oCEMP framing the parameters for the Final CEMP is provided in Appendix 5A (refer to EIAR Volume II). This includes the requirement for monitoring of surface water features before, during and after works.

12.6.4 The CEMP will be in keeping with available good practice at that point in time. The principles of the mitigation measures set out below are the minimum standards that the Contractor will implement. However, it is acknowledged that for some issues, such as the management of construction site runoff containing high levels of fine sediment, there are multiple ways in which adequate mitigation can be provided (e.g. fabric silt fences, straw bales, sand bags, construction SuDS or proprietary measures). In addition, the methods of dealing with pollutant risk will need to be continually reviewed on site and adapted as construction works progress in response to different types of work, weather conditions, and locations of work.

12.6.5 The CEMP will be followed (as is standard procedure) during the construction of the Proposed Development and will describe the principles for the protection of the water environment.

*Management of Flood Risk*

12.6.6 During the construction phase, the Contractor will monitor weather forecasts on a monthly, weekly and daily basis, and plan works accordingly. In addition, the Contractor will sign up to weather warning alerts and describe in the Emergency Response Plan the actions it will take in the event of a possible flood event. These actions will be hierarchal meaning that as the risk increases the Contractor will implement more stringent protection measures. This is important to ensure all workers, the construction site and third-party land, property and people are adequately protected from flooding during the construction phase.

12.6.7 If water is encountered during excavation, suitable best practice de-watering methods will be used.

Operational Phase

*Surface and Foul Water Drainage*

12.6.8 A Flood Risk and Drainage Assessment is presented within Appendix 12A (refer to EIAR Volume II). This shows the proposed strategy for dealing with surface water runoff.

12.6.9 The surface water drainage will tie into the existing system at the Tynagh Power Station. There is an increase in impermeable hard surfacing associated with the Proposed Development, with Site area of 5.53ha., a proportion nof which will be hard standing. In line with best practices, it is therefore required to attenuate the surface water runoff to mimic the greenfield runoff conditions. A drainage system with attenuation system will collect surface water before discharging it into the former open pit mine to the south of the Site through the existing outfall.

12.6.10 SuDS are provided for treatment of water quality and attenuation of flow in the northern portion of the Proposed Development. This will take the form of an attenuation system (see Appendix 12A, EIAR Volume II for plan of location). Run-off will flow through the attenuation tank before discharge to the existing Tynagh Power Station treatment system and outfall.

12.6.11 Surface water run-off will be routed via oil and silt interceptors into the attenuation tank, to provide additional treatment prior to being pumped to the existing treatment plant on the existing Tynagh Power Station site. The final discharge to the former open pit mine will utilise the existing outfall, and so no new structures are required. The final discharge will be required to adhere to conditions described within the IEL for the Site.

12.6.12 The Proposed Development will not lead to an increase in staff and therefore there will be no additional foul water generated (either from sanitation or process water) and as a result there will be no requirement for increased foul water management at the site over and above existing facilities.

*Fire Water Tank*

12.6.13 A fire water storage tank will be located to the west of the OCGT (between the OCGT and the AGI). The tank will have a maximum capacity of 1000m$^3$ and will be filled from the existing shared site services for fire management. It will be refilled from the

shared services on an as needed basis, and will not have a significant impact on the existing absraction rate associated with the existing Tynagh Power Station.

*Fuel Storage Tank*

12.6.14 The proposed plant will be required under the Grid Code to maintain a secondary fuel supply of approximately 6,100m$^3$ (5,200t) of distillate (diesel / HVO) fuel which will be contained in a single tank within a bunded area. The purpose of this secondary fuel is to ensure that power can still be supplied to the electricity network in the event of an interruption to supply from the gas connection. The secondary fuel will only be used in the unlikely event that both the gas connection is unavailable and other generation sources on the transmission grid cannot meet demand.

*Environmental Licence*

12.6.15 An IEL will be applied for to cover the operations of the Proposed Development. The Proposed Development will be required to comply with the requirements of the European Union (Large Combustion Plants) Regulations 2012 S. I. No. 566 of 2012 under the IEL so that any impacts of emissions to air, soil, surface and groundwater, and effects on the environment and human health, will be minimised and avoided where possible.

12.6.16 The Site will be operated in line with appropriate standards and the operator will implement and maintain an Environment Management System (EMS) which will be certified to International Standards Organisation (IS) 14001. The EMS will establish the requirements and procedures required to ensure that the Site is operating to the appropriate standard. Sampling and analysis of pollutants will be carried out where required.

*Hazard Prevention and Emergency Planning*

12.6.17 Measures to prevent the risks of flooding, spillages, or other potentially major incidents have been embedded in the design of the Proposed Development.

12.6.18 With regard to flooding, preventative measures includes an appropriate storage volume for surface water runoff within the Site (refer to Appendix 12A for calculations).

12.6.19 Measures to prevent spillages are as follows:

- Bunded or double-skinned storage areas for liquid chemicals, including a single bund around the proposed backup fuel storage tank;
- Maintenance and site housekeeping in line with best practice to reduce the likelihood of leakages and improve leakage detection;
- Spill kits stored on site; and
- Installation of the drainage system which will include oil interceptors for road drainage.

12.6.20 Measures to prevent other potentially major incidents are as follows:

- Compliance with all relevant health, safety and environmental legislation;
- Design, build and operation of the proposed development in accordance with good industry practice; and
- Maintenance and inspections to reduce the risk of equipment failures in line with best practice.

12.6.21 A site Emergency Response Procedure will be developed to cover the Proposed Development in accordance with the IEL.

12.6.22 This will outline procedures to clarify the responsibilities, actions and communication channels for operational staff and personnel on how to deal with emergencies, should they occur. Staff will also receive the level of training required for their role and position. This will include dealing with events such as fires, spillages, flooding, etc. Such measures will be included in the site operating and management system and regulated by the EPA through the IEL.

*Maintenance*

12.6.23 Routine maintenance will be undertaken in accordance with maintenance manuals provided by the E&C Contractor. Details of maintenance are provided in EIAR Chapter 5: The Proposed Development.

Decommissioning Phase

12.6.24 It is considered that the Proposed Development will have a design life of at least 25 years. Decommissioning would therefore be expected to commence at some point after 2052.

12.6.25 A Decommissioning Plan (including a Decommissioning Environmental Management Plan) will be produced and agreed with the EPA as part of any future updated Environmental Licence requirements and site surrender processes.

## 12.7 Residual Effects

Construction Phase

*Surface Water Quality: Suspended Fine Sediment*

12.7.1 Construction activities such as earthworks, excavations, site preparation, levelling and grading operations result in the disturbance of soils. Exposed soil is more vulnerable to erosion during rainfall events due to loosening and removal of vegetation to bind it, compaction and increased runoff rates. Surface runoff from such areas can contain excessive quantities of fine sediment, potentially with elevated heavy metal concentrations, which may eventually be transported to watercourses where it can result in adverse impacts on water quality, flora and fauna.

12.7.2 Other potential sources of fine sediment during construction works include water runoff from earth stockpiles, dewatering of excavations (surface water and groundwater), mud deposited on site and local access roads, and that which is generated by the construction works themselves or from vehicle washing.

12.7.3 Generally, excessive fine sediment in runoff is chemically inert and affects the water environment through smothering riverbeds and plants, temporarily changing water quality (e.g. increased turbidity and reduced photosynthesis) and causing physical and physiological adverse impacts on aquatic organisms (such as abrasion and irritation). Given the past industrial (base metal mining) activity on the Site, there may also be a likelihood for acute and chronic toxic effects to aquatic organisms.

12.7.4 Section 12.6 describes the broad range of surface runoff control measures that will be utilised on the Site, which will be described by the E&C Contractor in the CEMP.

12.7.5 Using the source-pathway-receptor approach, the source here is the numerous construction activities that might generate runoff laden with fine sediment, including construction of the surface water drainage system. The pathway is the process of

runoff over the impermeable surfaces on the Site towards watercourses, and likelihood for direct mobilisation of runoff water into the existing drainage system. The direct receptors are the surface water features identified in the study area (refer to Section 12.4).

12.7.6 With the embedded mitigation measures described in Section 12.6 in place, there would be a negligible impact to the surface water environment. Using the assessment criteria in Table 12.3 this would give a negligible effect for all of the waterbodies. As a medium importance receptor this would give an imperceptible effect.

*Surface Water Quality: Chemical Spillages*

12.7.7 During construction, fuel, hydraulic fluids, solvents, grouts, paints and detergents and other potentially polluting substances will be stored and/ or used on the Site. There may also be substantial volumes of stagnant water or other liquid/ chemical substances within the existing drainage network and other redundant process infrastructure on the Site. Leaks and spillages of the aforementioned substances (the source in the source-pathway-receptor approach) would pollute the nearby surface watercourses if their use or removal is not carefully controlled and if spillages enter the existing drainage network or waterbodies directly (the pathway in the source-pathway-receptor approach). The risk is greatest where construction works are undertaken in immediate proximity to, or within, watercourses. However, there will be no direct works to any watercourse as the new surface water runoff drainage system will discharge to the former open pit mine through an existing outfall. This will restrict potential for spillages directly into watercourses.

12.7.8 Given the implementation of the mitigation measures as described in Section 12.6, including implementation of the CEMP, and that there are no direct works to watercourses, then there would be a negligible impact.

*Effects on Groundwater*

12.7.9 There is a likelihood for contaminated soil or fill material exposed or disturbed during construction to reach the identified groundwater receptors and for contaminants to be introduced to the subsurface as a result of spillages, and to migrate into groundwater or surface water receptors (as baseflow or contributions to stream flow). Rain falling on exposed soil washes or leaches contaminants (if present) into the soil and downwards into the water table, which varies between 1m and 5m below the surface based on available site investigation information. The superficial deposits are present beneath the Made Ground to depths of between 1.8m and 9+m (thickest at the former mine site waste mound forming the northern portion of the site).

12.7.10 The protection of groundwater quality and supplies during the construction phase would be achieved via the standard construction mitigation measures as outlined in Section 12.6 of this chapter and Section 13.6 of Chapter 13: Soils and Geology, and as discussed further in the outline CEMP (refer to EIAR Volume II, Appendix 5A). The mitigation measures will manage the surface water run-off from the Temporary Construction Works Area (i.e. site preparation, earthworks and construction activities) to reduce the potential for impacts to receiving aquifers.

12.7.11 There is a likelihood of groundwater being encountered in excavations at depths between 1.2 and 5.3m below existing site levels, depending on location, and potential for temporary dewatering to be required for certain construction activities.

12.7.12 With the embedded mitigation measures outlined in Section 12.6 (and Chapter 13: Soils and Geology, Section 13.6) in place, the magnitude of impact to groundwater quality through the mobilisation of existing contaminants in soil and the migration of

introduced contaminants in soil as a result of spillages into groundwater receptors is likely to be negligible. This would result in an imperceptible effect on a high sensitivity receptor.

*Effects on Watercourse Hydromorphology*

12.7.13 There are no direct works to watercourses required for the Proposed Development such as new culverts or structures. The surface water drainage network will use an existing outfall to the former open pit mine. As such, there is no impact on the hydromorphology of watercourses during construction.

*Fluvial and Coastal Flood Risk*

12.7.14 The construction phase of the Proposed Development would not involve works in a fluvial flood plain.

12.7.15 With the implementation of standard construction methods and mitigation as described in the oCEMP, this risk can be effectively minimised (for example by monitoring weather forecasts and flood warnings, by ensuring an adequate temporary drainage system is in place and maintained throughout the construction phase and avoiding stockpiling material on floodplains). As such, the magnitude of flooding from these sources during construction is considered negligible, on Site and further downstream. This gives rise to an imperceptible effect in EIA terms.

*Surface Water Flood Risk*

12.7.16 The Site would in general be at a low risk from surface water flooding. During the works, existing surface flow paths may be disrupted and altered due to site clearance, earthworks, and excavation work. The exposure and compaction of bare ground and the construction of impermeable surfaces would alter the rates and volume of runoff and increase the risk from surface water flooding. However, with the implementation of standard construction methods and mitigation measures (see Section 12.6), this risk will be effectively minimised. As such, the magnitude of flooding impact from these sources during construction is considered to be negligible, resulting in an imperceptible effect.

*Groundwater Flood Risk*

12.7.17 Any excavations on the Site have the likelihood to liberate groundwater in some areas. With the implementation of the measures outlined in the oCEMP (see Section 12.6) this risk will be effectively minimised, giving a negligible magnitude of impact, resulting in an imperceptible effect.

Operational Phase

*Potential Pollution of Surface Watercourses: Surface Water Routine Runoff and Accidental Spillages*

12.7.18 The proposed surface water drainage system for the Proposed Development will tie into the existing on site water treatment plant, which currently outfalls to the former enclosed open pit mine under the conditions set out in the Tynagh Power Station IEL. This will enable attenuation of surface water flows, due to an increase in the impermeable area as a result of the Proposed Development. The attenuation tank and existing treatment arrangements would also provide treatment of runoff to ensure potential adverse effects on water quality are avoided. Before entering the pond, all ground level runoff will also pass through an oil interceptor in order to provide additional treatment. An appropriate oil separator with optimum treatment

performance for pollutants likely to be present on the Site will be selected by the E&C Contractor at the detailed design stage.

12.7.19 The requirements of access and frequency for maintaining the attenuation pond and interceptors will be set out as part of a maintenance schedule.

12.7.20 Using the source-pathway-receptor approach, the source of pollution would be contaminants on impermeable surfaces on site (e.g. metals or oils from vehicles on roads, fuel leaks from tanks and pipelines) which are transferred by the pathway of the surface water drainage network to the surface water environment (the receptor).

12.7.21 The Proposed Drainage Layout is included in Appendix 12A (refer to EIAR Volume II) and frames the parameters that will be developed at the detailed design stage. Pollution controls will be included to prevent accidental discharge of pollutants to surface watercourses. Provision shall also be made to prevent silt and debris entering the drainage system, and as described above, oil interceptors will also be included. Areas at most risk of causing frequent spills, including the backup fuel tank area, will be isolated through the use of bunds (or other physical barrier) to an appropriate level to prevent spread of spills across the Site and towards watercourses, and then would be disposed of appropriately. Penstocks, booms or absorbent systems will also be used, as appropriate, to ensure accidental fuel/ chemical spills and fire control do not enter the surface water network.

12.7.22 Hazardous substances will be used on site. In each case the product will have a Material Safety Data Sheet providing guidance on safe disposal of waste chemicals. During operation of the facility, the disposal of product containers and chemical waste will adhere to this guidance, and the impact avoidance measures above.

12.7.23 Appropriate bund inspections and integrity testing will be undertaken in accordance with the conditions of the IEL.

12.7.24 Spillages on the Site will be treated as per the Pollution Prevention Plan procedures described within the impact avoidance measures, and spilt substances will be collected and disposed of as per their individual requirements. A silt separation system or chamber shall be provided upstream of the oil separation system to isolate any spills or firewater in the surface water drainage system and prevent its discharge to the outfall.

12.7.25 Given that the Drainage Strategy will have to meet standards required by the IEL and local/ national policy requirements, and that measures will be in places for dealing with spillages and firewater, then a negligible impact from surface water drainage is predicted to surface water receptors, which are considered to be of high sensitivity. This would result in an imperceptible effect.

*Potential Pollution of Groundwater: Runoff and Accidental Spillages*

12.7.26 There is a likelihood for contaminants introduced to soil as a result of accidental spillages or leakages to migrate into groundwater receptors. The protection of groundwater quality during the operation phase will be achieved through implementation of the Drainage Strategy, with all surface water being directed to the existing outfall via treatment systems. With the proposed mitigations outlined in Section 12.6 in place, the risk of surface water runoff from the hardstanding areas of the Site containing significant levels of contaminants is low.

12.7.27 Through implementation of the embedded mitigation measures outlined in Section 12.6 (and in Chapter 13: Soils and Geology, Section 13.6) in place, the impact

magnitude of spillages in soil migrating into groundwater receptors is negligible. This would give an imperceptible effect for the aquifer.

*Foul Water Discharge*

12.7.28 The Proposed Development will not lead to an increase in staff and therefore there will be no additional foul water generated (either from sanitation or process water) and as a result there will be no requirement for increased foul water management facilities or foul water discharge at the site over and above existing facilities.

*Flood Risk during the Operational Phase*

12.7.29 The Flood Risk and Drainage Assessment is provided in Appendix 12A (refer to EIAR Volume II). It concluded the Proposed Development is not at risk from fluvial flooding and is at a very low risk from groundwater flooding. The Stage 1 assessment indicated a past flood history on lands adjacent to the Site arising from overland flow generated during a prolonged period (five or more days) of rainfall. Precautionary emergency resources were deployed and flooding of the Site was averted. Site operations, including power generation, continued without interruption. The site operator has developed specific emergency procedures for flooding and is aware of the risk posed. Additional drainage design measures are employed to further reduce the risk of flooding from overland flow. The Site is also elevated in relation to the lands outside the Site which has been subject to past flooding.

12.7.30 There is no process effluent drainage discharge to watercourses associated with the Proposed Development, and surface water runoff will be discharged at the greenfield runoff rate (1-2 litres/second/hectare) to the former open pit mine under conditions of an environmental permit. As such, there will be negligible impact on surface water flooding.

12.7.31 Based on the above it is concluded that the operational Proposed Development is at low risk from any external sources of flooding, nor do the proposals cause an increase in upstream or downstream flood risk. As such, the flood risk during operation is imperceptible.

Decommissioning Phase

12.7.32 As described in Section 12.6, at the end of its operating life, all above-ground equipment associated with the facility will be decommissioned and removed from the Site. Prior to removing the plant and equipment, all residues and operating chemicals will be cleaned out from the plant and disposed of in an appropriate manner at licensed treatment facilities. Materials recognised to pose a risk to health will be subject to detailed risk assessment in order to mitigate any adverse effect on workers.

12.7.33 Once the plant and equipment have been removed to ground level, the hardstanding and sealed concrete areas will be left in place.

12.7.34 A Decommissioning Plan (including a Decommissioning Environmental Management Plan) will be produced and agreed with the EPA as part of the Environmental Permitting and site surrender process as required by the IE licence process. The Decommissioning Environmental Management Plan will consider in detail all potential environmental risks on the Site and contain guidance on how risks will be removed or mitigated. This will include details of how surface water drainage will be managed on the Site during the decommissioning and demolition.

12.7.35 On this basis, potential decommissioning impacts are expected to be limited to waterbodies in close proximity to the Site. Impacts would be similar to the impacts

reported for the construction phase, but with fewer earthworks and excavations, thereby restricting the magnitude of impact.

12.7.36 Measures to control mobilisation of fine sediments and to control spillages associated with the use of chemicals and plant on site, as described in the outline CEMP (refer to Appendix 5A for oCEMP), would similarly apply to the decommissioning procedures. Given the restricted nature of the decommissioning works in comparison to construction, as well as the implementation of best practice, the potential for impacts are considered to be negligible.

Summary of Residual Effects

12.7.37 The residual effects resulting from the Proposed Development are summarised in Table 12.3 below.

12.7.38 No significant residual effects have been identified to the water environment or flood risk given the implementation of the mitigation measures described within this chapter and Appendix 12A Flood Risk and Drainage Assessment (refer to EIAR Volume II).

**Table 12.3: Assessment of Residual Effects**

| DESCRIPTION OF EFFECT | RECEPTOR | MAGNITUDE OF IMPACT | DESCRIPTION/ JUSTIFICATION FOR MAGNITUDE OF IMPACT | ADDITIONAL MITIGATION MEASURES | MAGNITUDE OF IMPACT (WITH ADDITIONAL MITIGATION) | SIGNIFICANCE OF RESIDUAL EFFECT |
|---|---|---|---|---|---|---|
| **Construction Phase** | | | | | | |
| Surface Water Quality: Suspended Fine Sediments | Surface waters: Medium | Negligible | Potential for sediment mobilisation through general site runoff from earthworks, site preparation, wheel washing, installation of new drainage system etc., which could runoff directly to watercourses or enter the existing drainage system and propagate to downstream receptors. General site runoff is controlled through measures in the CEMP. | No further mitigation further to that described in Section 12.6. This includes implementation of the CEMP, which will include water quality monitoring pre-, during and post-construction. | Negligible | Imperceptible |
| Surface Water Quality: Chemical Spillages | Surface waters: Medium | Negligible | Potential for spillages to impact water quality of receptors directly or through existing site drainage system. Accidental spillages controlled through measures in the CEMP. | No further mitigation other than implementation of the CEMP as described in Section 12.6, which will include water quality monitoring pre-, during and post construction, and emergency pollution control measures. | Negligible | Imperceptible |
| Groundwater Effects | Bedrock Aquifer: High | Negligible | Potential for mobilisation of contaminants and new pathways to be created to groundwater during construction. To be mitigated using standard measures in the CEMP. | No further mitigation other than implementation of measures outlined in Section 12.6, including those listed in the CEMP. | Negligible | Imperceptible |
| Flood Risk (from all sources | Site infrastructure and workers: High | Negligible | Any potential for increased flood risk is controlled through drainage design and measures outlined in the CEMP. | No further mitigation other than implementation of standard flood control measures outlined in Section 12.6 including those listed in the CEMP. | Negligible | Imperceptible |

| DESCRIPTION OF EFFECT | RECEPTOR | MAGNITUDE OF IMPACT | DESCRIPTION/ JUSTIFICATION FOR MAGNITUDE OF IMPACT | ADDITIONAL MITIGATION MEASURES | MAGNITUDE OF IMPACT (WITH ADDITIONAL MITIGATION) | SIGNIFICANCE OF RESIDUAL EFFECT |
|---|---|---|---|---|---|---|
| **Operational Phase** | | | | | | |
| Water quality impact to surface watercourses from routine runoff and spillages | Surface waters: Medium | Negligible | Implementation of the Drainage Strategy will ensure that surface water runoff would be treated using oil interceptors and a SuDS attenuation pond prior to outfalling to former open pit mine. All oil and chemical storage areas would be sufficiently mitigated against spillages. IEL requirements would be adhered to. | Further development of the drainage strategy at the detailed design phase, to include pollution control measures such as penstocks. | Negligible | Imperceptible |
| Water quality impact to groundwater from routine runoff and spillages | Bedrock Aquifer: High | Negligible | Potential for introduced contaminants in soil as a result of accidental spillages or leakages to migrate into groundwater receptors. This is controlled through the drainage arrangements which direct runoff to an oil interceptor, pond and existing treatment provisions. | Further development of the drainage strategy at the detailed design phase, to include pollution control measures such as penstocks. | Negligible | Imperceptible |
| Flood risk (all sources) | Site infrastructure and workers: High | Negligible | Runoff from the Site will be discharged at a controlled rate, via the surface water drainage system to the former open pit mine, under an IEL. | Development of the drainage strategy at the detailed design phase. | Negligible | Imperceptible |
| **Decommissioning Phase** | | | | | | |
| Surface Water Quality: Suspended Fine Sediments and Chemical Spillages | Surface waters: Medium | Negligible | Potential for sediment mobilisation relating to levelling and general site run off associated with decommissioning, and potential for chemical spillages (e.g. from fuel storage or plant).<br>This could propagate to downstream receptors. Mitigation measures will be outlined in the Decommissioning | Implementation of best practice mitigation as will be outlined in the Decommissioning Environmental Management Plan, and which will be based on those outlined in the CEMP. | Negligible | Imperceptible |

| DESCRIPTION OF EFFECT | RECEPTOR | MAGNITUDE OF IMPACT | DESCRIPTION/ JUSTIFICATION FOR MAGNITUDE OF IMPACT | ADDITIONAL MITIGATION MEASURES | MAGNITUDE OF IMPACT (WITH ADDITIONAL MITIGATION) | SIGNIFICANCE OF RESIDUAL EFFECT |
|---|---|---|---|---|---|---|
| | | | Environmental Management Plan in line with best practice. | | | |

## 12.8 Cumulative Effects

12.8.1 This section of the chapter assesses the likelihood of effects of the Proposed Development in combination with the potential effects of other development schemes (referred to as 'cumulative developments') within the surrounding area, as listed within Chapter 4: Existing Site and Conditions of this EIAR.

12.8.2 Based on a review of planning applications, as presented in Chapter 4: Existing Site and Conditions, Submitted Development Ref: 21/2192 is the only development with the potential to give rise to cumulative effects on the Water environment in conjunction with the Proposed Development. 'Submitted Development Ref: 21/2192' relates to planning application Ref. 21/2192 (submitted as an application to Galway County Council in November 2021, and currently awaiting determination by ABP under Ref. PL07.313538) – that is a separate 299MW OCGT development and project to that of the Proposed Development which is for a 350MW facility. Submitted Development Ref: 21/2192 is to be located to the south of the Proposed Development, primarily to the west of the existing Tynagh Power Station. Subject to planning approval being obtained for the Submitted Development Ref: 21/2192, the Applicant intends to build out and operate both Submitted Development Ref: 21/2192 and the Tynagh North OCGT.

12.8.3 Similar mitigation measures are proposed for both the Proposed Development and the Submitted Development Ref: 21/2192 and no significant cumulative effects due to the two schemes on either flooding or water quality in local watercourses are anticipated should both separate schemes proceed.

## 12.9 References

Ordnance Survey Ireland (OSI) website www.osi.ie

GSI website for public viewer and groundwater maps www.gsi.ie

EPA website www.epa.ie

EPA Catchments website www.catchments.ie

Topography maps http://en-ie.topographic-map.com

'Report of the Investigation into the Presence of Lead & other Heavy Metals in the Tynagh Mines Area, Co. Galway' EPA, 2003

Biannual groundwater monitoring reports for the site, Halston Environmental & Planning Limited, 2012-2020

Annual Environmental Reports for the site, 2015-2020

'Contaminants in surface water and sediments around the Tynagh Mine, Galway, Ireland', O'Neill et al., Science of the Total Environment, 512-513: 261-272, 2015

European Communities (Water Policy) Regulations, 2003 (S.I. No. 722 of 2003);

European Communities Environmental Objectives (Surface Water) Regulations, 2009 ('S.I. No. 272 of 2009 as amended'), as amended in 2012 (by S.I. No. 327/2012), 2015 (by S.I. No. 386/2015) and 2019 (by S.I. No. 77/2019); and

European Communities Environmental Objectives (Groundwater) Regulations, 2010 (S.I. No. 9 of 2010).

European Communities Environmental Objectives (Groundwater) (Amendment) Regulations, 2016 (S.I. No. 366 of 2016); and

European Communities, Environmental Impact Assessment of Projects – Guidance on Scoping (Directive 2011/92/EU as amended by 2014/52/EU) (EC, 2017).

The EU Floods Directive 2007/60/EC

European Communities (Assessment and Management of Flood Risks) Regulations, 2010 (S.I. No. 122 of 2010)

River Basin Management Plan 2018-2021 (DHPLG, 2018)

EPA's guidance document 'Guidelines on the Information to be Contained in Environmental Impact Assessment Reports' (EPA, 2022)

Advice Notes on Current Practice in the Preparation of Environmental Impact Statements' (EPA, 2003)

EPA's 'Management of Contaminated Land and Groundwater at EPA Licensed Sites' (2013)

The Institute of Geologists of Ireland (IGI) guidance document 'Guidelines for Preparation of Soils, Geology, Hydrogeology Chapters of Environmental Impact Statements' (IGI, 2013)

Galway County Development Plan (GCDP) 2022 – 2028 (Galway County Council, 2022)