Rowan



Environmental Impact Assessment Report, Vol 3 Appendices

Silver Hill Foods

November 2022

Appendix 1.1 EIAR Scoping Report

Environmental Impact Assessment Report

Scoping Report

Silver Hill Duck

July 2020

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1. Introduction

1.1 Purpose of this Report

This Environmental Impact Assessment (EIA) Scoping Report sets out the proposed scope of work and methods to be applied in the development of an Environmental Impact Assessment Report (EIAR). It is to be used to support the EPA licence review and also to provide information for the current planning application with Monaghan County Council (ref 20186) for Silver Hill Duck facility (hereafter referred to as the facility) in Emyvale. It also provides the proposed structure and contents of the EIAR.

Scoping is the process of determining what information should be included in the EIAR and which methods should be used to collect and assess that information.

The main objectives of this report are:

- Identify environmental effects which may arise during the construction and operation of the facility and which should therefore be addressed in more detail as part of the EIAR;
- Outline proposed assessment methodologies for completing the EIAR;
- Outline the likely contents of the EIAR; and
- Form a basis of common reference regarding the scope and methodology for the EIAR.

1.2 EIA Scoping Report Structure

The EIA Scoping Report structure is as follows:

Section 1: Provides an overview of the purpose and objectives of this EIA Scoping Report.

Section 2: Provides a description of the facility which is under consideration for this EIA Scoping Report.

Section 3: Provides an overview of the EIA process and the approach to the development of the EIAR.

Sections 4 – 13: These sections identify possible effects on the environment and outline the proposed assessment methodology that will be adopted in assessing the effects. The environmental aspects that will be considered in the EIAR are outlined below:

- Section 4: Population and Human Health;
- Section 5: Biodiversity;

- Section 6: Soils, Geology and Hydrogeology;
- Section 7: Water and Hydrology;
- Section 8: Air Quality and Climate;
- Section 9: Noise and Vibration:
- Section 10: Landscape and Visual;
- Section 11: Traffic and Transport;
- Section 12: Waste Management; and
- Section 13: Archaeology, Cultural Heritage and Architectural Heritage.

2. Project Description

2.1 Description of the Facility

The site is located just north of Emyvale, Co. Monaghan. The site as a whole, including auxiliary lands and infrastructure, encompasses approximately 35 hectares and is accessed by the N2 - the Dublin to Derry road. The site is set over a number of levels with the main processing and facilities area on the higher part off the site at an elevation of approximately 70m Above Ordnance Datum (AOD) and the lower part of the site encompassing the waste water treatment plant (WWTP) and environmental management area at 60m AOD.

Founded in 1962 by Ronnie and Lyla Steele in Emyvale, Co. Monaghan, Silver Hill Duck is a fully integrated duck producing company. All aspects of duck production are owned and controlled by Silver Hill Duck, to processing, cooking and packaging. In March 2019 Fane Valley Group acquired Silver Hill Duck. Fane Valley is a progressive agri-food business, based in Northern Ireland and has been Silver Hill's feed nutrition partner for over 20 years. The site currently employs 180 people.

The processes at Silver Hill Duck are as follows;

- Day old ducks are transported from the Hatchery in Bragan and placed on the duck rearing units. Silver Hill Duck employ 23 Contract Growers along with managing two of their own duck rearing farms. The Contract Growers are located in counties Donegal, Down, Monaghan, Waterford, Cavan, Armagh, Fermanagh and Tyrone.
- Silver Hill Duck Farm in Emyvale has the capacity to rear 80,000 ducks. Currently there are no ducks reared onsite due to the Covid 19 pandemic.
- When the Ducks have reached an age of 42 days they are slaughtered in the processing plant and are produced into both cooked and raw duck products. Approximately 3.5 million ducks are processed per year, with kills occurring 5 days per week Mon-Fri. Current kill pattern is 3 days a week to align production with sales during Covid pandemic.
- The feathers are washed at the onsite feather plant (Site 1) and are sorted according to their grade. The feathers are then sold in bulk or made into duvets, cushions, clothing and sold. All waste feathers are sent as Category 3 to Farragh Proteins, Crossdoney, Co. Cavan.
- The manure produced by the ducks on the offsite supplier farms is removed by licensed hauliers and is used as organic fertiliser by farmers off site – typically under Nutrient Management Plans (NMP) which are prepared to comply with the European Communities (Good Agricultural Practice for Protection of Waters) Regulations 2017 (S.I. No. 605 of 2017).
- If manure was produced on the Silver Hill site, it too would be landspread under NMPs prepared under the aforementioned regulations.
- Silver Hill Duck have a Waste Water Treatment Plant (WWTP) on site to treat the Process water and then release the final treated water to the stream in accordance with the EPA Licence.

- All parts of the duck are sold. All offal products sent worldwide are transported via transport companies sourced by the Agent involved in getting product to these regions.

2.2 Description of the Project

2.2.1 EPA Review

The EPA review was initiated to address two key changes proposed at the site – drip irrigation for treated wastewater disposal and a new rendering plant.

The drip irrigation system would use land adjacent to the site in up to 9 or 10 plots each with an area of 1.6ha area. Treated water would be piped to the fields and dispersed in the soil matrix using a network of distributor pipes. The design flow rate would be 3l/m2/day.

In addition to ongoing normal operations, Silver Hill Duck are examining options to convert their offal waste stream material into a raw material for use in the pet food industry or other similar industries. The processes will involve cooking the offal and then separating the solid material and the fat. It is proposed to locate this process on site by developing the building at the environmental management area, which was previous built for the processing of duck waste following anaerobic digestion.

2.2.1 Planning Permission

Separately, Silver Hill Duck has applied for planning permission for the following;

- construction of a part single storey/part two storey factory development incorporating chilling, plucking and processing areas, offices, plant rooms, Lairaige and loading and unloading areas, canteen and hygiene facilities and single storey conveyor linkage to existing factory facility;
- single storey skip storage and plant room;
- construction of 2 no. underground water storage tanks;
- construction of a single storey extension to side of existing storage shed to incorporate a rendering facility;
- provision of additional car parking facilities, security fencing and access roads;
- connection to existing on-site mains foul sewer, water and drainage services;
- partial removal of existing concrete yard areas and associated structures;
- installation of solar panels to roof structures; and
- completion of all associated site structures and ancillary site works.

3. Approach to the Environmental Impact Assessment

3.1 Introduction to the EIA Process

EIA is the process for anticipating the effects on the environment caused by a facility or development at a particular site. Where effects are unacceptable, design or other measures can be taken to avoid or reduce these effects to acceptable levels. The initial EIA Directive is in place since 1985 (85/337/EEC). This Directive along with three amendments was amalgamated into Directive 2011/92/EU in December 2011. Proposed changes to the Directive were adopted by the Council of the European Union in May 2014 (2014/52/EU) with a 3-year period to transpose the changes. These changes formed the first revision of the Directive 2011/92/EU.

The EU (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. No. 296 of 2018) transpose the requirements of Directive 2014/52/EU into planning law in Ireland and came into effect from the 1st September 2018.

The EIA Directive requires that certain developments be assessed for likely environmental effects before planning permission can be granted. When submitting a planning application for such a development, the applicant must submit an EIAR.

The EIA process can generally be summarised as follows:

- Screening – Is an EIA required
- Scoping – What issues should be considered within the EIAR?
- Baseline Data Collection – Establishing a robust baseline of the existing environment on and around the facility. This stage includes a review of existing available information and undertaking any surveys identified during the scoping phase;
- Impact Assessment – Assessment of the environmental impacts and establishing their significance;
- Mitigation – Formulation of mitigation measures to ameliorate the potential impacts of the facility which cannot be avoided practically through site design;
- Consultation – With Statutory Stakeholders, the public, and other bodies as required;
- Decision – The competent authority decides, taking into consideration the results of consultations, if the facility can be authorised;
- Announcement – The public is informed of the decision; and
- Monitoring – Monitoring of the effectiveness of implemented mitigation measures.

3.2 EIA Screening Assessment

Screening is the first stage of the EIA process, whereby a decision is made on whether or not a mandatory EIA is required. A mandatory EIA is required for developments or projects that are a classification specified by Annex 1 of the EIA Directive, as amended, or by Schedule 5 of the Planning and Development Regulations 2001, as amended.

Following correspondence and discussions with the EPA, they have advised that they consider that the licence review requires the benefit of an EIAR with a view to demonstrating that the facility will not present any significant environmental impacts in the future and the EIAR is proceeding under that advice.

3.3 Environmental Impact Assessment Scoping

Following screening, ‘scoping’ is the process of determining the content and extent of matters that should be covered in the environmental information contained within the EIAR. Scoping requires the consideration of the nature and likely scale of the potential environmental impacts likely to arise from a facility.

3.4 EIAR Methodology

This assessment of environmental impacts will be conducted giving consideration to best practice. The Environmental Protection Agency (EPA) has produced the following guidance which will be considered in the development of the EIAR for the facility:

- Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA, August 2017); and
- Draft Advice Notes for Preparing Environmental Impact Statements (EPA, September 2015).

In addition to these overarching guidance documents for an EIAR, the assessment of each environmental aspect addressed in sections 4 – 13 will also be undertaken with specific consideration to aspect specific guidance and best practice.

The following key stages will form the basis of the assessment process.

- Establishing a baseline of the existing environment on and around the facility;
- Assessment of the environmental impacts and establishing their significance (primarily the assessment of residual impacts once mitigation has been adopted); and
- Formulation of mitigation measures to ameliorate the potential impacts of the facility that cannot be avoided practically through site design.

3.4.1 Baseline Data Collection

The existing environmental baseline for the facility and its surroundings will be established for each environmental aspect under consideration. To date this has been and will continue to be achieved largely through a desktop review of existing data and literature. Additionally, baseline field surveys will be undertaken as required to support the establishment of the baseline.

Given the nature of the expansion project within an existing well-established site, in an immediate area that has seen little development over the last decade, it is anticipated that minimal physical data collection will be required.

3.4.2 Potential Impacts

The assessment will evaluate the construction and operational phases of the facility and the potential impacts will be described. The potential for cumulative impacts to arise will also be considered.

For all environmental aspects, the significance of residual impacts, i.e. those impacts predicted once mitigation is taken account of, will be assessed.

3.4.3 Mitigation Measures

The EIAR will address potential environmental effects associated with the facility and propose mitigation where significant effects are identified. All measures proposed as mitigation for the facility will be reported within the relevant Chapter of the EIAR.

The EIAR will also include a final chapter that contains a Schedule of Environmental Mitigation Measures which will bring together the mitigation measures recommended in the various EIAR Chapters for ease of reference.

3.5 EIAR Structure and Content

The EIAR will be submitted to the EPA to support the licence review for the facility.

Broadly the following key sections will form the content of the EIAR document:

- Introduction
- The Environmental Impact Assessment Process
- Facility Description
- Consideration of Alternatives
- The following environmental topics will be addressed:
    - Population and Human Health;
    - Biodiversity;
    - Soils, Geology and Hydrogeology;
    - Water and Hydrology;
    - Air Quality and Climate;
    - Noise and Vibration:
    - Landscape and Visual;
    - Traffic and Transport;

    - Waste Management; and
    - Archaeology, Cultural Heritage and Architectural Heritage
- Cumulative Impacts and Environmental Interactions

For each of the environmental aspects being assessed, the EIAR chapter will be structured broadly as follows;

- Introduction to the topic area;
- Methodology;
- Baseline conditions;
- Predicted Impacts (construction and operational phases);
- Mitigation Measures;
- Residual Impacts;
- Difficulties Encountered in Compiling Information; and
- Cumulative Impacts and Impact Interrelations.

3.6 Appropriate Assessment

European Sites (Natura 2000), i.e. Special Protection Areas (SPAs) and Special Areas of Conservation (SACs) are classified under the European Union Birds Directive (2009/147EC) and Habitats Directive (92/43/EEC). The procedures that must be followed when considering developments affecting a Natura 2000 site are specified in Articles 6(3) and 6(4) of Habitats Directive.

The EPA themselves initiated an Appropriate Assessment Screening and they concluded *'….an Appropriate Assessment is not required as the project, individually or in combination with other plans or projects, is not likely to have a significant effect on a European site.* Notwithstanding this, and ECIA will be undertaken for the facility to inform the EIAR process.

3.7 Flood Risk Assessment

A Stage 1 Flood Risk Assessment (FRA) will be carried out in accordance with the Office of Public Works Guidelines for Planning Authorities (GPA) 20: The Planning System and Flood Risk Management.

4. Population and Human Health

4.1 Potential Impacts

4.1.1 Potential Construction Phase Impacts

The main construction phase impacts would be associated with the potential nuisance and disturbance caused by construction activities. This would potentially include increases in noise and dust from the construction site and construction traffic on the roads surrounding the facility, resulting in some potential disruption to local people or groups. Such impacts may also result in impact to human health in the vicinity of the facility. There may also be beneficial impacts to the local economy during construction with some increases in local economic activity, with construction staff using local businesses for items such as food and fuel.

4.1.2 Potential Operational Phase Impacts

The facility employs approximately 180 people who work at the facility on a shift basis. In retrofitting / expanding the scope of operations of this facility, impacts would largely be associated with continued and increasing economic activity and security of employment at the plant.

The potential of significant residual impacts (either adverse or beneficial) occurring in relation to population and human health is generally considered low at this stage.

4.2 EIAR Scope

The assessment will comprise of a desk-based analysis of publicly available data, a site visit and review of relevant policies and plans. The following aspects will be considered, and information detailed, where relevant to the facility:

- Population;
- Economic Activity;
- Employment;
- Land Use and Development;
- Commuting Patterns; and
- Tourism, Recreation, and Access.

The significance of impacts on receptors such as primary public services and residential buildings located in proximity to the facility will be assessed.

Human health will be considered as required by Directive 2015/52/EU. This will likely be focused on identifying the environmental topics that have the potential to effect human health and the assessment of those impacts elsewhere within the EIAR. These environmental topics could include the likes of noise and vibration, air quality and traffic.

5. Biodiversity

5.1 Potential Impacts

5.1.1 Potential Construction Phase Impacts

Potential impacts for the construction phase of the facility, in the absence of mitigation would be associated with the:

- loss of habitat due to the footprint of the facility and its construction;
- some potential disturbance of bird, bat or mammal species in close proximity to the facility; and
- the potential spread of invasive species.

It is recognised that the pet food plant is being constructed within the boundary of an already developed facility. The potential of encountering habitats or notable species of ecological value is generally considered low.

5.1.2 Potential Operational Phase Impacts

Potential adverse effects for the operational phase of the facility, in the absence of mitigation have been identified as:

- lighting impacts – disturbance to nocturnal species, including badgers, bats, and birds;
- permanent loss of habitat within the footprint of the facility.

However, generally at this stage, no significant residual impacts on habitats or species are anticipated as a result of the facility.

5.2 EIAR Scope

A field walkover will be undertaken alongside a desk study of available ecological information and relevant plans and policies.

The impact assessment process will involve:

- Identifying any potential habitats or notable species of ecological value;
- Assessing potential direct, indirect and cumulative ecological impacts as a result of the construction and operation of the facility;
- Identifying and characterising potential significant impacts;
- Incorporating measures to avoid and mitigate (reduce) significant impacts where required; and
- Assessing the significance of any residual impacts after mitigation.

As noted in earlier sections, the EPA have screened out the need for Appropriate Assessment – see appendix 1 and this suggests that they consider the potential impact on the ecological environment to be quite benign.

6. Soils, Geology and Hydrogeology

6.1 Potential Impacts

6.1.1 Potential Construction Phase Impacts

Potential impacts associated with the construction phase of the facility may include:

- Loss of soil cover, soil erosion and compaction
- Removal and storage of spoil / overburden;
- Risk of encountering contaminated ground in unknown locations;
- Risk of contamination of existing soils and groundwater by the construction activities such as accidental spills;

6.1.2 Potential Operational Phase Impacts

Potential impacts associated with the operational phase of the facility may include:

- Changes in local surface run-off patterns resulting in local changes to recharge into the soils and bedrock over the operational life of the facility;
- Potential for the permanent loss of localised soils; and
- Potential contamination of soils and groundwater through accidental spillages of fuels or chemicals during operational and/or maintenance works.

The site's WWTP currently discharges (under the EPA licence) to the local stream. It is also connected to the Irish Water sewer system – but this is not in current use. As the EPA are aware, Silver Hill have been working to develop alternative treated water disposal routes. Drip irrigation has been proposed as a viable option. This would use land adjacent to the site in up to 9 or 10 plots each with an area of 1.6ha area. The design flow rate would be 3l/m2/day.

Silver Hill have proposed a pilot project to the EPA and feedback is awaited.

Just before the EIAR process was commenced, Irish Water agreed that the local sewer system can accommodate up to 230m3 of treated WWTP effluent per day in off peak hours (see appendix 2). This disposal route will be considered in the EIAR.

6.2 EIAR Scope

A field walkover will be undertaken alongside a desk study of available information and relevant policies and plans. The assessment will cover potential impacts on soils, geology and hydrogeology and will describe the existing conditions and the likely potential impacts associated with the construction and operation of the facility. The impact assessment process will involve:

- Identifying and characterising the significance of potential impacts;
- Incorporating measures to avoid and mitigate significant impacts where required; and
- Assessing the significance of any residual impacts after mitigation.

The assessment to be carried out will include the following elements:

- Identification of issues relevant to the facility;
- Review of current soil, bedrock and groundwater conditions in the vicinity of the facility;
- Review any potential sensitive receptors relevant to the facility, such as homes and businesses which may use and abstract groundwater in the vicinity;
- Review potentially available site investigation data for works undertaken in the area of the facility;
- Assessment of potential impacts of construction and operational activities on soils, geology and hydrogeology;
- Detailed description and impact assessment of drip irrigation system;
- Incorporating measures to avoid and mitigate (reduce) significant impacts where required; and
- Assessing the significance of any residual impacts after mitigation.

A detailed site assessment review has been undertaken for the drip irrigation system – conducted by Flynn and Shaw in 2016. A total of 15 trial holes were excavated throughout the lands, each to a depth of 1.5m. This report will be used as the basis of impact assessment for this chapter and no further detailed (hydrogeological) modelling is considered required.

7. Water and Hydrology

7.1 Potential Impacts

7.1.1 Potential Construction Phase Impacts

During the construction phase there is the potential for impact on the hydrological environment such as pollution of surface water features through surface water run-off and also flood risk. Sources of pollution include sediment and on-site spillages, which if uncontrolled may flow into local surface water drainage and outfall into the local watercourses.

7.1.2 Potential Operational Phase Impacts

During the operational phase there is the potential for pollution of surface water features through surface water run-off. Sources of pollution associated with the facility would be from potential spills, such as fuel / oil from vehicles on site or spillages from chemical drums. If such substances were allowed to flow into surface water drainage, there is the potential for them to reach nearby surface water bodies. Another potential impact could be flooding risk resulting from increased hardstanding introduced by the facility.

7.2 EIAR Scope

A field walkover will be undertaken alongside a desk study of available information and relevant policies and plans. The assessment will describe the existing water environment and any potential significant impacts associated with the construction and operation of the facility on these aspects.

The impact assessment process will involve:

- A review of drainage plans for surface and waste water at the facility and for the facility;
- Review of the receiving drainage system and existing surface water quality of the receiving environment;
- Inspection of data that may be available relating to surface water quality, such as from the EPA or Local Authority;
- Review of the relevant River Basin Management Plan;
- Identifying and characterising the significance of any potential impacts;
- Incorporating measures to avoid and mitigate (reduce) significant impacts (where they occur); and
- Assessing the significance of any residual impacts after mitigation.

Whilst from a preliminary review, no significant impacts to/from flood risk are anticipated, a Stage 1 flood risk assessment (FRA) will be carried out and appended to the EIAR. The FRA will be carried out in accordance with the Office of Public Works (OPW) Guidelines for Planning Authorities (GPA) 20: The Planning System and Flood Risk Management (OPW and Department of Environment, Heritage and Local Government 2009).

8. Air Quality and Climate

8.1 Potential Impacts

8.1.1 Potential Construction Phase Impacts

During the construction phase there is potential for an impact on air quality from the following sources:

- Potential for construction dust emissions and nuisance dust from activities such as excavation, soil movement, soil storage and backfilling. Dust tends to be deposited within 500m of the generation site, and therefore sensitive receptors which fall within this distance of construction activities would be more at risk; and
- Emissions from Heavy Goods Vehicles (HGVs) and on-site construction plant and equipment which may give rise to emissions including; particulates (PM10 and PM2.5), benzene, nitrogen oxides (NOx) and carbon monoxide (CO).

In order to minimise dust emissions during construction, mitigation measures will be included in the EIAR and be implemented during the construction phase of the facility. The appointed contractor will be required to comply with these measures.

8.1.2 Potential Operational Phase Impacts

During the operational phase of the facility, air quality impacts may be associated with emissions from the boilers and from the refrigeration systems. Air emissions may generate quantities of air pollution such as NO_2, CO, benzene and particulate matter (PM_{10} and $PM_{2.5}$) and those associated with refrigerant gases.

It is believed that the processing of offal onsite (in the pet food plant) will reduce the risk of odours as the offal is currently collected on a need to basis. Depending on the production rates this could be daily or every second day. The process will use only fresh offal and there will be very little odour generated. The process will work in tandem with the processing plant so this will ensure fresh product will be readily available every two hours. No material will be processed unless it is fresh.

An odour model will be generated and will assess the potential impact from the development.

8.2 EIAR Scope

The air quality assessment carried out on the facility will include the following elements:

- Identification of air quality issues relevant to the components of the facility, including boilers and refrigerants;
- Assess odour potential from the pet food plant;
- Review of background ambient air quality in the vicinity of the facility (relevant air quality baseline data will be obtained from the EPA and publicly available information);
- Assessment of potential construction related air quality impacts;
- Assessment of potential impacts of plant and equipment processes on air quality;
- Assessment of potential impacts of traffic on ambient air quality;

- Identifying the significance of any potential impacts;
- Incorporating measures to avoid and mitigate (reduce) significant impacts (where they occur); and
- Assessing the significance of any residual impacts after mitigation.

The assessment will identify potential sensitive receptors relevant to the facility. Sensitive receptors include locations where people spend significant periods of time, such as domestic properties. Sensitive receptors within the vicinity of the facility may include:

- Residential dwellings;
- Industrial or commercial uses sensitive to dust;
- Recreational areas and sports grounds;
- Schools and other educational establishments;
- Buildings of religious sensitivity;
- Designated ecological area of conservation (either Irish or European designation);
- Hospitals and nursing homes; and
- Offices or Shops.

Given the nature of the expansion project, detailed dispersion modelling of the boilers is not proposed to inform the impact assessment process – but an odour model is proposed.

9. Noise and Vibration

9.1 Potential Impacts

9.1.1 Potential Construction Phase Impacts

The potential construction phase noise and vibration impacts will be associated with the operation of machinery on the site. In addition, there may be some percussive noise generated as a result of the need to break down the concrete slabs existing on part of the site. The actual noise level produced by construction work will vary depending on a number of factors including the type of plant in use, plant location, duration of operation, hours of operation and intervening topography.

Vibration impacts are predicted to be low given the nature of the work to be undertaken.

9.1.2 Potential Operational Phase Impacts

It is anticipated that operational phase noise and vibration impacts would be minimal and would be associated with an expansion to the operation as opposed to new noise sources.

9.2 EIAR Scope

The assessment will cover potential impacts from noise and vibration and will describe the existing conditions and the likely potential impacts associated with the construction and operation of the facility.

The impact assessment process will involve:

- Identifying the significance of any potential impacts;
- Incorporating measures to avoid and mitigate (reduce) significant impacts (where they occur); and
- Assessing the significance of any residual impacts after mitigation.

The noise and vibration assessment carried out on the facility will include the following elements:

- Identification of noise and vibration issues relevant to the facility;
- Review of background noise in the vicinity of the facility. A field walkover and noise survey will be undertaken alongside a desk study any relevant baseline information.;
- Assessment of potential noise and vibration impacts resulting from construction activities;
- Assessment of potential impacts of operational phase plant processes on noise and vibration in and around the applicable parts of the facility;
- Assessment of potential impacts of traffic on noise levels in and around the facility.

Given the nature of the expansion project, detailed noise modelling is not proposed to inform the impact assessment process.

The assessment will take account of any Noise Sensitive Locations (NSL's) relevant to the facility. Sensitive receptors will comprise places where it would be reasonable to expect people to be exposed to local noise and vibrations. The EPA NG4 definition of an NSL will be used in the assessment, as reproduced below:

> *NSL – any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or other facility or other area of high amenity which for its proper enjoyment requires the absence of noise at nuisance levels:*

Noise monitoring will be consistent with that gathered as part of the maintenance of the current EPA licence.

10. Landscape and Visual

10.1 Potential Impacts

10.1.1 Potential Construction Phase Impacts

Potential construction phase impacts relevant to the Landscape and Visual Assessment may include;

- Visual impacts from the movement of traffic and machinery to and from the facility and associated ancillary construction requirements i.e. water drainage, power and lighting etc to and from the facility;
- Landscape and visual impacts arising from the movement of construction materials;

10.1.2 Potential Operational Phase Impacts

Potential operational phase impacts relevant to the Landscape and Visual Assessment may include:

- Landscape and visual impacts arising from the presence of new permanent structures at the facility.

The facility is being developed solely within the boundary of an existing well established and developed site. At this stage, no significant residual impacts on the landscape and visual environment are anticipated.

10.2 EIAR Scope

The assessment will include a field walkover undertaken alongside a desk study of available information and relevant policies and plans. The impact assessment process will involve:

- Describing the existing environment (both landscape and visual) taking into account the landscape character assessment published by Monaghan County Council in the County Development Plan 2019-2025;
- Identifying potential landscape and visual issues relevant to the facility;
- Assigning landscape and visual receptor sensitivity;
- Identifying the significance of any potential impacts;
- Incorporating measures to avoid and mitigate (reduce) significant impacts (where they occur);
- Assessing the significance of any residual landscape effects and visual effects after mitigation.

Given the nature of the expansion project within the confines of the existing facility, detailed photomontages are not proposed to be developed, to inform the impact assessment process.

11. Traffic and Transport

11.1 Potential Impacts

11.1.1 Potential Construction Phase Impacts

Potential impacts during the construction phase may include:

- An increase in noise and potentially dust generated from construction related traffic may cause some level of disruption;
- An increase in road traffic levels due to construction related activities supplying and accessing the site using the existing road network.

11.1.2 Potential Operational Phase Impacts

Potential impacts during the operational phase may include:

- Increase in traffic levels due to traffic accessing/ egressing the facility.

11.2 EIAR Scope

The assessment will address potential impacts on traffic and transport and will describe the existing conditions and the likely potential impacts associated with the construction and operation of the facility. The impact assessment process will involve:

- Evaluating the facility in relation to all road users including general traffic, HGV's, cyclists and pedestrians;
- Reviewing the future road and public transports proposals in the area surrounding the facility;
- Parking and loading availability at the facility during the construction and operational phases;
- Identifying and characterising the significance of any potential impacts;
- Incorporating measures to avoid and mitigate (reduce) any significant impacts (where they occur); and
- Assessing the significance of any residual impacts after mitigation.

A Traffic and Transport Assessment (TTA) will be undertaken as per TII TTA guidelines (2014).

12. Waste Management

12.1 Potential Impacts

12.1.1 Potential Construction Phase Impacts

Potential impacts during the construction phase may include:

- Production of additional waste material, arising from excavation works
- Excavation of possible contaminated lands, which would require disposal off site at a suitably licensed facility;
- Surplus materials and waste may occur where material supply exceeds material demand.

12.1.2 Potential Operational Phase Impact

Wastes generated during the operational phase of the facility are likely to include general waste and wastes produced as a result of the expansion to the production process. The waste streams are typically Category 1 and 3 (offal) animal by-products, fat, WWTP sludge, blood, municipal wastes and organic fertiliser (duck slurry)

The pet food process will have a solid material, a liquid fat and effluent. The effluent volume generated will be in the region of 150 m3 per week or less than 1 m3 per hour to the wastewater treatment plant. The products will be sold converting a waste material into a product.

12.2 EIAR Scope

The assessment will cover the potential impacts of waste generation, describe the existing conditions and the likely potential impacts associated with the construction and operation of the facility. The impact assessment process will involve:

- Review of current and future waste plans and/or requirements relevant to the facility i.e. national and regional waste management policies and objectives;
- Describing the waste streams arising from the construction and operational phase of the facility;
- Review of excavated materials expected to be generated during the construction phase;
- Identifying and characterising the significance of any potential impacts;
- Incorporating measures to avoid and mitigate (reduce) any significant impacts (where they occur); and
- Assessing the significance of any residual impacts after mitigation.

13. Archaeololgy, Architectural and Cultural Heritage

13.1 Potential Impacts

13.1.1 Potential Construction Phase Impacts

No significant impacts are currently anticipated upon the cultural heritage resource as a result of the facility. The pet food plant is being developed within the existing facility boundary in an area that has been previously constructed on and developed. Nothing of archaeological or architectural note has been identified to date on site and it is expected that there is low potential for other subsurface unrecorded archaeology to be present. The closest designated heritage asset is approximately 300m north west of the facility. It is described as a Ringfort (ref: MO001-044) in the townland of Knockakirwin.

13.1.2 Potential Operational Phase Impacts

Similar to the construction phase, no significant impacts are currently envisaged as a result of the operational phase of the facility. It is considered unlikely that there would be direct or indirect impacts on cultural heritage given that the development is occurring within the existing site boundary and also accounting for the distance to the closest designated heritage asset.

13.2 EIAR Scope

It is proposed that an assessment of cultural heritage will be carried out in and will be tailored accordingly based on professional judgement and local circumstances.

The assessment will cover potential for impacts on archaeology, architectural and cultural heritage, and will describe the existing conditions and any likely potential impacts associated with the construction and operation of the facility (where relevant). The impact assessment process will involve:

- Undertaking a search of the Record of Monuments and Places (RMPs), Site and Monuments Record (SMR), and National Inventory of Architectural Heritage (NIAH)
- Review of aerial photographic and cartographic sources available online;
- Review of the Excavation Bulletin;
- Identifying and characterising the significance of any potential impacts;
- Incorporating measures to avoid and mitigate (reduce) these any significant impacts (where they occur); and
- Assessing the significance of any residual impacts after mitigation.

14. Consultation with Council

The scoping report will be reviewed and approved by the EPA and Monaghan County Council. Both parties will comment on areas that they suggest require more or less attention than detailed above. The aim would be that when the EIAR is submitted to the EPA as part of the licence review process, and MCC to support the planning application, it is as they expect and an efficient review (with minimal amount of further information requests) can be achieved

Appendix 1 - EPA AA screening

Electronic copy
Mr. Michael Briody
On behalf of Silver Hill Duck

Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

12 September 2019 Reg. No. P0422-03

Re: Appropriate Assessment in respect of a licence review from Silver Hill Duck for an installation located at Silver Hill Duck, Hillcrest, Emyvale, Monaghan.

Dear Sir,

I refer to your application for a licence review in respect of an installation at Hillcrest, Emyvale, Monaghan.

I am to advise you in accordance with Regulation 42(8)(a) of the European Communities (Birds and Natural Habitats) Regulations 2011 as amended, that the EPA has made a determination that an Appropriate Assessment is not required as the project, individually or in combination with other plans or projects, is not likely to have a significant effect on a European site. Notification of this determination is attached for your reference.

The application and all associated correspondence are available to view on the EPA website at www.epa.ie. You are advised to refer to the website for information on the progress of the application.

If you have any further queries, please contact licensing@epa.ie.

Yours faithfully,

Environmental Licensing Programme
Office of Environmental Sustainability
Tel: 053 – 9160600

Appendix 2 - Letter from Irish Water

Uisce Éireann
Bosca OP 6000
Baile Átha Cliath 1
Éire

Irish Water
PO Box 6000
Dublin 1
Ireland

T: +353 1 89 25000
F: +353 1 89 25001
www.water.ie

Denise Jordan
Silver Hills Foods
Emyvale
Co. Monaghan

Reg No: P1022-03
Irish Water Reference: S99-PC-12755

16 June 2020

Dear Ms. Jordan,

I refer to your recent correspondence in relation to a proposed trade effluent emission to sewer from your facility at Silver Hills Foods, Emyvale, Co. Monaghan as part of your Industrial Emissions licence review application.

Irish Water have assessed your proposal and could support a discharge of trade effluent with emissions limit values as outlined in Schedule A below and subject to the following conditions:

- A maximum discharge limit of 21m3/hour from Silver Hill Foods to the public sewer would apply between the hours of 20:00 and 7:00 daily, with a total maximum discharge of 230m3 in this period and no shock loading to the public sewer from Silver Hill Foods at any time.

- It would be a requirement to provide two days effluent storage at your premises to control the release of effluent to the Emyvale WWTP and also for additional storage capacity necessary to cater for storm conditions (230m3 x 2 = 460m3 storage volume).

If you have any further queries, please do not hesitate to contact Irish Water.

Yours sincerely

DocuSigned by:

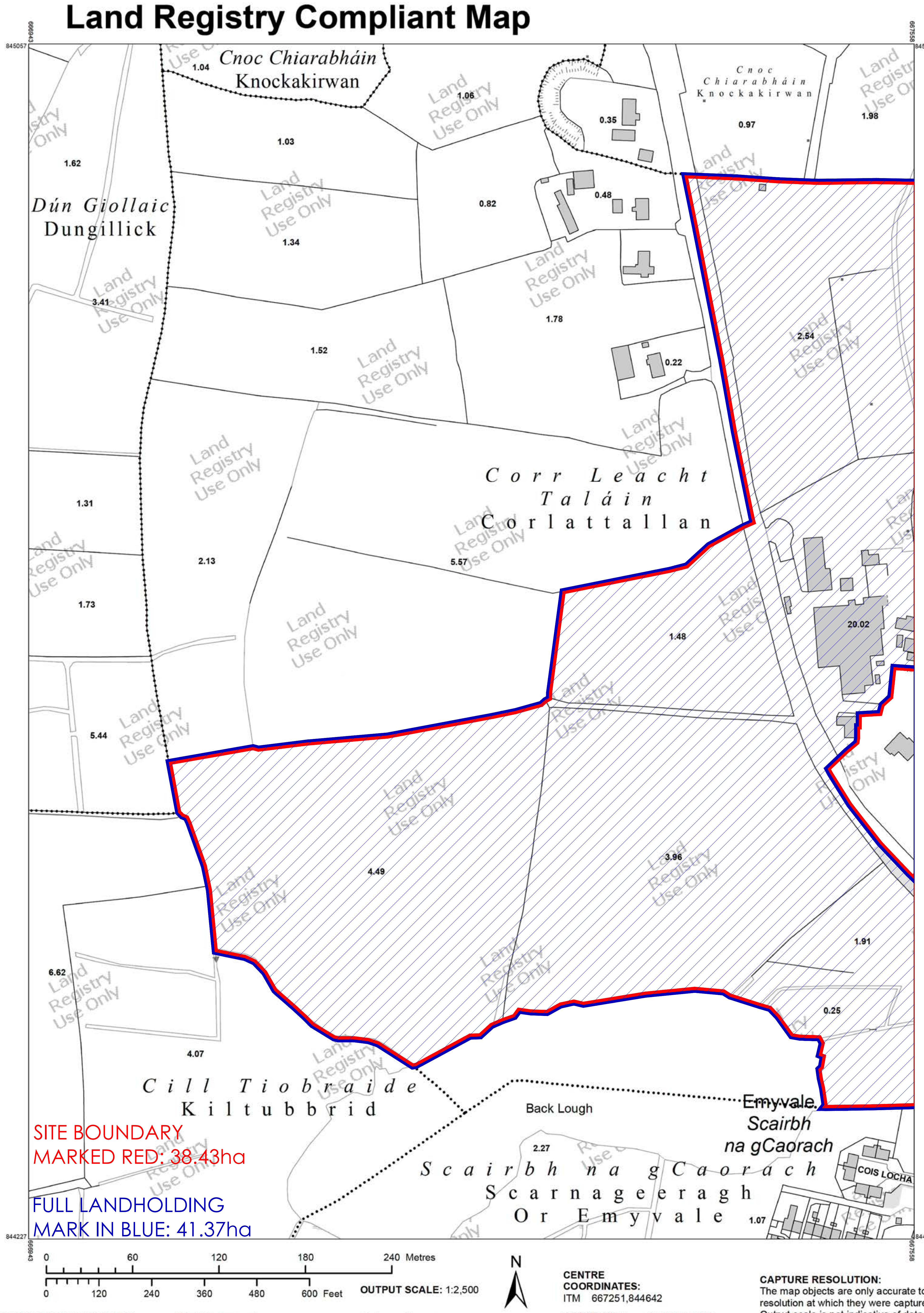
Ronan Connolly
Wastewater Source Control & Licensing

CC: Trevor Montgomery, Montgomery EHS Limited, Kantoher Business Park, Killeedy, Ballagh, Co. Limerick

Appendix 2.1: Drawings

PART "A"

Land Registry Compliant Map



OUTPUT SCALE: 1:2,500

CENTRE COORDINATES:
ITM 667251,844642

ORDER NO.:
50048144_2

PUBLISHED:
20/02/2019

MAP SERIES:
1:2,500
1:2,500

MAP SHEETS:
0873-B
0873-D

COMPILED AND PUBLISHED BY:
Ordnance Survey Ireland,
Phoenix Park,
Dublin 8,
Ireland.

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Ordnance Survey maps never show legal property boundaries, nor do they show ownership of physical features.

CAPTURE RESOLUTION:
The map objects are only accurate to the resolution at which they were captured. Output scale is not indicative of data capture scale. Further information is available at: http://www.osi.ie; search 'Capture Resolution'

LEGEND:
http://www.osi.ie; search 'Large Scale Legend'

Ordnance Survey Ireland
Suirbhéireacht Ordanáis Éireann.
www.osi.ie.

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Michael Hetherton Arch. & Eng. Services Ltd.
Cogan Street, Oldcastle, Co Meath, A82 VP65
www.mheng.ie
Phone: 049 - 8542911
Fax: 049 - 8550989
Mobile: 086 - 8048870
E-mail: admin@mheng.ie

CLIENT
Silverhill Foods Ltd.

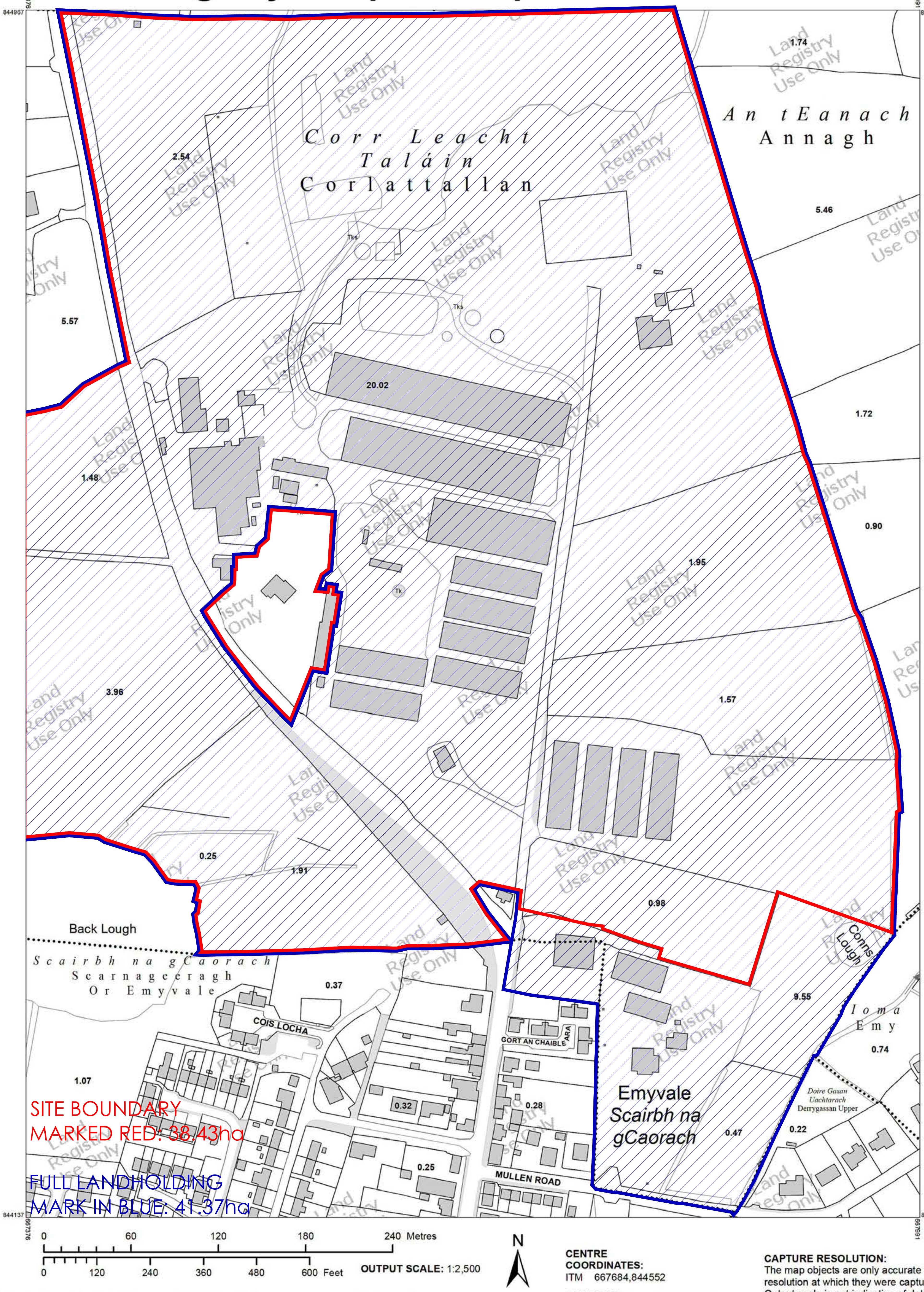
PROJECT			DATE
Proposed Factory Development at Corlattallan, Emyvale, Co. Monaghan			28/01/2023
REV	DRAWN	CHECKED	APPROVED
00	-	M. HETHERTON	M. HETHERTON

DRAWING No.
D1

TITLE	SCALES
SITE LOCATION PLANS: PORTION "A"	1:2500@A1

PART "B"

Land Registry Compliant Map



OUTPUT SCALE: 1:2,500

CENTRE COORDINATES:
ITM 667684,844552

ORDER NO.: 50049293_1

PUBLISHED: 27/02/2019

CAPTURE RESOLUTION:
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Output scale is not indicative of data capture scale.
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http://www.osi.ie; search 'Capture Resolution'

LEGEND:
http://www.osi.ie; search 'Large Scale Legend'

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Dublin 8,
Ireland.

The representation on this map of a road, track or footpath is not evidence of the existence of a right of way.

Ordnance Survey maps never show legal property boundaries, nor do they show ownership of physical features.

MAP SERIES:
1:2,500
1:2,500
1:5,000

MAP SHEETS:
0873-B
0873-D
0874

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www.osi.ie

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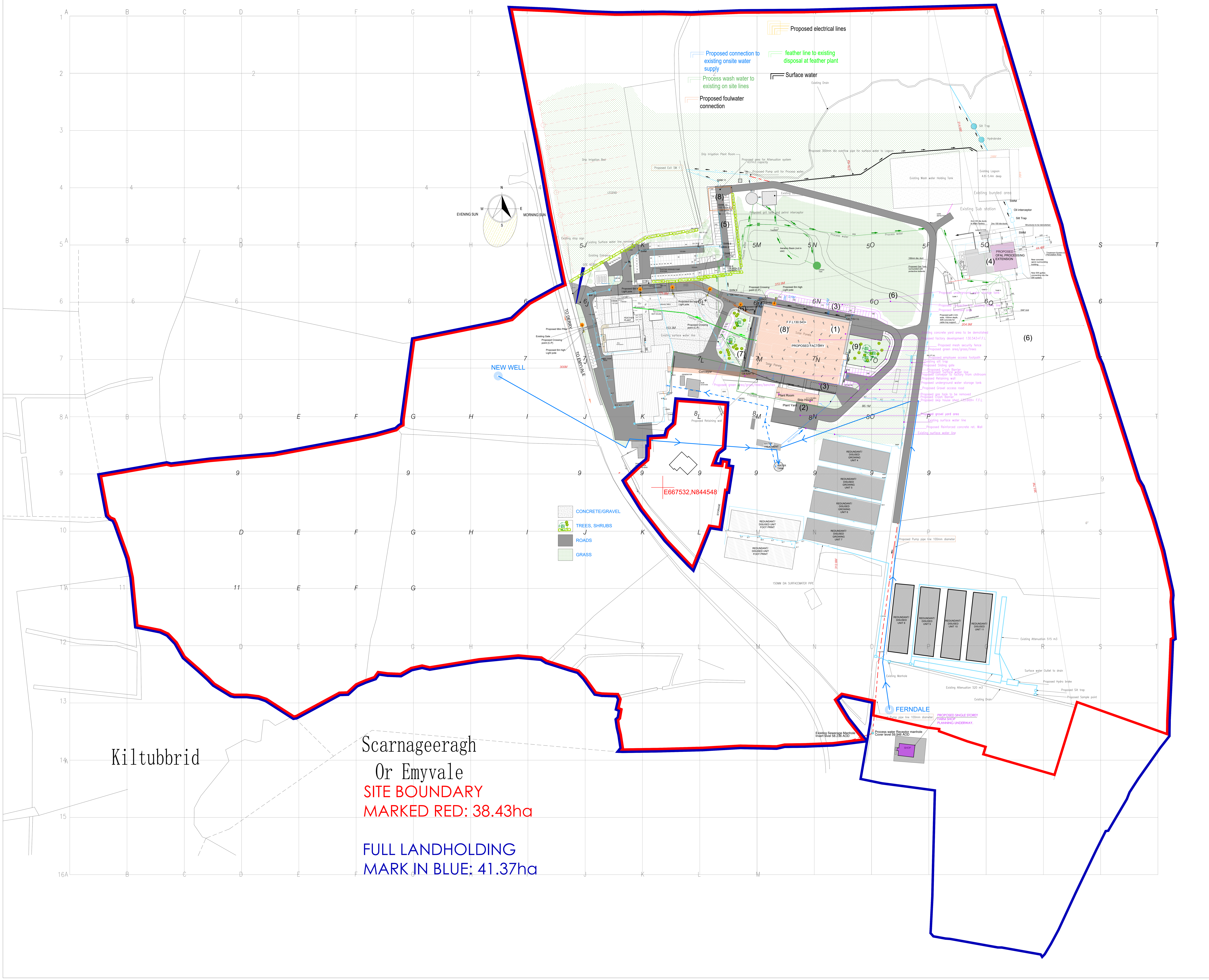
www.mheng.ie
Phone: 049 - 8542911
Fax: 049 - 8550989
Mobile: 086 - 8048870
E-mail: admin@mheng.ie

CLIENT Silverhill Foods Ltd.			
PROJECT Proposed Factory Development at Corlattallan, Emyvale, Co. Monaghan			DATE 28/01/2023
REV 00	DRAWN -	CHECKED M. HETHERTON	APPROVED M. HETHERTON
DRAWING No. D2			
TITLE **SITE LOCATION PLANS: PORTION "B"**			SCALES 1:2500@A1



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www.mheng.ie
Phone: 049 - 8542911
Fax: 049 - 8550988
Mobile: 086 - 8048870
E-mail: admin@mheng.ie

CLIENT	Silverhill Foods Ltd.
PROJECT	Proposed Factory Development at Corlattallan, Emyvale, Co. Monaghan
DATE	28/01/2023
REV	
DRAWN	-
CHECKED	M. HETHERTON
APPROVED	M. HETHERTON
DRAWING No.	D3
TITLE	MASTER SITE LAYOUT PLAN
SCALES	1:1500@A1

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Fax: 049 - 8550989
Mobile: 086 - 8048670
E-mail: admin@mheng.ie

CLIENT Silverhill Foods Ltd.			
PROJECT Proposed Factory Development at Corlattallan, Emyvale, Co. Monaghan			DATE 28/01/2023
REV 00	DRAWN -	CHECKED M. HETHERTON	APPROVED M. HETHERTON
DRAWING No. D4			
TITLE MASTER SITE LAYOUT PLAN PORTION "A"			SCALES 1:1000@A1

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www.mheng.ie
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Fax: 049 - 8550989
Mobile: 086 - 8048870
E-mail: admin@mheng.ie

CLIENT	Silverhill Foods Ltd.
PROJECT	Proposed Factory Development at Corlattallan, Emyvale, Co. Monaghan
DATE	28/01/2023
REV	00
DRAWN	-
CHECKED	M. HETHERTON
APPROVED	M. HETHERTON
DRAWING No.	D5
TITLE	MASTER SITE LAYOUT PLAN PORTION "B"
SCALES	1:1000@A1

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3. All works to comply with current Building Regulations.
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E-mail: admin@mheng.ie

CLIENT	Silverhill Foods Ltd.
PROJECT	Proposed Factory Development at Corlattallan, Emyvale, Co. Monaghan
DATE	28/01/2023
REV	00
DRAWN	-
CHECKED	M. HETHERTON
APPROVED	M. HETHERTON
DRAWING No.	D6
TITLE	SITE LAYOUT PLAN (PROPOSED FACTORY AREA)
SCALES	1:500@A1

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Fax: 049 - 8550989
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E-mail: admin@mheng.ie

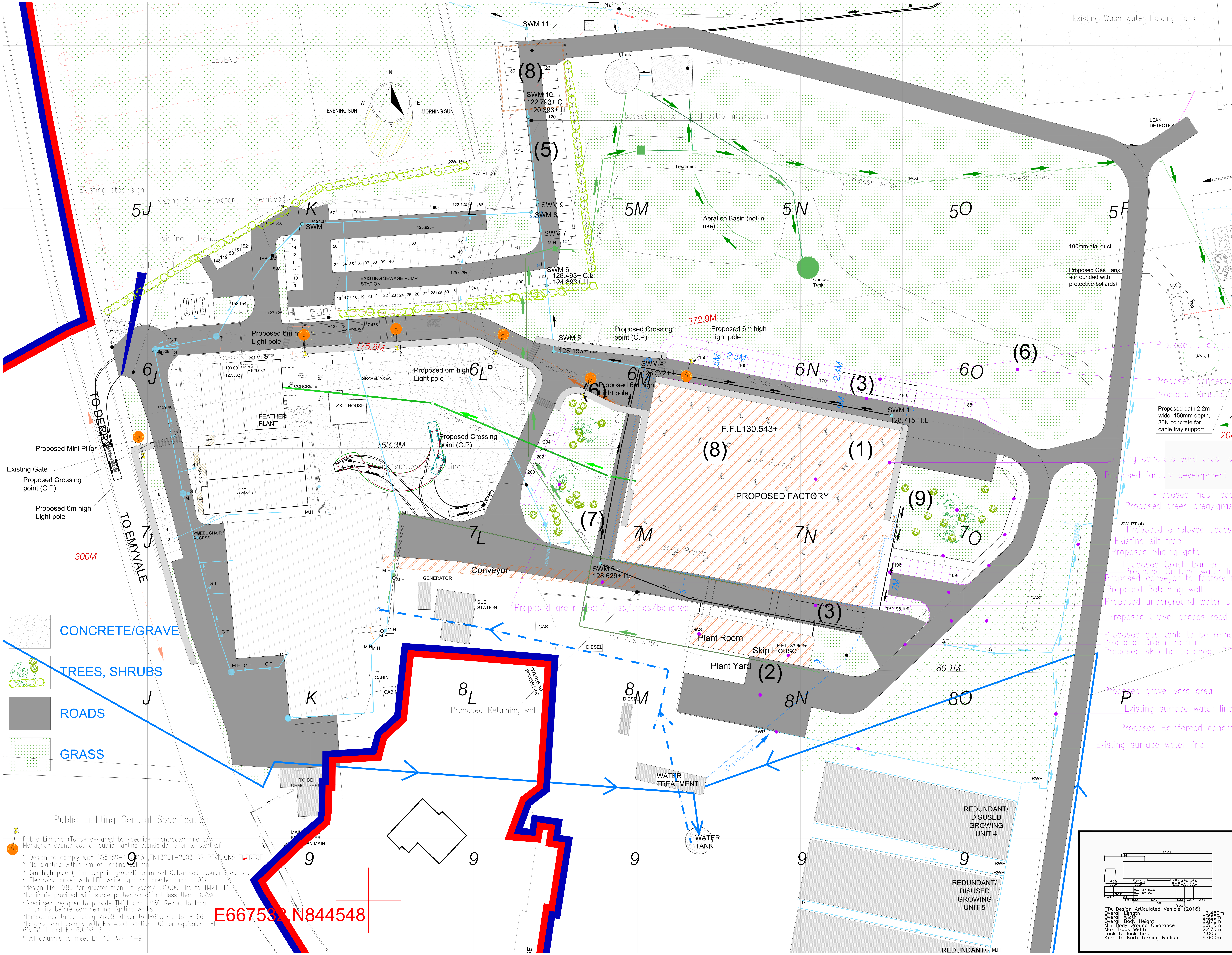
CLIENT
Silverhill Foods Ltd.

PROJECT	DATE
Proposed Factory Development at Corlattallan, Emyvale, Co. Monaghan	28/01/2023

REV	DRAWN	CHECKED	APPROVED
00	-	M. HETHERTON	M. HETHERTON

DRAWING No.
D7

TITLE	SCALES
SITE LAYOUT PLAN (PROPOSED OFFAL PROCESSING EXTENSION AREA)	1:500@A1



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Mobile: 086 - 8048870
E-mail: admin@mheng.ie

CLIENT
Silverhill Foods Ltd.

PROJECT			DATE
Proposed Factory Development at Corlattallan, Emyvale, Co. Monaghan			28/01/2023
REV 00	DRAWN –	CHECKED M. HETHERTON	APPROVED M. HETHERTON

DRAWING No. D8

TITLE
ROAD AUDIT, PATHS & AUTO TRACK LAYOUT

SCALES 1:500@A1

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CLIENT
Silverhill Foods Ltd.

PROJECT	DATE
Proposed Factory Development at Corlattallan, Emyvale, Co. Monaghan	28/01/2023

REV	DRAWN	CHECKED	APPROVED
00	-	M. HETHERTON	M. HETHERTON

DRAWING No.
D9

TITLE	SCALES
EXISTING AND PROPOSED SERVICES LINES	1:500@A1

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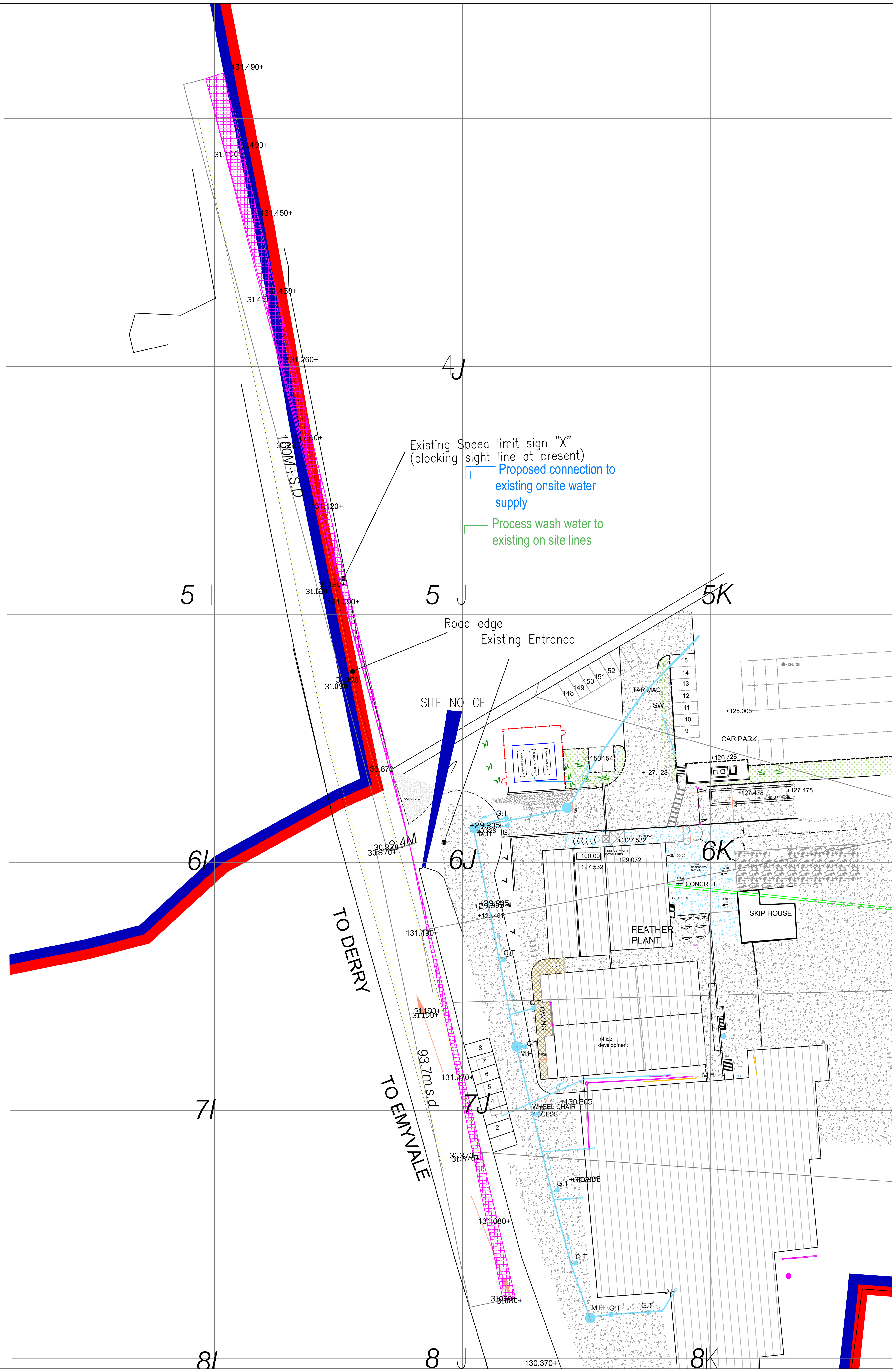
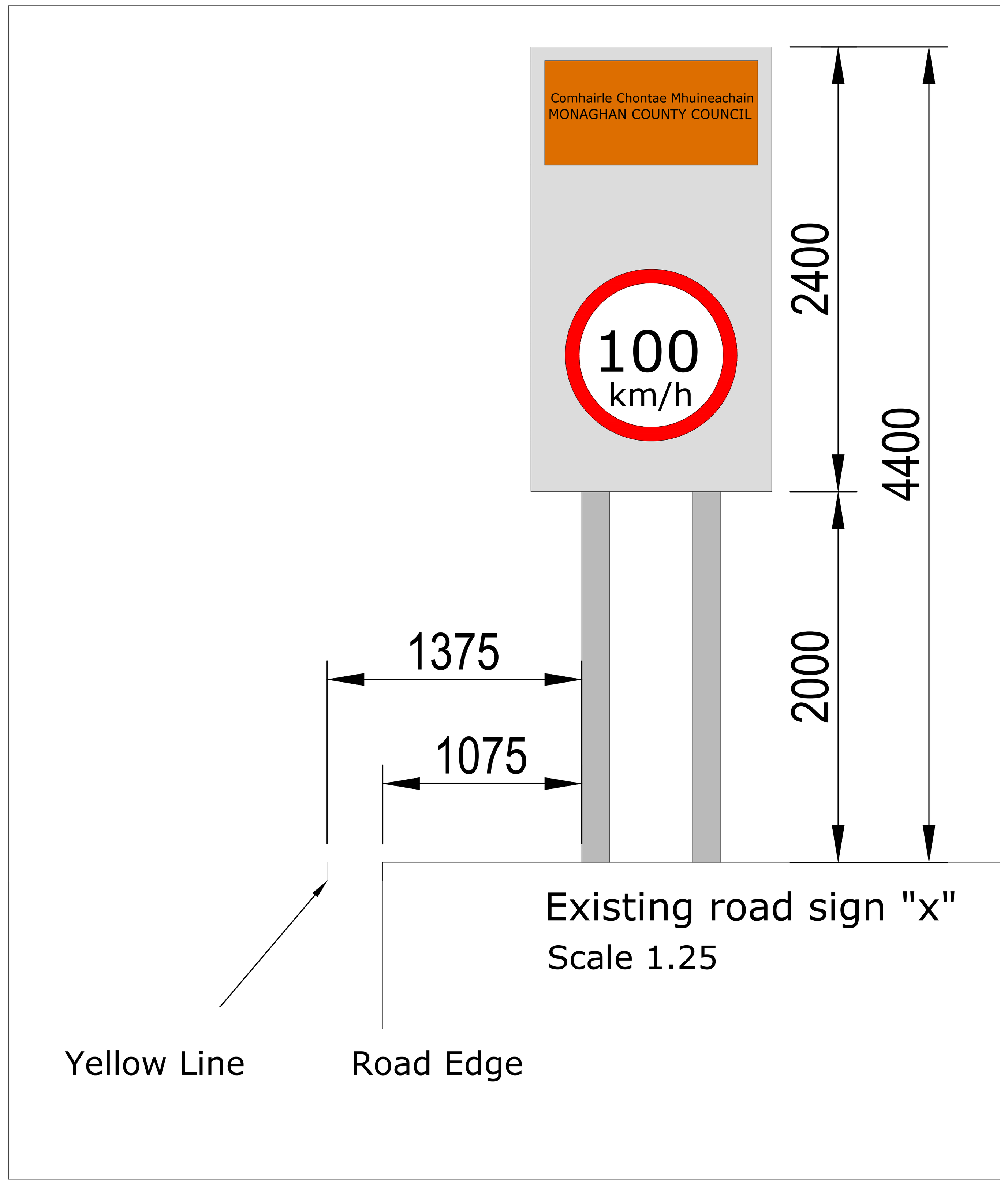
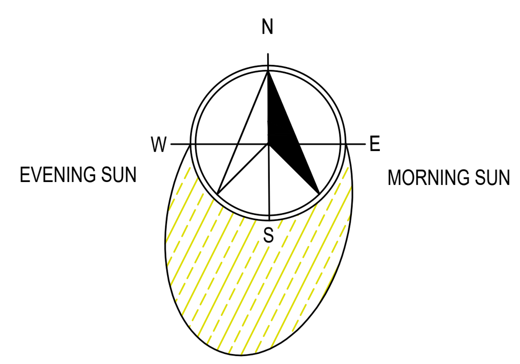
CLIENT
Silverhill Foods Ltd.
PROJECT
Proposed Factory Development at Corlattallan, Emyvale, Co. Monaghan
DATE
28/01/2023
REV
00
DRAWN
CHECKED
M. HETHERTON
APPROVED
M. HETHERTON
DRAWING No.
D10
TITLE
MASTER SITE LAYOUT PLAN "DRIP IRRIGATION"
SCALES
1:1250@A1
Proposed electrical lines
Proposed connection to existing onsite water supply
feather line to existing disposal at feather plant
Process wash water to existing on site lines
Surface water
Proposed foulwater connection
EVENING SUN
MORNING SUN
N
S
E
W
SITE AREA 96.86 ACRES/39.2 HEC
PROPOSED FACTORY
PROPOSED OFFAL PROCESSING EXTENSION
Plant Room
Skip House
Plant Yard
Conveyor
WATER TREATMENT
WATER TANK
NEW WELL
TO DERRY
TO EMYVALE
E667536, N844548
CONCRETE/GRAVEL
TREES, SHRUBS
ROADS
GRASS
REDUNDANT/ DISUSED GROWING UNIT
REDUNDANT/ DISUSED UNIT FOOT PRINT
Drip Irrigation Bed
FERNDALE
PROPOSED SINGLE STOREY FARM SHOP PLANNING UNDERWAY.
Existing Sewerage Manhole
Process water Receptor manhole
150MM DIA SURFACEWATER PIPE
Driphose Legend
PE 90mm
PE 63mm
Direction of Driphose
20mm Dia Driphose
Kiltubbrid
Scarnageeragh Or Emyvale
SITE BOUNDARY







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www.mheng.ie
Phone: 049 - 8542911 Mobile: 086 - 8048870
Fax: 049 - 8550989 E-mail: admin@mheng.ie

Client: Silverhill foods Ltd

DRAWING No.	DRAWN	CHECKED
	GG	M. HETHERTON

Job:Proposed Factory development at Corlattallan,Emyvale,Co. ,Monaghan

REV.	DATE	DETAILS
	28-01-23	

DRAWING No.
D11

TITLE	SCALES
Sight line Survey	1.25 1.500

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www.mheng.ie
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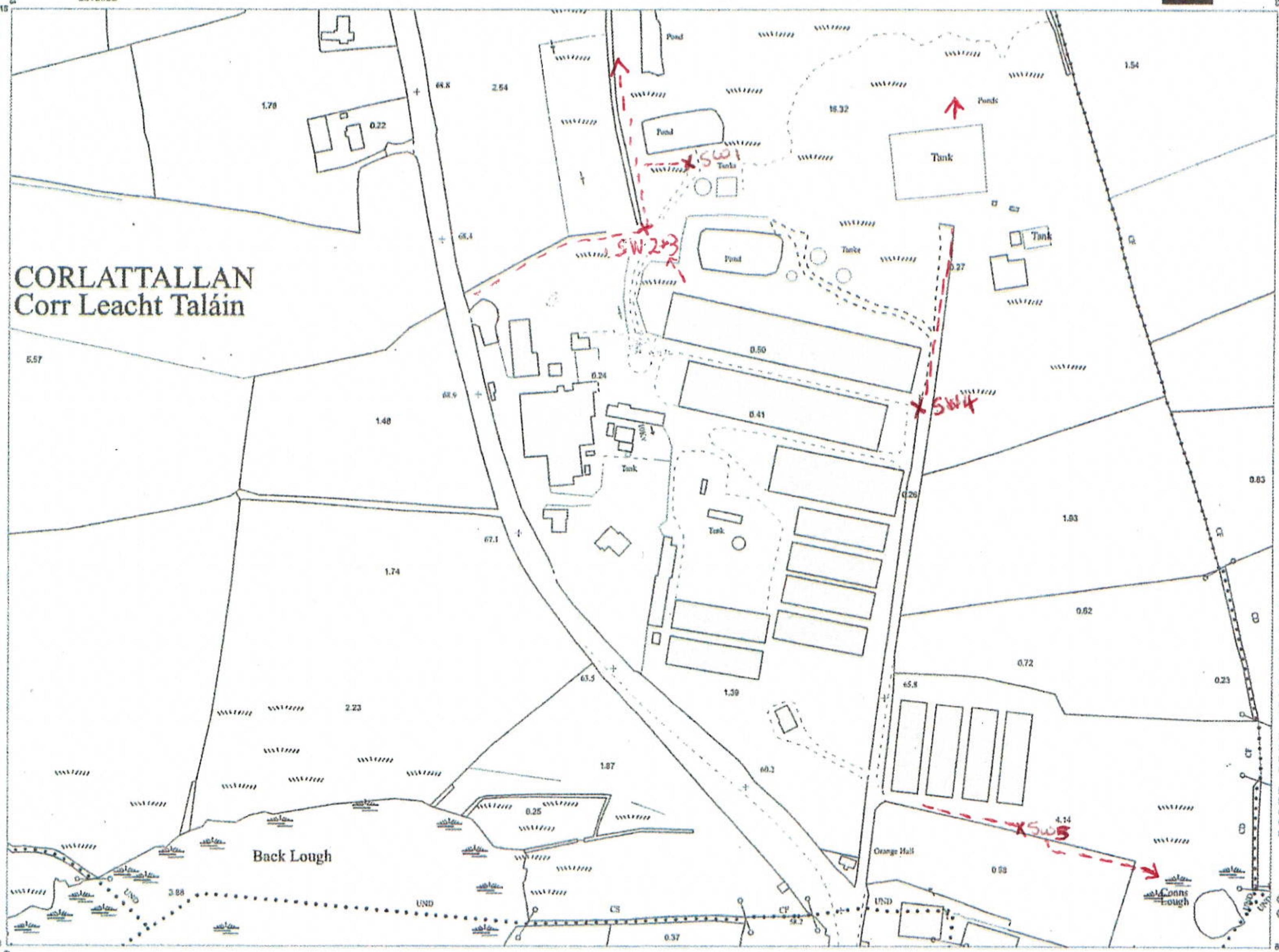
Mobile: 086 - 8048870
E-mail: admin@mheng.ie
CLIENT
Silverhill Foods Ltd.
PROJECT
Proposed Factory Development at Corlattallan, Emyvale, Co. Monaghan
DATE
28/01/2023
REV
00
DRAWN
-
CHECKED
M. HETHERTON
APPROVED
M. HETHERTON
DRAWING No.
D12
TITLE
LANDSCAPING SITE LAYOUT PLAN
SCALES
1:500@A1
LEGEND
CONCRETE/GRAVEL
TREES, SHRUBS
ROADS
GRASS
PROPOSED FACTORY
F.F.L130.543+
Solar Panels
Proposed 300mm dia overflow pipe for surface water to Lagoon
Existing Wash water Holding Tank
Drip Irrigation Plant Room
Proposed area for Attenuation system 637m3 capacity
Proposed Pump unit for Process water
Proposed grit tank and petrol interceptor
Aeration Basin (not in use)
Contact Tank
Treatment
Process water
Surface water
Foul Water
Feather Line
Existing surface water line
Existing Entrance
EXISTING SEWAGE PUMP STATION
FEATHER PLANT
SKIP HOUSE
GRAVEL AREA
office development
Proposed 6m high Light pole
Proposed Crossing point (C.P)
Proposed Mini Pillar
Proposed Gas Tank surrounded with protective bollards
100mm dia. duct
2no 125 dia ducts to Main Factory
SUB-STATION
Proposed path 2.2m wide, 150mm depth, 30N concrete for cable tray support.
To processing plant
TANK 1
TANK 2
TANK 3
Proposed green area/grass/trees
Proposed green area/grass/trees/benches
Proposed underground water storage tank
Plant Room
Skip House
Plant Yard
Conveyor
GENERATOR
SUB STATION
Proposed Retaining wall
OVERHEAD POWER LINE
TO DERRY
TO EMYVALE
SWM 11
SWM 10 122.793+ C.L 120.393+ I.L
SWM 9
SWM 8
SWM 7
SWM 6 128.493+ C.L 124.893+ I.L
SWM 5 128.193+ I.L
SWM 4 128.372+ I.L
SWM 3 128.629+ I.L
SWM 1 128.715+ I.L
275.1M
372.9M
175.8M
153.3M
204.9M
300M
86.1M
(1)
(2)
(3)
(5)
(6)
(7)
(8)
(9)

Surveyed 2000-2003
Revised 2006-2009
Levelled

Rural PLACE Map



ITM CENTRE PT COORDS

667568,844610

DESCRIPTION

MAP SHEETS

Digital Map
0874

1:2500
0873-B 0873-D

Authorised Internet Map

N

Scale:- 1:2,500
Scála:- 1:2,500

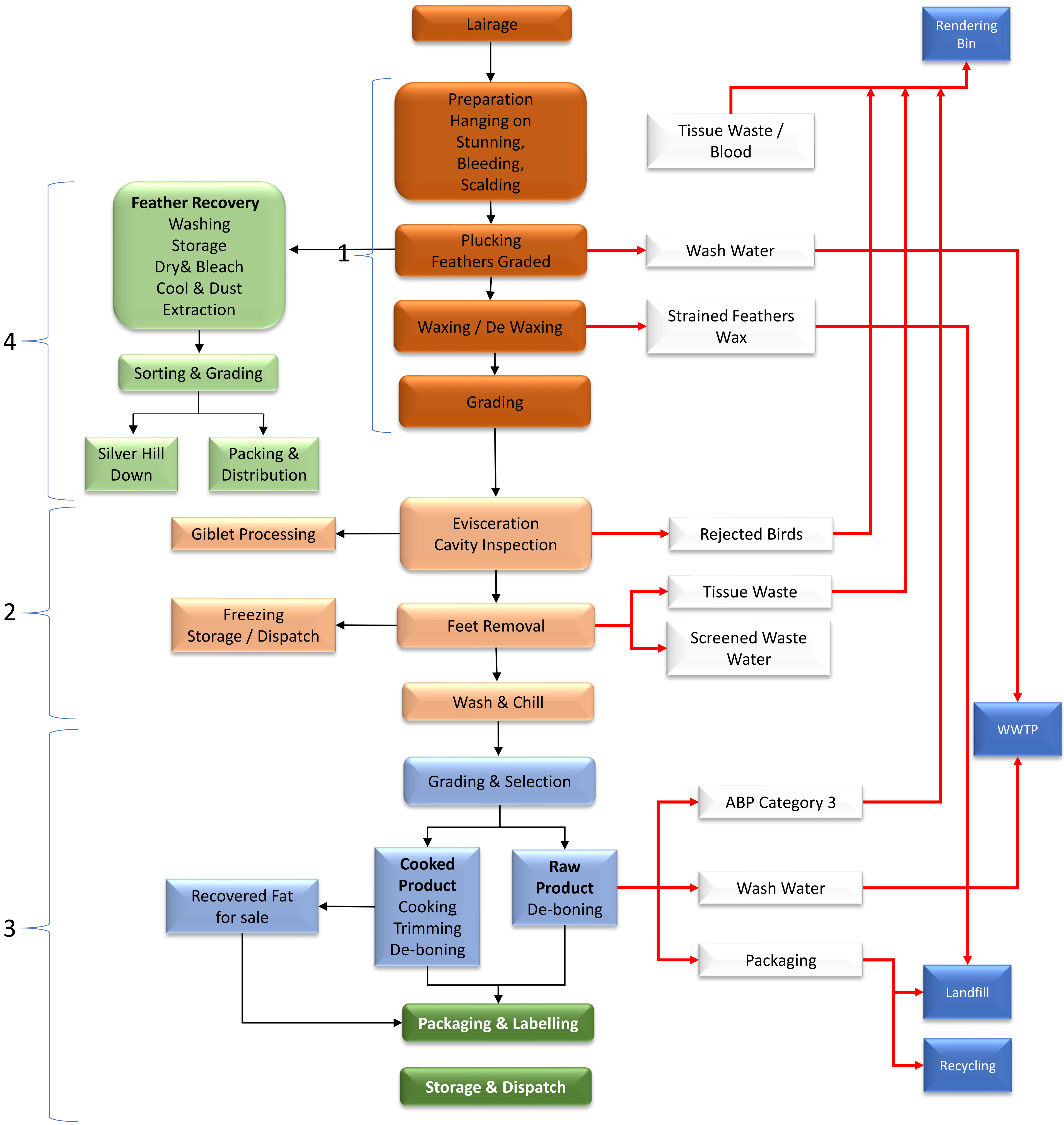
0 50 100 150 200 Metres
0 150 300 450 600 Feet

Plot Ref. No. 19612206_1_1
Plot Date 14-SEP-2011


W1
SW2
SW3
SW4
SW5
Silverhill Foods

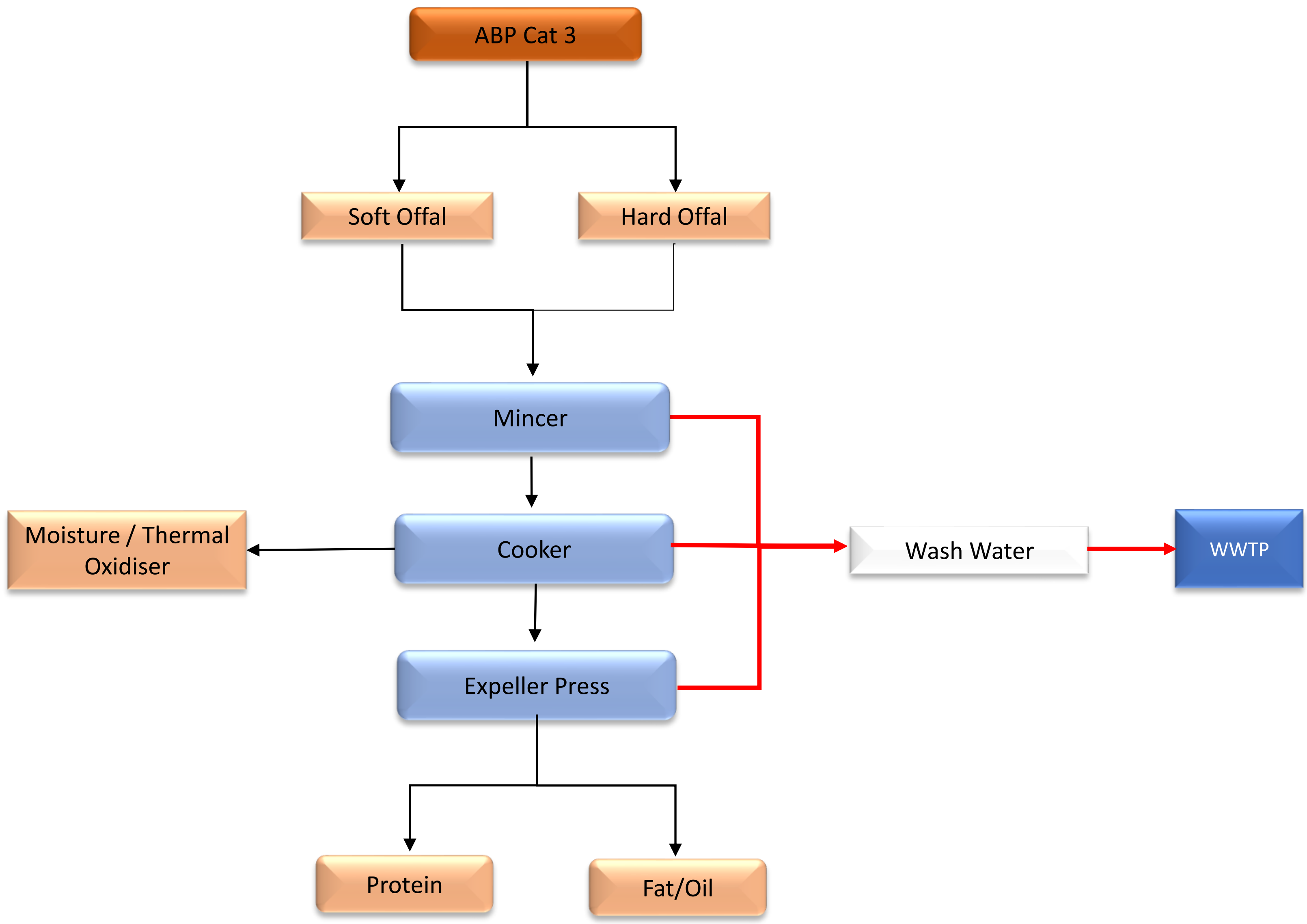
Appendix 2.2: Process Flowcharts

Silver Hill Foods – Production Process



1. **Pluck & Wax Department**
2. **Evisceration Department**
3. **Grading & Selecting Department**
4. **Feather Processing Plant**

Silver Hill Foods – Rendering Process



Appendix 2.3: Emergency Response Plan – Spills & Leakages

Corrective Action Procedure in the event of a spill or leakage of chemicals, fat, blood, offal, oil or any polluting liquid

Purpose;
To minimise the environmental effects of accidental spills or leaks and to follow correct procedures in relation to clean-up, EPA notification and incident recording.

References;
IE Licence (PO422-03) attached.
CAP 1 Spills and Leakages
Procedure;
1. Identify the source of the spill or leakage and stop it from continuing
2. Contain the spill immediately to prevent it reaching any water courses or surface water drains. There are spill kits located beside the chemical store and at the Environmental site which contains materials suitable for this purpose.
3. Clean up the spill using the spill kit or by slurry tanker
4. Should the spill or leakage reach a watercourse or surface water drain, CAP No. 4 relating to Contamination of Surface or Ground /Waters must be followed.
5. In the event of the spill reaching dirty water drains the WWTP must be closely monitored over the ensuing days to ensure the effects of the spill do not have an adverse impact on the final effluent.
6. If the final effluent is affected to the extent that licence limits are exceeded the EPA must be notified of the incident, the circumstances, and the environmental effects. If the effects are significant, the EPA may request that CAP No. 4 relating to Contamination of Surface or Ground Waters be followed.
7. In all cases the Environmental Manager should investigate and document the circumstances surrounding the spill or leakage i.e. how/why/when it happened
8. Where appropriate the Environmental Manager may introduce new procedures and monitor the situation to prevent re-occurrence. In this case re-training must be provided to any persons concerned.

Appendix 2.4: Emergency Response Procedure

Procedure on how to respond to an emergency response at Silver Hill Duck

Purpose:

To respond in a correct timely manner in the event of an Emergency

Reference

OCP 28 Procedure on emergency response

Procedure

- If an Emergency or incident occurs the Environmental Department must be notified immediately.
- The Environmental Manager or appropriate person shall contact the appropriate Emergency Services, EPA and relevant internal Senior Management within Silver Hill Duck, to communicate the incident details.
- Please see Table 1 - Emergency Response Agencies, Figure 1 - Silver Hill Duck Internal Reporting Structure and Table 2 - Emergency Response Agencies contact details.
- The Environmental Manager or appropriate person must be available to take calls regarding the incident.
- The Environmental Manager or appropriate person must have ongoing evaluation of the situation in order to determine the appropriate level of response from staff.
- The Environmental Manager or relevant person must provide and support the technical response to the emergency
- Health and Safety issues must always be in place when dealing with an incident
- The Environmental Manager or appropriate person must provide and support the monitoring and analytical response
- The Environmental Manager or appropriate person must advise on notification to the public and other agencies.
- The Environmental Manager or appropriate person must advise on remedial action necessary including preventative action i.e. potable water supplies
- The Environmental Manager or appropriate person must comply with the incident notification as detailed in the Occupational Control Procedure for the

Environmental Department Number 27 *Recording and reporting of an Incident to the EPA.*

Table 1: Emergency Response Agencies and Corresponding Incidents

Fire, explosion or industrial injury	**Discharge to water course**	**Discharge to sewer**
• Fire Services • Gardai • EPA • Local Authority – emergency services • Health Services Executive, • Health and Safety Authority.	• Fisheries Boards • Local Authority – Environment Section • EPA • Environmental Health Officers	• Irish Water • Eastern Regional Fisheries Board • EPA
Discharge to land	**Discharge to air**	
• Local Authority Environment section – illegal dumping • Gardai – illegal dumping • Environmental Health officers – drinking water supplies • EPA	• Health Service Executive, • Local Authorities – Emergency services, • Gardai, • Fire Services, • Food Safety Authority • EPA • Health and Safety Authority -asbestos	

Figure 1: Silver Hill Duck Internal Reporting Structure

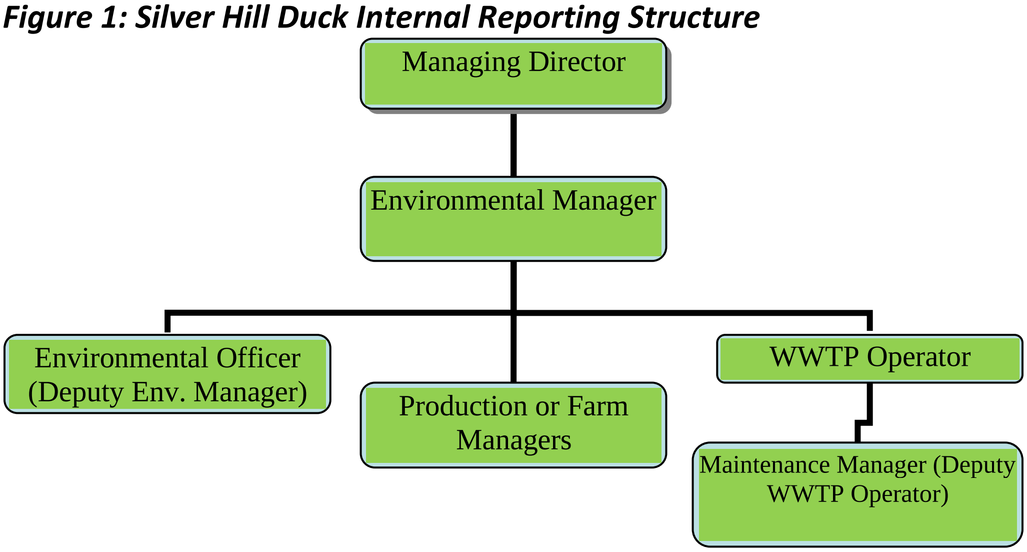


Table 2 Emergency Contact Details			
Emergency Contacts	**Name**	**Office hours**	**Out of hours**
Emergency services		999	999
EPA	Regional Inspectorate, Dublin	+353 1 2680100	+353 1 2680100
EPA	Headquarters, Wexford	+353 53 916 0600	+353 53 916 0600
EPA	Regional Inspectorate, Monaghan	+353 47 77600	+353 47 77600
Gardai	Emyvale, Co. Monaghan	+353 47 87222	+353 47 87222
Local Authority Emergency Services	Monaghan County Council, The Glen, Monaghan	+35347 30593 +353 47 82739	
Health Service Executive	Parkgate St. Business Centre, Dublin 8	1850 24 1850	
Health and Safety Authority	**Head Office:** The Metropolitan Building James Joyce Street Dublin 1	1890 289 389	
Fisheries Board	Eastern Regional Fisheries Board 15a Main Street, Blackrock, Co. Dublin	+353 1 2787022 +353 1 2787025 (fax)	
Sanitary Authority	Monaghan County Council, Emyvale, Co. Monaghan	+ 353 47 87387	
Food Safety Authority	**Food Safety Authority of Ireland**, Abbey Court, Lower Abbey Street, Dublin 1	1890 33 66 77	
Maintenance contractor:	Pauric Connolly	+353 83 4350197	+353 83 4350197
Proprietor:	Fane Valley	+353 47 87124	+353 86 8197799
General Farm Manager:	Peter McConnell	+353 86 6000599	+353 86 6000599
Processing company:	Silver Hill Duck	+353 47 87124	
Transport manager:	Eugene Mc Kenna	+353 86 2557978	+353 86 2557978

Appendix 2.5: Solar panel specifications

Enerpower 1.2MW Solar PV Installation Lidl RDC Newbridge 2019.

Enerpower – Silverhill Duck Ltd

June 2021

Enerpower, Unit 25C, Waterford Business Park, Co. Waterford.
Web Site: www.enerpower.ie
Tel/Fax: 051 364054
VAT No. IE 6419788K
Email: Info@enerpower.ie
Reg. No. 399788

ENERPOWER
TOTAL ENERGY SOLUTIONS

Date: 21/06/2021

Reference Number: Q20210621-1

Project: Solar PV Proposal – Silverhill Duck Ltd

The following document outlines a 179.3kW solar pv proposal using 445W panel modules on a roof mounted system.

All below solar panel modules carry a 12 year all-inclusive product warranty with a 25 year 80% performance warranty.

Please find proposal costs below;

Enerpower, Unit 25C, Waterford Business Park, Co. Waterford. Tel/Fax: 051 364054 Email: Info@enerpower.ie
Web Site: www.enerpower.ie VAT No. IE 6419788K Reg. No. 399788

Costs: 179.3kW Solar PV Proposal

179.3KWp Roof Mounted

Items	Description	Qty	Totals
1	Longi, LR4-72HBD-445M (445W)	403	
2	SUN2000-60KTL-HV-D1 (Huawei)	3	
3	Valk Fixings roof Mounted	403	
4	Breakers, Cabel, Isolators	1	
5	EGIP Controller	1	
6	Installation	1	
7	Transport	1	
	Total		€ 158,708
	ACA @ 12.5%		€ 19,838
	Total		**€ 138,869**

INCLUSIONS

- Supply, installation, and commissioning of solar PV system
- Roof Mounted fixtures and ballast
- 12 Year Warranty

EXCLUSIONS

- Alterations to existing structures to facility equipment i.e. routing cable through walls, roofs, trenching and backfilling for cables etc.
- Planning Permission
- Internet Connection
- VAT

ENERPOWER
TOTAL ENERGY SOLUTIONS

Financial Analysis

SYSTEM INPUT VARIABLES					
Capacity (kW)	179	O&M	€ -	% Site Usage	100.0%
System Cost	€138,869.12	Export tariff		Inflation RPI	0.0%
Output (kWhrs)	148,998	Peak Elect Cost	€ 0.120	Elect Inflation	2.0%

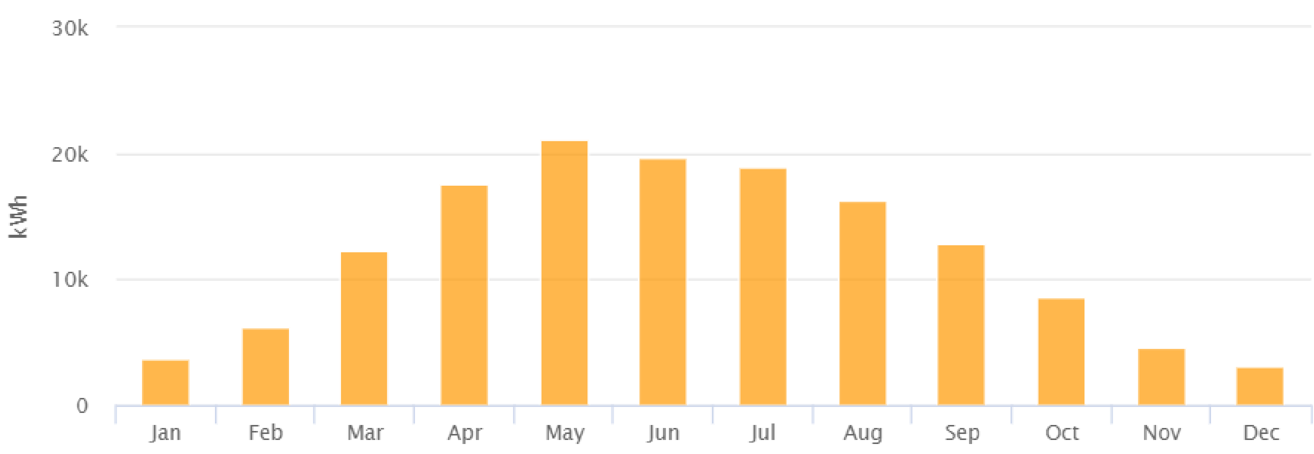
SYSTEM FINANCIAL SUMMARY	
Total 20 Year Revenue	€ 412,370
Payback years	7.40
Project IRR	12.8%
Total C02 Saving	948,031

SYSTEM 20 YEAR FINANCIAL ANALYSIS

Yr	Module	Output	Elect Cost	Export	O&M	Elect savings	Export	O&M	Revenue	Cash Flow	C02 Savings
	% of max	kWhr/Annum	€/kWhr	€/kWhr	€/kWhr	€	€	€	€/Annum	-€ 138,869.12	Kgs
1	100.0	148,998	€ 0.120	€ -	€ -	€ 17,879.80	€ -	€ -	€ 17,879.80	-€ 120,989.32	49,765
2	99.5	148,253	€ 0.122	€ -	€ -	€ 18,146.20	€ -	€ -	€ 18,146.20	-€ 102,843.11	49,517
3	99.0	147,508	€ 0.125	€ -	€ -	€ 18,416.12	€ -	€ -	€ 18,416.12	-€ 84,427.00	49,268
4	98.5	146,763	€ 0.127	€ -	€ -	€ 18,689.57	€ -	€ -	€ 18,689.57	-€ 65,737.43	49,019
5	98.0	146,018	€ 0.130	€ -	€ -	€ 18,966.59	€ -	€ -	€ 18,966.59	-€ 46,770.83	48,770
6	97.5	145,273	€ 0.132	€ -	€ -	€ 19,247.22	€ -	€ -	€ 19,247.22	-€ 27,523.61	48,521
7	97.0	144,528	€ 0.135	€ -	€ -	€ 19,531.49	€ -	€ -	€ 19,531.49	-€ 7,992.12	48,272
8	96.5	143,783	€ 0.138	€ -	€ -	€ 19,819.43	€ -	€ -	€ 19,819.43	€ 11,827.30	48,024
9	96.0	143,038	€ 0.141	€ -	€ -	€ 20,111.07	€ -	€ -	€ 20,111.07	€ 31,938.37	47,775
10	95.5	142,293	€ 0.143	€ -	€ -	€ 20,406.45	€ -	€ -	€ 20,406.45	€ 52,344.82	47,526
11	95.0	141,548	€ 0.146	€ -	€ -	€ 20,705.60	€ -	€ -	€ 20,705.60	€ 73,050.43	47,277
12	94.5	140,803	€ 0.149	€ -	€ -	€ 21,008.56	€ -	€ -	€ 21,008.56	€ 94,058.98	47,028
13	94.0	140,058	€ 0.152	€ -	€ -	€ 21,315.35	€ -	€ -	€ 21,315.35	€ 115,374.33	46,780
14	93.5	139,313	€ 0.155	€ -	€ -	€ 21,626.01	€ -	€ -	€ 21,626.01	€ 137,000.34	46,531
15	93.0	138,568	€ 0.158	€ -	€ -	€ 21,940.57	€ -	€ -	€ 21,940.57	€ 158,940.91	46,282
16	92.5	137,823	€ 0.162	€ -	€ -	€ 22,259.06	€ -	€ -	€ 22,259.06	€ 181,199.98	46,033
17	92.0	137,078	€ 0.165	€ -	€ -	€ 22,581.52	€ -	€ -	€ 22,581.52	€ 203,781.50	45,784
18	91.5	136,333	€ 0.168	€ -	€ -	€ 22,907.97	€ -	€ -	€ 22,907.97	€ 226,689.46	45,535
19	91.0	135,588	€ 0.171	€ -	€ -	€ 23,238.44	€ -	€ -	€ 23,238.44	€ 249,927.91	45,287
20	90.5	134,843	€ 0.175	€ -	€ -	€ 23,572.98	€ -	€ -	€ 23,572.98	€ 273,500.88	45,038

*Note: Payback period is based on electricity rate supplied in 2020

Monthly Solar Output



Enerpower, Unit 25C, Waterford Business Park, Co. Waterford.
Web Site: www.enerpower.ie
Tel/Fax: 051 364054
VAT No. IE 6419788K
Email: Info@enerpower.ie
Reg. No. 399788

Payment Terms

20% on receipt of Order

40% on Delivery

40% on Install & Commissioning

All quotations are strictly subject to Enerpower terms and conditions

This quotation is valid for a period of 28 days

CONTACT PERSON

John Liston

Enerpower
Unit 24 Waterford Business Park
Waterford.
Tel +353 (0) 51 364054
Fax +353 (0) 51 364054
Mob: +353 (0) 860353675

Offer established without obligation and free of charge.
A detailed site assessment is required.
I trust that the attached meets your requirements, however, please do not hesitate to contact me should you require clarification on any item.

Best Regards,
John Liston
Sales Manager

Unit 25, Waterford Business Park, Waterford. X91 P380
Mob +353 86 0353675 Tel +353 (0) 51 364054
email: john.liston@enerpower.ie website: www.enerpower.ie

Terms and Conditions

In these Terms of Business "We" "Us" "Ourselves" means Enerpower and "You" or "Your" means the person, firm or company purchasing goods and/or accepting services from Enerpower.

1. Payment Terms

We reserve the right to request pre-payment on account for any work where we feel it is appropriate to do so. Unless otherwise stated, payment of invoices is due within 7 days of date of invoice. We reserve the right to tender additional invoices calculated at the current bank rate + 6% per month on outstanding balances which have not been paid within our payment terms. Vat is charged at 23%.

2. Disputes

Should you ever wish to dispute an invoice, we ask that you confirm to us in writing the item(s) under query within 21 days of the invoice date. If the matter relates to charges levied by ourselves we will propose a resolution immediately.

If however the dispute is the result of media or other third party charges, we will use our best endeavours to achieve a speedy settlement. In the event of any dispute we have to insist that payment of any other monies owing, unrelated to the item under dispute, must be made in accordance with the normal payment terms.

In the unlikely event of unsatisfactory work, complaints should be made in writing within 7 days of receipt of goods. No complaint will be entered into unless all relevant materials are returned for inspection.

3. Cancellations

We understand that from time to time projects will need to be cancelled or postponed after go-ahead has been given. Whilst we will endeavour to keep cancellation charges to a minimum we will have to pass on any incurred costs.

4. Promotion

Enerpower reserve the right to promote the works carried out on the above named site in print and online media for the purposes of company advertisement and promotion, including but not limited to, Company Website, Facebook, Twitter, Linked In. Enerpower will create a case study of works carried out on site as well as using your company logo to further promote work carried out. Photographs may be taken on site and within the surrounding area of the site and used for promotional purposes.

5. Termination of Contracts

If you intend to terminate a contract with us, you will notify us in writing giving one month's notice.

6. Confidentiality

We undertake that all information made available to us in the course of our work for you shall be treated by us as confidential (except that which is manifestly in the public domain).

7. Copyright

The copyright for work created by us is vested in you once payment has been made in accordance with the terms set out at 2 above. In the case of materials or services provided by third parties (e.g. design, schematics), rights remain with those third parties unless agreement is specifically made to the contrary.

8. Approvals & Authority

In all the work we conduct for you, we act as a principal at law and thus incur legal liabilities for commitments made on your behalf. Therefore we require written conformation by an authorised person before we will undertake work on your behalf. Likewise on completion of a project an authorised person will be asked to sign approval.

9. Charges

All work carried out at your request, whether experimentally or otherwise, will be charged.

10. Privacy

All personal details held by Enerpower will not be passed to third parties.

Enerpower, Unit 25C, Waterford Business Park, Co. Waterford. Tel/Fax: 051 364054 Email: Info@enerpower.ie
Web Site: www.enerpower.ie VAT No. IE 6419788K Reg. No. 399788

Reference Projects

Please see blow Irelands largest roof mounted solar PV systems designed, installed and commissioned by Enerpower.

1.5MWp – Sam Dennigan & Co.

1.2MWp – Lidl Distribution Newbridge

Appendix 2.6: Silver Hill Procurement Policies

Silver Hill Duck - Farm HACCP

Process Stage	Hazard	Control	Limit	Monitoring	Corrective Action	Record	Verification
Day olds into farm **CCP 1**	Day olds in poor condition	Monitor Flock Health on placement of birds	32 ºC	Each Placement of day old's	Inform Hatchery, Liaison officer & comment on Unitas	Crop Booklet Day old delivery docket	Visit by Liaison officer
Temperature in Houses **CCP 2**	Temp. out of Spec.	Alarm in shed	1-11 Days - 29-32ºC 11-20/24 Days - 24-25ºC 20-45 Days - 12-17 ºC	Temp. check twice daily	Correct temperature Inform Farm Liaison officers	Crop booklet Unitas – comment section	FQAS 3
Feed Supply **CCP 3**	No feed in house	Monitor feed levels in shed on daily inspections	Feed must always be available	Daily x 2	Contact Mill if feed delivery needed Inform Farm Liaison officers Refer to Emergency Procedure	Crop booklet Unitas – comment section	FQAS 3
Water Supply **CCP 4**	No water in drinkers Micro out of spec.	Alarm in shed Regular water testing	Clean water must always be available Ecoli 0 per 100ml (ISO method 9308-1) Enterococci 0 per 100ml (ISO method 7899-2)	Daily x 2 Yearly	Refer to emergency procedure & inform Liaison officer immediately Re-test immediately	Crop booklet Unitas – comment section Lab results	FQAS 3 Farm Quality

Approved by: TMM

Appendix 4.1: Traffic Report

Traffic and Transport Assessment

Prepared by: Laila Donadel

Engineering a Sustainable Future
Dublin | Cork | Galway | Mullingar | Donegal
o: +353 1 5242060 | e: info@ors.ie | w: www.ors.ie

Traffic and Transport Assessment

Proposed Construction Works, Silverhill Foods, Emyvale, Co. Monaghan

Document Control Sheet

Client:	Silverhill Foods Ltd.
Document No:	201_329-ORS-XX-XX-RP-TR-7d-002

Revision	Status	Author:	Reviewed by:	Approved By:	Issue Date
P01	S2	ASG	AP	DMcC	10/09/2020
P02	S2	TC	AP	AP	12/04/2021
P03	S2	LD	AP	AP	08/12/2022
P04	S2	LD	Ap	AP	31/01/2023

Contents

Executive Summary

ORS have been commissioned by Silverhill Food Ltd. to carry out a Traffic and Transport Assessment (TTA) for the proposed expansion works at Silverhill Foods, Emyvale, Co. Monaghan. This TTA has been updated in response to item 4 of the further information request and TII submission regarding the planning application and shall be read in conjunction with all drawings, reports, specifications, and particulars associated with the planning application.

This TTA will examine existing and proposed traffic conditions and transport activity to determine the effects on the surrounding road network of the proposed development.

The site is located on the National Road N2, less than 1km north of Emyvale, Co. Monaghan and is accessed through an existing T-junction. The proposed works will include the demolition of some of the existing buildings on the site, the construction of a new factory building and the reconfiguration of on-site parking and circulation areas.

The proposal will provide upgraded, modern facilities for the existing staff and will enable a 60% increase in production, despite that, there will be no increase in the number of staff and therefore the traffic associated with them. However, as the production is going to increase, the traffic generated by HGV's will increase by approximately 33% comparing to current 2022 traffic.

The traffic profile likely to be generated by the factory expansion was obtained from TRICS. Existing traffic data for the proposed development was obtained via a 12-hour traffic count along the N2 National Road at the location of the site entrance. The count was carried out on Wednesday 16th November 2022 and the data was used to assess the capacity of the site access junction using *Junctions9* traffic modelling software.

Our analysis indicates that the traffic flows along National Road N2 at the access junction associated with the factory facility will have very little impact on the surrounding network. The existing T-junction access will function significantly below capacity for all future design years assessed and increases traffic along N2 by significantly less than 10%. It should also be noted that the proposed development is in keeping with the 'Spatial Planning and National Roads published in January 2012' in terms of providing for or intensifying existing accesses within transition zones.

In response to the further information request and the TII submission, additional information concerning the car parking spaces, TRICS analysis and demonstration that the traffic generated by the proposed factory expansion will not adversely impact the surrounding Road network has been assessed and provided for in the updated report.

1 Introduction

The purpose of this Traffic Assessment is to address the traffic and transport related issues that may arise in relation to a proposal by Silverhill Foods Ltd. to upgrade their existing factory facility at Emyvale, Co. Monaghan. The proposal includes the demolition of some of the existing buildings on the site, the construction of a new factory facility and the reconfiguration of on-site parking and circulation areas. A 60% production increase is expected, spread over a 6-day week instead of the current 5-day week, and will not require any additional staff at the premises.

This report therefore will assess the impact the proposed upgrade works will have on the public Road network in the vicinity of the facility.

This report therefore will follow the principles set out in the TII Publication PE-PDV-02045 'Traffic and Transport Assessment Guidelines' and will assess the impact the proposed development, and the associated traffic flows, will have on the public road network in the vicinity of the proposed development.

1.1 Objectives of this TTA

The objective of this report is to assess the impact that the proposed development will have on the existing surrounding Road network, with the assessment focusing primarily on the existing T- junction between the site access Road and National Road N2.

The objectives of this report are to assess:

- The prevailing traffic conditions on the local Road network in the vicinity of the proposed development
- The capacity of National Road N2 at the entrance to the site and the effect of the anticipated volume of traffic generated by the proposed development extension on the local Road network in conformity with the submission made by Traffic Infrastructure Ireland
- TRICS survey to access the departures and arrivals of the proposed factory expansion in accordance with item 4 of the further information request by Monaghan County Council.

1.2 Methodology

The TII Publication PE-PDV-02045 sets the methodology to be followed in any given Traffic and Transport Assessment. The methodology that will be used in this assessment follows the guidelines set in this document and can be outlined as follows:

- Automated traffic count was undertaken by IDASO at the Access junction to Silverhill Foods on the 16th of November 2022
- The traffic count data was used to establish existing peak traffic flows to be used as the baseline for the analysis

- Traffic from the existing development increases traffic along the N2 National Road by approximately 2% of existing traffic volumes. With the new facility in operation, this will rise to 5% of 2022 traffic figures.
- The T-junction access along National Road N2 was modelled using *Junctions9* software for future design years using TII's Central growth factors for Monaghan on existing traffic flows. The model shows that the junction will function significantly below capacity with minimal delays for all future design years up to 2039, 15 years after completion of the works.
- Parking requirements were assessed against parking standards set in Tables 15.6 of the Monaghan County Development Plan 2019 – 2025.

2 The Proposed Development

2.1 Developments Site Location

The development site is located to the north of Emyvale town in Co. Monaghan and is bounded by National Road N2 to the west and by agricultural lands to the north, east and south. The site has been used by Silverhill Food Ltd. since 1962 and can be accessed via an existing priority T-junction to the north-west of the site.

The speed limit on the National Road N2 near the entrance is 60km/h.

Figure 2.1 below indicated the site location and site access along the N2 National Road.

Figure 2.1 – Map indicating site location and site access Road along N2 (Source: Google Maps)

2.2 Description of the Proposed Development

The proposed development comprises the demolition of some existing buildings, construction of new replacement buildings and the reconfiguration of on-site parking and circulation areas. The works will upgrade the factory facilities and will provide additional chiller space, which will enable the existing staff to increase weekly production outputs over an increased, 6-day working week.

There will be no increase in staff numbers due to the extension of the factory, however, production will increase by up to 60% a week, from 180ton of product weight on a 5-day working week before the extension take place, to 288ton on a 6-day working week basis.

Figure 2.2 below shows the proposed site layout plan. The site area of the proposed new factory is outlined in red with 86No. additional car parking spaces proposed to the north of the new building. There will also be pedestrian walkways provided including a new yard area and a proposed new access road connecting the entrance to the new car park.

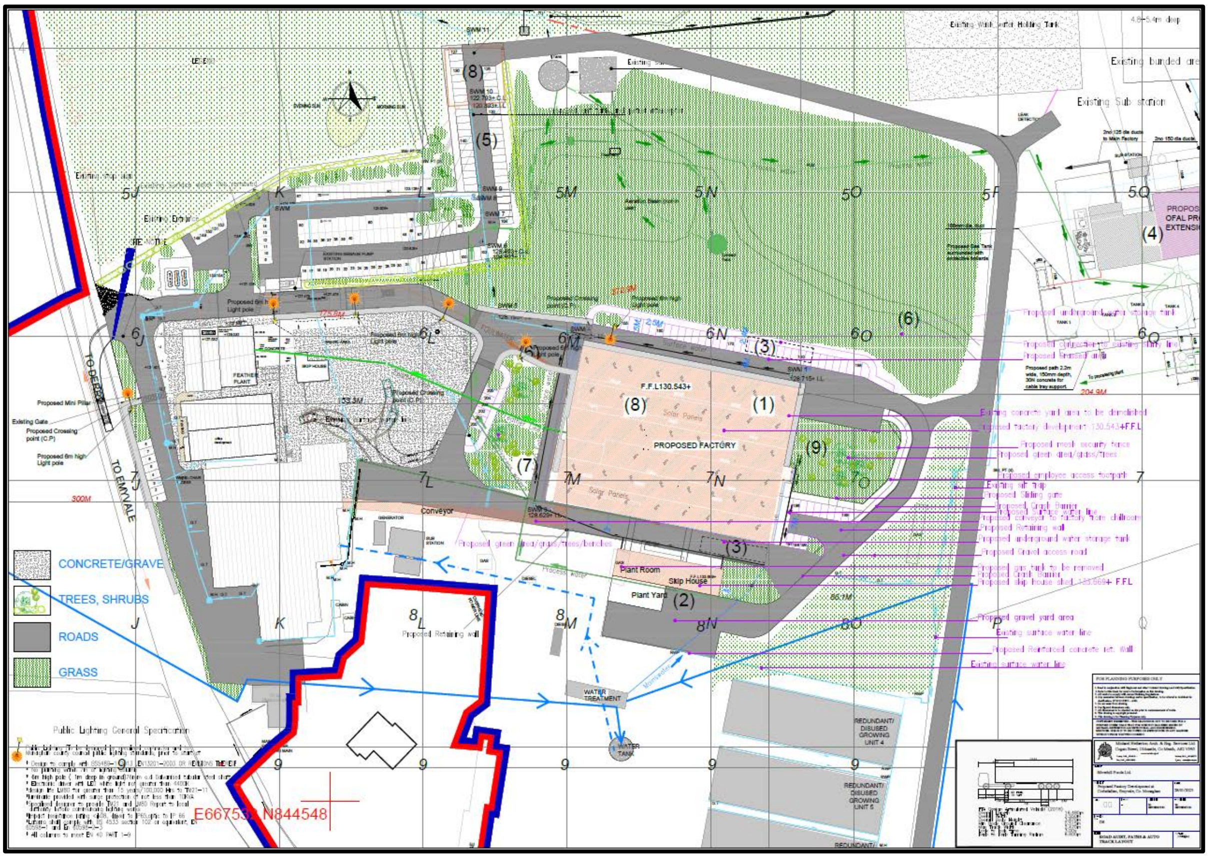


Figure 2.2 – Site Layout Plan (Source: Silverhill Foods Ltd.)

2.3 Accessibility and Parking

2.3.1 Site Access

The Silverhill Food factory is east of the National Road N2, 750m north of Emyvale town, in Co. Monaghan. All the traffic associated with the reconfigured factory will still be made through existing priority T-junction located to the northwest of the site.

The site was designed in accordance with the Design Manual for urban Roads and Streets (DMURS) guidelines, which states the desired sightlines for a 60km/h road with a 2.4m set back is 65 metres. Sightlines to both sides are adequate and can be easily achieved.

2.3.2 Internal Road Layout

The main function of the internal road network is to provide a safe and efficient parking and circulatory system that reduces the potential for conflicting movements, which can comfortably accommodate the anticipated volume of arrivals and departures without presenting a safety risk and not having a negative effect on the road network that it connects to.

The proposal was designed in accordance with the Design Manual for Urban Roads and Streets (DMURS) guidelines. The roads within the area will range from 5.5 to 6 metres in width and cater for a 2-way circulatory traffic flow.

2.3.3 Servicing Arrangements

The internal Road network is primarily designed to accommodate both cars and lorries, which will be the main vehicle types to use the factory. However, adequate provisions should be provided to facilitate the circulation and turning movements of emergency vehicles. In addition, an Autotrack analysis was carried out to ensure all vehicle types are able to manoeuvre within the site in a safe and efficient manner.

2.3.4 Parking Arrangements

The Monaghan County Development Plan 2019-2025, on Table 15.6 Car Parking Standards, requires 1 parking space for each 30m^2 of ground floor area for Factory Retail Unit. As the factory will have 5680m^2, the requirement is for the provision of 190No. parking spaces.

To obtain the expected number of cars parked in one hour length, the cumulative parking was calculated from the November 2022 traffic counts. The cumulative parking, shown in **Table 2.1** below, take into account the parked cars within the hour in question and the additional arrival from the next hour. When compared to the peak traffic generated by the development, the maximum number of vehicles parked at the same time is 53No., between 08:00 and 09:00 in the morning.

The site will have the provision of 205No. car parking spaces to cater for the overall development, which meets the minimum required as per Monaghan CDP 2019 – 2025. Likewise, the number of staff is not going to increase, the total number of parking spaces associated with the expanded factory is of suitable provision.

Table 2.1 – November 2022 traffic counts				
Time Range	**Arrivals**	**Departures**	**Totals**	**Cumulative Parking**
07:00-08:00	23.9	7.3	31.2	49.2
08:00-09:00	32.6	9.6	42.2	**52.9**
09:00-10:00	13.3	14.4	27.7	45.6
10:00-11:00	7.1	5.2	12.3	47.4
11:00-12:00	7	14.1	21.1	46.1
12:00-13:00	12.8	18.5	31.3	45.9
13:00-14:00	18.3	22.6	40.9	37.3
14:00-15:00	14	5	19	46.4
15:00-16:00	14.1	12.3	26.4	44.1
16:00-17:00	10	27.3	37.3	19.8
17:00-18:00	3	37.3	40.3	-10.2
18:00-19:00	7.3	5	12.3	-15.2

3 Existing Traffic Conditions

3.1 Existing Road Network

The traffic generated by Silverhill Food will access directly onto the National Road N2 using the existing priority T-junction, to the northwest of the development. Both staff and delivery vehicles gain access into the factory by the same junction that has been operational for many years.

The National Road N2 carriageway is approximately 7m wide near the T-junction at Silverhill entrance and caters for two-way traffic and connects Monaghan town to the south and to the border with Northern Ireland to the north. The speed limit near the junction is 60km/h, as shown in Figure 3.1 below.

ORS visited the site on August 12th, 2020, to assess the general Road condition and traffic flows in the vicinity of the site access junction. For visual detail of the Roadway in the vicinity, please refer to **Figures 3.1** to **3.4** below.

The roads included in this assessment are existing roads already in active usage and are part of a wider area; as such, their condition and suitability for purpose are not subject to assessment as part of this report.

For visual details of the junction tested as part of this assessment, please refer to **Figures 3.1 to 3.4**.

Figure 3.1 – View along N2 travelling south towards Emyvale

Figure 3.2 – View of site access junction along N2 travelling south towards Emyvale

Figure 3.3 - Sightlines from site access junction along N2 south towards Emyvale

Figure 3.4 - Sightlines from site access junction along N2 north towards Omagh

3.2 Pedestrian and Cyclist Connectivity

A walk from Emyvale town centre to the factory is approximately 8 minutes, as shown in **Figure 3.5** below. The National Road N2 has footpath along the eastern side of the Roadway until the entrance to Silverhill Food factory. The speed limit near the entrance is 60km/h.

The journey from Emyvale town centre to the factory is approximately 2 minutes cycling, however there are currently no cycle lanes provided along the National Road N2 from Emyvale town towards Silverhill Foods factory. The extension of the factory does not provide any bicycle parking spaces for its staff or visitors.

Figure 3.5 – Walking time from Silverhill Food Ltd. to Emyvale (Source: Google Maps

3.3 Sustainable Transport and Public Transport Provision

In relation to the proposed development, it is expected that the majority of the vehicles associated with the site will be privately owned cars and delivery vehicles.

For staff, public transport is limited. There is only one bus route that serves Emyvale, which is the expressway service 32/X32 of Bus Eireann that connects Dublin City to Letterkenny, Co. Donegal. This route offers 9 services throughout the day, from 6:15 am to 2:45 am and the nearest bus stop is located 750m to the south of the site, on Emyvale town centre.

3.4 Existing Traffic Flows

Automatic traffic counts were undertaken on the 16th of November 2022 and encompass all traffic movements at the access junction to Silverhill Foods. The traffic counts obtained cover movements of pedal cycles, cars, taxis, buses, LGVs and HGVs and overall traffic counts are presented as an equivalent to Passenger Car Unit (PCU). PCU is the impact that a mode of transport has on traffic compared to a single car, e.g., a private car represents 1 PCU whereas an HGV represents 2.3 PCUs.

As discussed previously, the expanded factory will be reconfigured to provide an increase in production with no additional staff required. With the rise in production, it is expected that the

HGVs travelling to and from the site increase by approximately 33%. The site will also amplify parking facilities for staff and visitors.

From the November 2022 traffic counts, the AM and PM peak were identified at the access junction to Silverhill Foods and occurs between 07:30 to 08:30 in the morning and between 17:00 to 18:00 in the evening.

During the 12-hour traffic analysis, there were a total of 7296 PCU travelling along the N2, where only 163 were recorded entering and exiting the site, and the majority of the traffic flow travel to and from the south, towards Monaghan town. The current traffic data to and from the site corresponds to only 2% of traffic on the N2.

Principal features of November 2022 traffic flows along the N2 were as following:

- A total of 7296 PCU travelled along the N2 over the 12-hour period between 7 am and 7 pm
- The majority of vehicles travel south from the factory, with peak hour occurring between 07:30 to 08:30 in the morning with 744.7 PCU recorded – 28.3 PCU accessing the site and 10.6 PCU leaving the facility.
- The highest number of vehicles recorded in the evening period was 775.8 PCU – 3 PCU accessing the site and 37.3 PCU exiting the facility - with the peak time observed to be 17:00 to 18:00.

Figure 3.6 – Location of Traffic Survey (Source: Google Earth)

3.5 Traffic Collisions Data in the Vicinity of the Site

Data on Road collisions near the existing Silverhill Foods site was obtained from the Road Safety Authority website, as shown in **Figures 3.7** & **3.8** below. Two minor incidents have been recorded along the National Road N2 near the site since 2005, one in 2006 and another one in 2016. Both incidents were recorded rear-end vehicle collision and both on a weekday during the day. There have been no serious or fatal incidents recorded near the priority T-junction access to Silverhill Food.

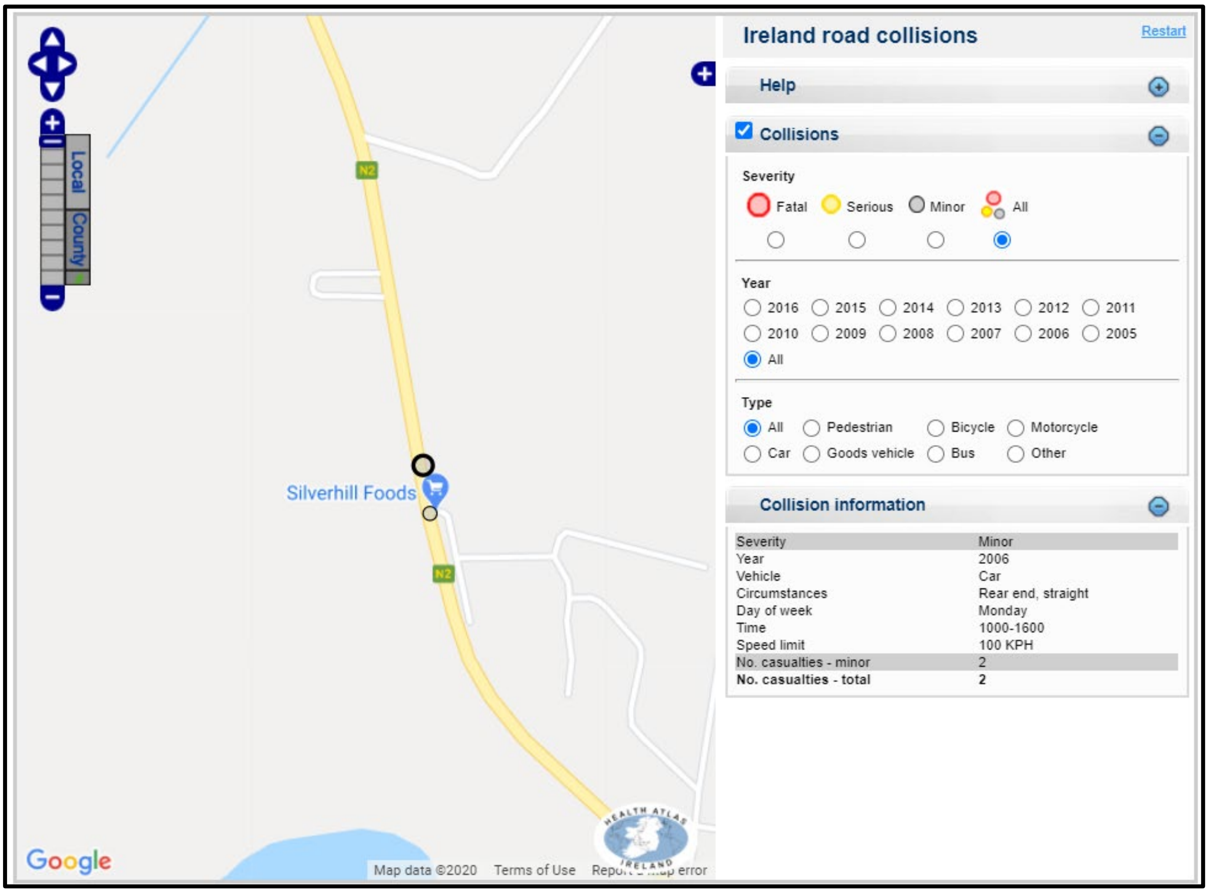


Figure 3.7 – 2006 Road Collision Details near Silverhill Foods site (Source: Road Safety Authority)

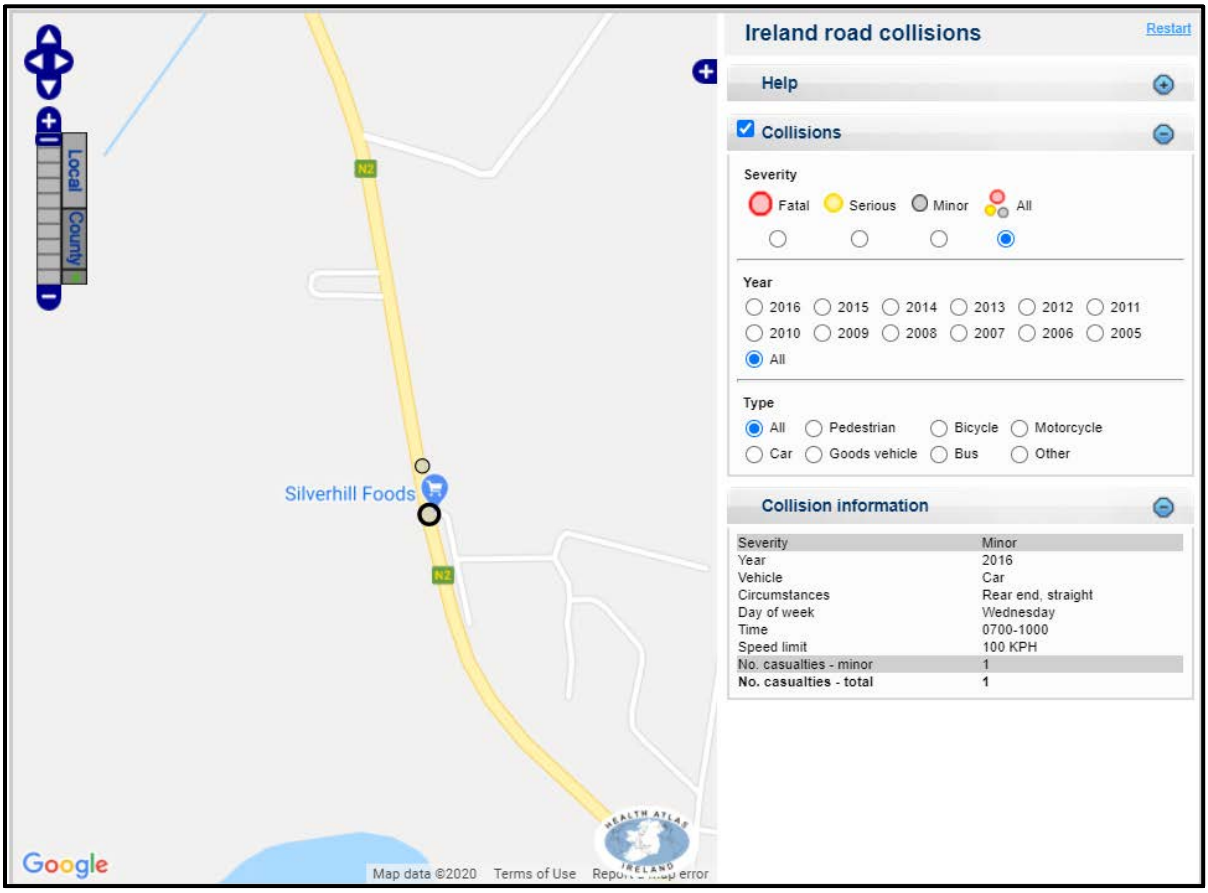


Figure 3.8 – 2016 Road Collision Details near Silverhill Foods site (Source: Road Safety Authority)

4 Trip Generation, Distribution and Impact on the Road Network

In order to obtain a trip rate for the proposed development once operational, the TRICS database was consulted. The TRICS (Trip Rate Information Computer System) database contains traffic generation data for developments of a similar nature to the proposed development. TRICS was established in the UK and is a substantial source of validated empirical data which contains information on arrival and departure rates for a range of different types and sizes of development throughout Ireland.

4.1 Development Traffic Generation

To determine the worst-case scenario for the traffic generation from the TRICS data, the proposed industrial units with the calculation factor by gross floor area. **Tables 4.1** and **4.2** shows the trip data for the proposed industrial unit with a total GFA of 5680 sq.m.

Table 4.1 – TRICS output for industrial units per gross floor area

TRICS 7.7.4						
Trip Rate Parameter: Gross Floor Area						
TRIP RATE for Land Use 02 – EMPLOYMENT/C – INDUSTRIAL UNIT						
Calculation Factor: 100 sqm						
Count Type: TOTAL VEHICLES						
TIME RANGE	ARRIVALS			DEPARTURE		
	No. Days	Ave. GFA	Trip Rate	No. Days	Ave. GFA	Trip Rate
05:00-06:00	3	1594	0.063	3	1594	0
06:00-07:00	3	1594	0.084	3	1594	0.021
07:00-08:00	**12**	**3550**	**0.765**	**12**	**3550**	**0.113**
08:00-09:00	12	3550	0.315	12	3550	0.143
09:00-10:00	12	3550	0.15	12	3550	0.120
10:00-11:00	12	3550	0.136	12	3550	0.108
11:00-12:00	12	3550	0.092	12	3550	0.106
12:00-13:00	12	3550	0.157	12	3550	0.160
13:00-14:00	12	3550	0.188	12	3550	0.214
14:00-15:00	12	3550	0.174	12	3550	0.131
15:00-16:00	12	3550	0.401	12	3550	0.305
16:00-17:00	**12**	**3550**	**0.12**	**12**	**3550**	**0.739**
17:00-18:00	12	3550	0.049	12	3550	0.336
18:00-19:00	12	3550	0.061	12	3550	0.084
19:00-20:00	3	1594	0.125	3	1594	0.146
20:00-21:00	3	1594	0.063	3	1594	0.084
Daily Trips Rates:			**2.943**			**2.810**

The TRICS output is presented in a trip rate per unit. The unit reference is dependent on the development in question, such as per person, per house or unit area. In this case, the multiplication factor to be applied to the unit rate is the gross floor area.

Table 4.2 presents the traffic data obtained from the TRICS database for the proposed factory expansion during the AM and PM peak period. From the TRICS data obtained, a number of 327 vehicles travel to and from the development in a 17-hour period, with peak hours occurring between 7 and 8am and 4 and 5pm.

Table 4.2 – Total Typical Daily Generated Profile

Time Range	Arrivals	Departures	Total
05:00-06:00	4	0	4
06:00-07:00	5	1	6
07:00-08:00	**43**	**6**	**50**
08:00-09:00	18	8	26
09:00-10:00	9	7	15
10:00-11:00	8	6	14
11:00-12:00	5	6	11
12:00-13:00	9	9	18
13:00-14:00	11	12	23
14:00-15:00	10	7	17
15:00-16:00	23	17	40
16:00-17:00	**7**	**42**	**49**
17:00-18:00	3	19	22
18:00-19:00	3	5	8
19:00-20:00	7	8	15
20:00-21:00	4	5	8
Total	167	160	327

4.2 Distribution Splits

Our current and future design year assessments are based on the traffic count data obtained in November 2022, and the increased production projections provided by the client. An expected 60% increase in production over a 6-day week will increase the daily counted traffic in and out of the facility by 33%. From the traffic counts undertaken, there were a total of 143 PCU travelling from Silverhill Food towards the south, 36 PCU travelling north from the site and 163 PCU entering the site from both the north and south of the N2 in a 12-hour period.

However, to obtain a conservative analysis, we have included all existing traffic to the site as HGV traffic, including staff vehicles, and we have increased all flows to and from the facility by 60%, which will give a total of 547 PCU travelling to and from the site. From the 547 PCU, 205 PCU are correspondent to the increase.

Based on November 2022 traffic counts, the peak hours of the road network and the proposed 60% increase in production at Silverhill Food, the expected traffic generated by the facility when fully operational is summarised in **Table 4.3** below.

Table 4.3 – Expected Traffic Generated by Silverhill Foods			
Time Range	**Arrivals**	**Departures**	**Total**
07:30 – 08:30	45	17	62
17:00 – 18:00	5	59	64

4.3 Future Year Traffic Growth

Transport Infrastructure Ireland (TII) issues a range of forecasts: low growth, central growth and high growth. The implementation of policies relating to the National Sustainable Mobility Policy will act as a deterrent to high growth in car-based travel. Low growth factors are however likely to be equally unrealistic at present, therefore, this assessment has used central growth factors, which were extracted from the TII Publication PE-PAG-02017 Project Appraisal Guidelines for National Roads Unit 5.3 – Travel Demand Projections, published in October 2021, outlined in **Tables 4.4** to **4.6** below.

The data used is for Monaghan County from 2016 to 2050 and is for light goods vehicles (LGV) and heavy goods vehicles (HGV).

Table 4.4 – Development Location Information	
Location of Development	Monaghan
Sensitivity Area	Central
Year of Traffic Counts	2022
Year of Assessment	2022
Year of Development Construction	2024

Table 4.5 – TII Annual Growth Rates (Central Growth) For Co. Monaghan		
	LGV	HGV
2016 – 2030	1.0115	1.0252
2030 – 2040	1.0047	1.0112
2040 – 2050	1.0041	1.0138

Table 4.6 – Growth Factors for Future Design Years					
	Counts	Baseline	Opening	Opening +5	Opening +15
	2022	2022	2024	2029	2039
LGV	1.000	1.000	1.023	1.083	1.143
HGV	1.000	1.000	1.051	1.190	1.306

4.4 Traffic Impact Assessment

Based on the traffic counts obtained in November 2022, the travel distribution at the junction analysed were established and the traffic generated by the Silverhill Foods is assumed to follow the same trend.

The projected 2024 traffic could be calculated using TII's Central Growth Factor for Co. Monaghan. Based on the traffic levels expected for 2024 and the predicted traffic associated with the proposed facility, the impact in the junctions could be calculated, as shown in **Table 4.9** overleaf.

4.4.1 Assessment Guidelines

Monaghan County Council Development Plan 2019 – 2025, in section 7.1, requires a Traffic Assessment to be carried out for any significant development, and it shall be in accordance with the TII publication 'Traffic and Transport Assessment Guidelines', PE-PDV- 02045.

The TII Publication PE-PDV-02045 recommends that junction modelling should be carried out where new traffic exceeds 5% of existing flows if congestion already exists and if traffic generated by the development exceeds 10% where no traffic congestion is present. As can be seen from **Table 4.8**, traffic associated with the factory facility amounts to less than 10% of the traffic along the N2 in the vicinity of the development, which does not exceed the minimum threshold of 10% for a TTA where no traffic congestion exists.

On this basis the TII Publication 'Traffic and Transport Assessment Guidelines', PE-PDV-02045, was consulted and it was found that the development did not meet any requirements for a TTA. **Table 4.7** below provides the thresholds for a TTA.

Table 4.7 – Traffic Management Guidelines Thresholds for Transport Assessments (TII)	
N/A	Traffic to and from the development exceeds 10% of the traffic flow on the adjoining road.
N/A	Traffic to and from the development exceeds 5% of the traffic flow on the adjoining road where congestion exists, or the location is sensitive
N/A	Residential development in excess of 200 dwellings
N/A	Retail and leisure development in excess of 100m^2
N/A	Office, education and hospital development in excess of 2,500m^2
N/A	Industrial development in excess of 5,000m^2
N/A	Distribution and warehousing in excess of 10,000m^2

As outlined in Sections 3 and 4, the traffic generated by the development at the access junction along N2 is very low throughout the day when considered alongside the existing traffic flows along N2 in the vicinity.

Table 4.8 - Traffic Impact on the Site access junction

Junction	2024 Projected Traffic		Traffic from Development		Increase in Traffic		TII Threshold of 10%	
	AM Peak	**PM Peak**	**AM Peak**	**PM Peak**	**AM Peak**	**PM Peak**	**AM Peak**	**PM Peak**
N2 / Silverhill Access junction	762	794	23	24	3%	3%	below	below

When comparing the traffic to/from the development with the threshold requirements in **Table 4.9** below, it is recommended by TII that if any of the listed conditions apply to the development then a TTA is required for the development. As can be seen in **Table 4.9**, two of these conditions apply in the case of the access junction to Silverhill Foods Ltd.

As noted previously, the traffic generated as a result of the increased production will account for an increase of only 2% of the passing traffic on the N2 National Road which is considered a minimal increase and would not have a detrimental impact on the National Road N2. It should also be noted that the proposed development is in keeping with the *'Spatial Planning and National Roads published in January 2012'* in terms of providing for or intensifying existing accesses within transition zones.

Table 4.9 – Advisory Threshold for Traffic and Transport Assessments Where National Roads are Affected (TII)

N/A	Type	Description	
N/A	Vehicle Movements	100 trips in/out combined in the peak hours for the proposed development	
N/A		Development traffic exceeds 10% of turning movements at junctions with and on National Roads	
N/A		Development traffic exceeds 5% of turning movements at junctions with National Roads if location has potential to become congested or sensitive	
N/A	Size	Retail	1,000m^2 Gross Floor Area
N/A		Leisure facilities including hotels, conference centres and cinemas	1,000m^2 Gross Floor Area
N/A		Business	2,500m^2 Gross Floor Area
YES		Industry	5,000m^2 Gross Floor Area
N/A		Distribution and Warehousing	10,000m^2 Gross Floor Area
N/A		Hospitals and education facilities	2,500m^2 Gross Floor Area
N/A		Stadia	1,500m^2 Gross Floor Area
N/A		Community facilities including places for worship, community centre	1,000m^2 Gross Floor Area
N/A		Housing	50 dwellings within urban area with a population less than 30,000 100 dwellings within urban areas with a population equal to or greater than 30,000
YES	Parking Provided	100 on-site parking spaces	

5 Capacity Analysis

5.1 Capacity Analysis Introduction

Capacity assessment was undertaken at the priority T-junction between the N2 and Silverhill Foods Access to demonstrate that the traffic associated with the facility will not adversely affect the functionality of the road network. The performance of the AM and PM peak hours were assessed in the junction for the following design years:

- 2022, traffic counts
- 2024, planned year of development conclusion
- 2029, 5 years after development completion
- 2039, 15 years after development conclusion.

Figure 5.1 below shows the location of the site and the junction in which traffic simulations were undertaken in order to obtain Ratio Flow Capacity (RFC) and the queue levels to determine if the junction will cater for the predicted level of traffic by the site when it becomes operational.

The Ratio of Flow to Capacity (RFC) describes the capacity of each approach to the junction and determines if the junction will cater for the predicted level of traffic. An RFC below 0.85 (85%) implies that an approach road is operating satisfactorily well within capacity; between 0.85 to 1.0 RFC means the approach operates well within capacity but at less optimal efficiency; and an RFC above 1.0 means that demand and capacity are equal and no further traffic can progress through the junction.

The queue levels are presented in Passenger Car Unit (PCU) and quantify the total number of vehicles queueing on each arm

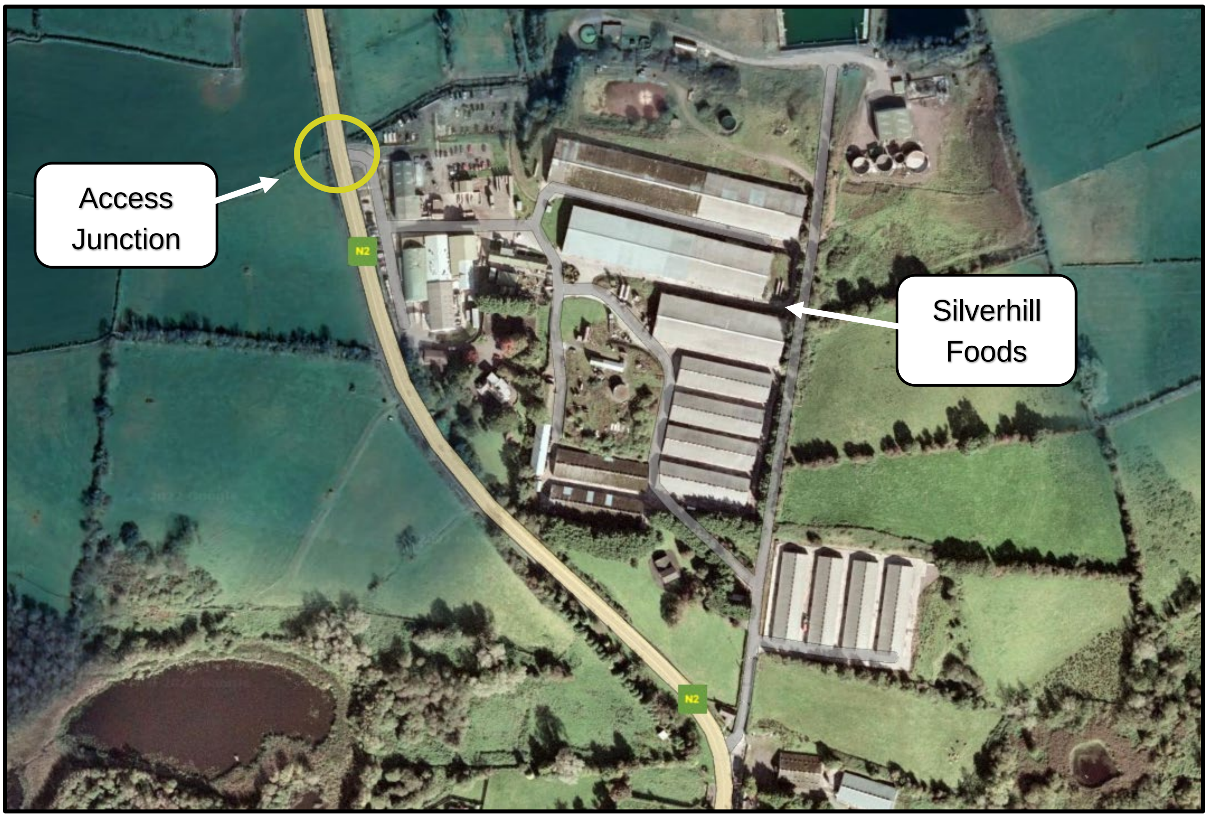


Figure 5.1 – Location of Junction Analysed (Source: Google Earth)

5.2 Traffic Impacts of the Proposed Development on Local Road Network

As stated in Section 3.5, traffic counts were undertaken in November 2022 at the site access junction. Traffic growth factors were applied to existing background traffic only and were not applied to development site traffic, since traffic associated with the site is limited by development size. Central Sensitivity growth factor for Kildare were used and the junctions were modelled using Junctions 9.

The capacity assessments were modelled for three different scenarios:

- Base-year: 2022 traffic flows modelled according to traffic counts obtained.
- Do-nothing: modelled without the intervention of the proposed development. For this analysis, the traffic counts were factored up using TII's Growth Factor for the design years 2024, 2029 and 2039.
- Do-something: the impact of the traffic generated by the proposed facility development was added to the design years of 2024, 2029 and 2039. This analysis will enable the comparison with the 'Do-nothing' scenario.

5.2.1 Priority T-junction Between the N2 and Silverhill Foods Access Road

In the following analysis of the R409 Caragh Road/ Osberstown industrial Park T-junction, the junction was assessed for the AM and PM peak period and the arms were labelled as follows:

- Arm A: N2 National Road to the north
- Arm B: Silverhill Foods Access Junction
- Arm C: N2 National Road to the south

Figure 5.2 – Silverhill Foods Access T-junction (Source: Google Earth)

As described in previous sections, the existing priority T-junction was assessed for a worst-case scenario whereby counted traffic is assumed to comprise 80% HGVs along N2 and 100% HGVs in and out of the facility. In addition, growth factors for HGV's are applied to all traffic flows for future design years in order to obtain a conservative, robust analysis.

As previously mentioned in the report, the anticipated traffic by the development is very low compared with traffic observed at the junction and represents an increase of less than 10% of existing traffic patterns. Furthermore, the new and more efficient facility will accommodate more storage this reducing the impact of proposed traffic along the road network.

Table 5.1 below shows that the traffic flows through the junction were modelled using *Junctions9* software and the results show that the junction will operate significantly below recommended RFC of 0.85 for all future design years using central growth factors for HGVs.

The Access junction will still function well below optimum capacity for the year 2039, 15 years after the expansion of the site with a negligible increase in RFCs. Comparing analyses 6 and 7 below, it can be seen that the additional traffic associated with the proposal will increase to a maximum of 0.05 RFC at the junction in the morning and evening peak, which is a negligible effect on the junction functionality.

Table 5.1 – *Junctions 9 Results for the N2/Silverhill Foods priority T-junction*

Analysis	Arm	AM		PM	
		Queue (PCU)	RFC	Queue (PCU)	RFC
1 – 2022, base year	B-AC	0.0	0.02	0.2	0.07
	C-AB	0.2	0.05	0.0	0.01
2 – 2024, do-nothing	B-AC	0.0	0.02	0.2	0.08
	C-AB	0.2	0.06	0.0	0.01
3 – 2024, do-something	B-AC	0.1	0.04	0.3	0.12
	C-AB	0.3	0.09	0.0	0.01
4 – 2029, do-nothing	B-AC	0.1	0.03	0.2	0.09
	C-AB	0.2	0.07	0.0	0.01
5 – 2029, do-something	B-AC	0.1	0.04	0.3	0.13
	C-AB	0.4	0.11	0.0	0.02
6 – 2039, do-nothing	B-AC	0.1	0.03	0.2	0.10
	C-AB	0.3	0.08	0.0	0.01
7 – 2039, do-something	B-AC	0.1	0.05	0.3	0.15
	C-AB	0.5	0.12	0.0	0.02

6 Conclusions

The main conclusions of this study are summarised as follows:

- This Traffic and Transport Assessment was conducted to accompany the planning application to Monaghan County Council for the proposed extension to Silverhill Foods Ltd., in Emyvale, Co. Monaghan.
- The proposal will provide a modernised operation therefore reducing the impact in traffic movements. The factory will operate shift basis which spreads the traffic movements over the day.
- Automatic traffic counts were undertaken on Wednesday, the 16th of November 2022 at the access junction to Silverhill Foods Ltd. by a third-party company called IDASO.
- Peak hours at the junctions were recorded to be between 07:30 to 08:30 in the morning and between 17:00 to 18:00 in the evening.
- The traffic split in the junction was calculated from the traffic counts and it is expected that the traffic associated with the proposed expansion will follow the same trend.
- The access junction to Silverhill Foods Ltd. was subjected to capacity analysis to examine the potential traffic levels generated by the proposed facility upgrade along the existing Road network in current and future design years.
- The junction was examined for peak conditions using a conservative traffic mix and future growth projections. It was found that the existing T-junction between Silverhill Foods and National Road N2 will operate significantly below capacity with a maximum of 0.15 RFC in all future design years following completion.
- The number of proposed parking bays associated with the factory expansion is of suitable provision, as the number of staff is not going to increase and a total number of 53 cars entered the site in a 12-hour period.
- The proposed development is in keeping with the ‘Spatial Planning and National Roads published in January 2012’ in terms of providing for or intensifying existing accesses within transition zones.
- In transportation engineering terms, the proposed upgrade works put forward by the design team will not generate excessive additional traffic at the site or along the adjoining National Road and will not adversely impact the operation of the National Road to which it connects.

Appendix A - Traffic Counts Data

Traffic Counts data available upon request.

Appendix B – *Junctions 9* Modelling Data

Modelling data available upon request.

Appendix 4.2: CEWMP

Appendix 4.2: Construction Environmental and Waste Management Plan (Outline)



Construction Environmental and Waste Management Plan

CEWMP Framework Document for the EIAR

Silver Hill Foods

Client Ref: SIL0002-09

Report Sign Off

REVISION	DATE	ORIGNATOR	REVIEWER
Draft	07/10/2020	SC	CF
Final	18/12/2020	SC	CF
Rev02	25/08/2022	JM	EG
Rev03	08/11/2022	JM	EG
Rev04	31/01/2023	JM	EG

Contents

1. Introduction

Rowan Engineering Consultants (Rowan) Ltd. were requested by Silver Hill Foods facility to draft a framework Construction Environmental and Waste Management Plan (CEWMP) for a proposed construction project within the boundary of the Silver Hill Foods facility scheduled to commence construction once approved for c. 5-17 months (subject to planning approvals).

1.1 Purpose and Scope of the CEWMP

The scope of the CEWMP covers the activities relating to the proposed construction project and includes those works undertaken by contractors during the construction phase of the development.

The purpose of the CEWMP is to set out a framework for management of future construction activities in compliance with legislative requirements, relevant best practise and also any construction requirements resulting from planning permissions.

The CEWMP is applicable to the Client (Silver Hill Foods), the appointed contractor and also any sub-contractors site staff during the construction phase of the proposed works.

The CEWMP will be finalised in conjunction with the appointed contractor(s) for the works and include supplementary information on the relevant contacts and responsibilities for the sections. The CEWMP will be made available to all construction site personnel.

The purpose of the CEWMP is to outline the required safeguards and mitigation measures identified in the EIAR to support their implementation onsite during the construction operations.

Operational Environmental Management of the Silver Hills facilities is not included in this document and is managed by the appointed Silver Hills Environmental Manager through the site environmental management systems.

2. Location of Silver Hill Foods

The site is located just north of Emyvale, Co. Monaghan. The site as a whole, including auxiliary lands and infrastructure, encompasses approximately 40 hectares and is accessed by the N2 - the Dublin to Derry Road. The site is set over a number of levels with the main processing and facilities area on the higher part off the site at an elevation of approximately 70m Above Ordnance Datum (AOD) and the lower part of the site encompassing the waste water treatment plant (WWTP) and environmental management area at 60m AOD.

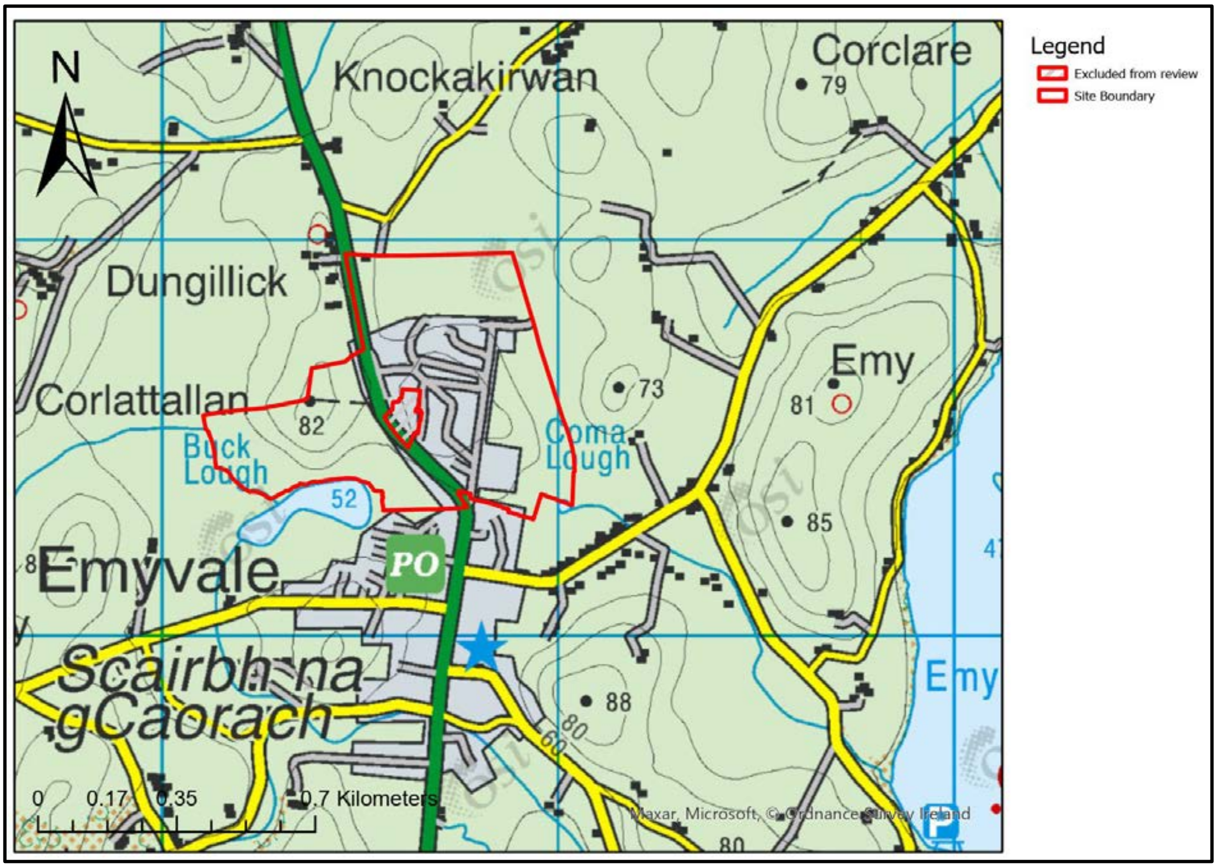


Figure 2-1 Site Location

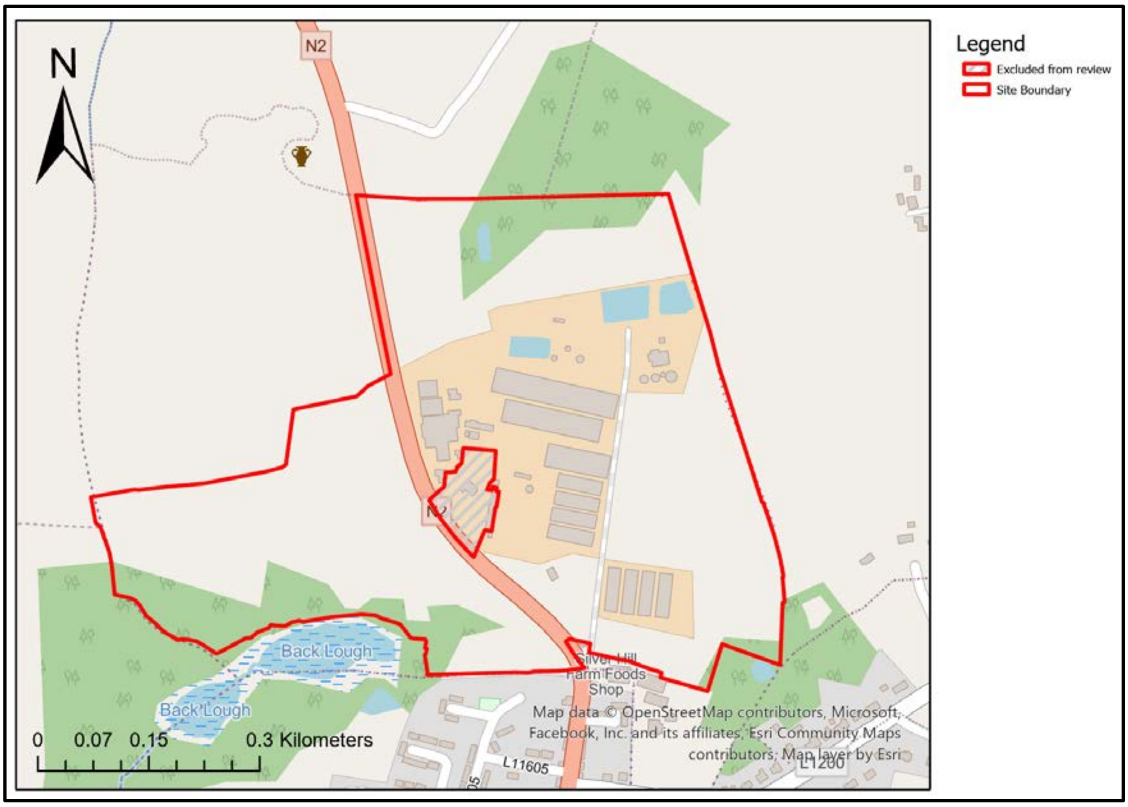


Figure 2-2 Site Location and Layout from OSI Maps, showing factory and adjoining lands.

3. Description of the Proposed Project

Currently on site, the Silver Hill Foods facility includes the following infrastructure:

- Administrative Building;
- 8 Unit Growing Facility (currently decommissioned);
- Processing plant consisting of areas for preparation, processing, cooking, storage/ refrigeration, loading, feather processing, waste handling;
- Carparks;
- WWTP and other site utilities;

The proposed works which are hereafter referred to as the **proposed Project** in this document, consist of an upgrade to the current production facility as follows:

Separately, Silver Hill Foods has applied for planning permission for the following works, referred to hereafter as the proposed Project;

- construction of a part single storey/part two storey factory development incorporating chilling, plucking and processing areas, offices, plant rooms, lairage and loading and unloading areas, canteen and hygiene facilities and single storey conveyor linkage to existing factory facility;
- single storey skip storage and plant room;
- construction of 2 no. underground water storage tanks;
- construction of a single storey extension to side of existing storage shed to incorporate a rendering facility;
- provision of additional car parking facilities, security fencing and access roads;
- connection to existing on-site mains foul sewer, water and drainage services;
- partial removal of existing concrete yard areas and associated structures;
- installation of the additional drip irrigation scheme;
- installation of solar panels onsite ; and
- completion of all associated site structures and ancillary site works.

4. Planning Permission Requirements

The proposed Project is subject to a planning permission application which is lodged with Monaghan County Council in November 2022.

An Environmental Impact Assessment Report (EIAR) which presents an assessment of environmental impacts and applicable mitigation has been prepared in support of the forthcoming EPA licence review and can also be provided to support the planning application.

5. Construction Programme and Sequencing

Construction is scheduled to commence in 2023 and the works are expected to be undertaken in two phases with approximate timelines of c. 4 months and c.13 months respectively.

A detailed construction programme/sequence will be developed during the detailed design and included in this document. The main phases would include:

- Mobilisation;
- Site Clearance;
- Structural;
- Internal Fitting Out;
- Mechanical / Electrical; and
- Commissioning.

6. Silver Hill Foods Environmental Policy

An Environmental Policy is currently implemented at the Silver Hill Foods facility and is outlined below in Figure 1.

During the construction phase, works associated with the proposed Project will be undertaken in adherence to this Environmental Policy. The Environmental Policy will be made available to the appointed contractor in advance of work commencing on site.

EMS | Ref: 1.2 Env. Policy | Rev: 004

SILVER HILL EST. 1962 DUCK

Silver Hill Duck Environmental Policy

The Environmental Department is the cornerstone of the company's sustainability efforts. It is our policy to design, develop and operate our activities, products and services in a way that prevents or minimises environmental impacts.

We aim to continually improve our environmental performance by applying the concept of BAT (Best Available Techniques) to achieve cleaner production, waste minimisation, conservation of natural resources, energy efficiency and sustainable development of our Business.

To achieve our aims, we are committed to the continuing development and implementation of our Environmental Management System. Through our EMS we envisage that we will:

- ✓ Comply with all legislative, regulatory and IPPC (Integrated Pollution Prevention and Control) Licence requirements
- ✓ Review and minimise the environmental impacts of our activities
- ✓ Establish and make known our environmental objectives and targets
- ✓ Develop and implement procedures for Environmental Management
- ✓ Implement an Environmental Training and Awareness Programme to involve all employees in Environmental Management
- ✓ Monitor and record our environmental performance and publish our results
- ✓ Strive to "Reduce, Reuse Recycle" wherever possible
- ✓ Work together with customers, suppliers and the local community for the good of the environment

Silver Hill Duck will continue to devote sufficient resources to the implementation of this Policy, and we look forward to receiving your continued support and co-operation.

Micheál Briody
Managing Director

Issued By: Denise Jordan | Date 15/09/20

Figure 1: Silver Hill Foods Environmental Policy

7. Construction Environmental Management

The following sections provide information in relation to the controls that will be in place during the construction phase and includes any mitigation measures that have been identified in the EIAR.

7.1 Construction Compound

During the construction phase, there will be a construction compound for the construction personnel. This compound will be located within the boundary of the existing facility.

7.2 Working Hours

Typical construction working hours are expected to be:

- Weekdays 7am-7pm; and
- Saturday and Bank Holidays 7am – 2pm.

7.3 Materials – Deliveries, Removal and Storage

Vehicles making deliveries and removing materials from the site will access via the main entrance onto the national road N2. These movements, as much as possible, shall be planned to be outside peak traffic hours. The delivery schedule will be planned so that there is no queuing on the local road network. All waste receptacles being removed from the site will be covered or enclosed.

Vehicles will be directed to additional car parking area for construction activities. On site traffic controls will be in place for the duration of construction. All vehicles will be admitted to site for direction, using the existing COVID control point as a traffic control. In the event the other gate is used for vehicles leaving the site to provide a 1 way system for construction deliveries a control point will be placed within the site at the entrance to the decommissioned rearing sheds for traffic check and control.

All materials to be stored at the construction compound shall be stored in a manner that is safe and that is in line with best industry practice.

Fuels and chemicals shall be stored in appropriately bunded areas/within double skinned tanks.

7.4 Bunding and Storage of Chemical/Oils/Fuels On-Site

The following controls shall be implemented by the appointed contractor in relation to the storage of chemicals, oils and fuels on-site:

- Fuel, oils and chemicals shall be stored on bunds in a hardstanding area;
- Bunds shall be able to contain at least 25% of the total volume of the stored products or 110% of the total volume the largest container (whichever is greater);
- The appointed contractor shall be responsible for confirming that their bunds are maintained, inspected and emptied of their contents in a manner that prevents environmental damage;
- Storage of fuels, oils and chemicals shall be away from the surface and foul sewer drainage systems on-site;
- All bunds shall be checked daily by the appointed contractor to:
    - Determine if it is necessary to drain the contents of the bund;

    - Ensure that the bund contents will not overflow the bund (Ideally the bund should be dry, as any volume occupied by liquid within the bund reduces the potential of the bund to retain the spilled contents of a tank should a spillage or leakage occur);
    - Check the condition of the bund; and
    - Confirm that any drain valves are in the closed position and locked if necessary.
- If the bund contains anything other than rainwater, then an odour and visual assessment of the bunds contents must be made before it can be discharged. It may be necessary to analyse the contents of the bund, if its identity cannot be determined following initial inspection;
- If it is determined, following the identification of the bunds contents that they are unsuitable for discharge to site drainage system, the appointed contractor shall transfer the material into suitable, clearly labelled drums or tanks and disposed of as deemed necessary by a licenced waste contractor.
- Material drained from the bunds shall not be drained to the surface water drainage system under any circumstances. The drained material, on approval from Silver Hill Foods personnel can be discharged to the foul sewer drainage system.
- The site drainage systems shall be checked by the appointed contractor as part of the weekly Environmental and Waste Management Inspections.

7.5 Refuelling of Plant and Equipment On-Site

The following controls shall be implemented by the appointed contractor in relation to refuelling activities on site:

- Delivery of any fuel to the facility for the appointed contractor will be in approved vehicles and tanks;
- All refuelling will be undertaken on designated, hardstanding areas, away from the drainage systems;
- Refuelling shall not be undertaken when plant and equipment engines are running;
- The appointed contractor will confirm that all equipment, fittings, hoses, tanks and nozzles are in good condition and free from leaks;
- All dispensing of fuel will be attended for the duration of the operation;
- The appointed contractor staff member will inspect the refuelling area prior to and on completion of the refuelling activity; and
- Filled and labelled spill kits will be maintained next to the refuelling area and readily available.

7.6 Spillage and Leakage Procedure

Silver Hill Foods will address all environmental incidences in accordance with their Emergency Response Procedure which is implemented as part of the site's Environmental Management System,

Key points for dealing with spillage/leakages are:

- The Silver Hill Foods Environmental Manager and appointed contractor's Environmental Representative must be notified of a spill immediately;
- Communication will include a text alert system for any emergency matters and an SOP contact to be notified in addition to Silver Hills and the Contractor Environmental managers.

- Where there is any indication that environmental pollution (releases to the environment) has, or may have, taken place, then site management will liaise with the appropriate Authority as deemed required;
- If possible, confirm the type / nature of the spilled material, the volume and determine any risks to human health and/or the environment;
- Stop the source and contain the spillage;
- Limit the spillage effected area by blocking, diverting or confining the spillage;
- Smaller leaks/spillages should be contained using a spill kit, where absorbent product is applied to the spill and removed as soon as it has absorbed all the material. All contaminated spill kit material should be put into a suitable waste container and labelled as to the contents, prior to collection by a licenced waste contractor;
- If bigger spillages occur, the nearest storm water drain must be blocked off to stop discharges to the environment (e.g. stormwater drains). Then, staff should clear up the spillage and dispose of the spill material to an authorised waste facility;
- If a spillage has resulted in discharges to stormwater drains, these shall be sucked out clean and rinsed thoroughly;
- The site interceptor will be inspected and if any spillage has reached the interceptor, the interceptor will be serviced immediately by a licensed waste contractor;
- The Silver Hill Foods Environmental Manager will record the spill/leakage incident and report to the appropriate Authority as required.

7.7 Staff Training

Staff will be trained on the requirements of the CEWMP during the induction process. A copy of the CEWMP will be available to all staff members. Records of staff training will be maintained by the appointed contractor at the site. An Environmental Awareness briefing will be included in the Site Induction.

7.8 Construction Environmental Mitigation from the EIAR

Construction environmental mitigation was outlined in the EIAR to avoid/reduce the potential for environmental impacts during the construction phase.

This mitigation will be implemented by the appointed contractor and is detailed in Table 1 below.

Table 1: Construction Environmental Mitigation

Chapter	Reference	Potential Environmental Impact	Description
4 – Traffic and Transport	Section 4.4	Impacts on road safety / traffic flows	"*An outline project Construction Environmental and Waste Management Plan (CEWMP) was prepared setting out a framework in relation to the management of environmental nuisances during the construction phase of the proposed Project.*" Compliance with the CEWMP will be mandatory for the appointed contractor.

Chapter	Reference	Potential Environmental Impact	Description
5 - Noise and Vibration	Section 5.5.1	Impacts on noise sensitive locations	• Limiting the hours during which site activities likely to create high levels of noise or vibration are permitted; • Establishing channels of communication between the appointed contractor, Silver Hill Foods, Monaghan County Council and residents; • Appointing a site representative responsible for matters relating to noise and vibration; and; • Keep all site access roads even, so as to mitigate the potential noise impact during the construction phase.
6 -Soils and Geology	Section 6.5.1	Pollution event on local soils and geology	Mitigation measures that will be implemented on site during the construction phase shall include: • All vehicles leaving the site will be cleaned by the wheel washing facility to prevent the spread of mud and dust on public roads; • Vehicles delivering materials with dust potential will be enclosed or covered with tarpaulin; • Fuel, oils and chemicals shall be stored on bunds in a hardstanding area; • Installation of drip irrigation system to be completed in dry weather to avoid damage to soils, • During prolonged dry or windy periods, any areas with the potential to generate dust will be watered, in particular areas next to the site entrance; and • Public roads will be inspected regularly for cleanliness and cleaned as necessary; and any spillages or leakages shall be cleaned up immediately and addressed in line with the requirement of the Emergency Response Procedure and Spill Protocol outlined in the EMP (Appendix 2.3). •
7 – Hydrology and Hydrogeology	Section 7.4.1	Pollution of surface and groundwaters	The CEWMP will detail the mitigation measures that will be implemented on site during the construction phase, to improve minimise environmental impacts including: • The storage of fuel in bunded areas; • Vehicle refuelling procedures; • Chemical/hydrocarbon spill procedures. The construction contractor's compound will be constructed on hard-core.

Chapter	Reference	Potential Environmental Impact	Description
8– Air Quality and Climate	Section 8.5.1	Nuisance Dust	Mitigation measures that will be implemented on site during the construction phase shall include: • Vehicles delivering materials with dust potential will be enclosed or covered with tarpaulin; • Hard surfaces will be swept to remove any mud or aggregate build up; • During prolonged dry or windy periods, any areas with the potential to generate dust will be watered; and • Public roads will be inspected regularly for cleanliness and cleaned as necessary. Training on the requirements of the CEWMP will be provided to construction site staff by the appointed contractor as part of their site induction. Records of this will be maintained on-site.

10 – Biodiversity	Section 10.6	Impacts on Ecological Features	• Mitigation measures that will be implementation on site during the construction phase shall include: • Site preparation and construction should be confined to the development site only and in order to protect water quality in the unnamed stream that turns into Corlattallan Stream, it should adhere to best practice and where applicable should conform to the Inland Fisheries Ireland Requirements for the Protection of Fisheries Habitats during Construction and Development Works at River Sites (www.fisheriesireland.ie) and The Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters. • During construction, in order to avoid any pollution of water quality, guidelines in the CIRIA (Construction Industry Research and Information Association) Publications including C532 – Control of Water Pollution from Construction, guidance for Consultants and Contractors should also be followed. These guidelines require the following measures when working in or near river sites and they include: • Fuels, oils, greases and hydraulic fluids must be stored in bunded compounds well away from watercourses and drains. Refuelling of machinery, etc., must only be carried out in bunded areas; • Run-off from machine service and concrete mixing areas must not enter the watercourse, rather it should only be routed to the watercourse via suitably designed and sited settlement ponds/filter channels; • Settlement ponds should be inspected daily and maintained regularly; • Watercourse banks should be left intact. If they have to be disturbed, all practicable measures should be taken to prevent soils from entering the watercourse; • Construction works, especially those involving the pouring of concrete must be carried out in dry weather. • Where concrete is being poured on site, the following concrete / aggregate management measures should include: • Best practice in bulk-liquid concrete management must be employed on site addressing pouring and handling, secure shuttering, adequate curing times etc. • Stockpile areas for sands and gravel should be kept to a minimum size, well away from the drains and watercourses (minimum 50m). • Where concrete shuttering is used, measures should be put in place to prevent against shutter failure and control storage, handling and disposal of shutter oils.

			• Ready mix concrete wagons and mixers should be washed off site to minimise emissions into the local watercourses. • Activities which result in the creation of cement dust should be controlled by dampening down the areas. • Raw and uncured waste concrete should be disposed of by removal from the site or by burial on the site in a location and manner which will not impact upon the local watercourses. • Stockpiles for sand and gravel will be sited over 50m from any surface water feature or drainage channel. Stockpiles or areas of bare soil will be covered or seeded if not required in the short term. • Measures for the protection of water quality during construction should be outlined in a Construction and Environment Management Plan. This should be presented to the local authority and Inland Fisheries Ireland for approval prior to the commencement of any works on site. • Any excavated material arising from the construction process must not be disposed of within any designated site or area of biodiversity value. It must be used responsibly within the boundary, stored within a bunded area away from the river or else disposed of in a licensed facility using a registered contractor. • The drip irrigation system should be installed under the supervision of a suitability qualified environmental engineer. • Once installed no excavation is permitted in the drip irrigation areas (including the already installed pilot area) without the Silver Hill Environmental manager and an environmental engineer present. • During site operation, surface water run-off into the stream should only be discharged via suitable oil and silt interceptors. These should be serviced regularly. Good ecological status in this stream should be achieved. • The existing hedgerows and treelines that occur throughout the application site are important biodiversity features. Their integrity should be maintained at all stages. It is illegal to remove hedgerows / treelines during the bird nesting season (September – March). • If any tree needs to be removed, it should be done outside of the bird nesting season. If it's a particularly mature tree, with crevices, fissures and ivy it should be inspected by a bat ecologist prior to felling. • Future management of the area of the application site and grasslands could also consider the creation of biodiversity areas for the benefit of local wildlife. Verges could be maintained in order to encourage the growth of nectar rich plants,

Chapter	Reference	Potential Environmental Impact	Description
			which would benefit local pollinating insects such as bees and hoverflies. • All organic waste arising from the poultry on site, should be utilised on lands that have an agronomic requirement for fertiliser, and in accordance with with S.I. 605 of 2017 European Communities (Good Agricultural Practice for Protection of Waters) Regulations, 2017). The above mitigation controls shall be reflected in an Construction Environmental and Waste Management Plan (CEWMP) which shall be implemented by the appointed contractor and Silver Hill Foods during the construction phase.
11 – Population and Human Health	Section 11.4.1	Impacts on local residents	A project Construction Environmental and Waste Management Plan will be (CEWMP) will be finalised in conjunction with the contractor. This will include management of environmental nuisances during the construction phase of the proposed Project. A complaint / grievance SOP will be included in the CEWMP communications plan and be made publicly available (See Section 13) . The CEWMP will be developed prior to the commencement of the construction phase. Compliance with the CEWMP will be mandatory for the appointed contractor. The CEWMP will detail the mitigation measures that will be implemented on site during the construction phase, to improve minimise environmental impacts and including: • Vehicles delivering materials with dust potential will be enclosed or covered with tarpaulin; • Hard surfaces will be swept to remove any mud or aggregate build up; • During prolonged dry or windy periods, any areas with the potential to generate dust will be watered; • Public roads will be inspected regularly for cleanliness and cleaned as necessary.
12 – Cultural Heritage	Section 12.5	Encountering unknown archaeology	No specific mitigation measures are required with respect to archaeological, architectural and cultural heritage.

Chapter	Reference	Potential Environmental Impact	Description
13- Waste Management	Section 13.5.1	Ineffective waste management	The CEWMP will be developed to reflect the waste management hierarchy and having regard to the resource value of even discarded materials. The CEWMP will detail the mitigation measures that will be implemented on site during the construction phase, to improve and minimise waste generation, manage materials on-site effectively and to prioritise the reuse and recycling opportunities on-site. Refer to Section 8 below.
14 – Material Assets	Section 14.5	Impacts on local utilities	All required works in relation to utilities will be undertaken in consultation with the utility provider and in adherence to their requirements.

8. Construction Waste Management

8.1 Waste Management During the Construction Phase

Waste management legislation defines waste as "*any substance or object which the holder intends discards or intends, or is required to, discard and anything which is discarded or otherwise dealt with as if it were waste shall be presumed to be waste until the contrary is proved"*

All Silver Hill Foods waste streams are managed in accordance with relevant waste management legislation and waste management documentation is retained at the individual facilities and managed by the Technical Manager at the facility.

Silver Hill Foods is committed to the continual improvement of its environmental performance and integral to this is the implementation of the waste management hierarchy at the facilities.

The construction phase of the proposed Project will be subject to the same waste management principles as those of the Silver Hill Foods facility.

The overarching waste management policies for the proposed Project will be to;

- Prevent wherever possible the generation of waste;
- To reuse waste on site where applicable or transport it to a suitably licenced facility;
- Recyclable waste fractions will be segregated at source on site and transferred to a suitably licensed facility;
- Provide sufficient resources and facilities for the implementation of waste management;
- Communicate to all levels of staff regarding their participation in these waste management policies; and
- Implement continual improvement of waste management performance through periodic inspections.

8.2 Construction Waste Streams

Expected construction waste streams for the proposed Project are detailed in Table 9.1.

The likely percentage breakdown of these wastes during the construction phase is also currently provided in Table 9.1. This percentage breakdown is based on data presented in the EPA National Waste Reports.

On completion of the detailed design and appointment of the Contractor, Table 9.1 will be updated to reflect expected waste volumes for each waste stream.

Table 9.1: Construction Waste Streams

Description of Material	Expected Percentage Breakdown (Generation on Site)	Management Options
Mixed construction and demolition (C&D)	33%	Reuse on site where possible, recycling & recovery. Disposal from some element expected.
Timber	28%	Largely managed through reuse on site where possible, recycling & recovery. Minimal disposal expected of these waste streams
Metals	8%	
Plasterboard	10%	
Concrete	6%	
Other	15%	Reuse on site where possible, recycling & recovery. Disposal of some elements expected.
Total Waste Generation	100%	-

Table 9.2: General Waste Streams

Description of Material	Management Options
Municipal waste	Waste segregation to encourage recycling will be implemented on site where possible. Disposal of some of elements expected.
Mixed recyclable waste	
Glass Plastics	
Waste electrical and electronic	

8.3 Waste Storage Area

A designated waste storage area will be situated on the site to facilitate the storage and disposal of waste. The appointed contractor shall be responsible for maintaining and managing the waste storage area for the duration of the construction phase.

The waste storage area will be located on an impervious layer i.e. concrete and will drain to the existing effluent drainage system on site i.e. to the WWTP. The waste storage area will not be situated in the vicinity of the existing surface water drainage system.

The waste storage area will have bunded facilities to store any potentially hazardous solid and liquid waste and also potentially leaking waste containers prior to transport off site. The bunds will be appropriately managed and monitored by the appointed contractor to allow the required retention capacity to be maintained.

8.4 Minimisation of Waste Generation on Site

In accordance with the waste management hierarchy and best practice, the proposed Project will operate to prevent the generation of waste where possible.

Measures implemented across the proposed Project to achieve these aims will include, but are not limited to, the following:

- Ordering of appropriate quantities of materials using the “just in time” philosophy;
- Appropriate handling procedures for materials will be developed to prevent damage; and
- Co-ordination in the supply of materials and services to avoid repeated and/or redundant deliveries.

Measures will be taken by the appointed contractor to maintain the proposed Project and surroundings to a high standard of cleanliness. These measures will include but are not limited to the following;

- A regular programme of site tidying to maintain a safe and orderly site;
- Scaffolding will have debris netting attached to prevent materials and equipment being scattered by the wind;
- Food waste will be strictly controlled on all parts of the proposed Project site; and
- In the event of any litter or debris escaping the proposed Project site, it will be collected immediately and removed to waste storage on site, and subsequently disposed-of in the required manner.

8.5 Management of the Segregation and Storage of Wastes

Waste collected on site will be subject to the following requirements:

- Appropriate waste containers will be used to ensure that different waste types are appropriately segregated and stored at all times;
- All waste containers will be kept clean;
- All waste will be appropriately sealed or covered in order to prevent nuisance and potential emissions to air, ground and water and to prevent cross contamination of waste streams;
- Where containment/bunding of the waste is required, this area will be bunded to retain a potential leakage comprising the capacity of 110% of the largest container or 25% of the total storage requirement, whichever is greater;
- Waste will be held in containers to prevent leakage, spillage or escape of the contents under normal conditions of handling, storage and transport;
- All waste will be clearly labelled and the label will be accurate and sufficient so as to enable proper and safe handling, storage and transportation;
- General non-hazardous waste generated on-site can be stored in movable, labelled skips at particular workplaces;
- All transfers of waste off-site will be recorded by the appointed contractor in line with the details in Section 8.6 and Section 12. This will be inspected by the Environmental Representative (Refer to Section 11) for the appointed contractor on a weekly basis and will be subject to periodic inspections by Silver Hill Foods representatives.

8.6 Movement of Waste

All waste will be documented and weighed prior to leaving the site. As noted earlier, all waste receptacles will be covered or enclosed when leaving the site.

All movement of waste and the use of waste contractors will be undertaken in accordance with waste legislation including the:

- Waste Management Acts 1996-2011;
- Waste Management (Collection Permit) Regulations 2007 as amended; and
- Waste Management (Facility Permit and Registration) Regulations 2007 as amended.

A copy of Waste Collection Permits, Certificates of Registrations, Waste Facility Permits and Waste Licences will be maintained on site.

If waste is being shipped abroad, a copy of the Transfrontier Shipping (TFS) notification document will be obtained from Dublin City Council (as the relevant authority for all authorities).

A receipt from the final destination of waste material will be kept as part of the on-site waste records.

9. Construction Traffic Management

The purpose of traffic management for the construction phase is to control movement of vehicles, plant and pedestrians that are present both on the construction site and adjacent road network and to ensure that safety is not compromised.

The objectives of the construction traffic management for the construction phase will be to:

- To provide protection to workers and the general public from traffic hazards that may arise as a result of the construction activity;
- To ensure the local road network performance is maintained at an acceptable and appropriate level; and
- To minimise adverse impacts on users of the road network and adjacent properties.

The construction phase of the proposed Project is programmed for c.5-17 months and during peak activity and it’s expected that the following will be generated:

- c. 20 vehicles movements per day (10 vehicles) for construction staff accessing and egressing the site; and
- c. 4 additional vehicle movements (2 vehicles) per week for building supplies.

It is considered that the additional traffic movements would be temporary and given that the N2 is working well within capacity, any impacts would be considered not significant. These additional truck movements are well within the maximum HGV levels modelled for the EIAR.

Key measures in relation to construction traffic management for the appointed contractor will be:

- Confirming that the N2 and site entrance surrounding the site are clean from debris and dirt on a daily basis;
- Confirming that construction vehicle routes to the site are via agreed routes;
- Programming deliveries outside peak hours where possible and always only within the site working hours;
- Confirming that site staff access parking locations within the facility boundary and that they are not parking outside the site entrance/ on the N2;
- No unloading/loading will occur outside the site entrance; and
- Communicate details of expected deliveries in advance with security staff, so that HGV's are not waiting outside the site entrance/ on the N2.
- Control points within the site to prevent any delay or waiting on or close to the N2 entrance.

10. CEWMP Roles and Responsibilities

10.1 Silver Hill Foods

Silver Hill Foods are:

- Responsible for the overall management and performance of the Silver Hill Foods facility;
- Shall be the main point of contact in the event of contact from member of the public, local authority and/or other organisations;
- Responsible for undertaking periodic inspections of the construction site; and
- Entitled to witness and measure the works being undertaken by the appointed contractor in relation to maintaining the environmental standards and procedures at at the proposed Project site during the construction phase.

10.2 Appointed contractor

The appointed contractor is responsible for:

- Revising this Framework to include the responsible individuals, communication plan and contacts and project specific implementation data;
- Implementing and maintaining the CEWMP and environmental monitoring (as required) requirements during the construction phase;
- Confirming at the proposed Project outset, with Silver Hill Foods, an appropriate resource (the Environmental Representative) who will be responsible for implementing the CEWMP and all required site environmental management procedures during the construction phase;
- Communicating environmental, construction traffic and waste management requirements to construction site personnel and maintaining records of this. This will be undertaken through site inductions and environmental toolbox talks;
- Undertaking all construction activities in accordance with the:
    - Silver Hill Foods Environmental Policy;
    - EIAR and any subsequent planning permissions;
    - CEWMP; and

  - Legislative requirements and construction best practise & guidance;
- Identifying all environmental impacts and confirming that the appropriate mitigation measures have been incorporated, prior to commencing all construction activities & tasks;
- Maintaining environmental, induction and waste management records on site (and having these available for inspection to Silver Hill Foods);
- Implementing and recording as minimum, weekly Environmental and Waste Management Inspections as detailed in Section 12 (and having these available for inspection to Silver Hill Foods); and
- Implementing any required corrective and preventative actions that arise from the Environmental and Waste Management Inspections or environmental incidents on site.

11. CEWMP Monitoring and Checking

11.1 Environmental and Waste Management Weekly Checklists

In addition to any environmental monitoring, as minimum weekly Environmental and Waste Management inspections will be undertaken by the appointed contractor's Environmental Representative.

These inspections will confirm that the construction activities are being undertaken in accordance with the requirements of the:

- Silver Hill Foods Environmental Policy;
- EIAR and any subsequent planning permissions;
- CEWMP; and
- Legislative requirements and environmental best practise.

These inspections will also provide the opportunity to highlight any areas where environmental management practices can be improved.

The Environmental Representative is responsible for the establishment and management of the Inspections, the action reporting system, and a comprehensive Inspection Checklist for carrying out site inspections.

This Environmental and Waste Management Inspection Checklist will be reviewed and agreed with Silver Hill Foods.

The implementation of any corrective and preventative actions by the appointed contractor will be monitored by Silver Hill Foods.

11.2 Silver Hill Foods Periodic Inspections

During the construction phase, Silver Hill Foods will undertake periodic inspections of construction activities.

The main objective of these inspections will be to undertake a systematic study of all the environmental management practises and to confirm that the appointed contractor is undertaking works in compliance with all relevant requirements.

The details of the inspections will be communicated to the appointed contractor and Silver Hill Foods management.

12. CEWMP Record Keeping

12.1 Environmental Management Record Keeping

The appointed contractor will maintain records relevant to environmental management. These shall include:

- Site induction training records;
- Environmental and Waste Management Checklists;
- Environmental monitoring records (as may be required):
- Evidence of environmental toolbox talks;
- Construction methods statement where environmental mitigation has been integrated/required.

12.2 Waste Management Record Keeping

The appointed contractor will maintain records for all waste material which leaves the site.

For each load, the following will be recorded by the appointed contractor:

- Waste Contractor name;
- Vehicle registration details;
- Time & date;
- EWC Code and waste description;
- Weight/Volume of each load of waste leaving site; and
- Final destination details.

13. Environmental Incidences and Complaints

During the construction phase, the local public will be able to make enquiries and complaints to the Silver Hill Foods Site Office. A formal complaints and grievance procedure will be developed with the contractor to log and respond to any complaints by the public.

Silver Hill Foods will record the complaint and liaise with the appointed contractor to determine if any of the issues raised are attributable to the construction activities and where required, corrective actions will be agreed and implemented by the appointed contractor.

In the event of an environmental incident, the appointed contractor will notify Silver Hill Foods site personnel immediately.

Where there is any indication that environmental pollution (such as release to the environment) has, or may have taken place, then Silver Hill Foods site management (Environmental Manager) will liaise with the appropriate Authorities.

Silver Hill Foods will address all environmental incidences in accordance with their Emergency Response Procedure which is implemented as part of the site's Environmental Management System.

Appendix 5.1: Acoustic Terminology

Appendix 5.1 Acoustic Terminology

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 $_{(LAF90,T)}$.
A-Weighting	A frequency weighting applied to measured or predicted sound levels in order to compensate for the non-linearity of human hearing.
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).
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_{10}	The noise level exceeded for just 10% of a sample period. $L_{10(1hour)}$ is therefore the noise level exceeded for 10% of the time over a period of one hour. $L_{10(18hour)}$ is the arithmetic average of the eighteen $L_{10(1hour)}$ values between 06:00 and 24:00hrs.
L_{90}	The noise level exceeded for 90% of a sample period; typically used as a descriptor for background noise level.
L_{max}	The instantaneous maximum sound level measured during a sample period.
$L_{Aeq,T}$	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_{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_{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.

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.
NSL	Noise Sensitive Location - 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.
PPV	Peak Particle Velocity (PPV) expressed in millimetres per second (mm/s) is a vibration indicator used for the purposes of assessing potential annoyance to humans or damage to buildings.
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 5.2: Overview of Fundamentals of Acoustic

Appendix 5.2 Fundamentals of Acoustics

This appendix is intended to provide a brief overview of the fundamentals of acoustics and to offer a broad understanding of some of the technical discussion in this noise assessment. This section is not intended to give a complete description of all of the quantities used in acoustics and noise control.

Sound pressure is the small variation above and below atmospheric pressure created by the passage of a sound wave; this is what most people think of as noise. The human ear is a very sensitive anatomical organ and can detect a wide range of fluctuations in pressure levels, from the quietest whisper to a jet engine take off. In order to represent this range of detectable pressure changes in a more efficient manner, sound is typically measured in terms of a logarithmic ratio of sound pressures. These values are expressed as Sound Pressure Levels (SPL) in decibels (dB).

The sound pressure as measured by a microphone varies in time and can also be described in terms of the frequency of the sound. The ear has different sensitivities to sounds of different frequencies, and a frequency weighting is often applied to the signal to make it more representative of the sound perceived by a listener.

The frequency of sound is the rate at which a sound wave oscillates, and is expressed in Hertz (Hz). Human hearing is less sensitive at very low and very high frequencies, that is to say it is not uniform across the sound spectrum. In order to account for this weighting, filters are commonly applied when measuring and/or assessing sound. The most common frequency weighting in current use is 'A-weighting', which is applied to instrument-measured sound levels in an effort to account for the relative loudness perceived by the human ear, as the ear is less sensitive to low audio frequencies. SPL's measured using 'A-weighting' are expressed as LpA (dB). The 'A' subscript denotes that the sound levels have been A-weighted.

In terms of sound pressure levels, audible sound ranges from 0dB (i.e. the threshold of hearing) to the threshold of pain at 120dB. A doubling/halving of pressure equates to a 3dB increase/decrease in decibel level. Typically, under normal circumstances, a 3dB change in environmental noise level is the smallest noticeable to the human ear. A 10dB increase/decrease in sound level normally equates to a subjective doubling/halving of noise.

An indication of the level of some common sounds on the LpA (dB) scale is presented in Figure A5.2.1 below.

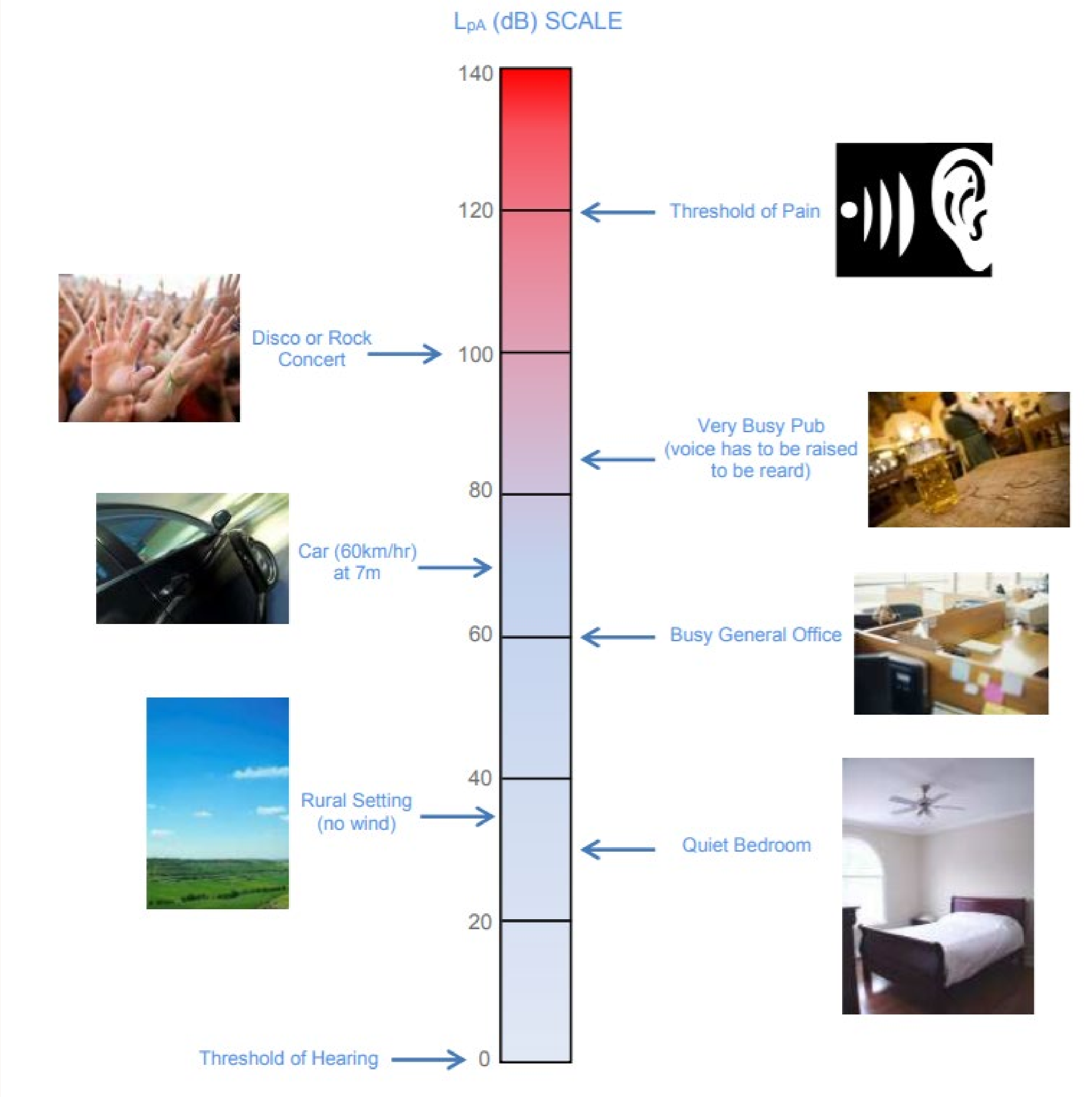


Figure A5.2.1: dB(A) Scale & Indicative Noise Levels – (EPA: Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4 – 2016)

Appendix 5.3: Baseline Noise Monitoring Report

Rowan

Silver Hill Foods

Environmental Noise Monitoring Report 2020

Client Ref:5799/SIL0002-1

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Table of Contents

Executive Summary

Writer's Instructions

Rowan Engineering Consultants were contracted to carry out a daytime, evening and night time Environmental Noise Assessment at Silver Hill Foods in Hillcrest, Emyvale, Co. Monaghan. During the noise survey, noise levels were recorded at 4 No. Noise Sensitive Locations (NSL's).

Conclusion

This conclusion is my professional opinion based on the baseline noise survey carried out at Silver Hill Foods on the 13–14 of August 2020.

Day, Evening and Night noise measurements were recorded at 4 No. Noise Sensitive Locations (NSL's) at Silver Hill Foods. Due to the fact that NSL1 & NSL2 are both located along the N2 road, the $L_{(A)90}$ results were used, as this factors out the intermittent public road traffic noise. The L_{Aeq} results were used for NSL3 and NSL4 as the road traffic did not interfere with these results. The daytime L_{A90} recorded at the NSL1 & NSL2 and the daytime L_{Aeq} recorded at NSL3 & NSL4 adhered to the daytime emission limit of 55dB(A).

The evening time L_{A90} results recorded at NSL1 and the evening time L_{Aeq} results recorded at NSL3 & NSL4 adhere to the evening time emission limit of 50dB(A), however the L_{A90} result at NSL2 was 52.3dB and therefore exceeded the evening time limit of 50dB, however this was resulting from a busy period on the N2 road and had no interference originating from Silver Hill Foods.

The night-time L_{A90} results recorded at NSL1 & NSL2 and the LAeq results recorded at NSL3 & NSL4 adhered to the night-time emission limit of 45dB(A).

No tonal or impulsive noises were recorded during the day, evening or night-time surveys.

Section 1 Introduction

1.1 Introduction

Rowan Engineering Consultants Ltd were contracted by Silver Hill Foods to undertake a day, evening and night-time noise survey at their rearing, slaughtering and processing facilities in Hillcrest, Emyvale, Co. Monaghan, as part of the facility's Industrial Emissions (IE) licence review application. During the noise survey, noise levels were recorded 4 No. NSL's.

1.2 IE Licence Requirements

As part of Silver Hill Foods IE licence review application, the facility is required to conduct noise monitoring as required by the Agency. The noise survey programme was undertaken in accordance with the methodology specified in the 'Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4)' as published by the Agency.

The EPA define a noise sensitive location (NSL) as a *'Any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or area of high amenity which for its proper enjoyment requires the absence of noise at nuisance levels'*.

In regard to noise the EPA define '*daytime to be 07:00 hours to 19:00 hours*', 'evening to be 19:00 hours to 23:00 hours' and '*night-time to be 23:00 hours to 07:00 hours*' and typical limit values for noise from licenced sites are as follows:

Daytime dB(A) L_{Aeq}	***Evening dB(A) L_{Aeq}***	***Night-time dB(A) L_{Aeq}***
55 ***Note 1***	*50* ***Note 1***	*45* ***Note 1***

Note 1: *There shall be no clearly audible tonal component or impulsive component in the noise emission from the activity of any noise-sensitive location.*

1.3 Background

Founded in 1962 by the Steele Family, Silver Hill Duck is a fully integrated premium Duck Producer. All aspects of our duck production are owned and controlled by Silver Hill Duck.

Silver Hill Duck is located on the N2 Dublin – Derry road on the outskirts of Emyvale village in County Monaghan

In March 2019 Fane Valley Group acquired Silver Hill Duck. Fane Valley is a progressive agri-food business, based in Northern Ireland and has been Silver Hill's feed nutrition partner for over 20 years. The announcement secured ongoing investment in the development of the existing production site at Emyvale.

The facility employs approximately 180 people with 130 involved in processing and the remainder involved in administration and services.

Section 2 Methodology

2.1 Monitoring Locations and Period

In order to assess the surrounding environmental noise levels, a daytime, evening and night-time noise survey was conducted on the 12–13 of August 2020. Following a review of the nearby sensitive receptors, it was considered sufficient to monitor 4 No. NSL's.

During the daytime and evening noise monitoring, the factory was in normal full operation. During the night-time monitoring, night cleaning inside the factory was operational.

Ian Douglas of Rowan Engineering Consultants undertook all the noise monitoring on the 13–14 of August 2020. Day and evening noise measurements were taken for 30 minutes and night-time noise monitoring measurements were taken for 15 minutes. Grid references were taken at each monitoring location and the noise monitoring locations are illustrated on the map in Appendix A.

In order to assess the noise environment at the facility, the following criteria was used:

Noise Monitoring Locations, Period and Duration of Monitoring	
Period	**Survey Duration**
Noise Sensitive Locations (NSL1 – NSL4)	
Daytime (07:00-19:00)	**3 No. consecutive 30-minute sample periods**
Evening (19:00-23:00)	**1 No. 30 minute sample periods**
Night-Time (23:00-07:00)	**2 No. consecutive 15-minute sample periods**

Table 1: Noise monitoring locations, period and duration of monitoring

2.2 Noise Monitoring Equipment and Calibration

The noise monitoring equipment used during the measurements was a SVANTEK 971 Class 1 IEC 61672-1:2013 Sound Level Meter (Serial No. 77617). The sound level meter was calibrated before the measurements, and its calibration checked after, using a SVANTEK SV33A Class 1 Acoustic Calibrator (Serial No. 79912). No calibration drifts were found to have occurred during surveys. All noise equipment had been calibrated to a traceable standard by UKAS (United Kingdom Accreditation Service) accredited laboratories within 12 months preceding the surveys.

2.3 Noise Monitoring Standard and Methodology

All measurements were carried out in general accordance with ISO 1996: '*Acoustics- Description and measurement of environmental noise*'. Consultation was also given to the Agency's 2016, *'Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4)'* prior to the noise survey been conducted. The 'Objective method for assessing the audibility of tones in noise' as detailed in Appendix D of ISO 1996-2:2007 was used to assess the 1/3 octave frequency analysis.

Measurements were made placing the microphone at a height of 1.2m above ground level and were free field, measured >3.5m from reflecting surfaces. The measurement results were noted onto survey record sheets immediately following each measurement and also stored in the instrument's internal memory for subsequent analysis, notes were taken in relation to the primary contributors to noise build-up at each location. A 1/3 octave frequency analysis was also carried out.

2.4 Metrological conditions

Weather conditions during the surveys were in line with the conditions described within ISO 1996, Acoustics 'Description and Measurements of Environmental Noise'. During the daytime survey, the weather was dry and sunny with a light northerly breeze (1.5 – 2.5 m/s), the air temperature was recorded at 24^{o}C. Evening monitoring weather conditions were dry and calm (<1m/s) and the air temperature was recorded as 18^{o}C. Night-time monitoring weather conditions were dry with a light north-westerly air (<1.5m/s) and the air temperature was recorded as 14^{o}C.

2.5 Noise Parameters

Environmental noise parameters which were measured are defined below:

Noise Parameter	Description
L_{Aeq}	*Is the A-weighted equivalent continuous steady sound level during the measurement period and effectively represents an average ambient noise value.*
L_{A10}	*Is the A-weighted sound level that is exceeded for 10% of the measurement period and is used to quantify road traffic noise.*
L_{A90}	*Is the A-weighted sound level that is exceeded for 90% of the measurement period and is used to quantify background noise level.*
A-weighting	*Is the process by which noise levels are corrected to account for the non-linearity of human hearing. All noise levels quoted are relative to a sound pressure of 2x10-5 Pa.*
Tonal Analysis	*One-third octave band tonal analysis involves the calculation of an averaged noise level to represent the frequencies within each third of an octave. These noise levels are then compared with the noise levels calculated for the adjacent one-third octave bands. The appropriate level differences vary with frequency. They should be greater than or equal to the following values in both adjacent one-third-octave bands to be considered tonal:* • *15dB in low-frequency one-third-octave bands(25Hz to 125Hz);* • *8dB in middle-frequency bands (160Hz to 400Hz) and;* • *5dB in high-frequency bands (500Hz to 10,000Hz).*

Table 2: Environmental Noise Parameters

Section 3 Noise Monitoring Results

3.1 Noise Sensitive Locations

As part of the noise survey, 4 No. NSL's were selected. The location of the NSL's are illustrated on the map in Appendix A. The NSL monitoring was undertaken at the four locations for 3 No. consecutive 30-minute sample periods during the day, 1 No. 30 minute period during the evening and 2 No. consecutive 15-minute sample periods during the night. The results from the NSL's are provided in Table 4 & 5 below and the 1/3 Octave Band Analysis Results can be reviewed in Appendix C.

3.3.1 NSL1 Monitoring Results

NSL1 (Grid Ref: E267474, N344817) is situated along the N2 at the entrance to a domestic residences c.150m northwest of the Silver Hill Foods boundary.

Monitoring Location	Monitoring period	Tonal/ Impulsive	$L(A)_{eq}$	$L(A)_{10}$	$L(A)_{90}$	Comments
NSL1 Day	10:55-11:25	No	76.1	81.2	47.3	Dominant noise from traffic passing on the N2 road.
	11:25-11:55	No	75.8	80.7	43.7	Dominant noise from traffic passing on the N2 road.
	11:55-12:25	No	75.9	80.8	43.8	Dominant noise from traffic passing on the N2 road.
	Arithmetic Average of L_{AF90} (dB)				**47.3**	
	Daytime Criterion, dB $L_{Ar,T}$				55	
NSL 1 Evening	20:45-21:15	No	75.6	80.7	49.5	Dominant noise from traffic passing on the N2 road.
	L_{AF90} (dB)				**49.5**	
	Evening time Criterion, dB $L_{Ar,T}$				50	
NSL1 Night	00.43-00.58	No	68.0	64.6	37.0	Dominant noise from traffic passing on the N2 road.
	00.58-01.12	No	68.7	58.6	34.3	Dominant noise from traffic passing on the N2 road.
	Arithmetic Average of L_{AF90} (dB)				**35.7**	
	Night-time Criterion, dB $L_{Ar,T}$				45	
Reported by:	**Name**					**Ian Douglas**
	Position					**Environmental Consultant**
	Signed					Ian Douglas

Table 4: NSL 1 monitoring results 13–14 of August 2020

The daytime, evening and night-time noise results at NSL1 are compliant given that the $L(A)_{90}$ results (without intermittent public road traffic noise) adhere to the daytime limit of 55dB, evening limit of 50dB and night-time limit of 45dB.

3.3.2 NSL2 Monitoring Results

NSL2 (Grid Ref: E267761, N344327) is located along the N2 road at the entrance to a derelict cottage and on the edge of Emyvale village, c.315m southeast of the Silver Hill Foods boundary.

Monitoring Location	Monitoring period	Tonal/ Impulsive	$L(A)_{eq}$	$L(A)_{10}$	$L(A)_{90}$	Comments
NSL2 Day	12:42-13:12	No	59.1	63.1	47.0	Dominant noise from traffic passing on the N2 road.
	13:12-13:42	No	61.0	63.4	46.6	Dominant noise from traffic passing on the N2 road.
	13:42-14:12	No	59.6	63.5	52.9	Dominant noise from traffic passing on the N2 road.
	Arithmetic Average of L_{AF90} (dB)				**46.3**	
	Daytime Criterion, dB $L_{Ar,T}$				55	
NSL 2 Evening	20:13-20:33	No	69.3	73.5	52.3	Dominant noise from traffic passing on the N2 road.
	Arithmetic Average of L_{AF90} (dB)				**52.3**	
	Evening time Criterion, dB $L_{Ar,T}$				50	
NSL 2 Night	00.10-00.25	No	65.8	68.3	28.6	Dominant noise from traffic passing on the N2 road.
	00.25-00.40	No	63.1	66	25.5	Dominant noise from traffic passing on the N2 road.
	Arithmetic Average of L_{AF90} (dB)				**27.1**	
	Night-time Criterion, dB $L_{Ar,T}$				45	
Reported by:	**Name**					**Ian Douglas**
	Position					**Environmental Consultant**
	Signed					Ian Douglas

Table 5: NSL 2 monitoring results 13–14 of August 2020

The daytime and night-time noise results at NSL 2 are compliant given that the $L(A)_{90}$ results (without intermittent public road traffic noise) adhere to the daytime limit of 55dB and night-time limit of 45dB. The evening time results at NSL2 had a reading of 52.3dB which exceeded the evening time limit of 50dB, however this was due to road traffic and no sound for Silver Hill Duck was observed at this NSL.

3.3.1 NSL3 Monitoring Results

NSL3 (Grid Ref: E268165, N344410) is situated within an agricultural field, just off the Mullan Road and beside 3No. private dwellings, c.430m south of the Silver Hill Foods boundary.

Monitoring Location	Monitoring period	Tonal/ Impulsive	$L(A)_{eq}$	$L(A)_{10}$	$L(A)_{90}$	Comments
NSL1 Day	15:02-15:32	No	40.4	42.2	32.7	Dominant noise from tractors gathering bales in a nearby field.
	15:32-16:02	No	42.9	42.9	32.2	Dominant noise from tractors gathering bales in a nearby field.
	16:02-16:32	No	40.8	43.5	34.0	Dominant noise from tractors gathering bales in a nearby field.
	Arithmetic Average of L_{Aeq} (dB)				**41.4**	
	Daytime Criterion, dB $L_{Ar,T}$				55	
NSL 1 Evening	19:36-20:06	No	37.2	38.7	28.1	Dominant noise from trees blowing and traffic in the distance.
	L_{Aeq} (dB)				**37.2**	
	Evening time Criterion, dB $L_{Ar,T}$				50	
NSL1 Night	23.33-23.48	No	29.5	30.9	25.9	Dominant noise from trees blowing and traffic in the distance.
	23.48-00.03	No	29.0	31.1	25.0	Dominant noise from trees blowing and traffic in the distance.
	Arithmetic Average of L_{Aeq} (dB)				**29.2**	
	Night-time Criterion, dB $L_{Ar,T}$				45	
Reported by:					**Name**	**Ian Douglas**
					Position	**Environmental Consultant**
					Signed	Ian Douglas

Table 6: NSL 3 monitoring results 13–14 of August 2020

The daytime, evening and night-time noise results at NSL3 are compliant given that the $L(A)_{eq}$ results adhere to the daytime limit of 55dB, evening limit of 50dB and night-time limit of 45dB.

3.3.1 NSL4 Monitoring Results

NSL4 (Grid Ref: E268226, N344774) is situated in an agricultural field at the rear of an agricultural yard, c.320m east of the Silver Hill Foods boundary.

Monitoring Location	Monitoring period	Tonal/ Impulsive	$L(A)_{eq}$	$L(A)_{10}$	$L(A)_{90}$	Comments
NSL1 Day	16:38-17:08	No	38.3	39.7	29.7	Dominant noise from tractors in the yard.
	17:08-17:38	No	35.7	38	30.1	Dominant noise from tractors in the yard.
	17:38-18:08	No	37.2	76.6	32.3	Dominant noise from tractors in the yard.
	Arithmetic Average of L_{Aeq} (dB)				**37.0**	
	Daytime Criterion, dB $L_{Ar,T}$				55	
NSL 1 Evening	19:00-19:30	No	39.0	40.8	33.0	Dominant noise from trees blowing and traffic in the distance.
	L_{Aeq} (dB)				**39.0**	
	Evening time Criterion, dB $L_{Ar,T}$				50	
NSL1 Night	23.00-23.15	No	33.3	33.3	26.4	Dominant noise from trees blowing and traffic in the distance.
	23.15-23.30	No	34.0	32.7	25.2	Dominant noise from trees blowing and traffic in the distance.
	Arithmetic Average of L_{Aeq} (dB)				**33.7**	
	Night-time Criterion, dB $L_{Ar,T}$				45	
Reported by:					**Name**	**Ian Douglas**
					Position	**Environmental Consultant**
					Signed	Ian Douglas

Table 7: NSL 4 monitoring results 13–14 of August 2020

The daytime, evening and night-time noise results at NSL4 are compliant given that the $L(A)_{eq}$ results adhere to the daytime limit of 55dB, evening limit of 50dB and night-time limit of 45dB.

Section 4 Conclusion

Day, Evening and Night noise measurements were recorded at 4 No. Noise Sensitive Locations (NSL's) at Silver Hill Foods. Due to the fact that NSL1 & NSL2 are both located along the N2 road, the $L_{(A)90}$ results were used, as this factors out the intermittent public road traffic noise. The L_{Aeq} results were used for NSL3 and NSL4 as the road traffic did not interfere with these results. The daytime L_{A90} recorded at the NSL1 & NSL2 and the daytime L_{Aeq} recorded at NSL3 & NSL4 adhered to the daytime emission limit of 55dB(A).

The evening time L_{A90} results recorded at NSL1 and the evening time L_{Aeq} results recorded at NSL3 & NSL4 adhere to the evening time emission limit of 50dB(A), however the L_{A90} result at NSL2 was 52.3dB and therefore exceeded the evening time limit of 50dB, however this was resulting from a busy period on the N2 road and had no interference originating from Silver Hill Foods.

The night-time L_{A90} results recorded at NSL1 & NSL2 and the LAeq results recorded at NSL3 & NSL4 adhered to the night-time emission limit of 45dB(A).

No tonal or impulsive noises were recorded during the day, evening or night-time surveys.

Ian Douglas

Ian Douglas BSc MSc
Environmental Consultant
Rowan Engineering Consultants

Appendix A: Noise Monitoring Locations

Appendix B: Calibration Certificates

Certificate of Calibration

Issued to:	Certificate Number
Rowan Engineering Consultants Unit 14 Scurlockstown Bus. Park Co. Meath	AC200099

Test Date: 03/02/2020

Equipment Information

Item Calibrated:	Acoustic Calibrator	**Model:**	SV33A
Make:	Svantek	**Serial Number:**	79912

Calibration Procedure

The above calibrator was verified in line with the requirements of BS EN 60942:2003. The calibrator was allowed to stablize for a suitable period, as described in the manufacturer's instruction manual, in laboratory conditions. The sound pressure level in the cavity (half-inch). The operating frequency and signal distortion were also measured.

Calibration Standards

Description	Serial Number
National Instruments PXI-4461	19C91D2
GRAS 42AA Pistonphone	227947
GRAS 46A0 Pressure Field Microphone	228216

The standards used in this calibration are traceable to NIST and/or other National Measurement Institutes (NMI's) that are signatories of the International Committee of Weights and Measures (CIPM) mutual recognition agreement (MRA).

Signed on behalf of Sonitus Systems:

Unit 2, Goldenbridge Industrial Estate, Inchicore, Dublin, D08 YY38
www.sonitussystems.com Email: info@sonitussystems.com

SONITUS SYSTEMS

Calibration Report

Equipment Information

Model: SV33A
Serial Number: 79912

Ambient Conditions

Measurement conditions were within the tolerances defined in BS EN 60942.

Barometric Pressure: 1040 hPa
Temperature: 19.6 °C
Relative Humidity: 42 %

Results

Calibrator Setting	Measured Parameter	Measured Value	Tolerance +/-	Uncertainty +/-
114 dB, 1KHz	Sound pressure level (dB)	114.37	0.75	0.14 dB
	Frequency (Hz)	1000.00	20 Hz	0.25 Hz
	Distortion (%)	0.09	4.0	0.3

RESULT: PASS

The sound calibrator has been shown to conform to the class 1 requirements for periodic testing, described in Annex B of IEC 60942:2003 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed. However, as public evidence was not available, from a testing organization responsible for pattern approval, to demonstrate that the model of sound calibrator conformed to the requirements for pattern evaluation described in Annex A of IEC 60942:2003, no general statement or conclusion can be made about conformance of the sound calibrator to the requirements of IEC 60942:2003.

The manufacturer's guidelines concerning free-field correction should be observed when using the calibrator.

Notes
1. All measurements were made with the half-inch configuration of the calibrator in place.
2. The measurement uncertainty is reported as a standard uncertainty multiplied by a coverage factor k=2 which, for a normal probability distribution, corresponds to a coverage probability of approximately 95%.
3. The given uncertainty corresponds to measured values only and does not relate to the long term stability of the device under test.

Unit 2, Goldenbridge Industrial Estate, Inchicore, Dublin, D08 YY38
www.sonitussystems.com Email: info@sonitussystems.com

SVANTEK

1/2" Prepolarized Condenser Microphone

Calibration Chart

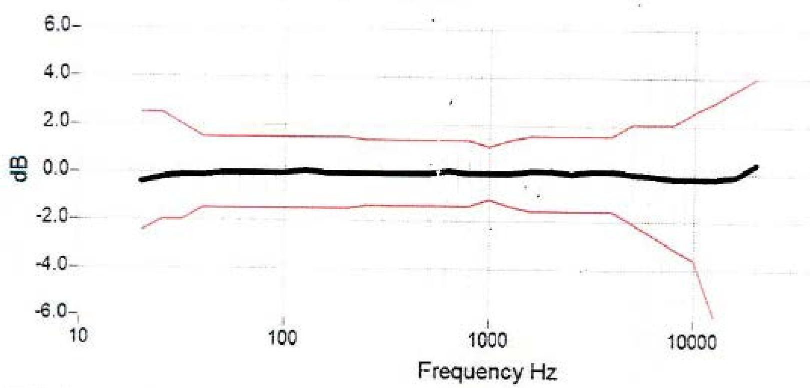
Type: ***7052E*** Serial No: ***72279***

Measured sensitivity: **31.16 mV/Pa**

Manufacturer: ***ACO PACIFIC***

Date: **2018-10-26** Signature: ....

Measured Free-Field Frequency Response



Environmental Calibration Conditions: **22 °C 41 % 997 hPa**

Range: **Low**; Steady level nominal result = 60dB

Result	Detector	Duration [ms]	1000	500	200	100	50	20	10	5	2	1	0.5
MAX	Fast	**Indication [dB]**	60.0	60.0	59.1	57.5	55.2	51.7	48.9	46.0	42.0	39.0	36.0
		Error [dB]	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0	0.0	-0.0	-0.0	-0.1
	Slow	**Indication [dB]**	58.0	55.9	52.5	49.7	46.8	42.9	39.9	36.9	32.9	-	-
		Error [dB]	-0.0	-0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-	-
SEL	-	**Indication [dB]**	60.0	57.0	53.0	50.0	47.0	43.0	40.0	37.0	33.0	30.0	27.0
		Error [dB]	0.0	-0.0	0.0	0.0	-0.0	0.0	0.0	-0.0	0.0	-0.0	-0.0

Range: **Low**; Steady level nominal result = 35dB

Result	Detector	Duration [ms]	1000	500	200
MAX	Fast	**Indication [dB]**	35.0	34.9	34.1
		Error [dB]	0.0	-0.0	0.0
	Slow	**Indication [dB]**	33.0	30.9	27.5
		Error [dB]	-0.0	-0.1	-0.2
SEL	-	**Indication [dB]**	35.0	32.0	28.1
		Error [dB]	0.0	-0.0	0.1

Range: **High**; Steady level nominal result = 134dB

Result	Detector	Duration [ms]	1000	500	200	100	50	20	10	5	2	1	0.5	0.25
MAX	Fast	**Indication [dB]**	134.0	133.9	133.1	131.4	129.2	125.7	122.9	120.0	116.0	113.0	109.9	106.9
		Error [dB]	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.1	0.0	-0.0	-0.0	-0.1	-0.1
	Slow	**Indication [dB]**	132.0	129.9	126.5	123.7	120.8	116.9	113.9	110.9	106.9	-	-	-
		Error [dB]	-0.1	-0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-	-	-
SEL	-	**Indication [dB]**	134.0	131.0	127.0	124.0	121.0	117.0	114.0	111.0	107.0	104.0	100.9	97.9
		Error [dB]	0.0	-0.0	0.0	0.0	-0.0	0.0	0.0	-0.0	-0.0	-0.0	-0.1	-0.1

Range: **High**; Steady level nominal result = 54dB

Result	Detector	Duration [ms]	1000	500	200	100	50
MAX	Fast	**Indication [dB]**	54.0	54.0	53.1	51.5	49.2
		Error [dB]	-0.0	0.0	0.0	0.0	-0.0
	Slow	**Indication [dB]**	52.0	49.9	46.6	43.8	40.9
		Error [dB]	-0.1	-0.0	-0.1	-0.1	-0.1
SEL	-	**Indication [dB]**	54.0	51.0	47.1	44.1	41.1
		Error [dB]	-0.0	0.0	0.0	0.0	0.0

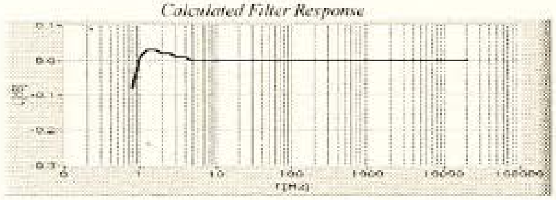
Range: **High**; Steady level nominal result = 45dB

Result	Detector	Duration [ms]	1000	500	200
MAX	Fast	**Indication [dB]**	45.0	44.9	44.0
		Error [dB]	0.0	0.0	0.0
	Slow	**Indication [dB]**	43.0	40.9	37.5
		Error [dB]	-0.1	-0.0	-0.2
SEL	-	**Indication [dB]**	45.0	42.0	38.1
		Error [dB]	0.0	-0.0	0.0

4. FREQUENCY RESPONSE* (electrical)

LEVEL METER function; Characteristic: Z; Range: Low; Input signal =120 dB;

Calculated Filter Response



Measured Filter Response with Preamplifier SV18
(f-frequency; L-level)

f [Hz]	L [dB]	f [Hz]	L [dB]	f [Hz]	L [dB]
10	-0.1	63	0.0	4000	0.0
12.5	0.0	125	0.0	8000	0.0
16	0.0	250	0.0	16000	0.0
20	0.0	500	0.0	20000	0.0
25	0.0	1000	0.0		
31.5	0.0	2000	0.0		

All frequencies are nominal center values for the 1/3 octave bands

5. INTERNAL NOISE LEVEL* (electrical - compensated)

LEVEL METER function; Range: Low; (Back-light – off) ; Calibration factor: 0dB

Characteristic	Z	A	C
Level [dB]	≤20	≤12	≤12

* measured with preamplifier SVANTEK type SV18 No. 78705.

6. INTERNAL NOISE LEVEL (acoustical - compensated)

LEVEL METER function; Characteristic: A; (Backlight – off)

Range	Low	High
Indication [dB]	≤15	21.1

Noise measured in special chamber, with reference microphone G.R.A.S type 40AN No. 73421

ENVIRONMENTAL CONDITIONS

Temperature	Relative humidity	Ambient pressure
21 °C	26%	1000 hPa

TEST EQUIPMENT

Item	Manufacturer	Model	Serial no.	Description
1.	SVANTEK	SVAN 401	127	Signal generator
2.	SVANTEK	SVAN 912A	4369	Sound & Vibration Analyser
3.	RIGOL	DM3068	DM30155100773	Digital multimeter
4.	SVANTEK	SV33	48878	Acoustic calibrator
5.	SVANTEK	ST02	-	Microphone equivalent electrical impedance (18pF)

CONFORMITY & TEST DECLARATION

1. Herewith Svantek company declares that this instrument has been calibrated and tested in compliance with the internal ISO9001 procedures and meets all specification given in the Manual(s) or respectively surpass them.

2. The acoustic calibration was performed using the Sound Calibrator and is traceable to the GUM (Central Office of Measures) reference standard - sound level calibrator type 4231 No 2292773.

3. The information appearing on this sheet has been compiled specifically for this instrument. This form is produced with advanced equipment & procedures which permit comprehensive quality assurance verification of all data supplied herein.

4. This calibration sheet shall not be reproduced except in full, without written permission of the SVANTEK Ltd.

Calibration specialist: Krzysztof Kubel ......Kubel........ Test date: 2018-11-26

*** SVAN 971 No. 77617 page 3 ***

Appendix C: 1/3 Octave Band Analysis Results at NSL1

Date: 13/08/2020 Time: Frequency [Hz]	NSL1 Day 10:55-11:25 LAeq [dB]	NSL1 Day 11:25-11:55 LAeq [dB]	NSL1 Day 11:55-12:25 LAeq [dB]	NSL1 Evening 20:45-21:15 LAeq [dB]	NSL1 Night 00:42-00:57 LAeq [dB]	NSL1 Night 00:57-01:12 LAeq [dB]
25	18.14	20.29	20.42	14.91	12.14	9.94
31.5	24.06	24.92	25.05	20.46	14.34	16.46
40	29.38	32.02	32.15	25.7	18.81	20.72
50	36.46	41.44	41.57	34.39	29.08	27.44
63	42.21	41.71	41.84	40.47	32.8	37.65
80	44.04	44.86	44.99	38.76	33.04	34.93
100	44.31	44.84	44.97	40.53	42.94	40.46
125	46.59	46.84	46.97	48.88	40.95	44.23
160	49.3	49.87	50	47.71	40.44	45.34
200	53.13	52.93	53.06	51.2	44.88	47.85
250	54.93	54.42	54.55	54.39	47.43	48.7
315	57.35	56.95	57.08	55.61	48.18	52.19
400	60.54	60.69	60.82	58.14	52	55.81
500	64.9	64.41	64.54	61.98	56.01	59.42
630	67.84	67.44	67.57	65.59	58.89	62.4
800	69.79	69.48	69.61	69.46	61.7	61.74
1,000	70.1	69.91	70.04	70.46	62.12	60.77
1,250	67.01	66.56	66.69	67.22	58.99	58.03
1,600	64.41	63.8	63.93	64.16	56.58	55.39
2,000	61.28	60.69	60.82	60.96	54.46	53.49
2,500	57.87	57.38	57.51	56.99	50.84	51.09
3,150	55.48	54.98	55.11	54.62	48.19	49.22
4,000	52.75	52.32	52.45	51.15	46	47.97
5,000	49.9	49.44	49.57	47.66	42.55	45.31
6,300	46.27	46.5	46.63	44.56	39.04	42.33
8,000	42.6	43.84	43.97	40.67	35.95	37.74
10,000	38.94	42.01	42.14	36.99	32.8	37.95

Appendix C: 1/3 Octave Band Analysis Results at NSL2

Date: 13/08/2020 Time: Frequency [Hz]	NSL2 Day 12:42-13:12 LAeq [dB]	NSL2 Day 13:12-13:42 LAeq [dB]	NSL2 Day 13:42-14:12 LAeq [dB]	NSL2 Evening 20:13-20:43 LAeq [dB]	NSL2 Night 00:10-00:25 LAeq [dB]	NSL2 Night 00:25-23:40 LAeq [dB]
25	14.34	13.54	13.14	13.94	11.25	11.28
31.5	19.57	18.61	18.89	21.77	16.89	19.08
40	28.66	25.98	25.11	31.16	34.69	26.44
50	33.85	33.78	33.64	39.59	30.67	42
63	37.17	38.06	34.75	37.75	38.13	36.84
80	36.42	35.33	34.71	39	35.01	34.89
100	40.33	38.63	40.01	43.5	48.29	36.6
125	37.32	39.38	37.91	42.71	41.62	40.26
160	39.57	42.92	39.74	45.41	42.58	49.72
200	40.83	43.4	41.1	50.08	49.23	44.47
250	42.51	44.41	42.95	52.02	49.29	47.07
315	44.93	45.49	43.97	52.89	50.23	48.19
400	45.9	47.38	46.1	54.66	53.86	48.61
500	48.41	49.6	49.28	57.45	56.5	51.97
630	49.96	51.35	50.71	59.56	57.21	53.58
800	51.82	52.89	52.66	62.19	58.19	55.1
1,000	52.23	53.61	52.8	63.27	58.12	56.06
1,250	50.02	51.81	50.65	61.01	56.29	54.49
1,600	47.06	51.18	47.7	58.63	54.03	52.58
2,000	44.15	48.15	44.57	55.86	51.77	50.04
2,500	40.92	45.64	41.06	51.67	47.95	45.94
3,150	39.1	43.67	38.92	49.2	45.6	43.03
4,000	36.93	43.81	37.24	45.74	42.4	39.7
5,000	33.3	38.42	32.64	42.56	39.56	37.02
6,300	29.23	35.63	28.96	39.06	36.37	33.58
8,000	24.84	30.96	25.67	35.27	32.99	30.73
10,000	19.3	26.07	21.23	31.16	29.33	26.5

Appendix C: 1/3 Octave Band Analysis Results at NSL3

Date: 13/08/2020 Time: Frequency [Hz]	NSL3 Day 15:02-15:32 LAeq [dB]	NSL3 Day 15:32-16:02 LAeq [dB]	NSL3 Day 16:02-16:32 LAeq [dB]	NSL3 Evening 19:36-20:06 LAeq [dB]	NSL3 Night 23:33-23:4 LAeq [dB]	NSL3 Night 23:48-00:03 LAeq [dB]
25	9.94	11.08	11.61	10	1.27	1.27
31.5	13.77	14.12	14.49	12.24	1.27	1.27
40	18.81	17.05	17.6	14.08	4.17	1.27
50	21.29	21.94	22.98	17.89	11.41	10.62
63	22.39	20.54	22.82	16.73	8.82	7.63
80	20.8	20.07	26.99	16.18	10.06	9.42
100	21.22	20.87	28.14	20.81	10.07	9.8
125	22.48	23.77	22.46	22.57	8.26	6.47
160	21.23	23.21	21.42	20.24	8.82	5.78
200	23.04	21.44	19	20.27	10.01	7.99
250	22.47	23.59	18.83	20.36	11.03	6.97
315	28.62	29.69	20.21	22.95	15.75	9.2
400	27.17	32.98	23.36	22.83	14.34	12.64
500	27.2	35.08	26.43	23.72	16.75	14.78
630	29.63	34.57	28.93	23.08	19.27	17.77
800	30.87	31.12	31.21	25.05	22.49	22.19
1,000	32.2	32.35	32.56	26.52	24.05	23.4
1,250	31.08	31.28	32.3	26.4	19.23	18.86
1,600	29.25	30.67	31.21	26.7	16.33	15.54
2,000	27.21	28.83	28.54	28.67	14.03	13.32
2,500	25	27.19	26.57	28.46	11.7	11.02
3,150	25	25.83	25.97	23.03	10.39	17.86
4,000	25.52	24.78	26.18	20.39	9.25	11.05
5,000	23.54	23.93	25.03	19.46	7.7	6.88
6,300	22.91	28.44	21.01	18.87	5.24	2.88
8,000	20.66	30.19	16.99	18.23	3.47	2.32
10,000	9.52	13.88	10.51	11.68	1.48	1.27

Appendix C: 1/3 Octave Band Analysis Results at NSL4

Date: 13/08/2020 Time: Frequency [Hz]	NSL4 Day 16:38-17:08 LAeq [dB]	NSL4 Day 17:08-17:38 LAeq [dB]	NSL4 Day 17:38-18:08 LAeq [dB]	NSL4 Evening 19:00-19:30 LAeq [dB]	NSL4 Night 23:00-23:15 LAeq [dB]	NSL4 Night 23:15-23:30 LAeq [dB]
25	7.35	10.33	10.46	10.22	1.27	2.31
31.5	10.3	12.47	12.76	12.4	1.27	2.87
40	12.99	14.64	14.82	14.4	4.17	4.47
50	17.96	18.19	18.05	17.71	14.46	15.23
63	18.45	17.46	18.16	16.76	13.24	12.59
80	17.67	19.8	24.47	25.21	10.53	14.05
100	17.28	19.28	18.98	18.77	12.72	15.96
125	19.12	16.43	19.86	19.5	11.45	15.97
160	19.34	17.07	20.74	23.06	12.73	14.68
200	16.34	16.06	18.69	26.9	16.55	19.57
250	18.43	16.34	19.45	26.84	17.18	20.07
315	19.49	18.1	20.97	25.06	16.56	21.21
400	19.72	20.78	22.53	24.46	17.48	19.8
500	21.12	23.41	24.76	24.48	20.03	20.89
630	22.25	24.25	25.09	25.5	22.11	22.74
800	23.91	25.43	26.08	27.39	23.58	24.79
1,000	24.74	25.8	27.01	28.25	24.02	25.38
1,250	24.6	24.74	26.92	29.12	22.57	24.81
1,600	24.19	23.49	26.62	28.73	21.28	24.01
2,000	23.04	22.72	25.12	27.46	22.96	21.41
2,500	22.14	22.94	24.33	26.7	20.82	20.91
3,150	29.75	23.67	23.48	25.09	18.63	19.89
4,000	32.11	24.44	23.03	26.27	19.81	16.51
5,000	29.95	20.52	20.82	23.14	20.41	14.3
6,300	26.46	22.05	24.69	21.54	22.8	11.17
8,000	24.86	21.44	22.31	20.33	15.3	7.35
10,000	9.67	9.08	11.45	13.62	6.38	4.12

Appendix 6.1: Rowan Hydrogeology Report – Pilot Drip Irrigation (2022) (including all previous hydro related reports)

Rowan

Drip Irrigation Pilot Project – Updated Hydrogeological Assessment Report

Client: Silver Hill Foods Unlimited

Site: Hillcrest, Emyvale, County Monaghan.

Date: June 2022

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Report Sign Off

REVISION	DATE	ORIGNATOR	REVIEWER
Rev 1	26/06/2022	TIERNAN KEANE	ELAINE GIBSON
Rev 2	07/07/2022	TIERNAN KEANE	ELAINE GIBSON
REV 3	17/07/2022	TIERNAN KEANE	ELAINE GIBSON
PROJECT REFERENCE: SIL0002-5			

Table of Contents

Executive Summary

Project Objective

Rowan Engineering Consultants Ltd. (Rowan) were contracted by Silver Hill Foods to produce an updated Hydrogeological Assessment Report to assess a drip irrigation pilot scheme at their site at Hillcrest, Emyvale, County Monaghan. The project objective was to evaluate an alternative means of discharging treated process effluent from the facility's onsite wastewater treatment plant due to a possible lack of assimilative capacity in the unnamed stream currently receiving the effluent. Drip irrigation has been identified by Silver Hill Foods as a viable solution of discharging treated process effluent from the facility.

Summary of Conclusions

With regard to the project objective to meet the requirements of Condition 6.23.1 within the sites current P0422-03 industrial emissions licence the report has assessed and met the objectives as follows:

Objective I of the Drip Irrigation Pilot for the P0422-03 licence*:*

"Evaluation of the suitability of upgradient and downgradient monitoring points and where necessary installation of new monitoring points to assess cumulative impacts."

Objective I Deliverable:

Surface and groundwater monitoring points were assessed for suitability and additional groundwater monitoring well MGW1 installed. Moisture monitoring probes MMP1 and MMP2 were also installed. Surface water sampling points MP1, MP3 and MP4 were deemed appropriate to assess cumulative impacts as discussed in detail in **Section 6.** As previously discussed with the EPA MP2 was not deemed suitable however results have been included in this report for completeness.

Objective II of the Drip Irrigation Pilot for the P0422-03 licence:

"Review the conceptual site model to provide a more detailed representation of conditions at the site, including the gleyed areas and the perched watertables in the subsoil."

Objective II Deliverable:

The following three sources of data provides assessment of effect of the drip irrigation system on the pilot field and gelyed areas and perched water table:

- The site CSM was reviewed and MGW1S was installed to assess perched water concentrations. A groundwater level data logger was installed within MGW1S to assess the effect of the discharge effluent on perched groundwater levels. As presented and discussed in **Section 7.2** no effect was observed during the pilot.
- Moisture probes were also installed as part of the drip irrigation monitoring system and data assessed as presented in **Section 7.2**. The moisture probes continually reported downward movement of the effluent dispersed via the drip irrigation system.
- A visual inspection of pilot field for waterlogged conditions was completed daily (with photographs as presented within **Appendix F**) and ponding was observed on 4 days only. Discharge to these areas was ceased and ponding was observed to dissipate within 24 hours.

Objective III of the Drip Irrigation Pilot for the P0422-03 licence:

"Determine compliance of proposed drip irrigation system with the European Communities Environmental Objectives (Groundwater) Regulations 2010 (SI. No 9 of 2010) as amended and the European Communities Environmental Objectives (Surface Water) Regulations 2009 (SI. No. 272 of 2009)."

Objective III Deliverable:

Groundwater and Surface Water monitoring results were compared against the Groundwater and Surface Water regulations as presented and discussed in **Section 7.3**. No sharp or continuous increase in ground or surface water concentrations was observed with the commencement of the drip irrigation pilot.

Objective IV of the Drip Irrigation Pilot for the P0422-03 licence:

"Demonstrate that the drip irrigation lands can percolate 900mm/yr of effective rainfall (treated effluent added to actual annual rainfall)."

Objective IV Deliverable:

The moisture probe data and lack of ponding observed throughout the pilot is evidence that the drip percolation lands can percolate at a rate of 900mm/yr.

Objective V of the Drip Irrigation Pilot for the P0422-03 licence:

"Incorporate previous assessments carried out including hydrogeological assessments, site investigations, and baseline report information."

Objective V Deliverable:

A summary of previous assessments is presented within **Section 3** of this report and information incorporated throughout the report as referenced.

The SI No.113 of 2022 European Union Regulations on Good Agricultural Practices for the Protection of Water) has also been considered. A Nutrient Management Plan specific to the drip irrigation pilot project was also prepared for the project and is presented within **Appendix A.**

No complete source – pathway receptor linkages were identified during the pilot which indicates drip irrigation is a suitable alternative to discharging effluent to the unnamed stream onsite.

In summary Silver Hill Foods have met all objectives that were laid out by the EPA for the Drip Irrigation Pilot and this is verified in detail in the ensuing report.

1. Introduction

1.1 Project Background

Silver Hill Foods operates a poultry processing facility at the site. The facility operates under an Industrial Emissions (IE) licence (register number P0422-03), which was granted by the Environmental Protection Agency (EPA) in March 2021. Process effluent from the facility is treated in an on-site waste water treatment plant. Effluent from the waste water treatment plant currently discharges to an unnamed stream located in the northern area of the facility. This unnamed stream discharges to the Corlattallan Stream (as referred to in all previous reports, now named Knockakirwan on EPA mapping) approximately 1.2 km northeast of the facility and the Corlattallan Stream in turn discharges to the River Blackwater approximately 5.6 km northeast of the facility. **Figure 1-1** below shows a summary of these locations.

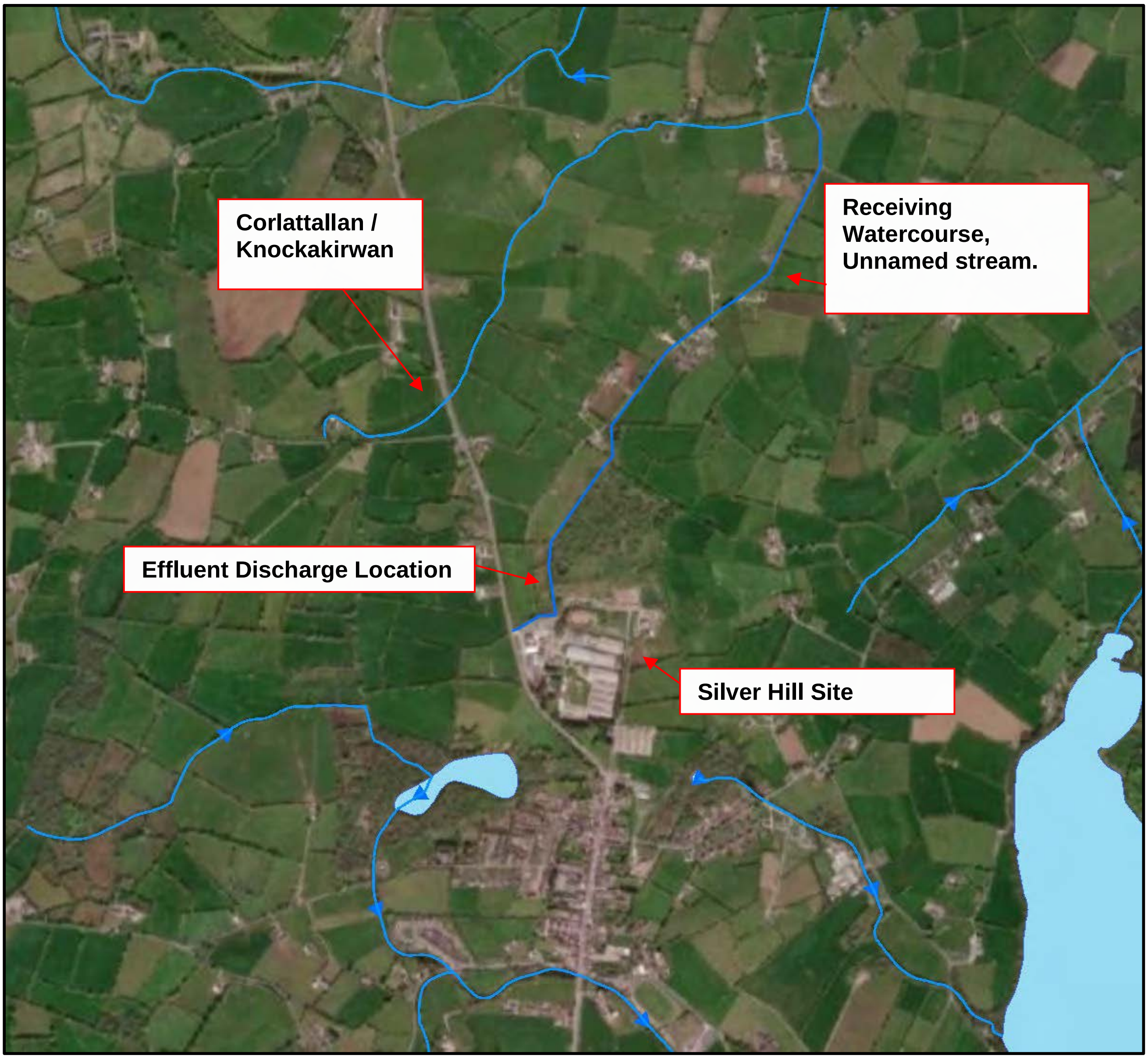

Figure 1-1: Site Context

Due to a possible lack of assimilative capacity in the unnamed stream and in the Corlattallan Stream the EPA requested discharge of the treated effluent to stream to cease by March 2023. Drip irrigation has been identified by Silver Hill Foods as the most viable alternative option.

A drip irrigation pilot scheme was agreed with the EPA as outlined in the site current EPA licence P0422-03.

This report details the findings of the drip irrigation pilot which took place from August 2021 to May 2022.

1.2 Project Objectives

The objective of this report is to meet the requirements of Condition 6.23.1 within the sites current P0422-03 licence:

6.23.1 The licensee shall arrange for the completion, by an independent and appropriately qualified consultant, of a review and update of the hydrogeological assessment within three months of the completion of the pilot project to include the following:

> *(i) Evaluation of the suitability of upgradient and downgradient monitoring points and where necessary installation of new monitoring points to assess cumulative impacts.*
>
> *(ii) Review the conceptual site model to provide a more detailed representation of conditions at the site, including the gleyed areas and the perched watertables in the subsoil.*
>
> *(iii) Determine compliance of proposed drip irrigation system with the European Communities Environmental Objectives (Groundwater) Regulations 2010 (SJ.No 9 of 2010) as amended and the European Communities Environmental Objectives (Surface Water) Regulations 2009 (SI. No. 272 of 2009).*
>
> *(iv) Demonstrate that the drip irrigation lands can percolate 900mm/yr of effective rainfall (treated effluent added to actual annual rainfall).*
>
> *(v) Incorporate previous assessments carried out including hydrogeological assessments, site investigations, and baseline report information.*

1.3 Project Scope

The following scope of works was completed to meet the above objectives:

- Sampling of groundwater and surface water prior to the drip irrigation commencing to form baseline data.
- Installation of a shallow and deep groundwater monitoring well (MGW1S and MGW1D),
- Drip irrigation system installed comprising control system, pumping unit, water meter, filtration unit, backflush valve, effluent holding tank and control valves
- Drip Irrigation monitoring system installed comprising moisture probes and inspection well points,
- Pressure loggers installed into the deep and shallow groundwater wells to monitor groundwater levels during the pilot and correlate fluctuations to volume of treated effluent discharged to the pilot field,
- Groundwater and surface water sampling monthly throughout the pilot
- Daily visual inspection of the drip irrigation lands with a logs and photograph recorded.
- Preparation of this updated hydrological assessment report.

1.4 Project Methodology

The *EPA (2011) Guidance on the Authorisations of Discharges to Groundwater* document is the most relevant and appropriate document to follow when assessing the effect of the pilot drip irrigation project on the surrounding environment. In line with it, the *EPAs (2013) Management of Contaminated Land & Groundwater at EPA Licensed Sites* and with groundwater protection schemes in Ireland a source-pathway-receptor (S-P-R) model has been used to assess the risks to the environment from the drip irrigation system.

The assessment of impacts to the environment has been risk based and focused on potential complete S-P-R linkages resulting in impacts to surrounding receptors.

As per the EPA (2011) when examining SPR linkages, the main questions to be answered are:

- Source characterisation – how significant is the potential discharge (input)?
- Pathways analysis – how and where would a pollutant flow, and to what extent would the pollutant be expected to attenuate? Is there a hydrological link that can deliver a pollutant to a nearby receptor?
- Receptor identification – who or what would potentially be affected?

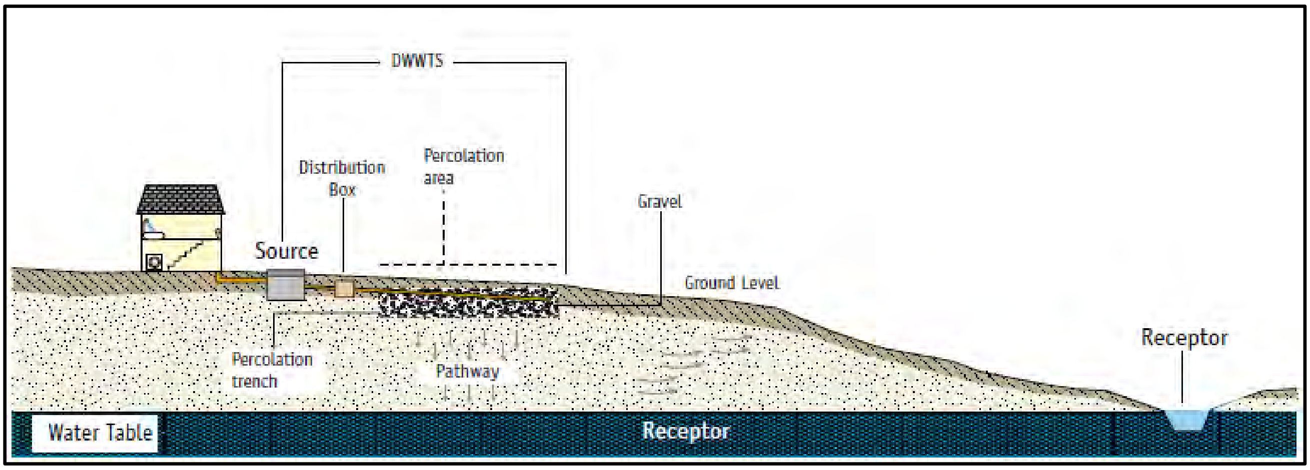

Figure 1-2: Example Conceptual Site Model showing source, pathways and receptors

This report and the assessment of the drip irrigation pilot in general has followed this methodology of complete SPR linkages to assess risk to the environment.

The SI No.113 of 2022 European Union Regulations on Good Agricultural Practices for the Protection of Water) has also been considered. A Nutrient Management Plan specific to the drip irrigation pilot project was also prepared for the project and is presented within **Appendix A.**

2 Environmental Setting

2.1 Site Location and Description

Table 1. Subject Site Location and Description

Aspect	Findings	
Site Name, Address and Description	The Silver Hills Foods facility is located in a rural area of Co. Monaghan on the northern outskirts of the town of Emyvale. The N2 Dublin to Derry Road runs approximately north-south adjacent to the western boundary of the site. The main production area is occupied mainly by buildings and internal roadways. The wastewater treatment plant and a slurry storage tank are located in a low-lying area north-east of the main production area. To the east, south and west of the site are areas of pasture. To the north of the site is an area of scrub beyond which is pasture. Much of the pasture that borders the site is owned by Silver Hill Foods.	
Zoning	Within the Monaghan County Development Plan 2019-2025, the subject site is situated within lands that are designated as Zone G3 - Conservation, amenity or buffer space, corridor/belt, landscape protection.	
Current Adjacent Land-Uses	**North**	Sparsely populated once off residential dwellings are situated immediately northwest of the subject site located along the N2 national primary road. The closest dwelling to the site is located c.215m northwest. Other residential dwellings are noted located c.284m, c.324m and c.386m northwest. Additional once off housing containing adjoining farmyards are located at greater distances c.602m north and c.885m northeast. The majority of the region is composed of agricultural grassland.
	South	The village of Emyvale is located immediately south of the subject site with the closest outskirts of the village located c.350m south. The village contains a large proportion of clustered residential dwellings in built up residential areas. Other land uses noted in the village include large industrial/agricultural buildings and recreational park and playground areas. The majority of the region is built up or semi-urban in nature.
	East	Sparsely populated once off residential dwellings containing adjoining farmyards are situated to the east of the subject site located off the Mullan road. The closest dwelling to the site is located c.690m east. Additional once off housing located at greater distances can be found c.698, c.768m and c.1,108m east. Emy Lough is situated c.1,340m east. The majority of the region is composed of agricultural grassland.
	West	The vast majority of the land located west of the subject site is composed of agricultural grassland with some smaller localised areas of scrubland. Very few once off residential dwellings are situated here, the closest being c.905m west. The N2 national primary road runs along the western boundary of the site.

Location maps for the subject site are included in **Appendix B**.

2.2 Geology and Hydrogeology

Table 2. Subject Site Geology and Hydrogeology

<table>
<tr><th>Aspect</th><th colspan="4">Findings</th></tr>
<tr><td>Soils, Subsoils and Bedrock</td><td colspan="4">According to the Geological Survey of Ireland (GSI) data viewer, topsoil underlying the subject site is classified as made ground, the topsoil type underlying the agricultural grasslands bordering the site is described as fine loamy drift with siliceous stones. The subsoil is classified as till derived from Devonian and Carboniferous sandstones. Bedrock beneath the site is composed of the localised Carrickaness Sandstone Formation.</td></tr>
<tr><td>Aquifer Classification</td><td colspan="4">The GSI national aquifer map of Ireland indicates the subject site is underlain with a locally Important Aquifer (Lm) - Bedrock which is Generally Moderately Productive. The groundwater is within the Aughnacloy WFD Groundwater Body classified as a productive fissured bedrock.</td></tr>
<tr><td>Groundwater Vulnerability</td><td colspan="4">All of the site has a groundwater vulnerability classified as Low, indicating a soil and subsoil thickness of >10m.</td></tr>
<tr><td>Source Protection Zones and Wells</td><td colspan="4">The GSI data viewer indicates that the subject site is not located within a source protection zone and there are no source protection zones within 5km. The closest source protection zone is the SO Monaghan PWS c.6.9km south. A number of groundwater wells (boreholes) occur within c.450m south and west of the site (Ref. 2633NWW154, Ref. 2633NWW155, Ref. 2633NWW217, Ref. 2633NWW104, Ref. 2633NWW102, Ref. 2633NWW103, Ref. 2633NWW105 and Ref. 2633NWW214).</td></tr>
<tr><td>Water Bodies</td><td colspan="4">The site is located in the Neagh Bann River Basin District, within the Lough Neagh & Lower Bann WFD catchment. According to the EPA GIS map viewer, a number of water bodies occur in close proximity to the subject site. The closest water body is Buck Lough c.290m southwest of the site. Other water bodies include Emylough stream c.565m southeast, Killybressal stream c.544m west, Corlattallan stream / Knockakirwan stream c.808m north and the Mountain Water River which runs through the village of Emyvale c.820m south. The most predominant and widely known water body feature of the region is Emy Lough, situated c.1,340m east of the subject site. Groundwater flow at the site is predicted to be towards the southeast.</td></tr>
<tr><td rowspan="4">Ecological Sites</td><td colspan="4">The National Parks and Wildlife Service’s online map viewer was consulted, and two designated sites were identified within 15km of the subject property, which are listed below:</td></tr>
<tr><th>Name</th><th>Designation</th><th>Site Code</th><th>Distance from Site</th></tr>
<tr><td>Slieve Beagh</td><td>Special Protection Area (SPA)</td><td>004167</td><td>c.11.2km west</td></tr>
<tr><td>Eshbrack Bog</td><td>Natural Heritage Area (NHA)</td><td>001603</td><td>c.12.4km west</td></tr>
<tr><td>Geotechnical and Site Investigations</td><td colspan="4">Three abstraction bores are installed onsite (AGW1, AGW2, AGW3). One borehole log is available for AGW3 which is presented as an attachment with Appendix C. Depth to bedrock at this location was 90 ft (27m) and the driller logged the bedrock at this location as limestone. The static groundwater table was observed at a depth of 55 ft (17m). The depth of the well is stated to be 504 ft (154 m). Logs of the other</td></tr>
</table>

two abstraction bores are not available but static groundwater elevations across the three abstraction wells were observed to be in the range 44 – 50 m above Ordnance Datum (2011 data), i.e. 20 – 30 m below ground level.

Publicly available information

According to GSI Geotechnical data viewer, there have been no geotechnical investigations carried out at the subject site. The closet boreholes and trial pits to the site are located c.11.2km south of the site in Monaghan Town resulting from a number of projects including the redevelopment of the cattle mart into a supermarket in June 1995 (Report ID: 2623), a ground investigation for Monaghan Town sewerage scheme in April 2007 (Report ID: 6977) and a site investigation for a community care development in January 2008 (Report ID: 7394). See the table below from findings from some of the nearest boreholes to the subject site.

Borehole BH100 (Report ID: 6977)		Borehole BH4 (Report ID: 7394)	
Depth (m)	**Observations**	**Depth (m)**	**Observations**
0.20 – 0.80m	Soft, brown, silt/clay with roots (subsoil).	0.20 – 0.50m	Made ground (Comprised of clay fill).
0.80 – 3.50m	Medium dense, brown, fine to coarse sandy clayey gravel with some cobbles.	0.50 – 1m	Firm brown sandy gravelly clay.
3.50 – 5.50m	Dense, brown, fine to coarse sandy gravel with occasional cobbles.	1 – 1.70m	Firm grey sandy gravelly clay.
5.50m	End of borehole.	1.70 – 2.20m	Orange brown sandy gravel (Possible gravelly sand).
-	-	2.20 – 3.90m	Grey slightly clayey sandy gravel.
-	-	3.90 – 5.10m	Stiff grey gravelly clay.
-	-	5.10 – 5.30m	Angular cobbles and boulders.
-	-	5.30 – 5.50m	Obstruction.
-	-	5.50m	End of borehole.

2.3 Other Geological Aspects

Table 3. Other geological aspects associated with the subject site

Aspect	Findings
Historical Mines and Quarries	A review of the EPA's historical mine database indicates there were no historical mines or quarries at or adjacent to the subject site.
GSI Landslides	The GSI landslide database indicated that there were no landslides recorded at or within 1km of the subject site. The closest recorded landslides were located c.18.3km northwest of the subject site in Clogher, Co. Tyrone (Event ID: GSI_LS03-0030) GSI notes associated with this landslide state that the event

Aspect	Findings
	date was 31/12/1911 and, c.25.9km southwest of the subject site in Carrowmaculla, Co. Fermanagh (Event ID: GSI_LS03-0072) GSI notes associated with this landslide state that the event date was 25/11/1979.
Radiological Protection Institute of Ireland	The Radiological Protection Institute of Ireland (RPII) radon map indicates the subject site is located within an area where less than 1% of homes in the area are affected by radon gas above the radon reference level of 200Bqm[3].

2.4 Groundwater Quality

The Groundwater Body (GWB) underlying the site is the Aughnacloy Groundwater Body. Currently the EPA on-line mapping classifies the GWB as being '*Not at risk*'. The status of the GWB under the Water Framework Directive (WFD) for the period 2013-2018 was "*Good*" for Chemical, Overall and Quantitative status and it has a current risk score under the WFD scoring system of "*Strongly expected to achieve good status*".

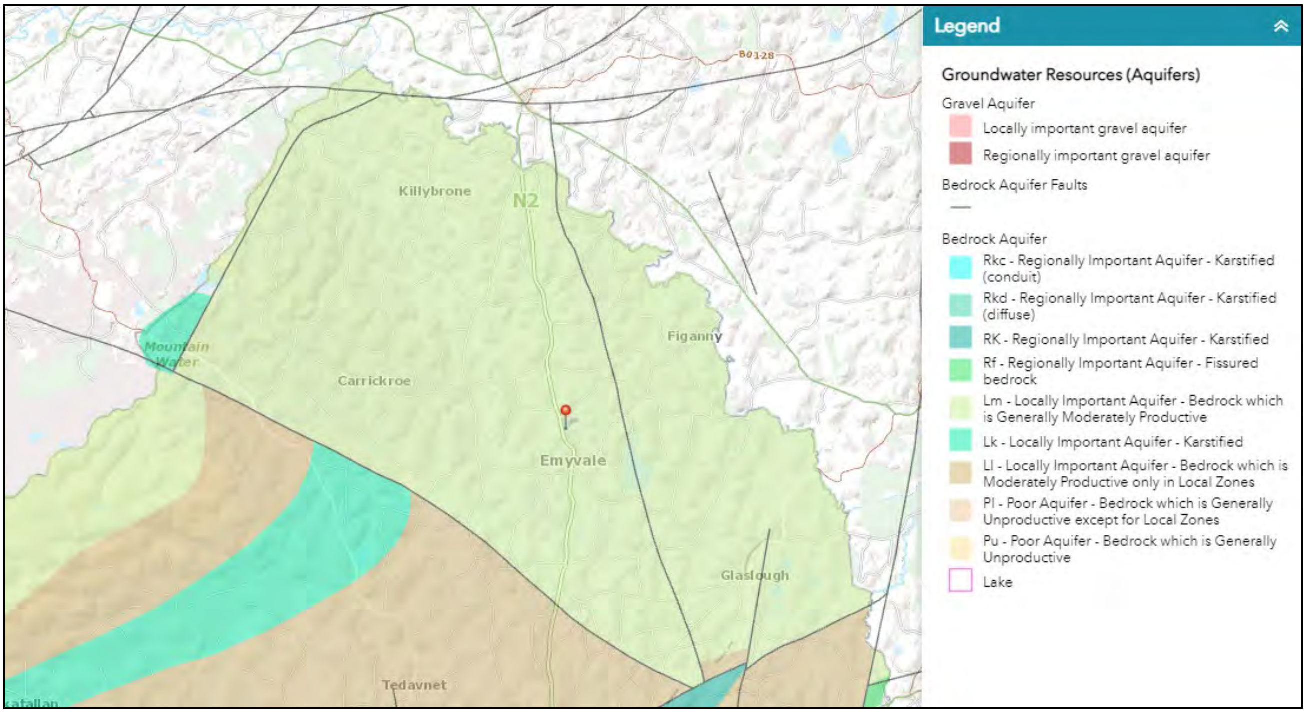

Figure 2-1: Bedrock Aquifer Classification

Groundwater Aquifer Vulnerability

Aquifer vulnerability is a term used to represent the geological and hydrogeological characteristics that determine the ease with which the groundwater may be contaminated, generally by human activities.

The GSI Interim Vulnerability Map (See Figure 7.5 below) presently classifies the aquifer in the area of the facility as predominantly Low (L) which indicates an overburden[1] depth of c. 10m of low permeability till present.

[1] Overburden being the depth of soils/deposits overlying the aquifer

The groundwater vulnerability has localised areas of Moderate or High vulnerability, to the north of the site beyond the lagoon and surrounding the Buck lough. It ranges from Extreme (E) to Rock at or near surface or karst (X) to the east of the site. This corresponds to an area of high ground.

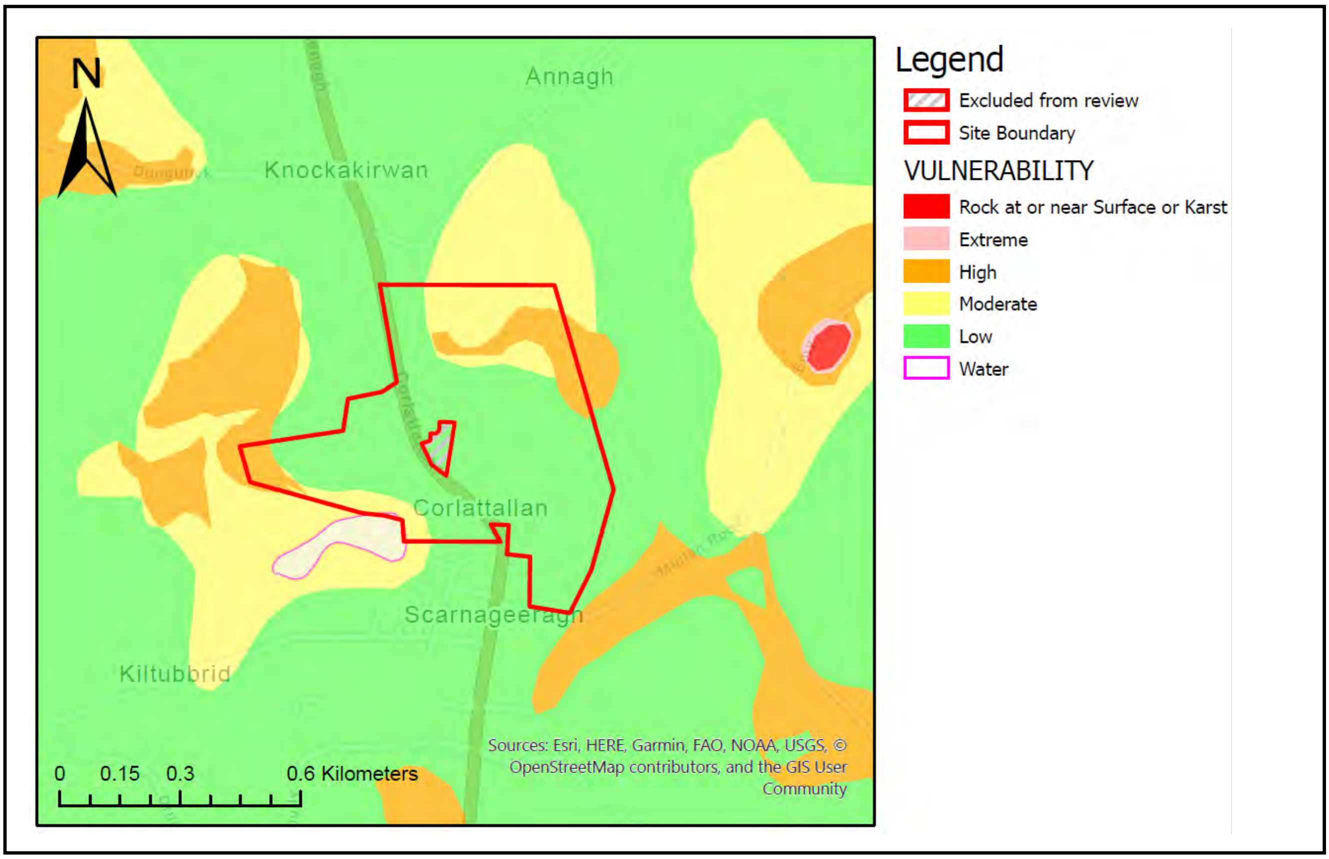

Figure 2-2: Aquifer Classification / Groundwater Vulnerability Map

Groundwater Quality and Supply Wells (Onsite Abstraction Wells)

Three abstraction bores are installed onsite (AGW1, AGW2, AGW3). One borehole log is available for AGW3 which is presented in **Appendix C**. Depth to bedrock at this location was 90 ft (27m) and the driller logged the bedrock at this location as limestone. The static groundwater table was observed at a depth of 55 ft (17m). The depth of the well is stated to be 504 ft (154 m). Logs of the other two abstraction bores are not available but static groundwater elevations across the three abstraction wells were observed to be in the range 44 – 50 m above Ordnance Datum (2011 data), i.e. 20 – 30 m below ground level.

The onsite abstraction bores are monitored quarterly as part of the site current licence and results for 2021 and 2022 results are presented and discussed within **Section 6** of this report.

Groundwater Quality and Supply Wells (Off-Site Wells)

There are a number of wells generally for domestic and private use recorded by GSI within 1km of the facility. The wells recorded by the GSI in the area surrounding the site were generally installed within the underlying bedrock at depths ranging from 18.3m to 88m. The groundwater yield for these wells is recorded as mainly Excellent with some Poor and Moderate.

Figure 2-3: GSI Groundwater Well SearchFigure 2-3 and **Table 2-1 GSI Well Index Table from Well SearchTable 2-1** presents a summary of the groundwater wells included in the GSI well search for the general area surrounding the site and provides an indication of the yield estimate for each. It should be noted that the GSI's well records may not be complete and it is possible there are private wells in the area south-east of the site that are not included in the GSI's records.

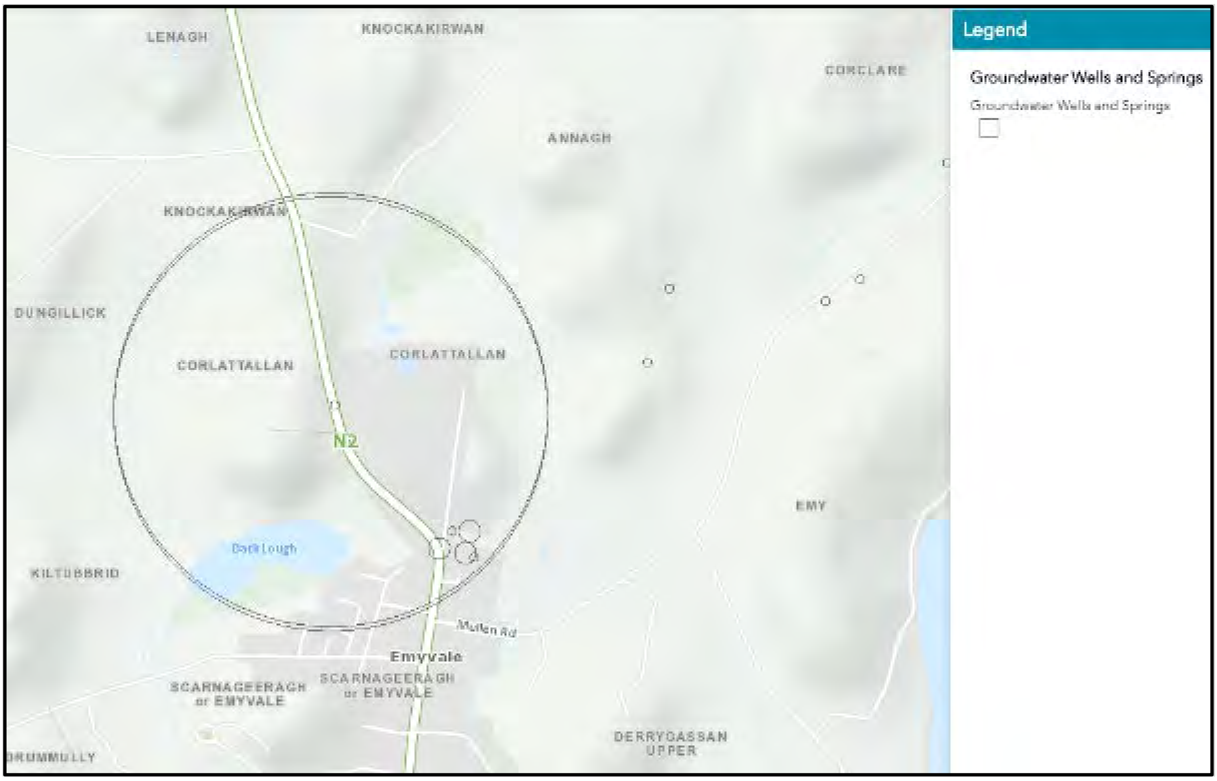

Figure 2-3: GSI Groundwater Well Search

Table 2-1 GSI Well Index Table from Well Search

GSI Name	Depth	Depth to Rock Confidence	Townland	County	Use	Yield Class	Yield m^3/d
2633NWW217	N/A	N/A	Annagh	Monaghan	Not Noted	Not Noted	Not Noted
2633NWWW155	18.3	3.1	Killycooly	Monaghan	Not Noted	Poor	32.7
22633NWWW154	21.9	4.6	Corlattallan	Monaghan	Not Noted	Poor	28
22633NWWW102	68	15	Emyvale	Monaghan	Not Noted	Excellent	648
22633NWWW104	88	15	Emyvale	Monaghan	Not Noted	Excellent	760
22633NWWW103	80	6	Emyvale	Monaghan	Not Noted	Excellent	518
2633NWWW105	60	13	Emyvale	Monaghan	Not Noted	Excellent	544

2633NWWW036	38	18	Annagh	Monaghan	Not Noted	Poor	34.6
2633NWWW043	29	8	Annagh	Monaghan	Not Noted	Moderate	60.5
2633NWW058	N/A	N/A	Dungillick	Monaghan	Not Noted	Low Spring	8.6

2.5 Surface Water Quality

Effluent from the waste water treatment plant currently discharges to an unnamed stream located in the northern area of the facility. This unnamed stream discharges into the Corlattallan Stream approximately 1.2 km northeast of the facility and the Corlattallan Stream in turn discharges to the River Blackwater approximately 5.6 km northeast of the facility. The Ulster Blackwater continues on to enter Lough Neagh west of Derrywarragh Island.

The River Blackwater is within the Blackwater sub-catchment of the Lough Neagh–Lower Bann Catchment as defined under the Water Framework Directive (WFD). The Mountain Water river flows into the sub-catchment south of Emyvale. See **Figure 2-4** below for an overview of the sub-catchments.

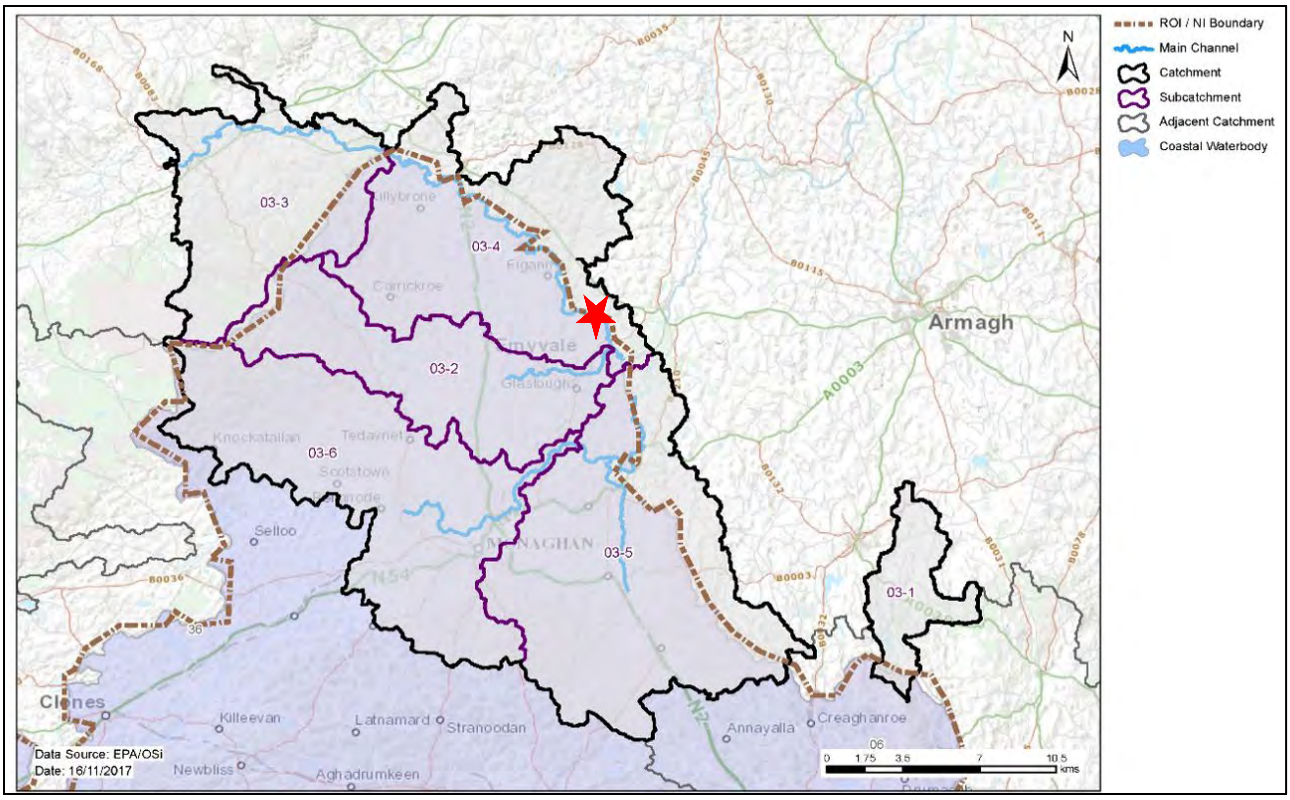

Figure 2-4: Sub-catchments in the Blackwater Catchment Area, facility marked with the red star.

Under the drainage layout for the site as shown in **Figure 2-5**, the centre and northern portions of the site drain to the unnamed stream and onward to the Corlattallan Stream (SW1, SW2 and SW3). SW4 captures drainage from hardstand in the central portion of the site (previously growing sheds which have been demolished) and drains northwards entering the unnamed stream past MP3 and before MP4 (surface water sampling points as detailed on **Figure 6.1**). The southern portion of the site is drained via an unnamed stream and onward to Emy Lough (SW5).

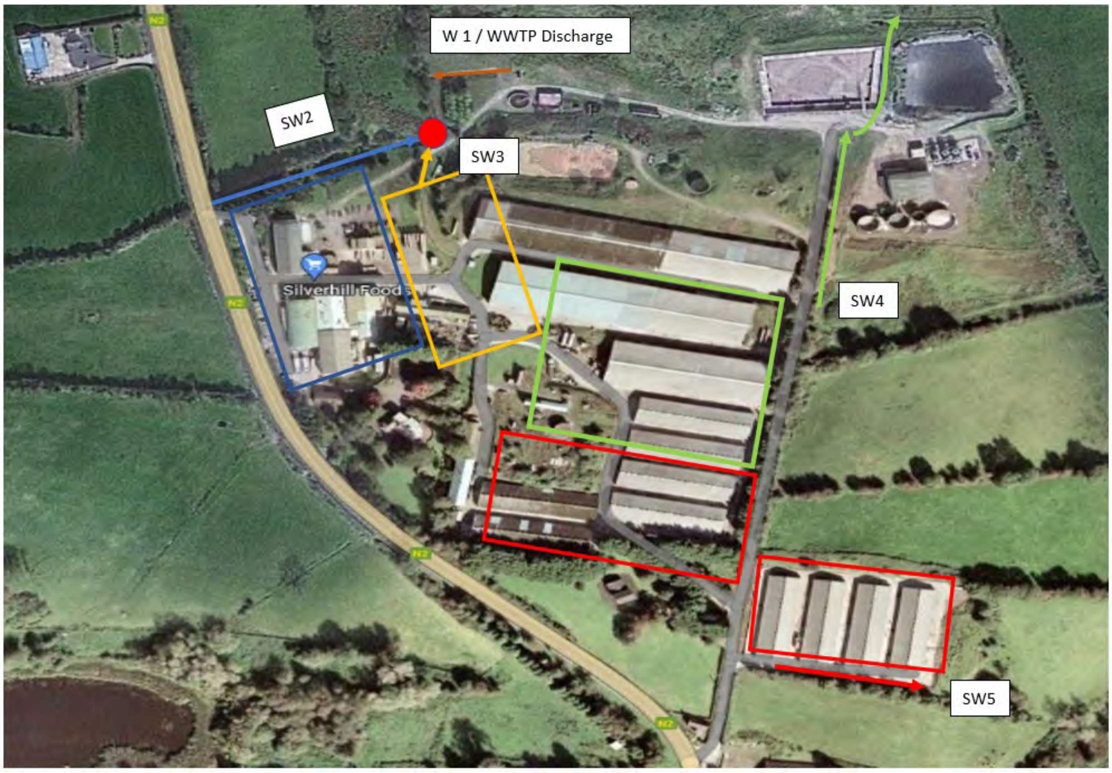

Figure 2-5: Onsite Surface Water Drainage Map and IED licence monitoring points

Under the WFD, all water bodies are required to meet *"good status"* by certain timeframes. The Directive runs in 6-year cycles with the first cycle running from 2009 - 2015, the second cycle from 2016 - 2021 and the third cycle from 2022 - 2027. Ireland has now completed the second cycle of the WFD and therefore good status should have been achieved in all water bodies by the end of the cycle, i.e., 2021. The third cycle of the WFD has commenced in 2022 and runs until 2027.

If a waterbody is unlikely to achieve this status, then it is deemed to be "*At Risk".* The River Blackwater is currently classed as *"Moderate Status"* and deemed to be "*At Risk*" on the WFD Risk Code. Mountain Water downstream of Emyvale is classed as *"Poor Status"* and deemed to be "*At Risk"* of not achieving good status in the current WFD. Emy Lough is currently classed as *"Moderate Status"* and also deemed to be "*at risk*" on the WFD Risk Code and identified as a significant pressure in the catchment. It should be noted that the latest WFD Cycle 2 reports were last generated in November 2018.

Corlattallan Stream Assimilation Capacity Assessment

Silver Hill Foods were advised by the EPA prior to the 2011 Industrial Emissions Application that they believed the unnamed stream into which the treated effluent is discharged did not have the capacity for the volume of effluent received.

As a result, a waste assimilation capacity reports was produced to assess this (*IE Water Consulting (2011), Assimilative Capacity Assessment Report, Silverhill Foods, Wastewater Effluent Discharge to Corlattallan Stream Emyvale, Co Monaghan* attached in Appendix D and summarised in **Table 3-1***).* After lengthy discussions with the EPA the site elected to go with alternative disposal routes and it is proposed to dispose the wastewater produced by the site to land surrounding the site via drip irrigation.

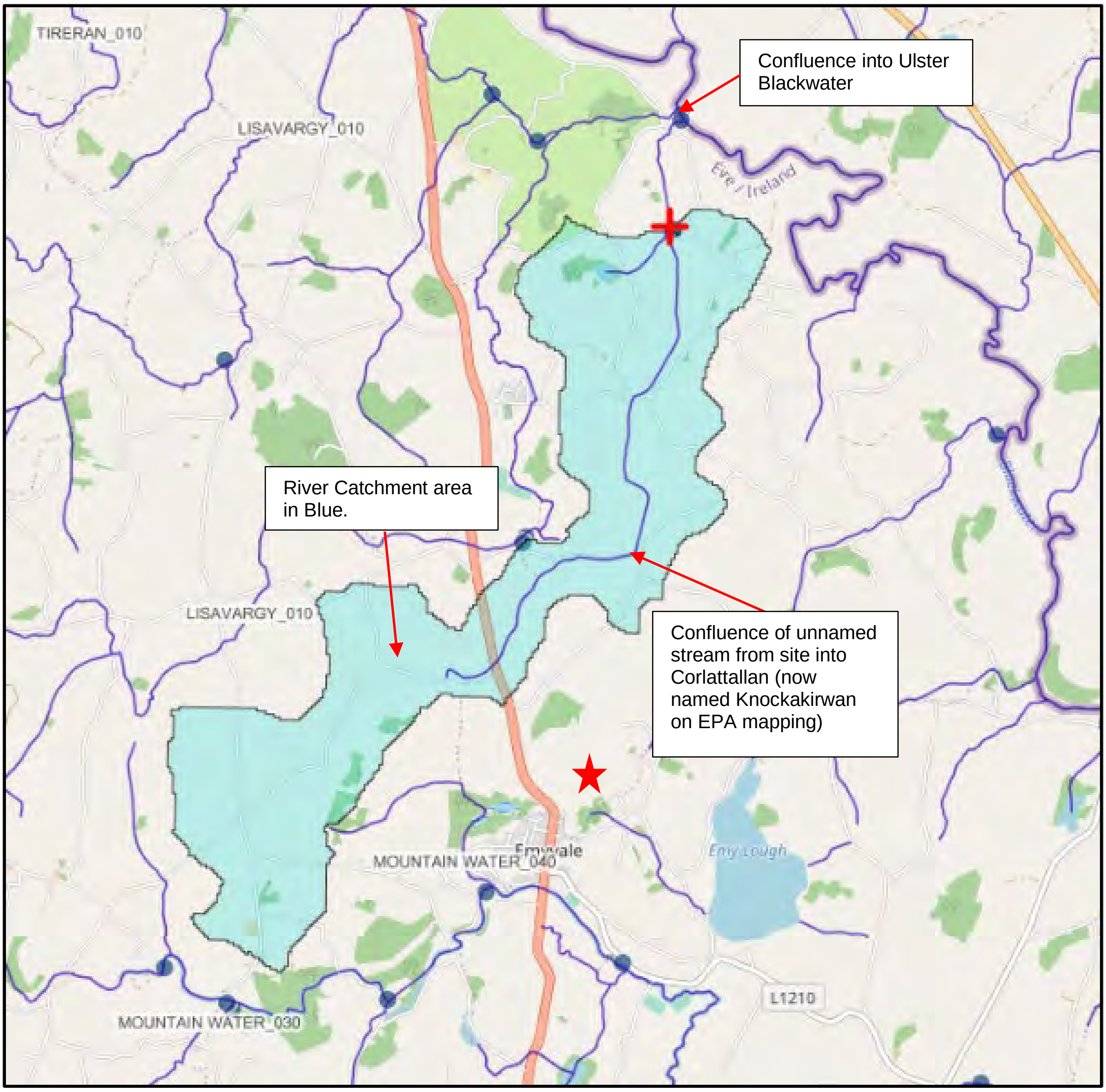

Figure 2-6: View of Contributing Catchment into which Corlattallan Stream flows (site shown in red star)

Corlattallan Stream Q-Value Assessments

The EPA have not classified the ecological status of the Corlattallan Stream/ Knockakirwan Stream or the Blackwater Tributary (this lies within the UK therefore they would not be obliged to monitor this). The Department of Agriculture, Environment and Rural Affairs in Northern Ireland have classed the ecological status of the River Blackwater as moderate. Under the requirements of the Water Framework Directive, this is unsatisfactory and good status must be achieved

In 2017, in order to gather a baseline ecological status (presented as a Q value) of the unnamed stream into the WWTP discharges effluent to, kick samples were taken from three points along the stream by Montgomery EHS and a Q-analysis was undertaken for these samples. The results of this Q analysis were as follows:

- Site 1 (at discharge) – Q2-3, poor ecological status
- Site 2 (downstream of discharge) – Q2-3, poor ecological status
- Site 3 – (upstream of confluence with Blackwater) – Q3, moderate ecological status.

The sample points are shown in the **Figure 2-7** below.

Figure 2-7: Biological Sample points from water quality tests in 2017.

Additional Q value assessment was also completed in 2020 as part of an Environmental Impact Assessment completed to support a review of the sites EPA IED licence (now on hold).

The results of the Q value assessment for the upstream and downstream stations of the unnamed stream are presented in Table 8. A full list of the invertebrates recorded from both stations is presented in the EIAR (Rowan, 2020, EIAR Silver Hill Foods).

Table 2-2: 2020 Q Value Assessment Results

Station	Location	Q Value & Status
1	Upstream	Q3 - Moderate
2	Downstream	Q2-3 - Poor

Station One – Unnamed Stream (Upstream of site)

The sample was taken across the road from the Silver Hill foods site, before the stream is culverted under the N2. The stream here is more akin to a drainage ditch and no suitable riffle habitats were present. There was very little flow in the stream here and it has formed a small pool in the corner of the field. There is a hedgerow along the eastern (roadside) bank of the stream whilst the western bank of the stream was fenced off from grazing livestock. There was a high level of silt in the stream at this point.

Macro-invertebrate biodiversity in the sample was very low, and the sample was dominated by diptern larvae from the Chironomidae family. These comprised over 87% of the total faunal assemblage. Chironomidae larvae are Group C organisms, which mean that they are relatively tolerant of organic pollution. Other Group C taxa included beetles from the Dytiscidae family. The most sensitive Group

A and Group B taxa were absent from the sample. Group D taxa are quite tolerant of pollution and these were present in small numbers. They were represented by bivalves from the Sphaeriidae family.

Overall, based on the presence and absence of the indicator taxa and the presence of Group C taxa in excessive numbers, a Q3 was assigned here. This means that the stream at this point is of moderate ecological status and under the requirements of the Water Framework Directive, this is unsatisfactory.

Station Two – Unnamed Stream (Downstream)

Sample Two was taken within the site, just downstream of the primary discharge point. The stream at this point is quite narrow, with a gravelly substrate, although the level of silt between the stones and gravel was quite high. The western bank of the stream here consists of a treeline, and the eastern bank is open.

Macro-invertebrate biodiversity in this sample was relatively low. The most sensitive Group A and Group B taxa were absent from the sample. Group C and Group D taxa were present in similar numbers. The most common organism in the sample was the water louse *Asellus aquaticus.* This Group D taxa is quite tolerant of pollution. *Asellus* comprised 49% of the overall taxa (numerous) and it was the only Group D taxa present. Group C were also numerous in the sample at 46% and taxa included Chironomidae larvae, Simuliidae larvae and beetles from the Dytiscidae family. The most tolerant Group E taxa were also present in this sample in fair numbers. This group are very tolerant. Dipterns from the chironomous genus represented this group.

Overall, based on the presence and absence of the indicator taxa and the presence of both Group C and D taxa in similar proportions, a Q2-3 was assigned here. This is indicative of poor status and this result aligns with the previous baseline report that was carried out for this stream.

From an analysis of both upstream and downstream samples, there is a difference in the ecological status of the unnamed stream at points upstream and downstream of the Silver Hills discharge. This indicated that the discharge may be influencing the status of this stream. It is also likely that generalised run-off from the carpark and surrounding site may be impacting the stream.

The Ecological Impact Assessment Report for which the Q value assessment was completed as part of the EIAR concluded:

With the recommended mitigation measures, it can be concluded that the proposed development at Silver Hill Foods in Emyvale, Co. Monaghan will have a neutral impact upon locally areas of biodiversity value. Eliminating WWTP discharge into the unnamed Stream and providing silt and oil interceptors for surface water run-off into the stream will have a positive effect.

The EIAR was prepared to assess the impact of the extension of the production facilities at site and did not include assessment of the drip irrigation pilot therefore the conclusion above although related is not directly comparable assessment of the drip irrigation pilot.

2.6 Flooding

The Office of Public Works (OPW) Flood Maps and Catchment Flood Risk Assessment and Management (CFRAM) maps were consulted as part of the assessment. A review of historical flood records indicates there was a number of flood events recorded within 1km of the subject site.

These events are summarised in the table below:

Table 4. Summary of flood events recorded within the vicinity of the subject site.

Name	Details	Distance from Subject Site
Mountain Emyvale 1 Recurring	Recurring Flood the source is the Mountain Water River.	c.971.4m south
Mountain Emyvale 2 Recurring	Recurring Flood the source is the Mountain Water River.	c.876.8m south

Figure 2-8: Summary of historic flood events in the vicinity of the subject site (OPW Flood Maps)

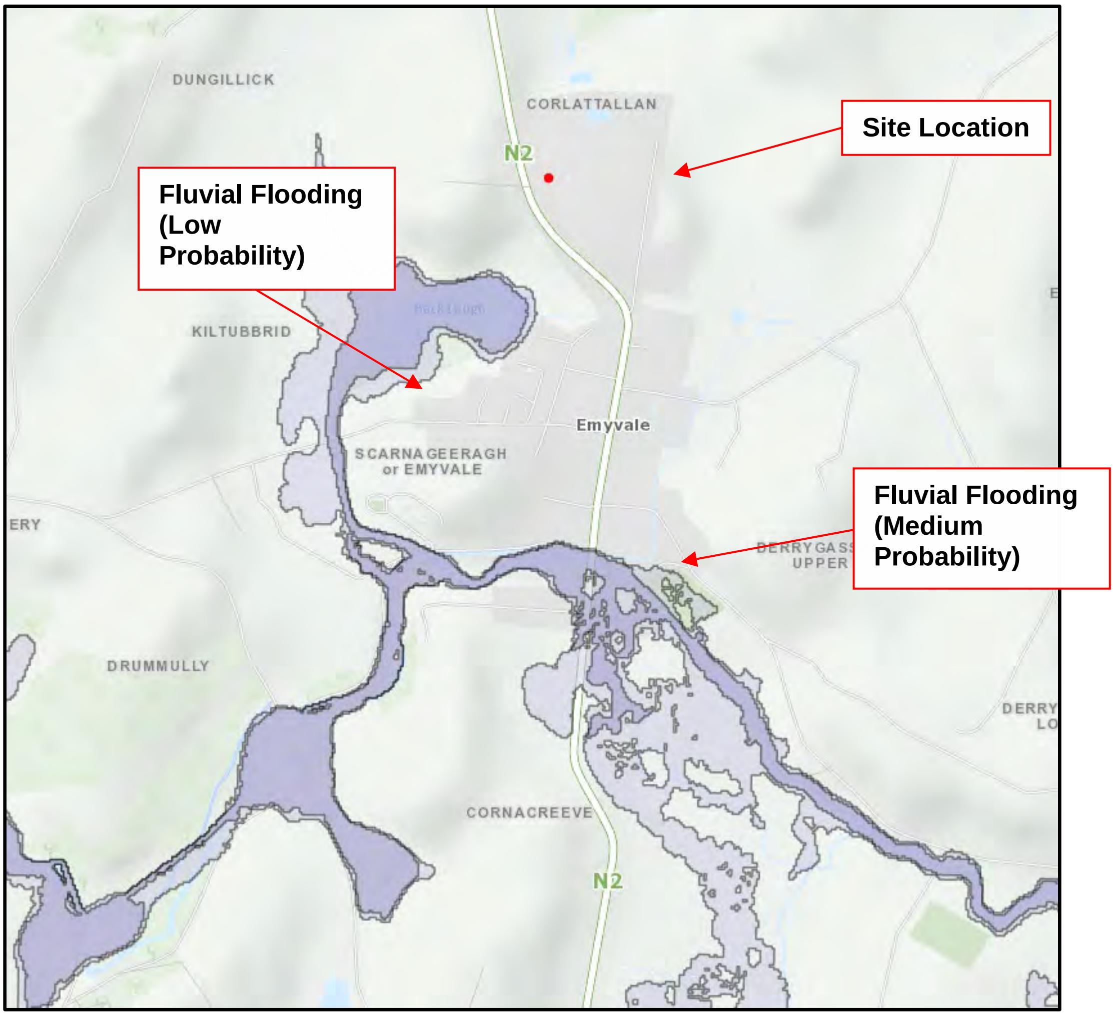

Figure 2-9: Summary of fluvial flood events in the vicinity of the subject site (OPW Flood Maps)

The Eastern CFRAM study commenced in June 2011 and ran until the end of 2016. The study involved detailed hydraulic modelling of rivers, their tributaries and tidal flooding to develop and implement flood risk management plans, where required. The OPW released the final Plans on the OPW's Flood Maps (*www.floodinfo.ie*) website.

Pluvial flooding is usually associated with high intensity rainfall and inadequate stormwater drainage systems. Pluvial flooding events are generally short-term and dissipate within hours of a rainfall event. Pluvial flooding was reviewed by the OPW during a National Preliminary Flood Risk Assessment (PFRA) study published in 2011. Data collected by the OPW from the PFRA study is presented on the Department of Housing, Planning, Community and Local Government's (*www.myplan.ie*) website. According to the 2011 PFRA mapping, the subject site is not at risk of fluvial, pluvial or coastal flooding. According to the 2016 OPW Flood Maps, the subject site does not appear to be within an area at risk of fluvial, pluvial or coastal flooding.

As both sets of flood mapping indicates that the subject site is not at risk of fluvial, pluvial or coastal flooding and the fact that the nearest historical flood event occurred c.876.8m away, the risk score is rated as Low Risk.

<u>Please note Rowan has not conducted a full Flood Risk Assessment and cannot provide further comment in relation to flood risk.</u>

3 Previous Hydrogeological Reports Summary

Table 3-1: Previous Hydrogeological Reports Summary

Report	Summary
IE Water Consulting (2011), Assimilative Capacity Assessment Report, Silverhill Foods, Wastewater Effluent Discharge to Corlattallan Stream Emyvale, Co Monaghan.	Samples were taken from the unnamed stream and the Corlattallan Stream during September 2011 for hydro chemical analysis. The sample from the unnamed stream was taken downstream of the discharge point at a location on the stream just before it discharges to the Corlattallan Stream. Two samples were taken from the Corlattallan Stream: one upstream and one downstream of the confluence of the unnamed stream and the Corlattallan Stream. The report concluded; *The Corlattallan Stream is currently assessed as being at 'Moderate' Status. Sampling results for the Corlattallan Stream upstream and downstream of the confluence with the unnamed stream (into which the effluent discharges) indicate that the concentrations of Ammonia and BOD exceed the threshold values for 'Good' Status as specified in the Surface Water Regulations 2009. No monitoring data for Orthophosphate was available. However, an assessment of the Total Phosphorous results indicates it is likely that MRP results also exceed the relevant threshold value.* The assimilative capacity assessment was undertaken for the Corlattallan Stream for two scenarios: assimilative capacity based on effluent quality (i.e. direct discharge of the effluent to the Corlattallan Stream) and assimilative capacity based on water quality in the unnamed stream. For both scenarios the volume of discharge was taken to be 480m3/day (licence limit) and 146m3/day (average recorded effluent flow for 2010). <u>Scenario 1 – Effluent Discharge Directly to Corlattallan Stream</u> Assimilative capacity calculations for the Corlattallan Stream under 95%ile flow conditions with maximum permitted discharge volumes indicate the discharge will result in an increase in concentrations of Ammonia (65%), Total Phosphorous (31%) and BOD (18%). Based on the assumed concentrations of Orthophosphate there will be an increase in concentrations of MRP (31%). Assimilative capacity calculations for the Corlattallan Stream under 95%ile flow conditions and average recorded discharge volumes indicate the discharge will result in an increase in concentrations of Ammonia (31%), Total Phosphorous (15%) and BOD (8%). Based on the assumed concentrations of Orthophosphate there will be an increase in concentrations of MRP (15%). <u>Scenario 2 – Unnamed Stream Discharge to Corlattallan Stream</u> Assimilative capacity calculations for the Corlattallan Stream under 95%ile flow conditions with maximum permitted discharge volumes indicate the discharge will result in an increase in concentrations of Ammonia (687%), Total Phosphorous (990%) and BOD (123%). Based on the assumed concentrations of Orthophosphate there will be an increase in concentrations of MRP (980%). Assimilative capacity calculations for the Corlattallan Stream under 95%ile flow conditions an average recorded discharge

	volumes indicate the discharge will result in an increase in concentrations of Ammonia (330%), Total Phosphorous (475%) and BOD (59%). Based on the assumed concentrations of Orthophosphate there will be an increase in concentrations of MRP (475%).
Dr. Emmett McMahon (environmental consultant and Caitriona Lazdauskas of Silver Hill Foods, 2013. Assessment of the impact of the Silver Hill Effluent Discharge on the Mountain Water River, Silverhill Foods Licence No: 422 -03.	Silver Hill Foods of Emyvale, Co. Monaghan, currently discharges its treated effluent (under IPPC license No. 670) to a drain leading to the Corlattallan Stream, a minor tributary of the Ulster Blackwater. Following discussions with the EPA Silver Hill Foods now proposes to change the discharge location to the Mountain Water River at Emyvale, also a tributary of the Ulster Blackwater, but with a larger flow. The report assesses the impact of the proposed new discharge location on the water quality of the Mountain Water River and sensitive areas downstream of the effluent entry point. Biological monitoring of water quality in the Mountain Water was carried out in September 2013 by Conservation Services of Killarney, on behalf of Silver Hill Foods. Sampling was carried out at two sites, upstream and downstream of Emyvale. The macroinvertebrate fauna recorded at the upstream site merited a Q rating of Q4 indicating unpolluted conditions and good ecological status. The macroinvertebrate fauna recorded at the downstream site merited a Q rating of Q3-4 indicating slightly polluted conditions and moderate ecological status. The EPA had carried out biological monitoring in 2007 and 2010 with the following results: • Station 0400 (1.5 km upstream) ….Q3-Q4 • Station 0500 750m downstream .... Q3 The results of the 2013 biological monitoring programme represent a noticeable improvement in the quality of the river compared to earlier assessments. The report concluded that that the quality of the Mountain Water River would comply with Good Status requirements at both the mean and 95%ile flow rates after entry of the Silver Hill and the WWTP effluent.
Flynn and Shaw (2016) Site Assessment for the Proposed Drip Irrigation System.	Fifteen trial pits were excavated to a depth of 1.5m across lands proposed for drip irrigation. Each of the following was assessed within each of the trial pits: (i) Soil layers/type/classification (ii) Depth to water ingress when excavated (iii) Depth to water table after 24 hours (iv) Depth to water table after 48 hours (v) Depth to bedrock Fifteen percolation holes were also completed adjacent to the trial pits. The dimensions of each hole was 300mm x 300mm x 400mm deep. Each of these holes were pre-soaked twice on Tuesday 29th November, 2016 at 10am and 4pm. In order to achieve an indication of any percolation qualities of the soils it was decided that pre-soaking would be carried out twice and the level of water remaining in the hole prior to testing on the 30th November, 2016 would be recorded. *The assessment found that there is a wide and varied range of soils and subsoils throughout the lands. A common trend concluded that the soils generally are shallow poorly drained soils with mottling evident suggesting a seasonally adjusting water*

	table. *A good depth of soil was recorded above recorded water table levels, ranging from 0.85m to in excess of 1.5m., and the predominant soil type recorded was silty in nature with sand and gravel content common.* Richard Flynn *concluded: such soils would be acceptable for a drip irrigation system, given the depth to water table, the seasonal nature of the water table, and the percolating quality of the soils. The use of drip irrigation in Ireland is relatively new and has tended thus far to be used as an option where percolating qualities are poor. The presence of mottling in the trial holes would suggest that there may be occasions during wet periods where complete sub-surface drainage may prove difficult in some areas, and these areas may need to be avoided.* *However, the low levels of water in trial holes after 48 hours and the complete absence in some, combined with the low loading rates envisaged in the region of 3 litres/m2 would seem to indicate that sub-surface infiltration aided by horizontal movement in the upper soil horizons should be achieved. In addition, the removal of the build-up of vegetation from the existing drains in the lands so that surface water can move more freely, would assist the drainage of the lower lying areas.* The full report is presented within **Appendix D** which includes Individual trial pit logs and percolation logs and shows the location of trial pits.
Geosyntec Consultants (2017) Hydrological Assessment of Proposed Drip Irrigation System, Silverhill Foods, Emyvale, Co. Monaghan (IE licence No. P0422-02).	The report presents a hydrogeological assessment of the proposed drip irrigation system at the Silver Hill Foods facility in Emyvale, Co. Monaghan (the site). The report includes a desktop review of previous reports, publicly available information, development of conceptual site model, comparison of groundwater data for onsite abstraction wells against the Groundwater Threshold Values (SI no.9 of 2010) and a Tier 2 Risk Assessment as outlined in the *EPA 2011 Guidance on the Authorisations of Discharges to Groundwater.* The report groundwater flow direction was to the south east based on 2011 data however the 2011 was not provided within the report. The report concluded: *Based on the CSM presented herein, the following conclusions can be drawn:* • *Any impact on the bedrock aquifer as a result of the proposed discharge in terms of increases in COPC concentrations is expected to be minor. Exceedance of GTVs for the key COPCs is not expected at any point within the aquifer;* • *The discharge is not expected to have a significant impact on groundwater quality in the three abstraction wells currently used by Silver Hill Foods; however, on-going chlorination of the water prior to use is advised as a precautionary measure;* • *The discharge is not expected to have an impact on local surface waters, provided application rates are monitored and controlled;* *In summary, it is expected that the indirect discharge of effluent from the proposed drip irrigation system will be compliant with the Groundwater Regulations.*
Ash Environmental in conjunction with Silverhill Foods (2018). Proposal for a wastewater Drip Irrigation	The Drip Irrigation Proposal for the Pilot aimed: 1. Take account of the site challenges and the risks identified in the Geosyntec report

System Pilot Project for Silverhill Foods, Emyvale, Co. Monaghan. (Referred to as *Drip Irrigation Pilot Proposal 16.01.18* within condition 5.3 (i) of current EPA licence PO422-03)	2. Establish infiltration rates for different soil types and conditions on the site 3. Present a proposal on this basis to the EPA 4. Prove the suggested infiltration rates during a phased installation. The proposal presents the planned area for the pilot to be installed and the proposed monitoring to be completed during its operation. The full proposal is presented within **Appendix D.**
Rowan 2020, Environmental Impact Assessment Report, Silver Hill Foods.	The facility operates under IED licence no. P0422-02 and the EIAR was prepared to support IE Activity Licence review in order for the existing plant to comply with the EPA (Industrial Emissions) (Licensing) Regulations 2013 – specific to proposed changes in waste water disposal and site wide factory add-ons, improvements and redevelopment. The findings are presented within the EIAR. The drip irrigation was included as part of the system upgrades but not individually assessed as part of the EIAR, the assessment of the drip irrigation was to be completed as part the pilot project and this updated hydrological assessment report. None the less the EIAR contains a large amount of relevant information which has been included in this report as appropriate.

4 Initial Conceptual Site Model

In line with the project methodology presented in Section 1.4 an initial SPR linkage table was completed for the project and is presented below in **Table 4-1**. This informed pathways and receptors which needed to be assessed as part of the pilot project. An updated CSM is presented within **Section 8** which incorporates the results of pilot project and assess whether the pathways identified below are complete and pose a potential risk to the identified receptors.

Table 4-1: Initial Conceptual Site Model

Potential Sources of contamination	Potential Pathway(s)	Potential Receptor(s)
WWTP Effluent discharged via the Drip Irrigation System	Vertical movement down through the soils.	Groundwater Aquifer – Aughnacloy Groundwater Body. Onsite abstraction wells within aquifer – AGW1, AGW2, AGW3 onsite. Offsite wells within aquifer within 1km radius.
	Lateral movement through the soils.	Surface water features - Unnamed stream into which the WWTP discharges to, the Corlattallan Stream into which the unnamed stream flows into and the River Blackwater River Ulster further downstream.
	Surface ponding and subsequent surface run off.	Surface water features - Unnamed stream and Corlattallan Stream with Blackwater River and Ulster River further downstream.

5 Proposed Drip Irrigation Project Overview

The drip irrigation pilot dispersed treated effluent from the WWTP onto a small patch of land of approx. 1.6 ha. If this project is deemed successful by the EPA, Silverhill plan to extend the system across 14.6 hectares taking the findings into account of the pilot project.

Bosta UK Ltd were commissioned to provide and install a turn-key pilot solution on site. This solution includes all required equipment necessary for the complete drip irrigation system. Bosta UK Ltd have designed the system for approximately 14.6 ha, with a pilot project area of 1.6 ha. The project will be executed in two main phases. Phase 1 is the pilot phase for plot 1 and consists of the installation of a pump station and irrigation system for 1.6 ha land which was installed in summer of 2021.

If deemed appropriate by the EPA, Phase 2 would be the extension of system into plots 2 to 9 across an additional 13 ha as shown below in **Figure 5-1.**

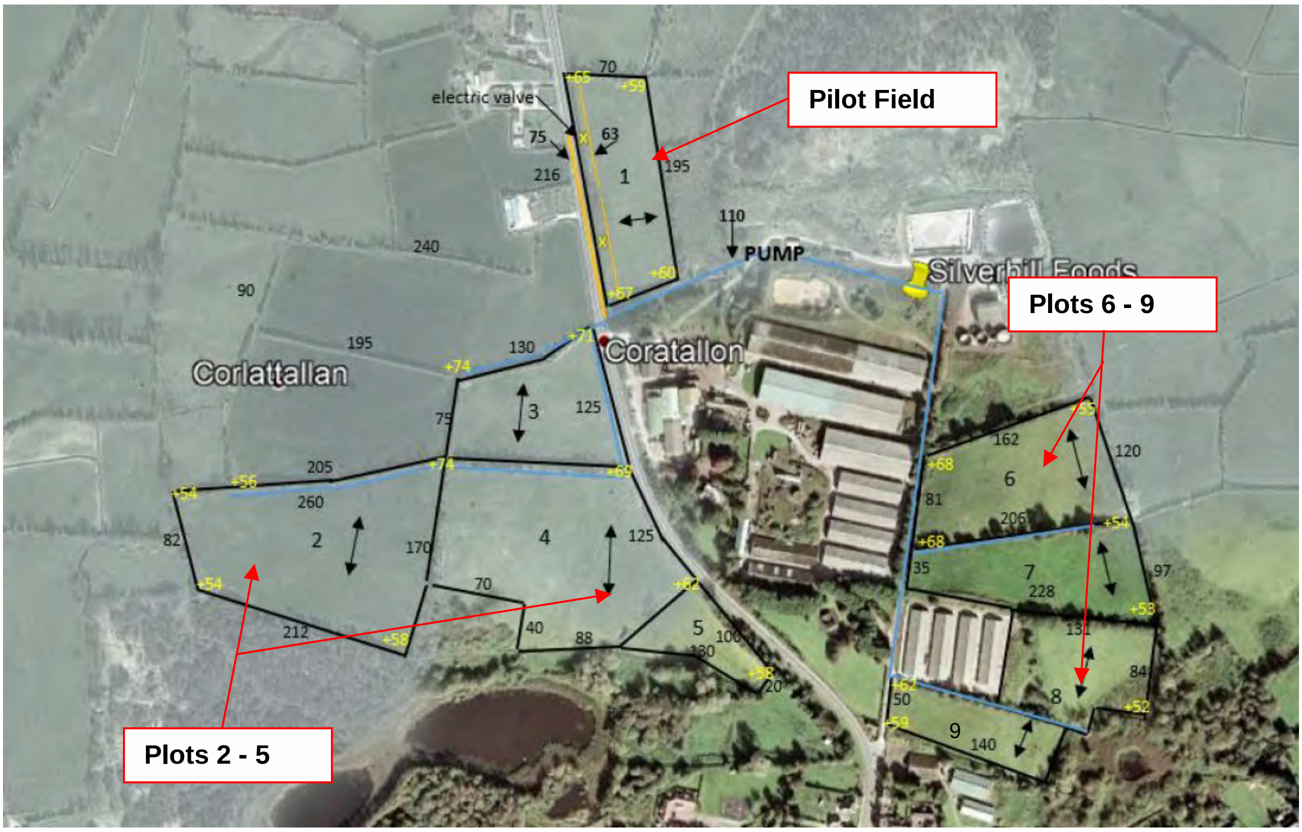

Figure 5-1: An overview of the proposed drip irrigation system on lands around the site.

5.1 The Drip Irrigation System

Drip irrigation is widely known as a method of crop production whereby a slow, even application of low-pressure water is provided to soil and plants using perforated plastic tubing (drip lines) placed approximately 300mm beneath the ground surface. A well designed drip irrigation system loses practically no water to surface runoff, evaporation, or deep percolation in silty or sandy soils. An example of a drip irrigation system can be seen in **Figure 5-2** below.

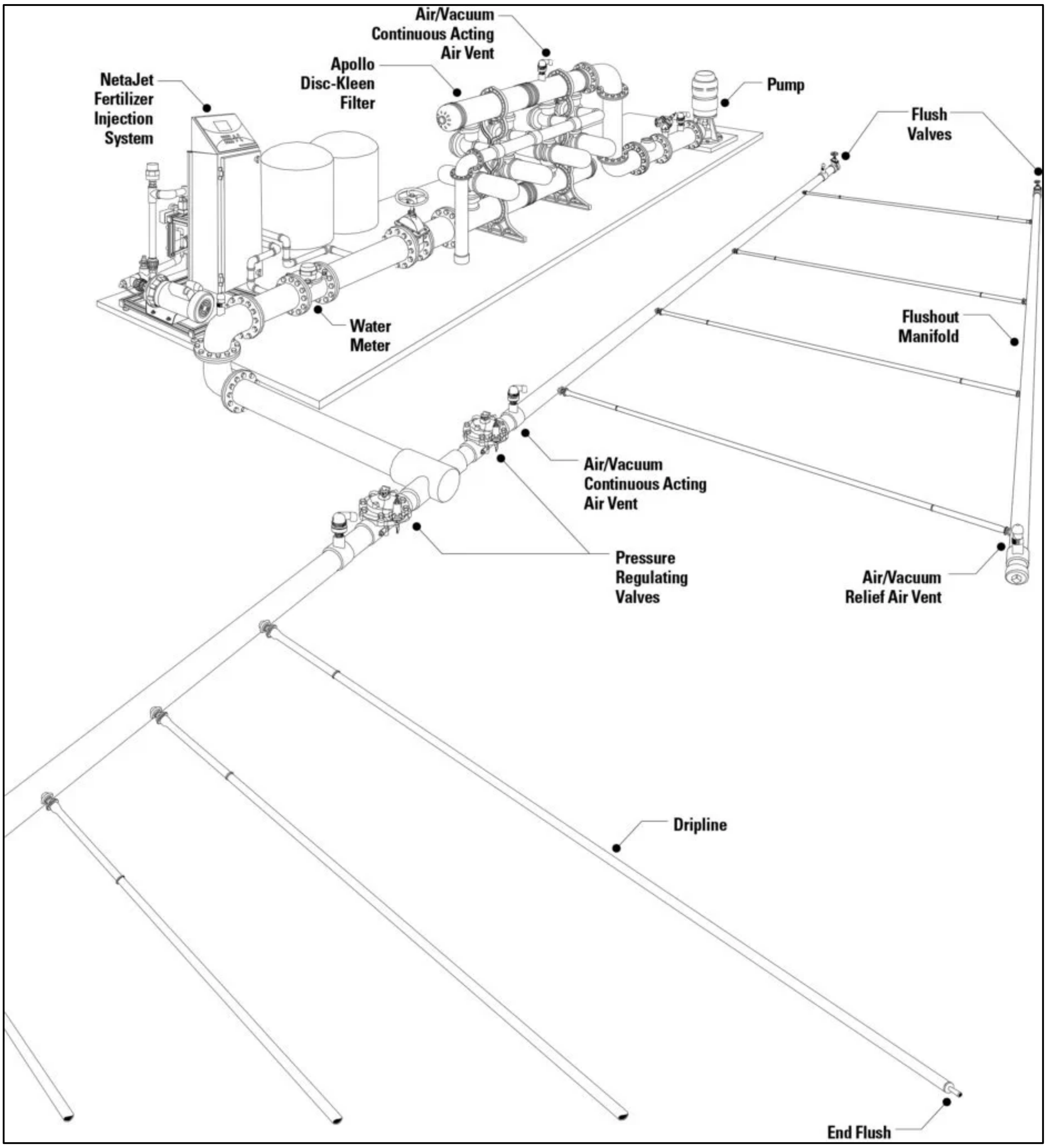

Figure 5-2: Example Drip Irrigation System

More recently, drip irrigation has been used in many regions of the US to reuse treated wastewater to irrigate golf courses, lawns, landscaping, forests, and crops. Recycling wastewater can have both economic and environmental benefits. Irrigation also can be the most practical and environmentally sustainable way to dispose of treated effluent from wastewater treatment plants by relieving the burden on local streams and rivers. Other benefits of applying wastewater to land is that the soil provides a high degree of additional treatment of the effluent through naturally occurring physical, biological, and chemical processes. Irrigating with wastewater also adds nutrients and minerals to soil and can help to recharge valuable groundwater resources.

5.2 System Specifications

The drip irrigation system that will be installed at the Silverhill site is composed of a number of components discussed in detail below.

Control System
The system will be controlled via the IQ4 Platform of which offers state-of-the-art monitoring, programming and control features in an easy to learn user interface. IQ4 provides advanced water management features saving money and time, with total control on or off site via the 4g integrated network and downloadable on android or apple. IQ4 is available in a Cloud-based version.

Pumping Unit
Bosta has selected a pump delivering a flow of 65 m3 /h at 6.5 bar. This pump is sufficiently large to handle the total flow of 480 m3 per day across the entire 14.6 ha. The type of pump is a multi-stage centrifugal DAB NKV 65/3 T.

Water Meter
To ensure the correct amount of water is dispersed on each plot, a pulse Woltman water meter is installed. This meter provides pulses to the control unit, which in turn switches the valves in the field after 30 m3 /ha has been delivered.

Filtration Unit
After the pump, a Yamit AF804NL filtration unit is installed. This is an automatic hydraulic filter unit equipped with an electronic 12V DC control system. The filters are equipped with a 120-micron screen filter whereby cleaning is performed automatically once the pressure loss (ΔP) across the filter has reached the pre-set value up to 0.5 bar. During the whole process, water supply is uninterrupted.

Backflush Valve
After the filter, a Bermad 4” 3-way backflush valve is fitted. This valve is used to close the main line when the filter flushes the system.

Effluent Holding Tank
Silverhill will purchase and install a suitable effluent holding tank. The effluent will be filtered with a max. mesh of 1 mm and fed through a PVC pipe of 125 mm. A ball valve is installed to this piping to allow for maintenance. Bosta will connect the drip irrigation system to this 125 mm PVC pipe after the ball valve.

Piping, Connections, and Driplines
From the pump, filtration & control station, the effluent will be pumped through a network of piping and tubing to flow into the ground through a series of perforated subsurface driplines. Bosta has designed the system with a network of PE piping for the 14.6 ha land. The piping system will be composed of main lines, semi lines, branch offs, water valves, air release valves, flush valves and driplines as required.

Main Lines
There will be a 125 mm PE main line, which starts from the pump, filtration and control system. This main line runs in two directions and splits several times to enable sufficient flow to each plot. For the pilot project, the main line will run only to the pilot plot. The pressure losses have been calculated for the total project, meaning the 125 mm PE main line for the pilot project will stay in place at the time of expansion.

Sub Lines

There will be several sub lines per plot, depending on the plot size, orientation and slope. For the pilot plot, there will be one 90 mm and two 63 mm PE sub lines. At the end of each 63 mm PE sub line, the piping will surface and is fitted with an air release valve on either side. This is necessary to allow air to flow from the sub lines upon each start-up, as this enters when the water pressure drops after dispersion, but also to let air into the system to prevent a vacuum in the sub lines and driplines.

Control Valves

Each sub line will have its own Bermad 2.5" Type 100 electrical control valve, which allows opening and closing of the effluent flow to the driplines. These valves are controlled by the Galcon GSI Smart-3G control system. The valves are mounted in the field above the surface. The valves have a pressure reduction function, to regulate the pressure to the driplines.

Ball Valves and Manometers

Each sub line will also be equipped with a ball valve as well as a pressure gauge. The ball valve is installed to allow closing of the lines in case of any maintenance to the components down the line from the sub lines. The pressure gauge is installed to monitor the pressure in the sub lines just after the control valves and driplines.

Cabling

To enable control of all the valves in the sub lines, 0,8 mm diameter, 8, 12 or 20-core cabling will be used, depending on the distance from the control station. The distance from the control unit to the valves determines the number of wires used for each valve.

Monitoring Wells

Bosta will supply and install all elements of the wells. There are 5 well locations based on high ground, mid ground and low ground.

Moisture Sensors

Bosta has selected the NDJ Root Sense probe Viridix Technology developed by Naandanjain AgTech solutions of which by using its underground probe system can detect and alert to underground water build up and potential waterlogging. The system operates using centre bar technology and with its solar panelled computer system installed on site it allows a real time view of what and how dispersed treated effluent is behaving underground. The onsite computer will send an alert/message where water build up is detected based on the metric and parameters set out by Bosta and working in conjunction with the water table samples and site assessment. Locations of probes are based on high ground, mid ground and low ground monitoring points.

Peripheral Equipment

Besides the major components discussed above, various additional parts, components and materials will be installed where necessary, which may include.

- PVC piping, bends, reducers, adaptors,
- Ball valves,
- Relays, temperature and safety switches,
- Gravel/Stones – Media.

System Installation

Bosta and a sub-contractor will install and commission the equipment on the site. The installation and commissioning will comprise of the following items:

- Coordination on site,
- Integration & connection of cabling,
- Power up & check operation of all systems.

5.3 The Drip Irrigation Pilot System

The pilot of the drip irrigation system was completed across 1.6ha in the northern section of the site. The pilot system contained the system specification as detailed above. The layout of system within in pilot field is shown in detail in **Figure 5-3** below along with the monitoring systems installed as part of the pilot.

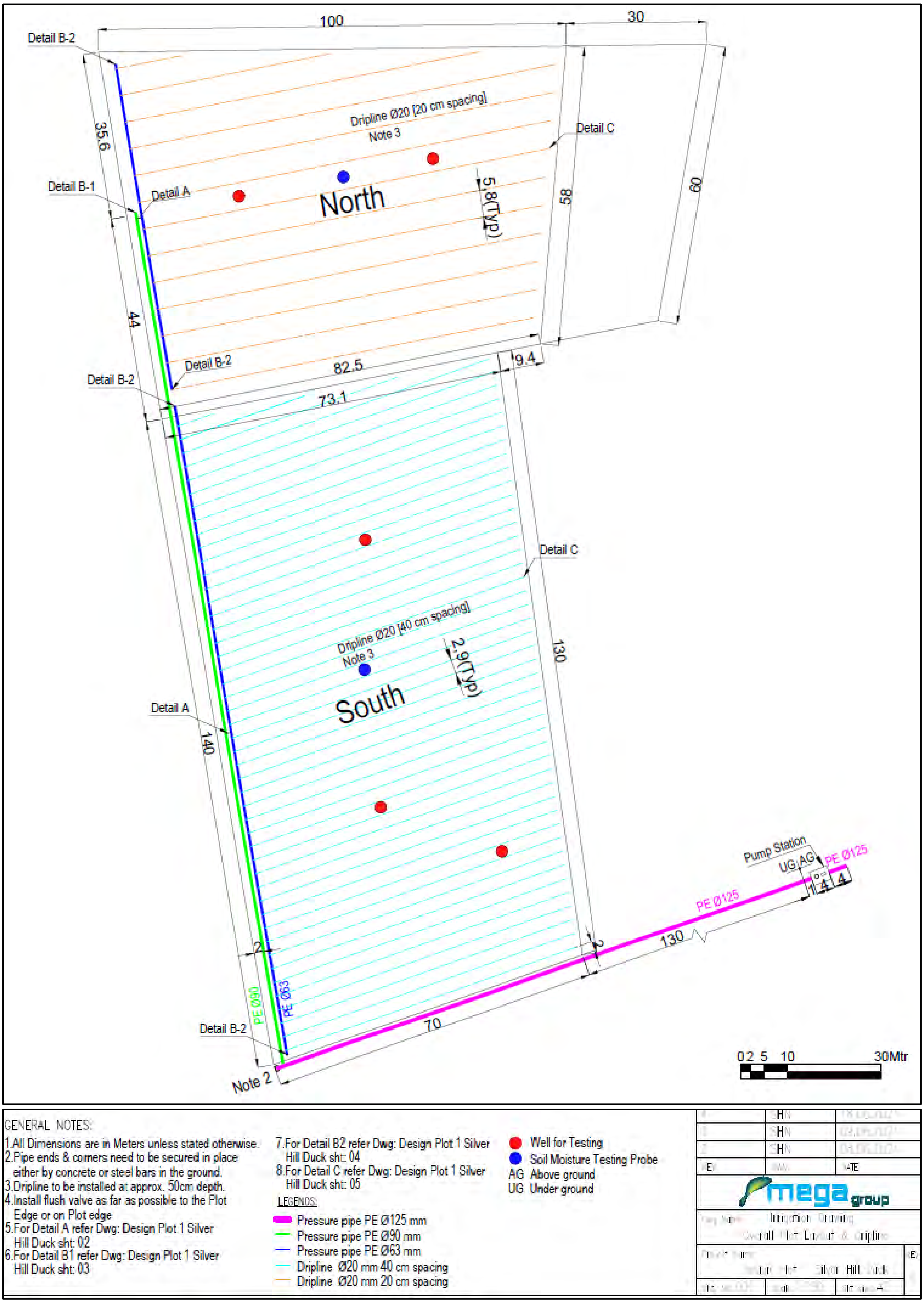

Figure 5-3: Drip Irrigation Pilot System Layout and Monitoring Points

The drip irrigation pilot monitoring system included:

1. **Drip Irrigation Soil Moisture Probes (MMP1, MMP2)**
   The soil moisture probes monitor the quantity of moisture in the soil where the percolation area discharges to the pilot field. The probes allow the discharge volume to be reduced when increased moisture is detected in the subsurface to ensure water logging of the soil does not

occur. If ponding/waterlogging is detected by the probes in an area, discharge to the area is ceased to give time for the excess water to drain from the land.
The probes were fitted at 0.3m below ground level (mbgl) and 0.75mbgl and respective to the drip irrigation lines sit 0.2m above the drip line and 0.25m below the drip lines. The data was assessed continually throughout the project and data is discussed in **Section 7.2.3** and **Appendix G.**

2. **Narrow diameter (~5mm) pore water sampling wells (MGW1a, MGW1b, MMGW1c, MGW1D, MGW1e)**.
   Narrow diameter shallow pore water sampling wells were installed to approximately 0.5mbgl however were unsuccessful at retrieving water samples therefore results have not been presented or assessed as part of this project. Perched water well MGW1S samples have been used instead.

6 Pilot Monitoring Methodology

The following data and sampling was completed in order to assess the impact of the drip irrigation pilot on the surrounding environment. The methodology **follows the source - pathway - receptor linkage methodology** presented in **Section 1.4.** All monitoring locations are shown on **Figure 6-2** below.

6.1 Source Characterisation

The onsite Waste Water Treatment Plant (WWTP) consists of the following stages:

Screening:
The process water is a combination of blood and wash water from the Processing Factory and Feather Plant at Silver Hill Foods. The screen removes all heavy solids, large fats, and other materials that may gain access to the foul sewer drains. The screened material is diverted to a waste bin for disposal as CAT1 waste. It is then brought offsite by an approved rendering contractor.

Balance Tank:
Balance tank holds the produced waste water and ensures mixing and steady flow of the waste water through to the DAF.

DAF Unit:
The DAF unit removes the solids in the effluent. It uses a combination of diffused air and chemicals (as required) to remove up to 80% of the pollution load in the wastewater being treated. The sludge produced from this process is sent to the sludge tank for settling and then disposal off site.

Contact Tank: The contact tank receives the process water from the DAF unit, this mixture flows by gravity down into the Aeration Basin.

Settling Tank: Receives the returned activated sludge after clarification before transfer to Tank 2.

Aeration Basin: The aeration tank is designed to remove biological oxygen demand (BOD) and Ammonia (Nitrification). It has three surface aerators that are set to run on timers. A dissolved oxygen (D.O.) probe protrudes into the tank and records the D.O in the aeration tank. After treatment in this tank there is a retention time of 3 or 4 days where Nitrification and Denitrification occurs to treat the effluent. The wastewater then flows out of the aeration tank to the clarifier.

Final Clarifier: The clarifier allows the sludge to settle to the bottom of the tank and the clean water to flow to the overflow weirs. The effluent entering the tank mixes with aluminium chloride before it reaches the clarifier. This is to remove the Phosphorus constituent in the wastewater and aid settlement of the solids.

The following upgrade to the WWTP was made in September 2021:

Dewatering Unit: A dewatering unit has been added to the system in September 2021 comprising of a press and chemical additive to dewater sludge. A full spec sheet is presented in **Appendix E.**
The dewatering unit allows the sludge to be sent for anaerobic digestion and is seen as beneficial to the environment as it removes the requirement for land spreading of sludge and reduces the burden on surrounding water courses with regard to potential surface run-off. This is important to note in the context of the drip irrigation as it will not take place in addition to land spreading but, as an improved alternative to direct discharge to the stream.
The sludge is sent offsite under a waste collection permit also attached in **Appendix E.**

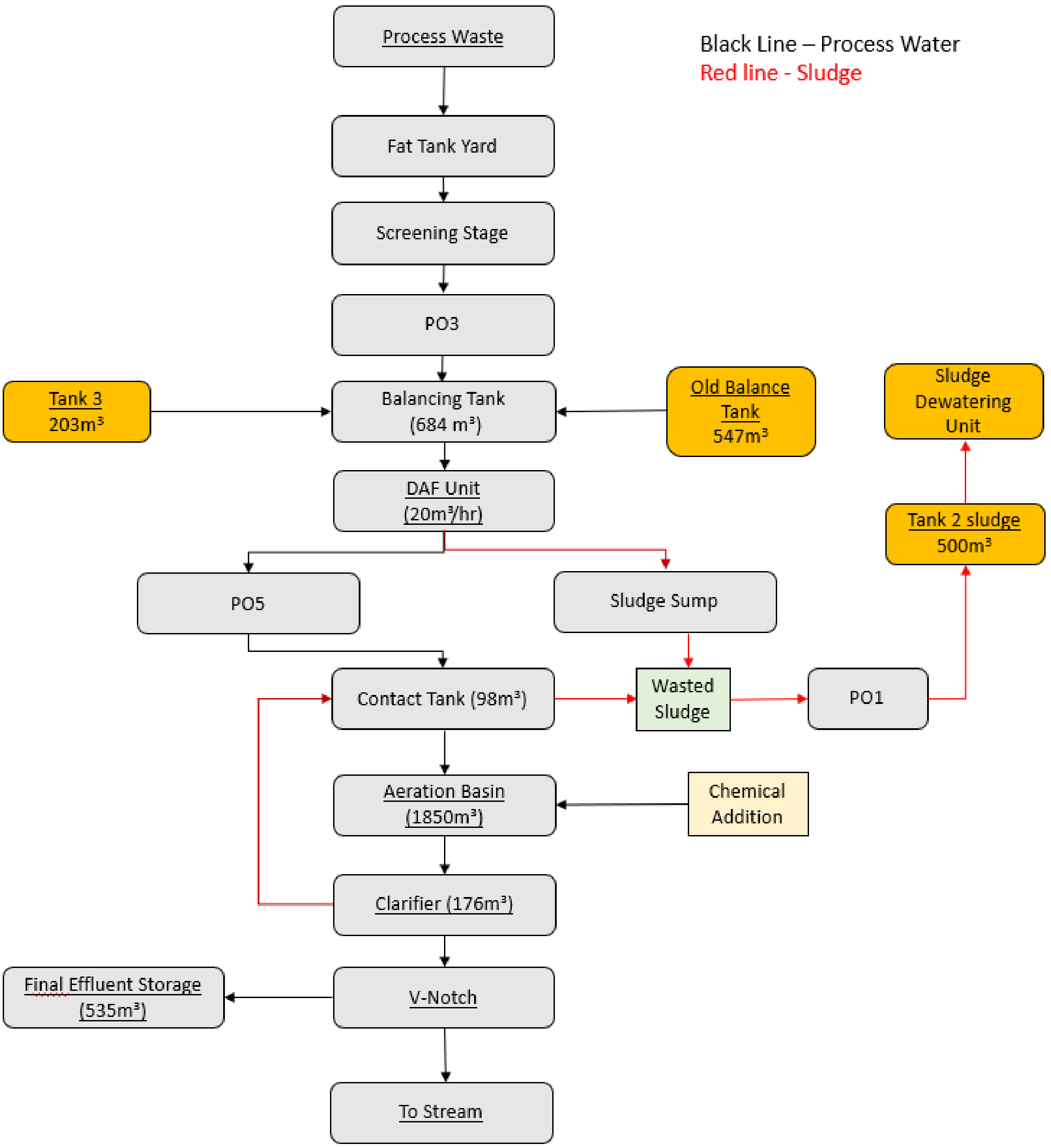

Figure-6-1: Existing Waste Water Treatment Plant Process Flow Diagram

The WWTP treated effluent is sampled daily as part of the sites current IED licence referred to as emission point W1. The results were examined to inform what chemicals of potential concern need to be assessed within potential pathways and the concentration ranges of the COPCs found within the source. The chemical results of W1 are discussed in **Section 7.1**.

6.2 Pathway Assessment

Drip Irrigation Soil Moisture Probes (MMP1, MMP2)

The soil moisture probes were fitted at 0.3m below ground level (mbgl) and 0.75mbgl and respective to the drip irrigation lines sit 0.2m above the drip line and 0.25m below the drip lines. They monitored moisture levels in the soils in the immediate vicinity of the drip irrigation system and assessed if the treated effluent discharged was moving down through the soil or if the soils were becoming saturated and water was not moving downwards. This data was continually monitored, and volumes discharged adjusted to ensure waterlogging/ponding in the field did not occur.

Daily Visual Inspection and Photograph Log

A daily walkover of the pilot field was complete which is presented within Appendix F of this report.

Groundwater Monitoring Wells

A new groundwater monitoring well (MGW1) was installed in the south eastern corner of the pilot field in July 2021 to assess the drip irrigation pilot. The monitoring well log is presented as an attachment with **Appendix C**. Geology encountered can be summarised as topsoil underlain by dry dense silty clays to approximately 1.0m underlain by a band of wet fill material of brick and concrete fragments to approximately 1.5mbgl. Dry dense boulder CLAYS were present from 1.5mbgl to 4.5mbgl underlain by sandstone, siltstone and mudstone bedrock (Carrickaness Sandstone Formation). A water strike was encountered at 24mbgl and the well advanced to 30mbgl, standing water levels 24 hours were recorded at 7.8mbgl.

Two nested wells, a deep and shallow well were installed with the bore. MGW1d was installed to 30mbgl and screened from 24mbgl. MGW1s was drilled to 5mbgl and screened from 2mbgl within the overburden. The wells was sampled monthly to assess the concentrations of COPCs within the groundwater at these depths, perched water from approximately 2-5mbgl in MGW1s and deeper groundwater from 24-30mbgl in MGW1d.

The wells were purged of three well volumes prior to sampling and samples collected into clean laboratory supplied containers. MWG1s was noted to go dry during purging and in these instances a grab sample was collected.

Sampling results are presented and discussed in Section 7.2 of this report and laboratory certificates of results presented within **Appendix F.**

Barometric Data Level Logger (within MGW1)

Barometric level loggers were installed in MGW1s and MGW1d to assess changes in perched groundwater levels and the deeper groundwater relative to the volume of water discharge via the drip irrigation system and relative to rainfall levels. Groundwater was also gauged manually periodically to cross check data collected by loggers. The groundwater level v's discharge volumes v's rainfall data are presented and discussed in **Section 7.2** of this report.

6.3 Receptor Assessment

Surface Water Monitoring Points (MP1, MP2, MP3, MP4)

Four surface water monitoring points were completed along the unnamed stream running parallel to the drip irrigation field as shown on **Figure 6-2**. MP1 is cross to upgradient of the drip irrigation system while MP3 is cross to down gradient and MP4 is offsite and downgradient. After close inspection and as previously agreed with the EPA MP2 was deemed unsuitable, data is presented within the report for completeness however has not been considered in making the conclusions of this report.

The surface water sampling points (MP1, MP3 and MP4) were sampled to assess surface runoff and / or if lateral discharge was adversely impacting the surface water surrounding the site.

Groundwater Aquifer Monitoring Wells (AGW1 and AGW3)

Three existing abstraction bores have been installed on the site for a number of years. One borehole log is available for AGW3 which is presented as an attachment in **Appendix C**. Depth to bedrock at this location was 90 ft (27m) and the driller logged the bedrock at this location as limestone. The well is installed to a depth of 504ft (153m) and static groundwater table was observed at a depth of 55 ft (17m). AWG1 was dipped while onsite in May 2022 and depth to base was recorded as approximately 85m with depth to water recorded as 19.25m.

Logs of the other two abstraction bores are not available but static groundwater elevations across the three abstraction wells were observed to be in the range 44 – 50 m above Ordnance Datum (2011 data), i.e. 20 – 30 m below ground level.

The abstraction bores on average pump approximately 1,500 – 2,300m^3/week based on a 5-day operating week. Given the depth of the abstraction wells and productivity they are installed within the Aughnacloy Groundwater Body and sampling results from them are considered reflective of the aquifer conditions in the vicinity of the site.

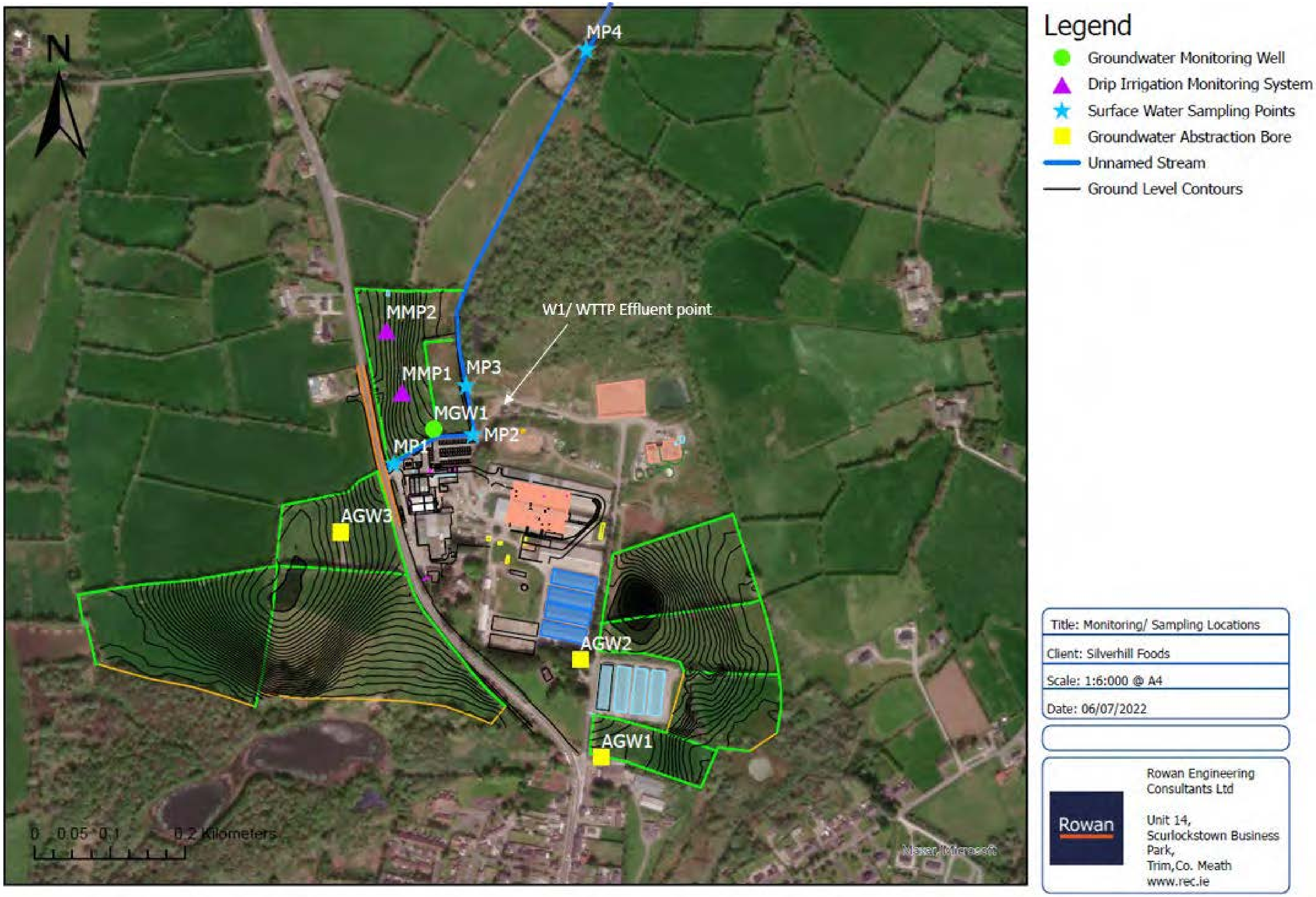

Figure 6-2: All monitoring locations used to assess pilot project

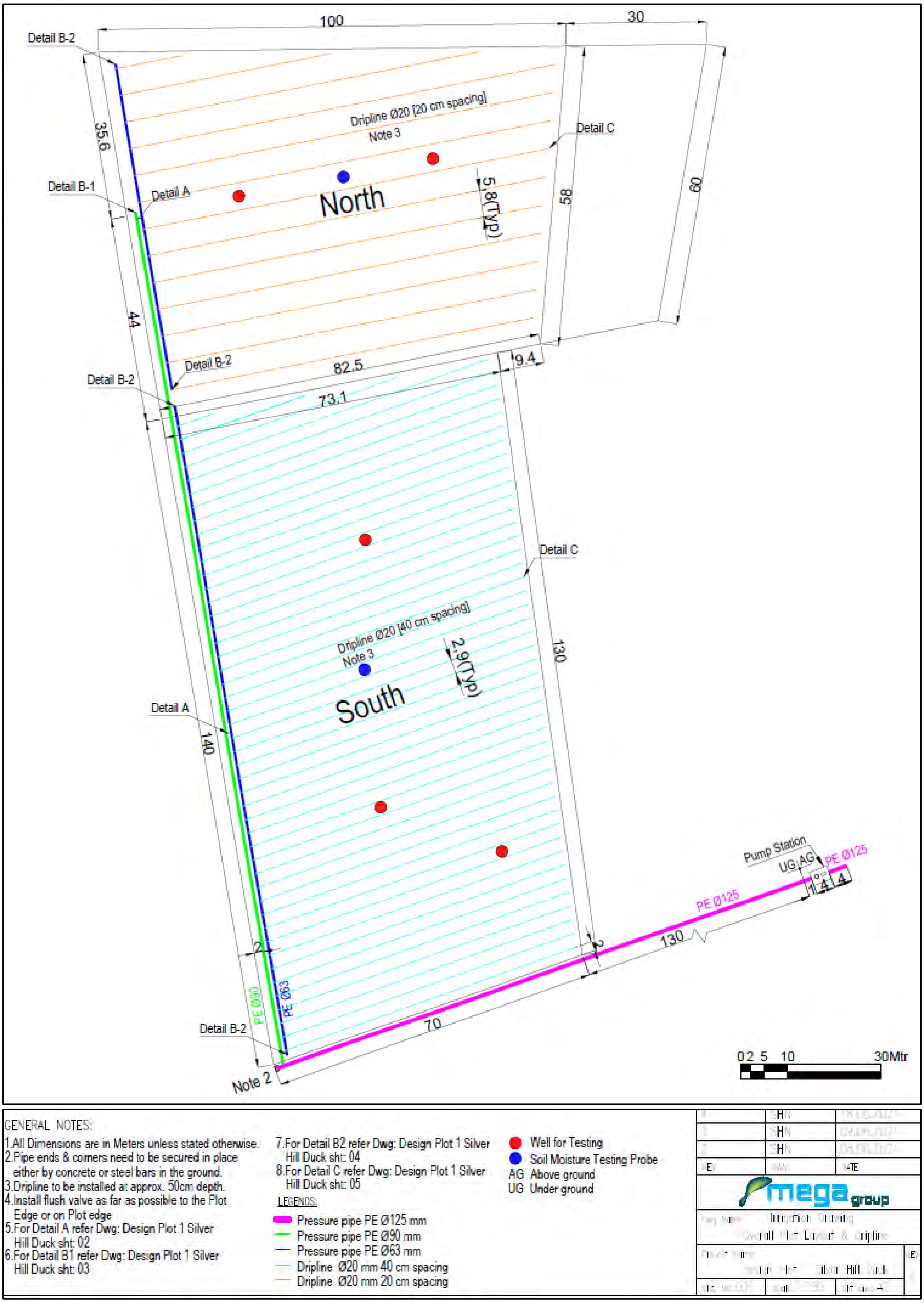

Figure 6-3: Moisture probe monitoring locations and drip Irrigation system pipeline layout.

7 Pilot Results

7.1 Source Characterisation

As identified in **Section 6** above the source in this instance is the treated effluent from the Waste Water Treatment Plant. As detailed above the onsite WWTP has a number of treatment stages prior to discharging to the unnamed stream onsite.

A summary of average annual concentrations of the WWTP effluent (W1 compliance monitoring point as per the sites existing IED licence P0422) are presented below for 2020, 2021 and for January - May 2022. The results are screened against the sites emission limit value, the surface water regulations and EQS for surface water as presented in the *EPA (2003) Interim Report Towards Setting Guidelines for the protection of Groundwater in Ireland.*

Table 7-1: WWTP Effluent Annual Average Results

Parameter	COD	Total Ammonia	Total Nitrate	Total Nitrogen	Suspended Solids	pH	Total Phosphorus	Orthophosphate	Temp	BOD	FOG	Flow Rate	Total Flow
Units	**Daily mg/l**	**Daily mg/l**	**Daily mg/l**		**Daily mg/l**	**Daily mg/l**	**Weekly mg/l**	**Weekly/ mg/l**	**Daily / °C**	**Weekly mg/l**	**Yearly mg/l**	**m3/hr**	**m3/day**
Licence Limits	**100**	**0.8**	**-**	**15**	**15**	**6-9**	**2**	**0.5**	**25°C**	**10**	**5**	**20**	**480**
Surface Water Regs		0.04 -0.140				6-9				1.3 – 2.6			
EQS for Surface Water		0.02	50										
2020 Yearly Averages	28	0.05	1.12	-	6.80	7.22	0.50	-	12.81	4	-	8.26	244
2021 Yearly Averages	29	0.05	2.54	5.83	6.97	7.26	0.39	0.31	12.47	3	2	8.71	206
2022 Averages (Jan to May)	24	0.11	-	8.59	6.74	7.58	0.32	0.21	10.67	4	2	5.64	124

The effluent concentrations are continually well below the sites IED licence limits and also below the surface water regs with the exception of total ammonia which marginally exceeds high status limits but is below good status limits.
There is an increase in Total Ammonia and Total Nitrogen in 2022, this is due to bird flu affecting Silver Hill late in 2021 and as a result production numbers have dropped off significantly leading to less dilution from wash water in the processing plant. The values for Total Ammonia and Total Nitrogen are still comfortably within the licence limits and production will be gradually increasing over the summer months and return to normal levels by September 2022.
The remainder of analyte concentrations are similar between 2020, 2021 and 2022 and provide certainty over the effluent concentrations to be dispersed via the drip irrigation system.

7.2 Pathway Assessment

7.2.1 Groundwater Monitoring Well Results

The groundwater monitoring results for MGW1D and MGW1S are presented below in **Table 7-2.** The results are also graphed as presented in **Figure 1-1Figure 7-1** and **Figure 7-2** below.

Table 7-2 Groundwater Monitoring Well Results

		pH	Conductivity	COD	Nitrate	Total Ammonia	Total Nitrogen	Total Phosphorus	Ortho - phosphate	Faecal Coliforms	Total Coliforms
	GTVs	6-9	1875		37.5	0.04 -0.140		0.035	0.035		
	IGVs	6.5-9.5	1000		25	0.15		0.03	0.03	0	0
Date	Sample ID	-	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/l	mg/L	count per 100ml	count per 100ml
30/06/2021	MGW1D	7.1	773	14	<0.50	**1**	0.9	<0.01	<0.01	**25.3**	**33.2**
15/07/2021	MGW1D	7.1	771	17	<0.50	**2.03**	1	<0.01	<0.01	**56.5**	**69.6**
03/08/2021	MGW1D	7.2	783	16	<0.50	**2.1**	1.2	0.03	0.02	**21.3**	**39.9**
08/09/2021	MGW1D	7.0	839	7	<0.50	**2.82**	2.8	0.02	0.03	**6.3**	**17.1**
14/10/2021	MGW1D	7.1	788	6	<0.50	**1.38**	0.5	<0.12	0.01		
18/11/2021	MGW1D	7.0	855	6	0.4	**0.209**	0.1	0.012	0.10		
17/12/2021	MGW1D	7.1	772	15	<2.2	**1.75**	1	0.02	0.01		
19/01/2022	MGW1D	7.1	742	8	<0.5	**1.63**	<0.5	0.02	0.01	0	0
07/02/2022	MGW1D	7.1	789	7	<0.50	**1.48**	0.6	0.02	0.01	0	**8**
22/03/2022	MGW1D	7.1	819	9	<0.50	**1.53**	<0.5	0.02	0.01	0	0
19/04/2022	MGW1D	7.3	773	<1	<0.50	**1.5**	<0.5	0.02	0.01	0	0
03/05/2022	MGW1D	7.1	806	11	<0.50	**1.53**	<0.5	0.02	0.01	0	0
17/12/2021	MGW1s	6.9	819	24	<2.2	**11.85**	4.8	**0.04**	0.02		
19/01/2022	MGW1s	6.9	762	13	<0.5	**10.29**	3.17	0.07	<0.01		
07/02/2022	MGW1s	6.9	801	20	<0.50	**<0.01**	3.2	**0.04**	<0.01	0	**1**
22/03/2022	MGW1s	6.9	835	30	<2.2	**4.18**	1.6	**0.19**	<0.01	0	**4**
19/04/2022	MGW1s	6.8	806	36	3.1	**2.39**	2.1	0.03	0.01	0	**5.3**
03/05/2022	MGW1s	6.9	856	34	0.5	**1.4**	2.2	0.04	0.01	0	0

GTVs: Groundwater Threshold Values as presented within the Groundwater Regs 2010, 2016, 2019.
GTVs Italics: Value for receiving river water body, range <0.040 - <0.090 for high quality, 0.065<0.140 for good quality.
GTV nitrate value: Assessment of the general quality of groundwater in a groundwater body in terms of whether its ability to support human uses has been significantly impaired by pollution.
GTV used for Orthophosphate is for Molybdate Reactive Phosphorous (MRP)
IGVs: Interim Guideline Values as presented by the *EPA (2003) Interim Report Towards Setting Guidelines for the protection of Groundwater in Ireland.*
*Exceedances are highlighted in **bold**.*

Total ammonia concentrations exceed the GTVs and IGVs in both the deep and shallow well however an increase with the commencement of the drip irrigation system on the 3rd August 2021 is not seen and concentrations generally follow a decreasing trend. The elevated ammonia concentrations may be reflective of background concentrations within the perched water and groundwater. The scheduled ending of effluent discharge to the unnamed stream in March 2023 and additional attenuation of the effluent through soils available via the drip irrigation system would likely aid in concentrations continuing to decrease. The WWTP upgrade in 2021 of the addition of a sludge press also removes the requirement for land spreading and would again aid in the reduction of background concentrations.

The total ammonia concentrations at MGW1s are noted to be high in December and January, this is likely as a result of the well going dry during purging and a grab sample only being collected. It is also noted that land was used for livestock prior to the commencement of the pilot and fertiliser application / manure at surface may impact perched water within the pilot field, the decrease in concentrations as the pilot progress's would support this interpretation of the results.

Data prior to December is not available for the perched water well MGW1S as it was not an original sampling point required by the IED licence but added to supplement data.

The groundwater analytical sampling results are graphed below in **Figure 7-1** and **Figure 7-2** below.

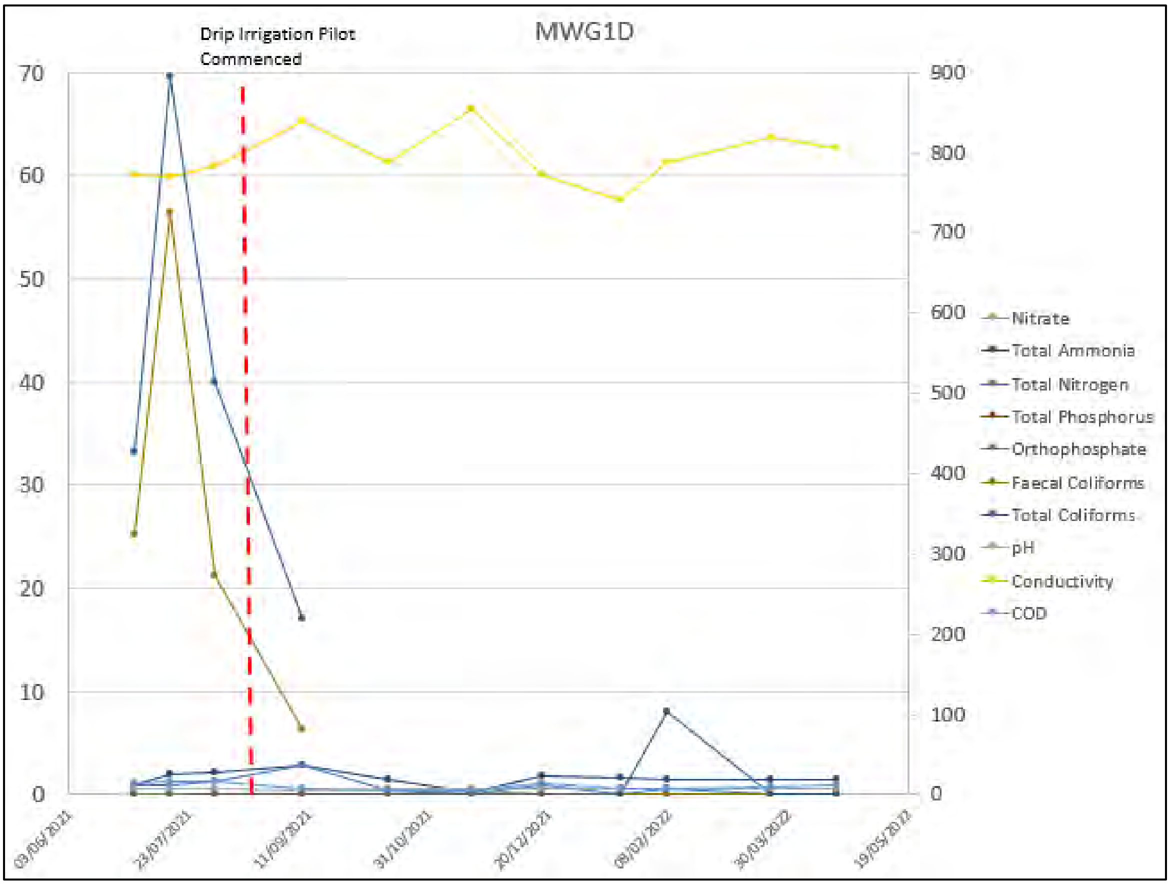

Figure 7-1: Groundwater Analytical Sampling Results MGW1D

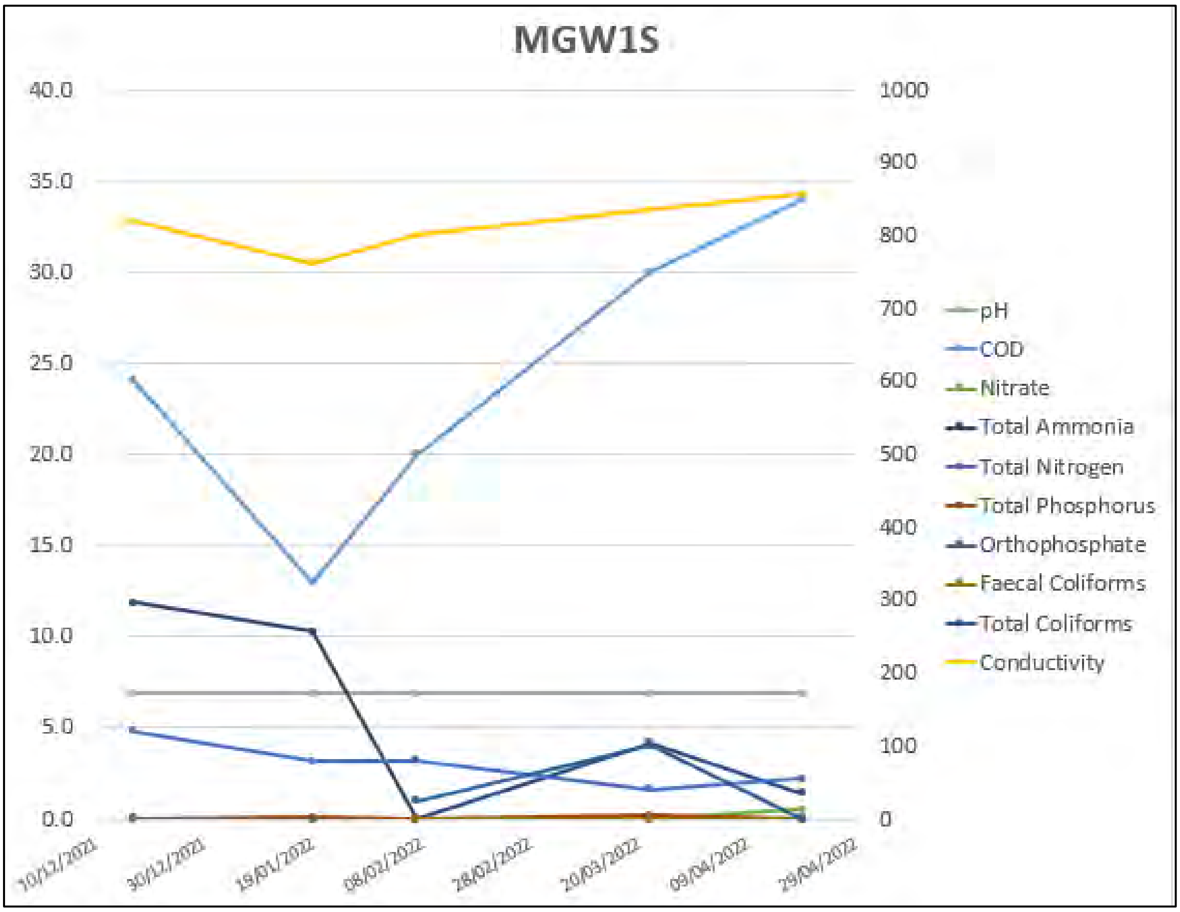

Figure 7-2: Groundwater Analytical Sampling Results MGW1S

7.2.2 Barometric Data Logger Results

The results of the barometric data loggers installed within MGW1s and MGW1D are presented below in **Table 7-3** and **Figure 7-3.** Manual gauging data was also collected to cross check and calibrate level loggers and is presented in **Table 7-3** below.

Table 7-3: Groundwater Manual Gauging Data

Date	Time	Well	Depth to Water (mbgl)	Depth to Base (mbgl)
27/08/2021	13:30	MGW1D	7.83	30.0
16/12/2021	10:30	MGW1D	6.65	30.0
13/01/2022	16;25	MGW1D	6.30	30.0
10/03/2022	11:50	MGW1D	5.70	30.1
10/05/2022	11:30	MGW1D	6.83	29.92
27/08/2021	13:30	MGW1S	2.72	5.14
16/12/2021	11:30	MGW1S	2.40	5.15
13/01/2022	16:00	MGW1S	2.39	5.20
10/03/2022	11:30	MGW1S	2.25	5.20
10/05/2022	12:15	MGW1S	2.32	5.25

Notes: mbgl: metres below ground level

The graphs show groundwater levels within the wells versus the volume of effluent discharged via the drip irrigation system versus met Eireann rainfall data collected from Emyvale weather station. Groundwater levels are presented as cm below ground level to be comparable with rainfall levels reported in cm. The volume of discharge is presented as m^3 on the secondary axis.

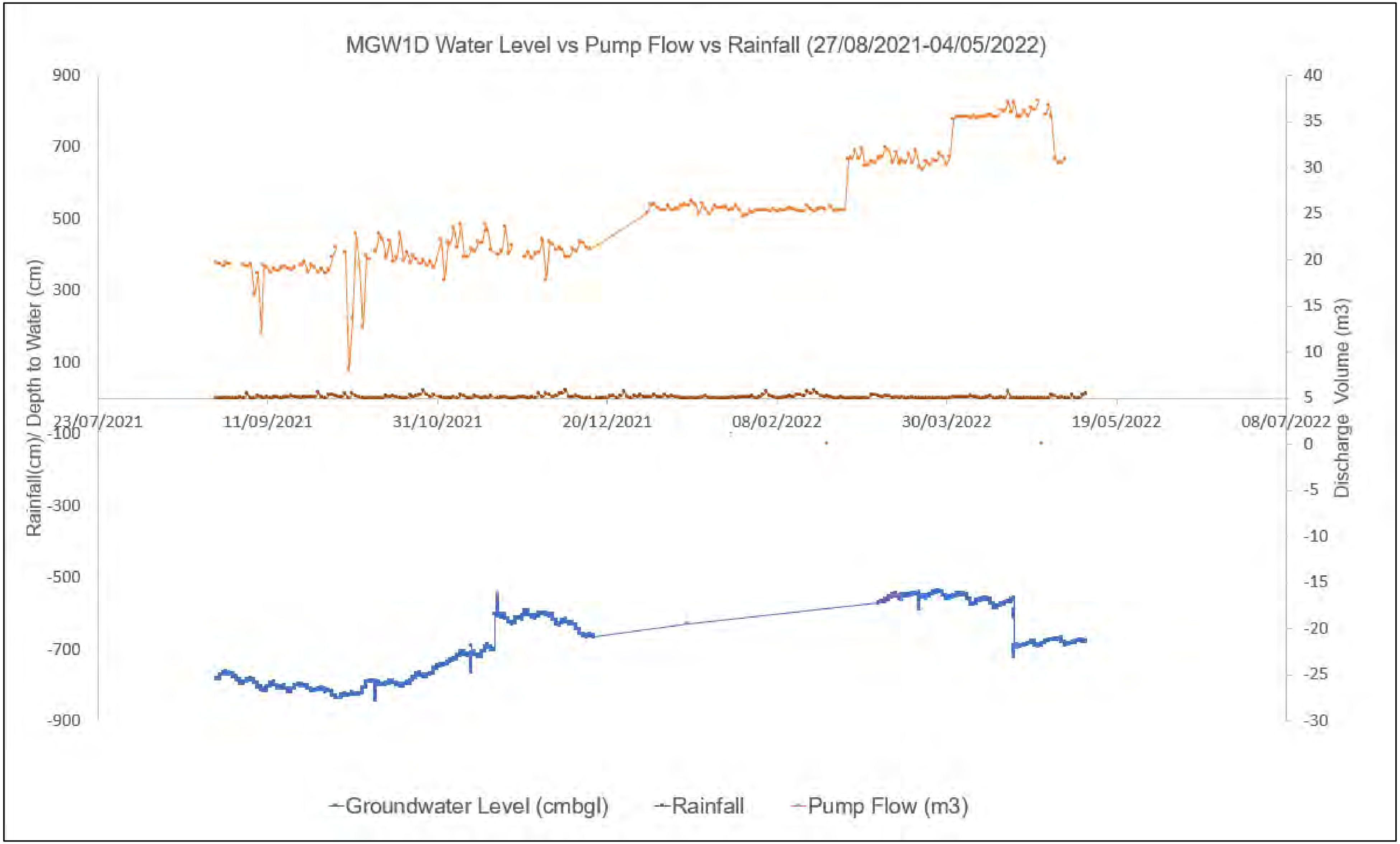

Figure 7-3: MGW1D Barometric Logger Data

*An error in data download file for the period from 12th December 2021 to 10th March ment logger data is not available for this period. Manual gauging data for the 13th January 2022 was used instead to supplement data. The January level was between December and March levels as presented in **Table 7.3** above*

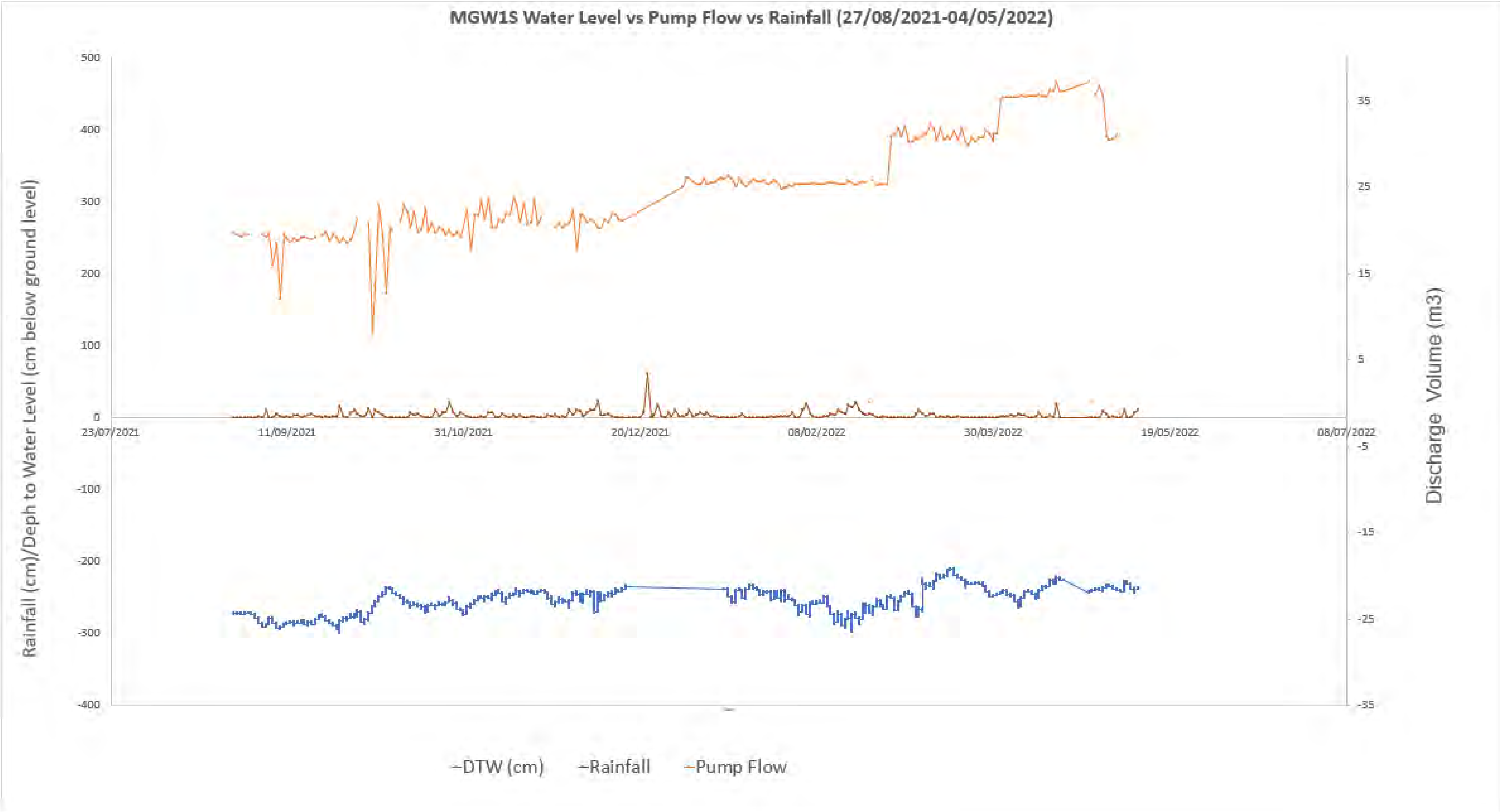

Figure 7-4: MGW1S barometric logger data

MGW1D

It can be seen that the groundwater level within the deeper well does not react rapidly to rainfall, or the volume of treated effluent discharged via the drip irrigation as it remains at quite a constant level. This is likely due to the depth to the groundwater of approximately 24m below ground level (mbgl) (as encountered during the installation of MGW1

The lack of 'reactivity' of the groundwater supports the theory that there is a large amount of overburden present above the groundwater which would allow dispersed effluent time to attenuate before reaching the bedrock aquifer. This is supported by the groundwater sampling results which do not show any increase of concentrations of chemicals of potential concern after the commencement of the pilot project.

MGW1S

The perched water is noted to slightly mimic the discharge volume of effluent dispersed with perched water levels increasing slightly after increased volumes of effluent are discharged, there appears to be a slight lag of one day to two days. With no great change in the perched water levels (remaining between 2.7 – 2.2mbgl) and no evidence of ponding of effluent at the surface the water appears to move through the top 5m of soils within a day to two. The surface water results which show no increase in concentrations of chemical of potential concern support the theory that water is moving vertically down through soils and surface water runoff is not the predominant pathway.

7.2.3 Drip Irrigation Monitoring System

Soil Moisture Probe Results

A monthly review of the soil moisture probe data is presented in **Appendix G**. In summary the moisture probes showed continual movement of effluent vertically down through the subsurface and ponding was observed on 4 days only. An average application rate of 2mm/hour was achieved without adverse impacts on the pilot field.

7.2.4 Daily Visual Inspections

A visual inspection of the drip irrigation lands was completed daily (as per condition 6.22.3 of the site current IE licence P0422-03). If ponding was evident in an area, discharge to the area is ceased. The daily log sheet and photolog is presented within **Appendix F**. Ponding was observed on 4 days only and the discharge to these areas stopped until ponding was no longer present, ponding dispersed within 24 hours.

7.3 Receptor Assessment

7.3.1 Surface Water Sampling Results

The surface water monitoring results for point MP1, MP2, MP3 and MP4 from April 2021 to May 2022 are presented below in **Table 7-4**. The results have been graphed for each location which is presented below in **Figure 7-5** to **Figure 7-8** below. The drip irrigation pilot commenced on the 3rd August 2021, data for April, May June and July 2021 is considered baseline data while thereafter from August 2021 to May 2022 monthly data is considered representative of the pilot.

Table 7-4: Surface Water Sampling Results

		pH	Conductivity	COD	Suspended Solids	Ammonia (as N)	Ortho - Phosphate (as P)
	S.I. No.77 of 2019	6-9	1000	-	-	0.14	0.075
Date	**Sample ID**						
15/04/2021	**MP1**	8	**1354**	1	1	0.06	0.03
21/05/2021	**MP1**	8	**1451**	5	2	0.07	0.07
03/06/2021	**MP1**	7.6	**1220**	<2	10	0.13	**0.08**
29/07/2021	**MP1**	8	859	25	12	**1.7**	0.35
11/08/2021	**MP1**	7.7	**1558**	12	10	**1.1**	0.50
08/09/2021	**MP1**	9.1	**2830**	18	71	**2.9**	**0.76**
14/10/2021	**MP1**	7.8	376	10	2	0.05	0.01
11/11/2021	**MP1**	7.6	342	8	5	0.04	0.04
17/12/2021	**MP1**	7.7	367	12	23	0.09	0.03
19/01/2022	**MP1**	7.6	382	14	16	0.08	0.40
07/02/2022	**MP1**	7.6	493	18	5	0.04	0.02
22/03/2022	**MP1**	7.9	430	10	3	**0.39**	**0.43**
19/04/2022	**MP1**	7.9	515	9	6	**0.16**	**0.40**
03/05/2022	**MP1**	7.8	337	46	72	**0.17**	**0.16**
15/04/2021	***MP2****	7.8	**1468**	12	1	**0.45**	**2.27**
21/05/2021	***MP2****	7.7	**1647**	35	10	0.02	**0.32**
03/06/2021	***MP2****	7.9	**1765**	<2	33	**0.17**	**1.87**
29/07/2021	***MP2****	8	918	20	11	**1.8**	**0.85**
11/08/2021	***MP2****	7.8	966	15	8	**0.7**	**0.43**

08/09/2021	***MP2****	8	707	16	24	**0.8**	**0.47**
14/10/2021	***MP2****	8.3	982	16	13	**0.56**	**1.03**
11/11/2021	***MP2****	8.2	700	17	13	**0.75**	**1.64**
17/12/2021	***MP2****	7.9	772	14	12	**0.3**	**0.46**
19/01/2022	***MP2****	8.1	884	12	11	**0.8**	**0.87**
07/02/2022	***MP2****	7.9	745	13	9	0.13	**0.44**
22/03/2022	***MP2****	8	830	14	11	**0.32**	**0.4**
19/04/2022	***MP2****	8.2	684	11	10	**0.14**	**0.33**
03/05/2022	***MP2****	8.2	502	20	56	**0.16**	**0.16**
15/04/2021	**MP3**	7.9	**1176**	27	6	**0.25**	**0.2**
21/05/2021	**MP3**	8.2	**1244**	20	6	**0.33**	**0.1**
03/06/2021	**MP3**	8	**1161**	2	7	**0.1**	**0.08**
29/07/2021	**MP3**	8.1	**1061**	20	17	**0.93**	**2.12**
11/08/2021	**MP3**	7.8	**1123**	16	10	**0.5**	**0.55**
08/09/2021	**MP3**	7.9	**1287**	18	8	**0.35**	**0.47**
14/10/2021	**MP3**	7.9	**1163**	20	6	0.08	**1.14**
11/11/2021	**MP3**	7.8	**1025**	17	12	0.11	**0.37**
17/12/2021	**MP3**	7.7	**1134**	20	9	**0.16**	**0.18**
19/01/2022	**MP3**	7.7	988	16	8	**0.50**	**0.5**
07/02/2022	**MP3**	7.9	792	13	8	**0.29**	**0.7**
22/03/2022	**MP3**	8.2	815	12	7	**0.32**	**0.31**
19/04/2022	**MP3**	8.1	730	15	4	0.13	**0.12**
03/05/2022	**MP3**	8	429	22	60	**0.17**	**0.10**
15/04/2021	**MP4**	8	**1147**	5	2	0.07	0.10
21/05/2021	**MP4**	7.6	**1311**	17	1	**0.18**	0.09
03/06/2021	**MP4**	7.6	**1107**	<1	16	0.05	0.09
29/07/2021	**MP4**	7.6	**1238**	40	30	**1.46**	**2.76**
11/08/2021	**MP4**	7.6	**1220**	15	7	**0.98**	**0.74**
08/09/2021	**MP4**	7.5	**1247**	23	4	**1.67**	**1.48**
14/10/2021	**MP4**	7.4	**1019**	15	2	**1.17**	**1.83**
11/11/2021	**MP4**	7.4	797	36	4	**1.32**	**1.48**
17/12/2021	**MP4**	7.3	773	28	3	**0.72**	**1.17**
19/01/2022	**MP4**	7.3	800	19	12	**0.55**	**0.66**
07/02/2022	**MP4**	7.4	550	37	11	**0.16**	**1.35**
22/03/2022	**MP4**	7.4	978	26	10	**0.36**	**0.77**
19/04/2022	**MP4**	7.4	556	37	6	**0.21**	**1.64**
03/05/2022	**MP4**	7.4	597	30	6	**0.3**	**1.47**

MP2*: *sampling point not considered representative; data include for completeness only.*

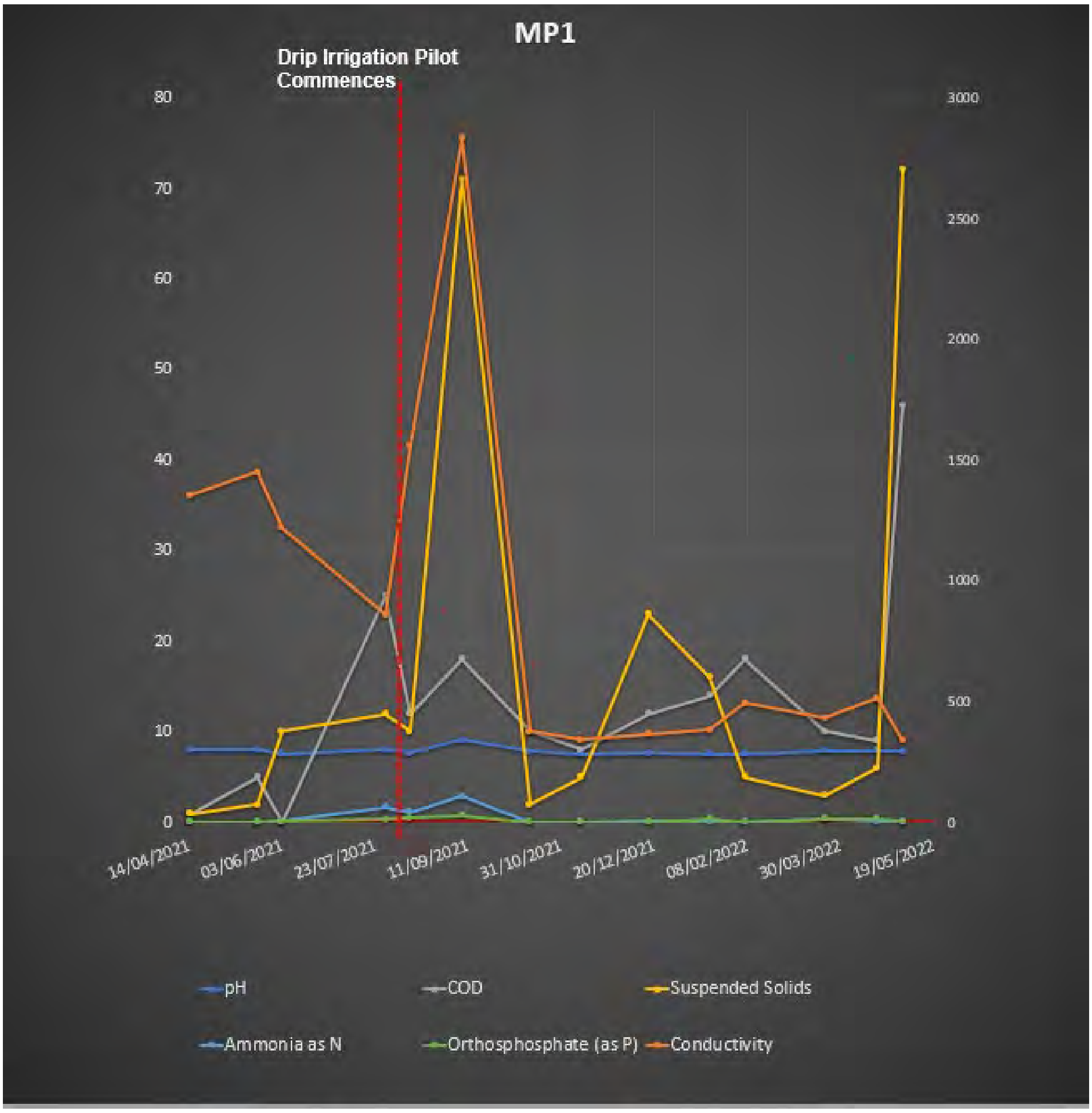

Figure 7-5: Surface water monitoring results graph for point MP1

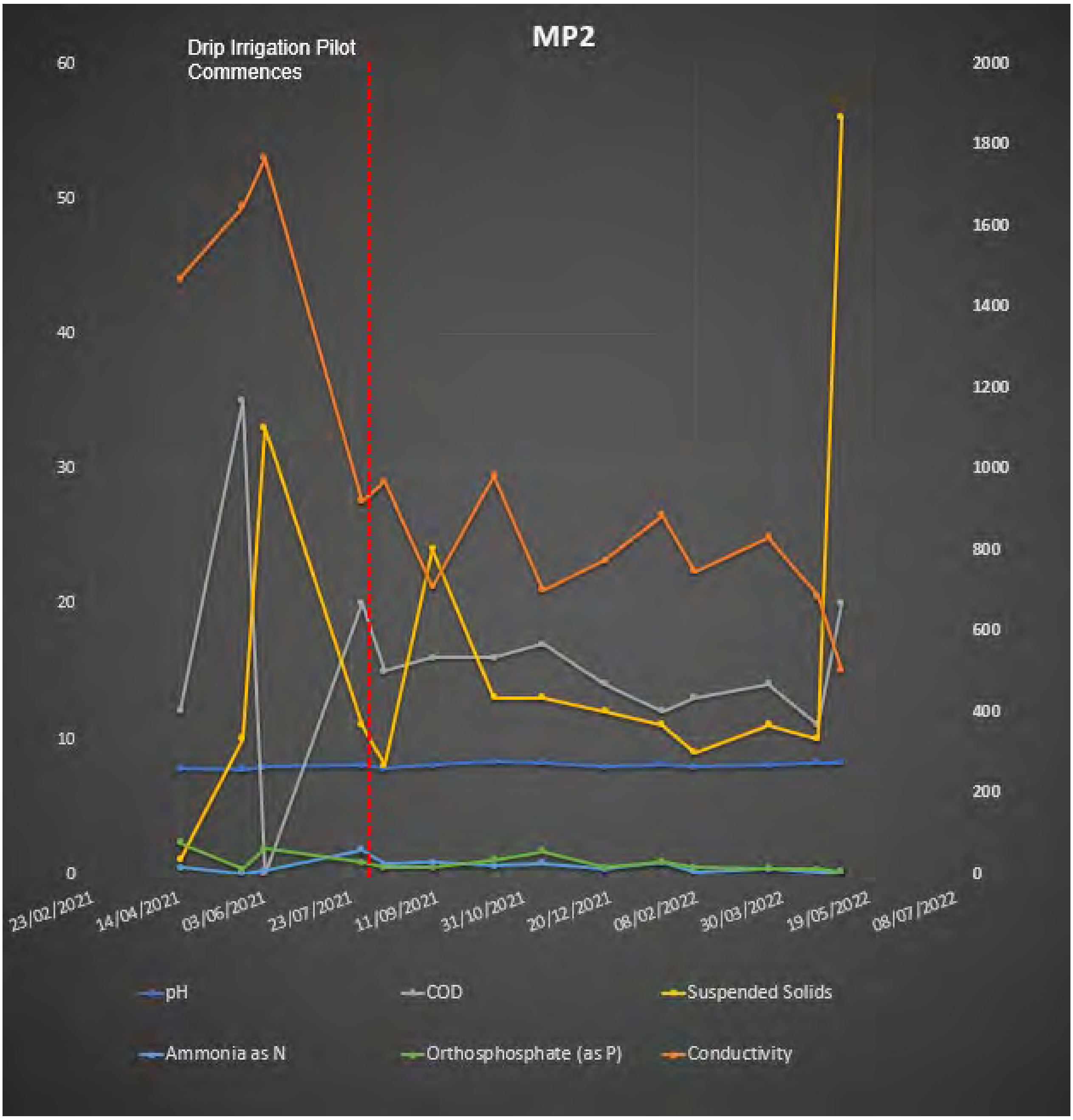

Figure 7-6: Surface water monitoring results graph for point MP2

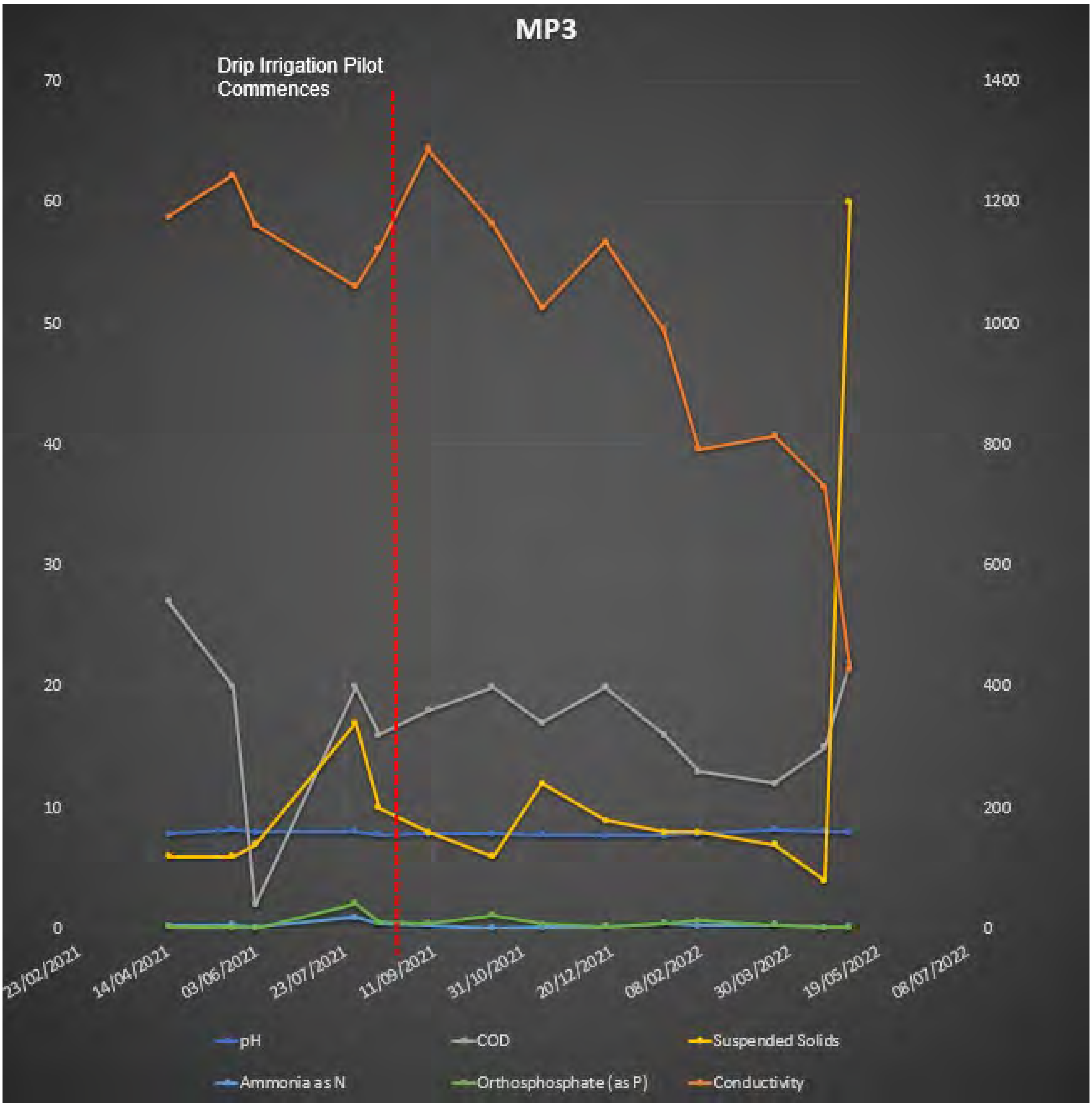

Figure 7-7: Surface water monitoring results graph for point MP3

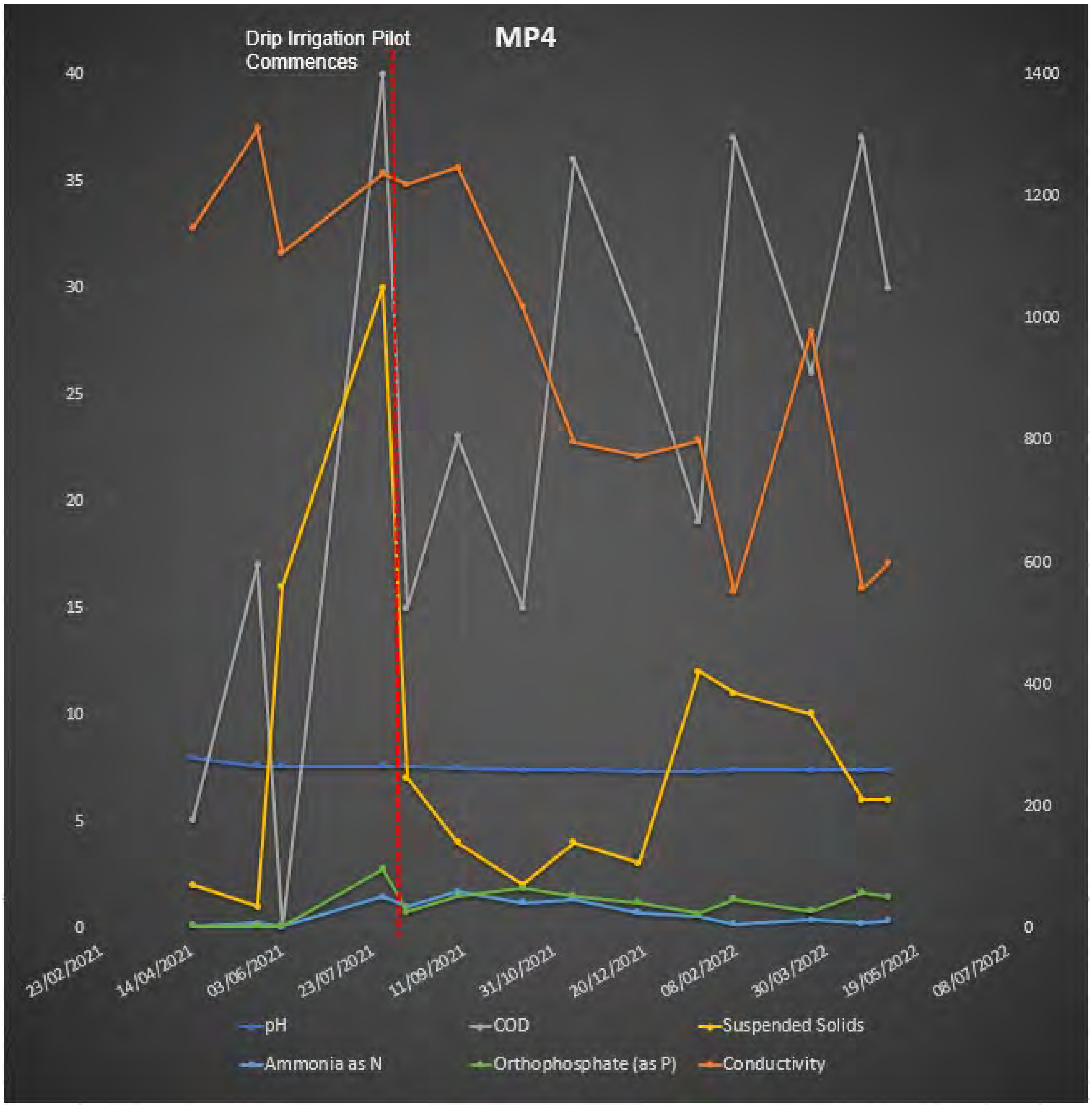

Figure 7-8: Surface water monitoring results graph for point MP4

The data at all surface water monitoring locations can be seen to bounce around quite a bit in particular suspended solids, conductivity and COD. Suspended solids reported increased levels in the May sampling event, it was observed that heavy rainfall had occurred prior to sampling. Ammonia as N, Orthophosphate and pH are more consistent, and a dramatic increase cannot be seen after the commencement of the pilot. Average concentrations of total ammonia and orthophosphate within the treated effluent ranged from 0.05mg/l in 2020 and 2021 and – 0.11mg/l 2022 (Jan – May), a lack of sharp increases would suggest run-off from the pilot field into surface waters did not occur during the pilot.

Ammonia and orthophosphate concentrations are noted to be slightly higher at MP4 compared to MP1, MP2 and MP3 before and after the commencement of the drip irrigation system. MP4 is offsite within a stream running along the base of a valley with agricultural lands on hillsides either side. Fertiliser and / or slurry spreading on these lands maybe increasing ammonia and phosphate concentrations at this location. The direction of surface water flow to the north east from the site, and the lower concentrations at cross and downgradient locations MP1, MP2, and MP3 compared to MP4 indicate that the drip irrigation system and/or the site is not source of these higher ammonia and orthophosphate concentrations at MP4.

7.3.2 Groundwater Aquifer (Onsite Abstraction Wells)

There are 3 groundwater abstraction wells in the vicinity of the site which supply water for the licenced activities, AGW1, AGW2 and AGW3. The locations are shown in **Figure 6-2.** AGW2 is currently not in use and the site usage from remaining two wells water is approximately 1,500 – 2,300m^3/week based on a 5 day operating week. The pumping of the abstraction bores will affect natural groundwater levels within the aquifer and direct groundwater flow towards the wells. Sampling of the abstraction wells is required quarterly by the sites current IED licence. Additional samples were collected as part of the drip irrigation pilot to assess impacts if any on the groundwater aquifer. Results are presented within **Table 7-5** below.

Table 7-5: Groundwater Abstraction Well Results

		pH	Con ductivity	COD	Nitrate	Total Ammonia (as N)	Total Nitrogen	Total Phosphate	Ortho phosphate	Faecal Coliforms	Total Coliforms
	GTVs	6-9	1875		37.5	*0.04 - 0.140*		0.035	0.035		
	IGV's	6.5-9.5	1000		25	0.15		0.03	0.03	0	0
Date	Sample ID	-	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/l	mg/L	0 counts per 100ml	0 counts per 100ml
30/04/2021	AGW 1	7.0	648	15	0.20	**0.41**	0.40	**0.06**	**0.12**	0	0
31/05/2021	AGW 1	7.5	751	<1	<0.50	**1.05**	<0.50	<0.01	**0.05**	0	0
02/06/2021	AGW 1	7.5	758	<1	<0.50	**1.18**	0.60	<0.01	**0.08**	0	0
17/11/2021	AGW 1	7.2	694	11	2.2	**0.50**	0.60	0.01	<0.01	0	0
07/02/2022	AGW 1	7.5	809	3	<2.2	**1.01**	0.50	<0.01	<0.01	0	0
24/05/2022	AGW 1	7.5	864	25	<0.50	**0.95**	<0.50	0.01	<0.01	0	0
30/04/2021	AGW 3	6.7	552	4	0.20	**0.19**	0.60	**0.08**	**0.26**	0	0
31/05/2021	AGW 3	7.1	699	<1	<0.50	**0.23**	<0.50	<0.01	<0.01	0	0
02/06/2021	AGW 3	7.1	705	<1	<0.50	**0.21**	<0.5	<0.01	<0.01	0	0
17/11/2021	AGW 3	7.5	893	56	<2.2	**0.93**	0.9	0.01	0.01	0	0
07/02/2022	AGW 3	7.1	738	3	<2.2	**0.50**	<0.50	<0.01	<0.01	0	0
24/05/2022	AGW 3	7.2	784	15	<0.50	**0.55**	<0.50	<0.01	<0.01	0	0

GTVs: Groundwater Threshold Values as presented within the Groundwater Regs 2010, 2016, 2019.
GTVs Italics: Value for receiving river water body, range <0.040 - <0.090 for high quality, 0.065<0.140 for good quality.
GTV nitrate value: Assessment of the general quality of groundwater in a groundwater body in terms of whether its ability to support human uses has been significantly impaired by pollution.
GTV used for Orthophosphate is for Molybdate Reactive Phosphorous (MRP)
IGVs: Interim Guideline Values as presented by the *EPA (2003) Interim Report Towards Setting Guidelines for the protection of Groundwater in Ireland.*
*Exceedances are highlighted in **bold**.*

Total Ammonia concentrations are noted to be above the GTVs and IGVs at both AGW1 and AGW3 with concentrations slightly higher at AGW1. Total phosphate and orthophosphate marginally exceed the GTVs and IGVs on occasion but are predominately below both values. The remainder of parameters are well below the GTVs and IGVs where guideline values exist.

The groundwater quality of the Aughnacloy Groundwater Body was recorded as Good for the period 2013-2018 however more up to date data is currently not publicly available on the EPA mapping website (https://gis.epa.ie/EPAMaps/).

The results have also been graphed as presented in **Figure 7-9** and **Figure 7-10** below.

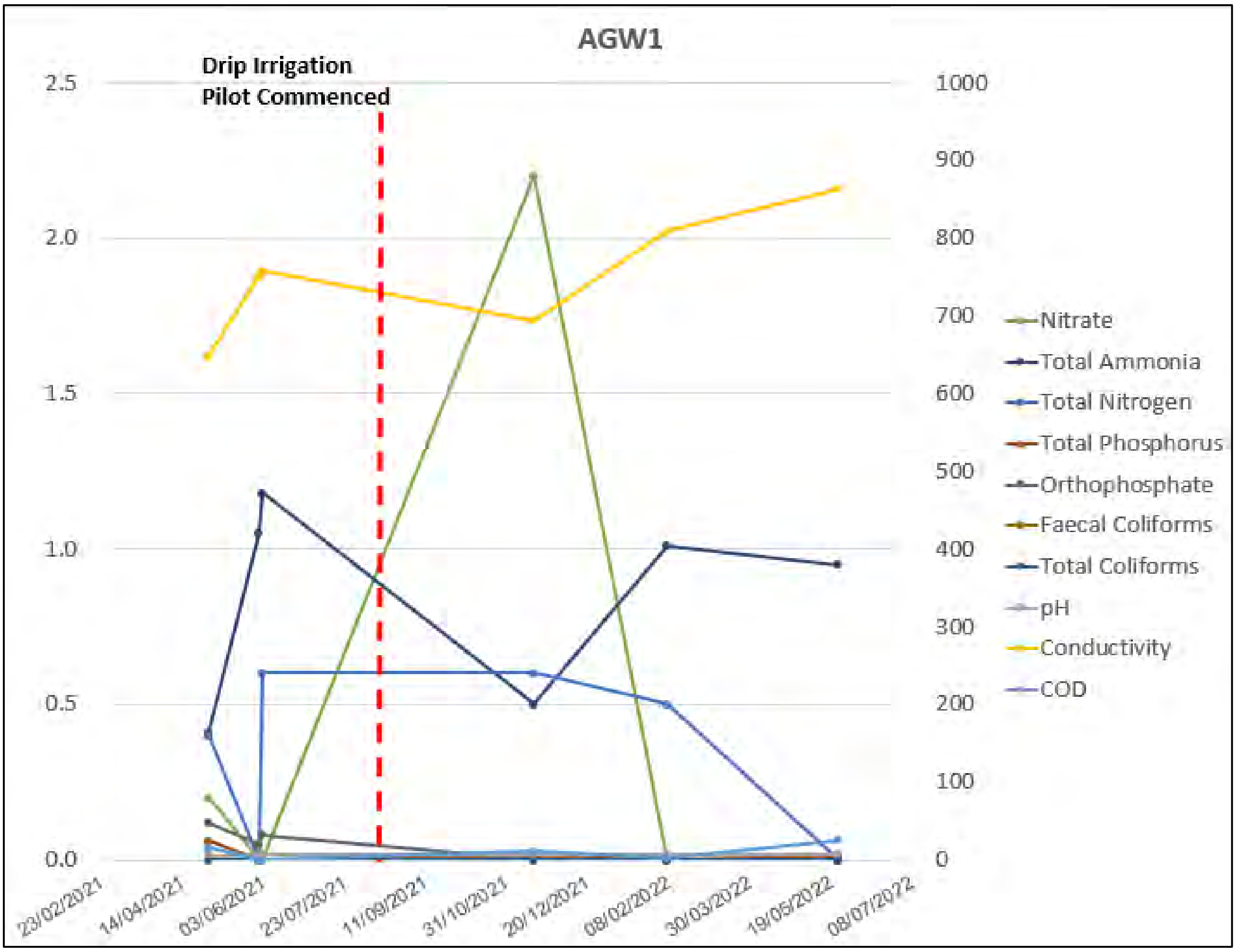

Table 2-1

Figure 7-9: Groundwater Results AGW1

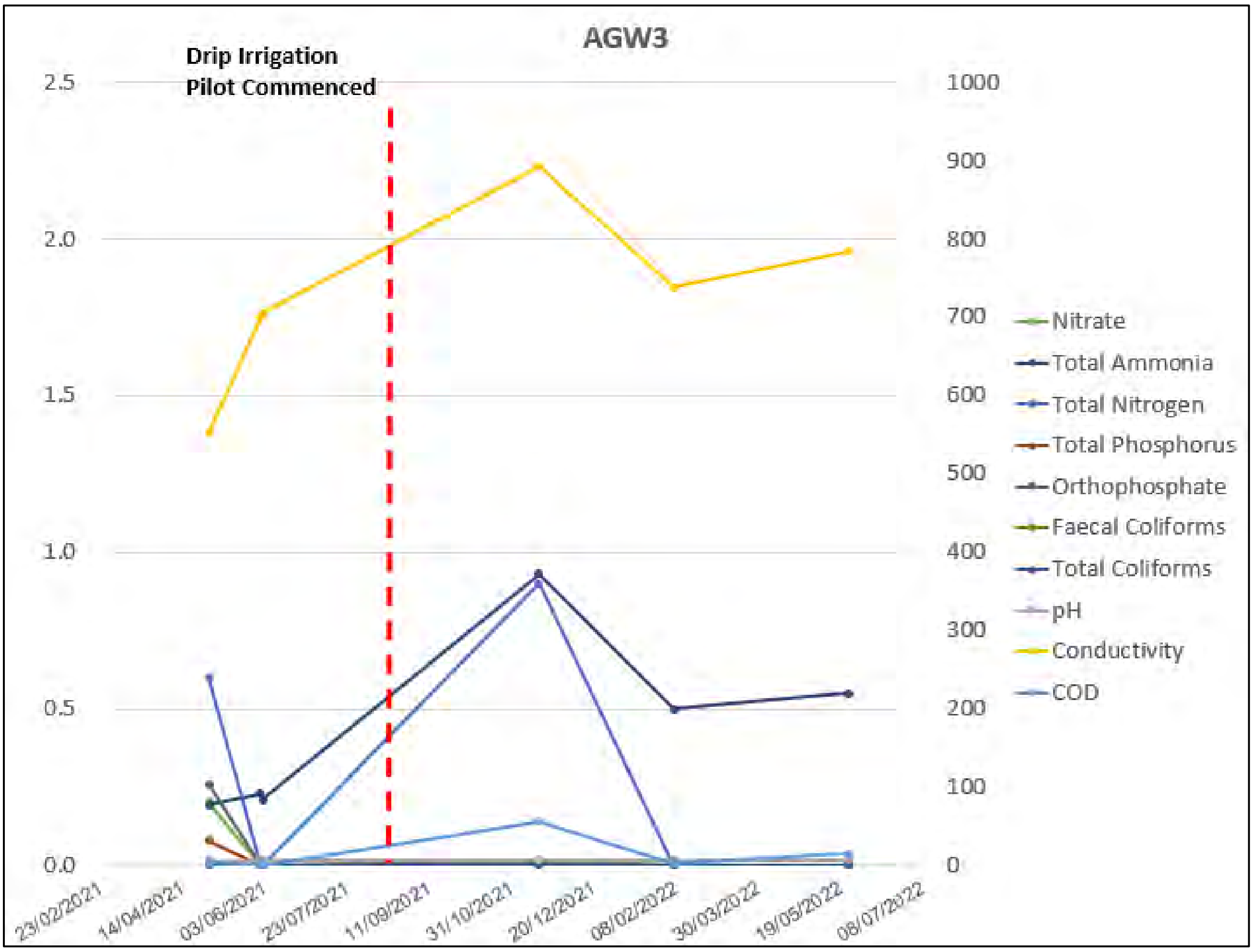

Figure 7-10: Groundwater Results AGW3

The groundwater sampling results at AGW1 and AGW3 are quite consistent throughout the sampling events with results remaining within the same order of magnitude for each of the parameters analysed.

From the graphs no sharp increase after the commencement of the pilot can be seen, this suggests it did not adversely affect the groundwater body over the period of the pilot.

The depth to the groundwater aquifer is believed to be 20-30mbgl with overburden consisting of silty clays and sandstone bedrock. As noted by the groundwater vulnerability mapping the site is primarily within an area of low vulnerability. The thickness of overburden and depth to groundwater would allow a large amount of time for water dispersed at near surface to attenuate through the substrate before reaching the groundwater aquifer body.

8 Discusion

Key findings of the pilot project can be summarised as follows;

- Groundwater data collected from MGW1S and MGW1D portray no sharp or continued increase in concentrations of COPCs with the commencement of the drip irrigation system.

- The moisture probe data shows vertical movement of the effluent down through the surface which is supported by the lack of ponding noted onsite by the daily logs and photographs.

- The surface water results do not show an increase after the commencement of the pilot which supports the moisture probe data in that surface run off of the effluent was not occurring once the effluent was dispersed.

- It is observed from the data collected from the barometric data logger within MGW1D that the groundwater levels do not react rapidly to rainfall, or the volume of treated effluent discharged via the drip irrigation system. Groundwater levels remain at quite a constant level regardless of rainfall or discharge volume from the system which on average was 2mm/hour. This is likely due to the depth to groundwater of approximately 24m below ground level and the time it takes for the treated effluent and rainfall to percolate down through the overburden soils and sandstone formation. This suggests that the discharge of treated effluent via the drip irrigation system at a rate of 2mm/hour would not have an adverse impact on groundwater levels.

- Groundwater data collected from the abstraction wells does not show an increase in concentrations of COPC's after the commencement of the pilot which supports the theory the overburden is attenuating COPC's.

- Higher concentration of COPCs within the perched water well MGW1s compared to groundwater monitoring well MGW1d and MGW1d compared to the deeper abstraction bores also supports the theory that downward attenuation of COPCs is occurring.

- Based on the findings and observations from the drip irrigation pilot monitoring as outlined above, it can be concluded that the system did not have an adverse impact on the environment surrounding the Silver Hill site during the pilot project.

9 Updated Conceptual Site Model

The basis for this risk assessment is the source-pathway-receptor (S-P-R) model which underpins all groundwater protection schemes in Ireland, as well as the EU Water Framework Directive on which both surface water and groundwater regulations are based. Within the S-P-R model, a source is assessed to determine pollution linkage to one or more receptors via pathways. S-P-R risk factors must be determined and quantified through a desk study and a field-based study, where possible.

Table 9-1: Updated Conceptual Site Model

Potential Sources of contamination	Potential Pathway(s)	Potential Receptor(s)	Pathway Complete	Evidence
WWTP Effluent discharged via the Drip Irrigation System	Vertical movement down through the soils.	Groundwater Aquifer – Aughnacloy Groundwater Body. Onsite abstraction wells within aquifer – AGW1, AGW2, AGW3 onsite. Offsite wells within aquifer within 1km radius.	Incomplete.	Concentrations of COPC's have not increased within the abstraction wells onsite (which are installed in the groundwater aquifer) since the commencement of the pilot. The geology of silty clays over sandstone and depth to the aquifer means there is approximately 20-30 metres of substrate for the treated effluent to percolate down before reaching the aquifer, this allows a large amount of time for COPCs to attenuate. Given that the onsite abstraction wells did not show impacts it not likely offsite wells would be impacted. The increase in COPCs concentration between the groundwater monitoring wells and deeper abstraction wells also supports that downward attenuation is occurring.
	Lateral movement through the soils.	Surface water features - Unnamed stream into which the WWTP discharges to, the Corlattallan Stream / Knockakirwan into which the unnamed stream flows into and the River Blackwater River Ulster further downstream.	Incomplete	Concentrations of COPCs have not increased in surface water sampling points since the commencement of the drip irrigation pilot. Moisture probe data supported that downward movement of the effluent was occurring continuously.
	Surface ponding and subsequent surface run off.	Surface water features - Unnamed stream and Corlattallan Stream with Blackwater River and Ulster River further downstream	Incomplete	Concentrations of COPCs have not increased in surface water sampling point since the commencement of the drip irrigation pilot. The visual daily records did not report frequent water logging which is supported by the moisture probe data which showed downward movement of the dispersed effluent.

No complete source – pathway – receptor linkages have been identified during the drip irrigtaion pilot.

10 Conclusions

With regard to the project objective to meet the requirements of Condition 6.23.1 within the sites current P0422-03 industrial emissions licence the report has assessed and met the objectives as follows:

Objective I of the Drip Irrigation Pilot for the P0422-03 licence*:*

"Evaluation of the suitability of upgradient and downgradient monitoring points and where necessary installation of new monitoring points to assess cumulative impacts."

Objective I Deliverable:

Surface and groundwater monitoring points were assessed for suitability and additional groundwater monitoring well MGW1 installed. Moisture monitoring probes MMP1 and MMP2 were also installed. Surface water sampling points MP1, MP3 and MP4 were deemed appropriate to assess cumulative impacts as discussed in detail in **Section 6**. As previously discussed with the EPA MP2 was not deemed appropriate however results have been included in this report for completeness.

Objective II of the Drip Irrigation Pilot for the P0422-03 licence:

"Review the conceptual site model to provide a more detailed representation of conditions at the site, including the gleyed areas and the perched water tables in the subsoil."

Objective II Deliverable:

The following three sources of data provides assessment of effect of the drip irrigation system on the pilot field and gleyed areas and perched water table:

- The site CSM was reviewed and MGW1S was installed to assess perched water concentrations. A groundwater level data logger was installed within MGW1S to assess the effect of the discharge effluent on perched groundwater levels. As presented and discussed in **Section 7.2** no effect was observed during the pilot.
- Moisture probes were also installed as part of the drip irrigation monitoring system and data assessed as presented in **Section 7.2**. The moisture probes continually reported downward movement of the effluent dispersed via the drip irrigation system.
- A visual inspection of pilot field for waterlogged conditions was completed daily (with photographs as presented within **Appendix F**) and ponding was observed on 4 days only. Discharge to these areas was ceased and ponding was observed to dissipate within 24hours.

Objective III of the Drip Irrigation Pilot for the P0422-03 licence:

"Determine compliance of proposed drip irrigation system with the European Communities Environmental Objectives (Groundwater) Regulations 2010 (SI. No 9 of 2010) as amended and the European Communities Environmental Objectives (Surface Water) Regulations 2009 (SI. No. 272 of 2009)."

Objective III Deliverable:

Groundwater and Surface Water monitoring results were compared against the Groundwater and Surface Water regulations as presented and discussed in **Section 7.3**. No sharp or continuous increase in ground or surface water concentrations was observed with the commencement of the drip irrigation pilot.

Objective IV of the Drip Irrigation Pilot for the P0422-03 licence:

"Demonstrate that the drip irrigation lands can percolate 900mm/yr of effective rainfall (treated effluent added to actual annual rainfall)."

Objective IV Deliverable:

The moisture probe data and lack of ponding observed throughout the pilot is evidence that the drip percolation lands can percolate at a rate of 900mm/yr.

Objective V of the Drip Irrigation Pilot for the P0422-03 licence:

"Incorporate previous assessments carried out including hydrogeological assessments, site investigations, and baseline report information."

Objective V Deliverable:

A summary of previous assessments is presented within **Section 3** of this report and information incorporated throughout the report as referenced.

The SI No.113 of 2022 European Union Regulations on Good Agricultural Practices for the Protection of Water) has also been considered. A Nutrient Management Plan specific to the drip irrigation pilot project was also prepared for the project and is presented within **Appendix A.**

No complete source – pathway receptor linkages were identified during the pilot which indicates drip irrigation is a suitable alternative to discharging effluent to the unnamed stream onsite.

In summary Silver Hill Foods have met all objectives that were laid out by the EPA for the Drip Irrigation Pilot.

11 References

No.	Reference
1.	EPA (2011) Guidance on the Authorisations of Discharges to Groundwater
2.	EPA, 2012. 'Guidance on the Management of Contaminated Land and Groundwater at EPA Licensed Sites'.
3.	Environmental Agency, 2004 'Model Procedures for the Management of Land Contamination, Contaminated Land Report 11.
4.	S.I. No. 336/2016 European Union Environmental Objectives (Groundwater) (Amendment) Regulations 2016.
5.	S.I. No.77/2019 European Union Objectives Surface Waters (Amendment) Regulations 2019.
6.	Interim Guideline Values as presented by the EPA (2003) Interim Report Towards Setting Guidelines for the protection of Groundwater in Ireland.
7.	Google Maps and Google Earth – Accessed February 2021
8.	Geological Survey of Ireland Databases (www.gsi.ie) – Accessed June 2022.
9.	Environmental Protection Agency Databases (www.epa.ie) – Accessed June 2022.
10.	National Parks and Wildlife Services Databases (www.npws.ie) – Accessed June 2022.
11.	Radiological Protection Institute of Ireland Radon Database (www.rpii.ie) – Accessed June 2022.
12.	Office of Public Works – Flood Maps (http://www.floodinfo.ie) and Catchment Flood Risk Assessment and Management (CFRAM) (www.cfram.ie) – Accessed June 2022.

Appendix A: Nutrient Management Plan

Rowan

Pilot Drip Irrigation NMP 2021



Client: Silver Hill Foods

Project Reference:6446/SIL0002-5

Date: August 2021

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Sign Off Record

REVISION	DATE	ORIGNATOR	REVIEWER
DRAFT TO CLIENT	10/08/2021	ID	CF
Revision 1	16/08/2021	ID	CF
REPORT ID: 6446/SIL0002-5			

Contents

1. Introduction

Rowan Engineering Consultants Ltd (Rowan) were requested to provide a Nutrient Management Plan (NMP) including an Aquifer Vulnerability Assessment and associated mapping in support of Silver Hill Foods Drip Irrigation Pilot study. The following landbanks were mapped and aquifer vulnerability was assessed.

Landbank Townlands
• Corlattallan, Co. Monaghan

2. Nutrient Management Plan (NMP)

2.1 Summary

This NMP 2021 was prepared to promote the efficient use of nutrients being applied to the soil without causing any adverse environmental impact and also to promote an optimum soil mineral balance in order to optimise crop production efficiency in terms of yield and output. The application of the Silver Hill Foods final effluent on to the land through drip irrigation directly substitutes for chemical fertiliser. The NMP was prepared in compliance with the S.I. No. 605 of 2017 - European Communities (Good Agricultural Practice for Protection of Waters) Regulations 2017.

2.2 On-Farm Slurry

The table below outlines the expected stocking rate that will be applied to each farm and the total nitrogen and phosphorus produced by the livestock.

Table 1. Livestock stocking rates

Livestock Type	No. of Animals	% Time of landbank	Total Nitrogan	Total Phosphorus	On Farm Nitrogen (kg/per annum)	On Farm Phosphrous (kg/per annum)
Lowand Hogget	20	60%	6	1	72	12

2.3 Regulations

This Nutrient Management Plan (NMP) has been prepared to comply with the European Communities (Good Agricultural Practice for Protection of Waters) Regulations 2017 (S.I. No. 605 of 2017). The following

(5) Subject to sub-article (6), soiled water shall not be applied to land—

(a) in quantities which exceed in any period of 42 days a total quantity of 50,000 litres per hectare, or

(b) by irrigation at a rate exceeding 5 mm per hour.

(6) In an area which is identified on maps compiled by the Geological Survey of Ireland as "Extreme Vulnerability Areas on Karst Limestone Aquifers", soiled water shall not be applied to land—

(a) in quantities which exceed in any period of 42 days a total quantity of 25,000 litres per hectare, or

(b) by irrigation at a rate exceeding 3 mm per hour unless the land has a consistent minimum thickness of 1m of soil and subsoil combined.

3. Aquifer Vulnerability Assessment

3.1 Introduction

As part of drafting the Drip Irrigation Pilot study NMP, Rowan undertook an aquifer vulnerability assessment on the proposed landbank. The selected landbank has also previously been approved for landspreading. In conclusion this report concluded that landspreading of organic wastes on the land surface here is: 'R1-Acceptable subject to normal good practice'.

3.2 Methodology

This NMP has been prepared by Ian Douglas BSc, MSc of Rowan Engineering Consultants Ltd in accordance with:

- *S.I. No. 605 of 2017– 'European Communities (Good Agricultural Practice for Protection of Waters) Regulations 2017'.*
- *'Explanatory Handbook for Good Agricultural Practice for the Protection of Waters Regulations 2014'.*

The contents of this NMP have been updated to reflect the EPA circular issued on 6th January 2021 entitled "Changes to information required in Nutrient Management Plans submitted to the EPA".

The relevant landbank owner is aware of the information being provided within this NMP to the EPA and a copy of this NMP has been made available to all relevant landowners to view.

The study involved collecting all relevant data about the lands in question. Information about soils, subsoils, bedrock, groundwater information, aquifer categories and vulnerability data was taken from the Geological Survey of Ireland (GSI) website: www.gsi.ie. From this information an assessment was made regarding the sites subsoil's geology and the hydrogeology and their suitability for landspreading in terms of groundwater vulnerability.

The vulnerability rating is based on the GSI methodology in Figure 1 below. The ratings are divided into four vulnerability categories - Extreme **(E)**, High **(H)**, Moderate **(M)** and Low **(L)** - based on the geological and hydrogeological factors described in Figure 2 below. In addition, areas with bedrock at or close to surface are given a classification of **(X).**

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.

Figure 1. GSI Vulnerability classification

VULNERABILITY RATING	SOURCE PROTECTION AREA		RESOURCE PROTECTION Aquifer Category					
			Regionally Important (R)		Locally Important (L)		Poor Aquifers (P)	
	Inner	Outer	Rk	Rf/Rg	Lm/Lg	Ll	Pl	Pu
Extreme (E)	R4	R4	$R3^{2}$	$R3^{2}$	$R3^{2}$	$R3^{1}$	$R3^{1}$	$R3^{1}$
High (H)	R4	$R2^{1}$	R1	R1	R1	R1	R1	R1
Moderate (M)	$R3^{3}$	$R2^{1}$	R1	R1	R1	R1	R1	R1
Low (L)	$R3^{3}$	$R2^{1}$	R1	R1	R1	R1	R1	R1

Figure 2. Response Matrix for Landspreading.

Based on the vulnerability rating and aquifer types the responses are determined using Figure 3 below.

R1- Acceptable, subject to normal good practice.
$R2^{1}$-Acceptable subject to a maximum organic nitrogen load (including that deposited by grazing animals) not exceeding 170 kg/hectare/yr.
$R3^{1}$-Not generally acceptable, unless a consistent minimum thickness of 1 m of soil and subsoil can be demonstrated.
$R3^{2}$- Not generally acceptable, unless a consistent minimum thickness of 2 m of soil and subsoil can be demonstrated.
$R3^{3}$-Not generally acceptable, unless no alternative areas are available and detailed evidence is provided to show that contamination will not take place.
R4-Not acceptable.

Figure 3. Response Matrix

3.3 Landbank Assessment

1. SHF (Corlattallan, Co. Monaghan)

Location: The landbank is situated in the townland of Corlattallan, Co. Monaghan. It is located c.500m northwest of Emyvale, Co. Monaghan. There is 1 No. landbank with a total useable land area of 1.84ha.

Soils: According to EPA mapping, the soils at the landbank are AminPD - Surface water Gleys, Ground water Gleys, with a tiny section of Cut - Basin Peats, Blanket Peats along the north-eastern boundary.

Subsoils: The Teagasc subsoils from GSI show that the Majority of the landbank is underlain with TDCSs – Sandstone till Devonian/Carboniferous, with a small section along the north-eastern boundary underlain with Cut – Cutover peat.

Groundwater Aspects: There are no Source Protection Zones, Karst Features located in the immediate area of the landbank as recorded in the GSI mapping. 3 No. boreholes are recorded within the immediate area of the subject landbank (GSI ID's: 2633NWW154, 2633NWW217 & 2633NWW155). Location accuracy of these boreholes range between 20m -1km), however a visually inspection of the landbank did not identify any boreholes within the study boundary.

Aquifer Vulnerability: The aquifer at the site is classed as Lm (Locally Important Aquifer - Bedrock which is Generally Moderately Productive) by the GSI. The vulnerability rating for the majority of the landbank is classed as Low with a small section along the north-eastern boundary classed as Moderate. The subsoil thickness is likely to be >10m.

Groundwater Responses**:** The landbank has a vulnerability rating of Low, with a small area rated as Moderate and the landbank is underlain by a Locally Important Aquifer. Based on the GSI criteria the response is classed as follows:

R1- Acceptable, subject to normal good practic*e.*

4. Calculations

4.1 Organic Waste Nutrient Values

Silver Hill Foods final effluent was sampled at various intervals throughout 2021 and the average Nitrogen and Phosphorus levels have been included in the table below and inputted into the NMP calculations.

Table 1. Organic waste nutrient values

Monthly Averages	Nitrogen (Mg/l)	Phosphorus (Mg/l)	m^3/hour	m^3/Day
January	3.65	0.02	9.81	227.81
February	2.16	0.03	10.03	240.18
March	1.58	0.09	9.66	231.32
April	3.61	0.11	8.08	191.8
May	1.68	0.04	7.09	164
June	2.1	0.05	6.38	151.57
July	7	0.05	7.05	167.1
2021 Average Results	**3.11**	**0.06**	**8.30**	**196.25**

The Nitrogen & Phosphorus content in the final effluent was then converted into kg/m^3,

Table 2. Organic waste nutrient values mg/kg

Sample	Nitrogen mg/kg	Phosphorus mg/kg
Final Effluent	3	0.06
Average kg/MT	**0.00311**	**0.00006**

4.2 Soil Sampling Methodology

The following information was compiled and collated:

a) Ordnance Survey Maps of the areas intended for the receipt of organic material.

b) The cropping program for the coming year and previous land use.

c) Each potential land spread area was assigned a reference number.

d) By reference to the farm map, the current land use and the areas to which the waste is to be applied were identified.

e) Soil analysis of the landbanks were carried out by Silver Hill and analysed in April 2021 by Old Castle Laboratories (Appendix B).

f) In line with S.I. No. 605 of 2017 [16.3 (c)] soil analysis for the landbank will be required to be repeated every 4 years.

Soil samples were taken in accordance with the procedure as specified by the Nitrates Regulations:

a) The sampling area shall not exceed 4 hectares. Exceptionally, where soil types and cropping of lands were similar during the previous five years, a sample area of up to 5 hectares shall be deemed acceptable.

b) Separate samples shall be taken from areas that are different in soil type, previous cropping history, slope, drainage or persistent poor yields.

c) Any unusual spots such as old fences, ditches, drinking troughs, dung or urine patches or where fertilisers or lime has been heaped or spilled shall be avoided.

d) A field shall not be sampled for phosphorus until 3 months after the last application of any fertiliser containing this nutrient (chemical or organic).

e) The sampling pattern shown in the Figure 4 below shall be followed. A soil core shall be taken to the full 100mm depth. 20 cores shall be taken from the sampling area and placed in the soil container to make up the sample. Ensure the container is full of soil.

f) The field and sample numbers shall be written/attached onto the soil container.

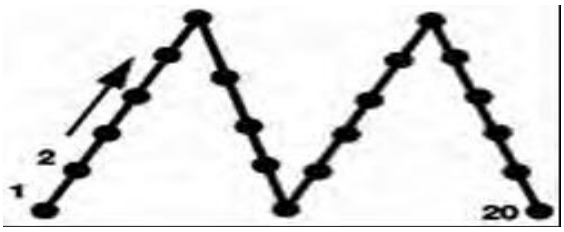


Figure 4: Soil sampling pattern

The following indices and application rates as detailed in S.I. No. 605 of 2017 were used for the NMP calculations.

Table 3. Phosphorus Index System.

Soil Phosphorus Index	Soil Phosphorus ranges (mg/l)	
	Grassland	*Other Crops*
1	0.0 – 3.0	0.0 – 3.0
2	3.1 – 5.0	3.1 – 6.0
3	5.1 – 8.0	6.1 – 10.0
4	> 8.0	>10.0

Table 4. Annual maximum fertilisation rates of available nitrogen on grassland.

Grassland stocking rate[1] (kg/ha/year)	*Available nitrogen[2] (kg/ha)*
≤ 170	*206*
Grassland stocking rate greater than 170 kg/ha/year [3,4]	
171 – 210	*282*
211 – 250	*250*
>250	*250[5]*

[1]Total annual nitrogen (kg) excreted by grazing livestock averaged over the eligible grassland area (ha)(grazing and silage area). Stocking rate refers to grassland area only.
[2]The maximum nitrogen fertilisation of grassland shall not exceed that specified for stocking rates less than or equal to 170 kg/ha/year unless a minimum of 5% of the eligible area of the holding is used to grow crops other than grass or a derogation applies in respect of the holding.
[3]This table does not imply any departure from Article 20(1) which prohibits the application to land on a holding of livestock manure in amounts which exceed 170kg nitrogen per hectare per year, including that deposited by the animals themselves (or 250kg in the case of a holding to which a derogation has been granted, in accordance with the Nitrates Directive).
[4]From 1 January 2021 these fertilisation rates are only applicable where the fertiliser type specified by the Minister for Agriculture, Food and the Marine is used.
[5]The application of nitrogen from livestock manure (including that deposited by the animals themselves) to the eligible grassland area shall not exceed 250 kg nitrogen per hectare per year.

Table 5. Annual maximum fertilisation rates of phosphorus on grassland.

Grassland Stocking rate [1] (kg/ha/year)	**Phosphorus Index**			
	1	**2**	**3**	**4**
Available Phosphorus (kg/ha) [2,3]				
<85	27	17	7	0
86-130	30	20	10	0
131 – 170	33	23	13	0
Grassland stocking rate greater than 170kg/ha/year[3,4]				
171-210	36	26	16	0
211-250	39	29	19	0
>250	39	29	19	0

[1]Total annual nitrogen (kg) excreted by grazing livestock averaged over the eligible grassland area (grazing and silage area). Stocking rate refers to grassland area only.
[2]The fertilisation rates for soils which have more than 20% organic matter shall not exceed the amounts permitted for Index 3 soils.
[3]Manure produced by grazing livestock on a holding may be applied to Index 4 soils on that holding in a situation where there is a surplus of such manure remaining after the phosphorus fertilisation needs of all crops on soils at phosphorus indices 1, 2 or 3 on the holding have been met by the use only of such manure produced on the holding.
[4]The maximum phosphorus fertilisation of grassland shall not exceed that specified for stocking rates less than or equal to 170 kg/ha/year unless a minimum of 5% of the eligible area of the holding is used to grow crops other than grass or a derogation applies in respect of the holding.
[5]This table does not imply any departure from Article 20(1) which prohibits the application to land on a holding of livestock manure in amounts which exceed 170kg Nitrogen per hectare per year, including that deposited by the animals themselves (or 250kg in the case of a holding to which a derogation has been granted in accordance with the Nitrates Directive).
[6]An additional 15 kg of phosphorus per hectare may be applied on soils at phosphorus indices 1, 2, or 3 for each hectare of pasture establishment undertaken.

4.3 Limiting Factors

The following limiting factors were considered while completing this NMP:

Total Phosphorus

It is envisaged that the subject landbank will have sheep grazing for the year with a stocking rate of <85kg/ha/year phosphorus. Therefore the maximum Total Phosphorus that can be spread on the land is 27kg/ha based on an Index 1 soil. On farm Phosphorus was calculated to be 12kg/ha Phosphorus (20 lowland hoggets on land for 60% of the year). This leaves an allowance of 15kg/ha Phosphorus to be spread.

Total Nitrogen

It is envisaged that the subject landbank will have sheep grazing for the year with a stocking rate of <170kg/ha/year nitrogen. Therefore the maximum Total Nitrogen that can be spread on the land is 206kg/ha based on an Index 1 soil. On farm Nitrogen was calculated to be 72kg/ha Nitrogen (20 lowland hoggets on land for 60% of the year). This leaves an allowance of 134kg/ha Nitrogen to be spread.

Volume

The guidance states that the max drip irrigation permitted is at a rate not exceeding 5mm per hour. Therefore, once it can be demonstrated that the soil in the landbank is not water logged etc, the max permitted irrigation per year is 438,000m^3/ha/year based on the calculation below:

Irrigation Rate Calculation

5mm per hour
= 10,000m^3 = ha
5mm*10,000m^2 = 50m^3/hour/ha
50m^3*24 hours = 1,200m^3/day/ha
1,200m^3*365 = 438,000m^3/year/ha
438,000m^3*1.84 = 805,920m^3/year/pilot landbank

All relevant data was inputted into the NMP calculation, and it was determined that Total Nitrogen was the limiting factor.

The maximum quantity of Total Nitrogen that can be irrigated is 134kg/ha/year. In order to stay within this threshold, the maximum quantity of final effluent that can be irrigated onto the landbank is 79,304m^3/year. To achieve this, the maximum irrigation level for final effluent would be 118.08m^3 per day (217.27m^3 * 365 = 79,302.5m^3) the following rates per hours of irrigation, depending on the hours that pumping occurs per day:

Table 6. Quantity of final effluent irrigated per day

m^3	Hours per day	Total per day
4.92	24	118.08
9.84	12	118.08
14.76	8	118.08
29.5	4	118
59	2	118

5. Conclusion

This conclusion is based on the statutory requirements set out in S.I. No. 605 of 2017, and on soil and final discharge analysis.

The landbank was soil sampled and mapped in 2021. Buffer zones were incorporated into the mapping as per S.I. No. 605 of 2017 and will need to be considered during the installation of the drip irrigation system. On this basis, the actual useable area of the landbanks may be less than the total area of the land holding brought forward for consideration.

The subject landbank has a Phosphorus Index of 1. Also, in some instances, a maximum volumetric loading 438,000m^3/ha/year shall be applied on the drip irrigation landbanks once the nutrient content of the final effluent is not the limiting factor, in accordance with S.I. No. 605 of 2017.

If an area is identified on maps compiled by the Geological Survey of Ireland as “Extreme Vulnerability Areas on Karst Limestone Aquifers”, soiled water shall not be applied to land by irrigation at a rate exceeding 3mm per hour unless the land has a consistent minimum thickness of 1m of soil and subsoil combined.

The proposed landbank for this pilot trial has a capacity to receive **79,302.5m^3 of Final Effluent** via drip irrigation per year (365 days/year). To ensure this level is not exceeded, the maximum irrigation level for the final effluent should be within the following pumping rates at various hours of irrigation. Therefore the pumping rate must be adjusted to suit the hours of operation per day as per Table 6.

Appendix A: Mapping & Calculations

Farmer/Land Owner Name:	SHF
Farmer/Land Owner Address:	Corlattallan, Co. Monaghan
Farmer Ref Code:	SHF
Material:	Drip Irrigation of Final Effluent

Crop Legend	
GG	Grazed Grass

Field ID No.	Total Area (ha)	Total usable area (ha)	Soil Sample Ref.	Soil P Test (mg P/l)	Date of Test	P Index	Crop	Maximum P required kg P/ha**	On Farm P (kg/ha)	Imported organic fertiliser to be applied (m^3/ha)	Imported P to be applied (kg P/ha)	Total Imported Organic Fertiliser per plot (MT)	Maximum N required kg N/ha*	On Farm N (kg/ha)	Imported N/Ha	Total N	Load Factor required due to N limitations
SHF 1	1.97	1.84	296609	2.7	04/05/2021	1	GG	27	12	43,100	2.6	79,304	206	72	134.0	206.0	17%
Total:	1.97	1.84										79,304					

*Total available N = (as per Table 16 S.I. 605 of 2017)

**Total available P = (as per Table 17 S.I. 605 of 2017)

Total capacity:	79,304	MT
Total usable area:	1.8	Hectares

Concentration of P	0.000060	Kg P/MT
Concentration of N	0.003110	Kg N/MT

Legend
Site Boundary
50m Buffer (Dwellings)
5m Buffer (Public Road)
Usable Area

Total Hectares: 1.97
Usable Hectares: 1.84

X,Y Coordinates: 54.3481014, -6.9625380

Title: Nutrient Management Plan (NMP)	
Townland: Corlattallan, Co. Monaghan	
Client: Silverhill Duck	
Scale: 1:2,000 @ A4	
Date: 23/07/2021	

Rowan Engineering Consultants Ltd

Unit 14,
Scurlockstown Business Park,
Trim,Co. Meath
www.rec.ie

Appendix B: Lab Soil Results

Oldcastle Laboratories Ltd

Cogan Street, Oldcastle, Co. Meath : A82 HW90

info@oldcastlelabs.ie : Tel: (049) 854 1160 : www.oldcastlelabs.ie

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.302T

CERTIFICATE OF ANALYSIS

Lab Ref No:	Date Received:	Condition of Sample:
296609- 296610	29th April 2021	Satisfactory
Start Date:	**Certificate Date:**	**Sampled By:**
29th April 2021	4th May 2021	Customer

Customer Name: , Silver Hill Foods, Environmental Department

Address: Hillcrest, Emyvale, Co. Monaghan

Reporting Method: Email **Email Address:** environment@silverhillfoods.com

Additional Notes / Customer Requests:

Sample No.	Customer Reference	pH		Lime Reqt. Grassland Only	Phosphorus			Potassium	
		Water	Buffer		mg/L	Index		mg/L	Index
		TM2063	TM2064 (Tonnes / ha)		TM2066	Grassland TM2066	Other Crops TM2066	TM2065	
296609	Soil Sample 1	n/a	n/a	n/a	2.7	1	1	n/a	n/a
296610	Soil Sample 2	n/a	n/a	n/a	6.1	3	3	n/a	n/a

Inab Accredited for:

Water pH	TM2063
Buffer pH	TM2064
Phosphorus	TM2066
Potassium	TM2065
Lime Requirement	TM2064
P Index	TM2066
K Index	TM2065

Soil Index Guidelines		(P) mg/l	(K) mg/l	Explanation
Very Low	Index 1	0 - 3	0 - 50	Nutrient response definite
Low	Index 2	3.1 - 5.0	51 - 100	Nutrient response likely
Medium	Index 3	5.1 - 8.0	101 - 150	Nutrient response unlikely
High	Index 4	> 8	> 150	Nutrient levels adequate

Lime Requirement is calculated for grassland purposes only in tonnes/ha

Signed : Philip Reilly Rachel Hamilton

Analyst Authorized by

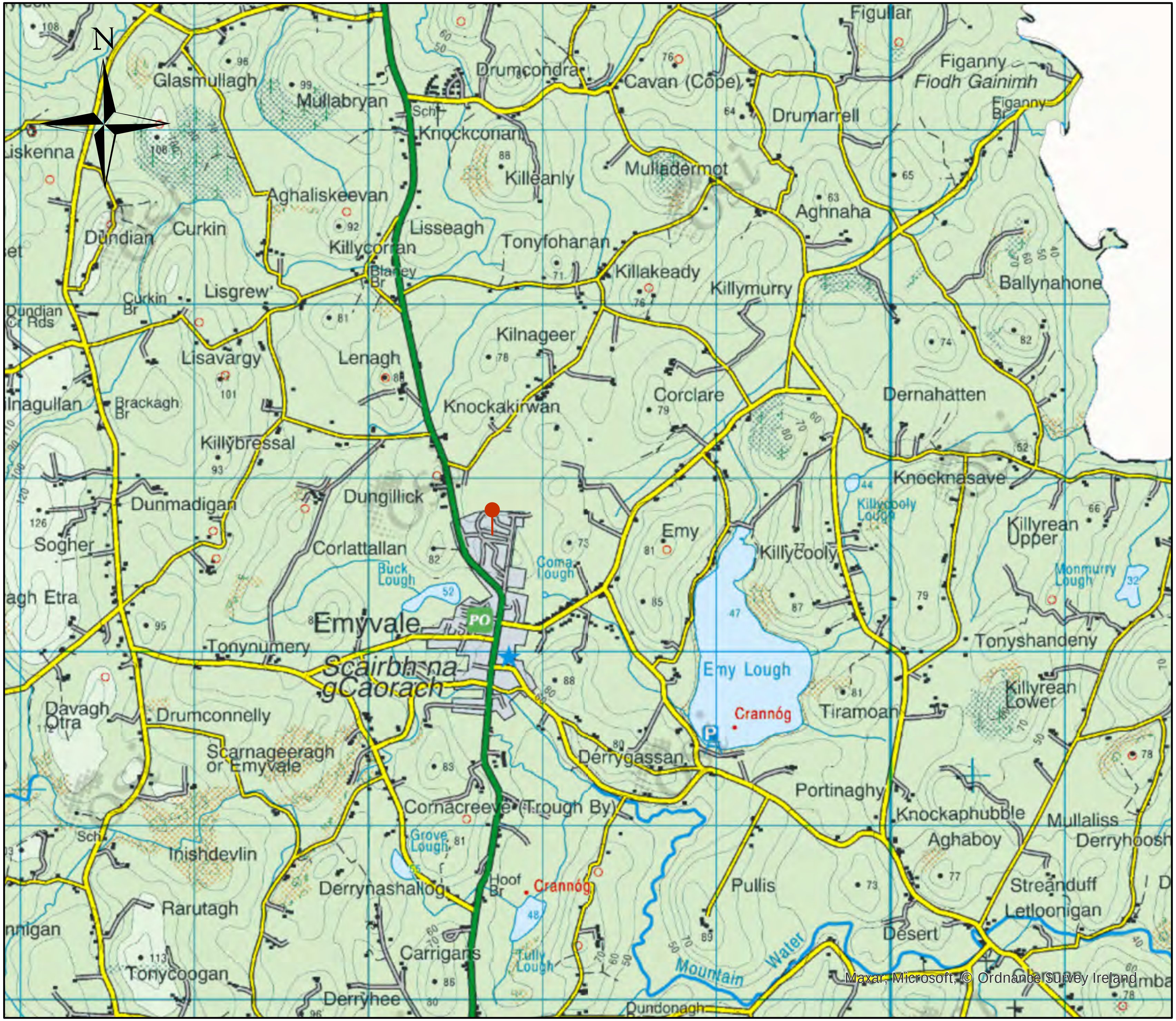
The Above results relate only to the sample(s) submitted. This Certificate of analysis shall not be reproduced except in full without the approval of the laboratory.

Form 4068 Certificate of Analysis *Revision 013* *Page 1 of 1*

Appendix C: Lab Sludge Results

Monthly Averages	Nitrogen (Mg/l)	Phosphorus (Mg/l)	m^3/hour	m^3/Day
January	3.65	0.02	9.81	227.81
February	2.16	0.03	10.03	240.18
March	1.58	0.09	9.66	231.32
April	3.61	0.11	8.08	191.8
May	1.68	0.04	7.09	164
June	2.1	0.05	6.38	151.57
July	7	0.05	7.05	167.1
2021 Average Results	**3.11**	**0.06**	**8.30**	**196.25**

Appendix B: Site Figures



Legend

Site Location

Discovery

Title: Site Location Map
Client: Silverhill Foods
Scale:1:50,000 @A4
Date: 24/06/2022

Rowan Engineering Consultants Ltd

Unit 14,
Scurlockstown Business Park,
Trim,Co. Meath
www.rec.ie

Legend

- River Network and River Flow Direction Arrows
- Lake Segments

Title: Site Context

Client: Silverhill Foods

Scale: 1:15,000 @

Date: 24/06/2022

Rowan

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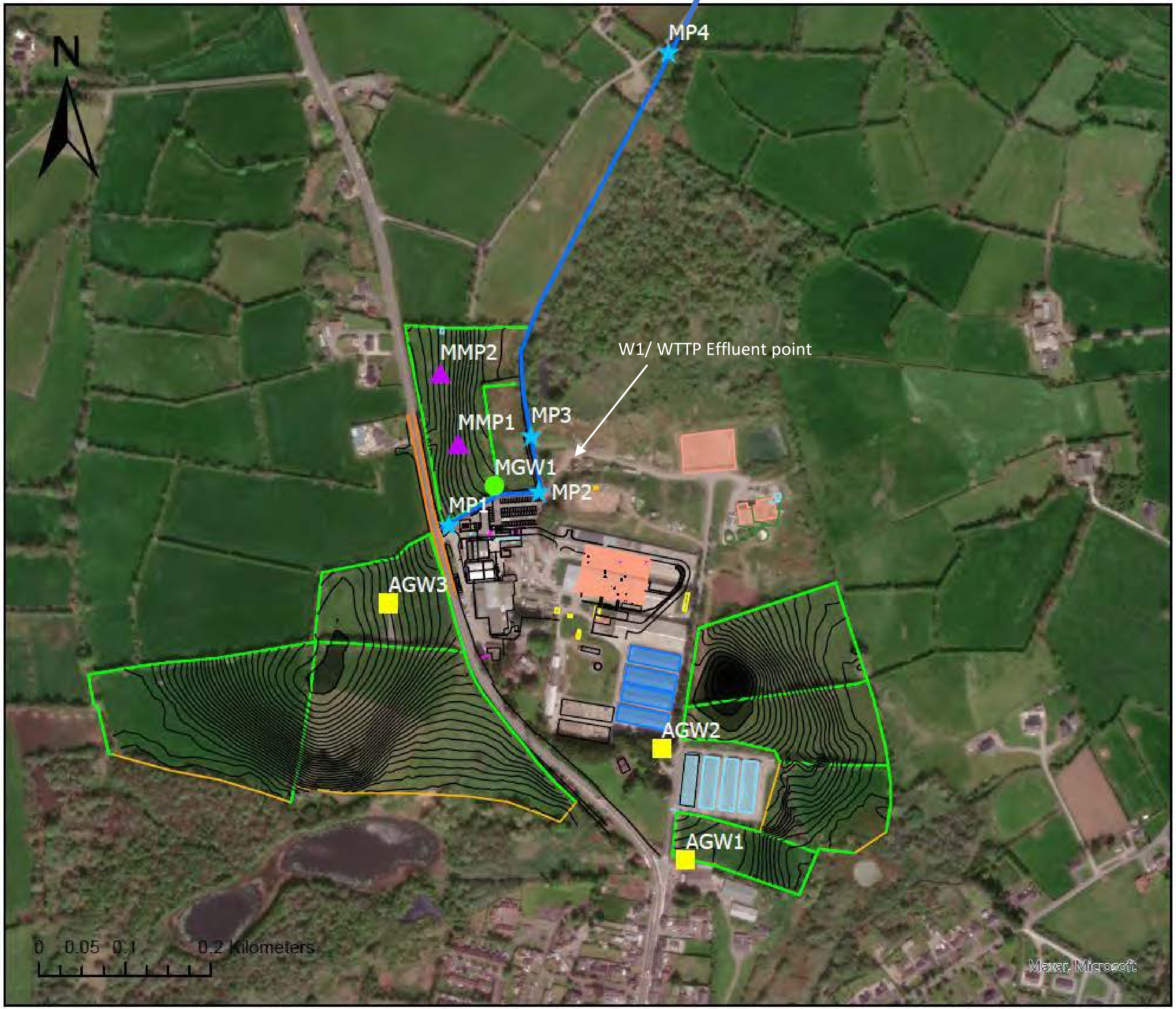


Legend

- Groundwater Monitoring Well
- Drip Irrigation Monitoring System
- Surface Water Sampling Points
- Groundwater Abstraction Bore
- Unnamed Stream
- Ground Level Contours

Title: Monitoring/ Sampling Locations

Client: Silverhill Foods

Scale: 1:6:000 @ A4

Date: 06/07/2022

Rowan

Rowan Engineering Consultants Ltd

Unit 14,
Scurlockstown Business Park,
Trim,Co. Meath
www.rec.ie

Appendix C: Borehole Logs

Water Well Log
Des Meehan & Co. Ltd.

Blackrock,
Co. Louth.
Tel 042-9321767
Mobile 086-8122333

Enniskillen,
Co.Fermanagh.
Tel 028-66322205
Mobile 07860-812233

Website: - www.meehandrilling.com

Borehole No **870**

Date of Drilling: **20-08-01**

Name of Client: **Silver Hill Foods Ltd**

Nearest Town: **Emyvale** County: **Monaghan**

Address: **Hillcrest (New Borehole in Hill Field opposite Plant)**

Farm / Private / Factory / Etc.: **Poultry Farm & Processing Plant**

Drilling Method: Hammer / Odex or Rotary / Etc.: **Hammer**

Depth of Borehole: 504ft **Depth of Overburden: 90 ft.**

Type of Overburden: **Clay/Sand/Gravel**

Steel Casing to Bedrock Depth: **40 ft 10"&. 104 ft. 8"** Diameter: **8" & 10"**

Grouted to bedrock: **Yes**

Estimated Maximum Safe Yield: **8,500 Gallons per Hour after 5 hours development.**

Static Water Level Below Ground: **55ft**

MAIN WATER ENTRY LEVELS

1. **134 ft 200 Gals per hr**
2. **155 ft. 650 Gals per hr**
3. **310 ft. 3000+ Gals per hr**
4. **435 ft. 8500+ Gals per hr.**

ROCK TYPE

TOP: **Limestone**
BASE: **Limestone**

WATER QUALITY

(e.g. clear/cloudy/etc.): **85%**

COMMENTS (e.g. any unusual features):

I suggest a 7 day pumping test of this borehole in order to ascertain the correct size of permanent pump and pipe size suitable for the application.

Reviewed by, for Des Meehan: ______________________

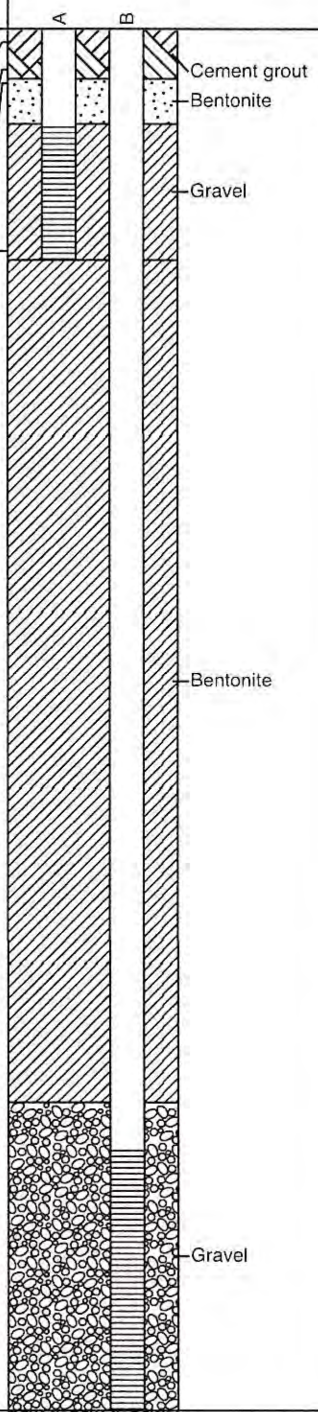
GROUNDWATER LOG Silverhill BH01 GW

PROJECT NUMBER EN2108	**DRILLING DATE** 29/06/2021 - 30/06/2021	**COORDINATES**
PROJECT NAME Groundwater Monitoring	**TOTAL DEPTH** 30.5	**COORD SYS**
CLIENT Silverhill	**DIAMETER** 125mm	**COMPLETION**
ADDRESS Main St., Emyvale, Co. Monaghan	**CASING** 60x52mm uPVC	**SURFACE ELEVATION**
	SCREEN 60x52mm uPVC Factory Slotted	**WELL TOC**

COMMENTS Near the corner to entrance into field. Locable steel cap on 168mm stand pipe. Air lift at total depth for 1 hour, estimated yield of 5 m3/hr.

LOGGED BY N Meehan
CHECKED BY N Meehan

Samples	Drilling Method	% Recovery	Water	Depth (m)	Graphic Log	Material Description	Well Diagram	Elevation (m)
						TOPSOIL:		
						SILTY CLAY: Silty clay with minor organic matter, Dry, Dense	Cement grout	
				2		FILL MATERIAL: Brick and concrete fragments, Water bearing.	Bentonite	-2
						BOULDER CLAY: Dry, Dense		
				4			Gravel	-4
						Sandstone, siltstone & mudstone: Carrickaness Sandstone Formation		
				6				-6
				8		2		-8
				10				-10
				12				-12
				14			Bentonite	-14
				16				-16
				18				-18
				20				-20
				22				-22
				24		2		-24
				26				-26
				28			Gravel	-28
				30				-30
						Termination Depth at 30.5 m		



Disclaimer This bore log is intended for environmental not geotechnical purposes.

produced by ESlog.ESdat.net on 11 Feb 2022

Appendix D: Previous Reports

SILVER HILL FOODS

WASTEWATER EFFLUENT DISCHARGE TO CORLATTALAN STREAM EMYVALE, CO. MONAGHAN

ASSIMILATIVE CAPACITY ASSESSMENT

IE CONSULTING
CIVIL-WATER-ENVIRONMENTAL

GES Limited

Innovation Centre
Green Road
Carlow

Tel:- 059 91 33084
Fax:- 059 91 40499
Email:- info@iece.ie

VEARNCOMBE ASSOCIATES
CONSULTING ENGINEERS

Integrated Engineering Consulting
An Associate Company of VA Consulting Engineers & Geotechnical & Environmental Services Ltd

GES Limited

IE CONSULTING
CIVIL-WATER-ENVIRONMENTAL

SILVER HILL FOODS

WASTEWATER EFFLUENT DISCHARGE TO CORLATTALAN STREAM, EMYVALE, CO. MONAGHAN

ASSIMILATIVE CAPACITY ASSESSMENT

IE Consulting / GES Ltd.
Innovation Centre
Green Road
Carlow

Client :-
Silver Hill Foods
Hillcrest,
Emyvale.
Co. Monaghan

Document No:	IE679/697
Issue No:	03 ISSUE
Project No:	IE672
Date:	12th October 2011
Revision:	3.0
Prepared By:	Aisling Whelan BSc PDip Hydrogeology
Checked By:	P McShane BEng(Hons) MIEI J Keohane MSc BSc CGeol MIEI

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Table of Contents

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Table of Contents

1. INTRODUCTION

IE Consulting was retained by Silver Hill Foods to undertake an assimilative capacity assessment for an existing wastewater effluent discharge from their facility at Hillcrest, Emyvale, Co. Monaghan (IPPC Licence Reg. No. P0422-03). The wastewater is discharged to an unnamed stream adjacent the site, which is a tributary of the Corlattalan Stream.

This assimilative capacity assessment was undertaken as part of a review of the existing discharge to ensure compliance with *Article 7* of the *European Communities Environmental Objectives (Surface Waters) Regulations 2009.*

2. DESCRIPTION OF RECEIVING WATER COURSE

Treated effluent is discharged from the facility to an unnamed stream adjacent the site to the north. This stream flows in a northeasterly direction and discharges to the Corlattalan Stream approximately 1.2km to the northeast of the site. The Corlattalan Stream in turn discharges to the River Blackwater approximately 5.6km to the northeast of the site. The unnamed stream and Corlattalan Stream are shown in a regional setting in *Drawing No. IE679-001-B, Appendix A.*

3. ASSESSMENT OF LOW FLOW CONDITIONS

There are no EPA/OPW flow gauging stations within the catchment of the receiving water body. The EPA Hydrotool website has determined low flows for the Corlattalan Stream by correlation with a similar gauged catchment. The 95%ile flow for the Corlattalan Stream at this location of the confluence with the unnamed stream is $0.005m^3/s$. The catchment area of the Corlattalan Stream at this location is $6.1km^2$. The EPA Hydrotool Report for the Corlattalan Stream is included in *Appendix* B.

4. BACKGROUND PHYSICO-CHEMICAL QUALITY OF RECEIVING WATER COURSE

Under the Water Framework Directive (WFD) all surface water bodies are required to achieve 'Good' Status by 2015. The Corlattalan Stream is currently assessed as being at 'Moderate' status with the objective of restoring 'Good' Status by 2021.

Samples were taken from the unnamed stream and the Corlattalan Stream during September 2011 for hydrochemical analysis. The sampling locations are shown in *Drawing No. E679-001-B, Appendix A*. The sample from the unnamed stream was taken downstream of the discharge point at a location on the stream just before it discharges to the Corlattalan Stream. Two samples were taken from the Corlattalan Stream: one upstream and one downstream of the confluence of the unnamed stream and the Corlattalan Stream. The results are shown in *Tables 1, 2* and *3* below. Samples were not analysed for Orthophosphate (MRP). In order to enable an assessment of the MRP results, the MRP concentrations were assumed to be approximately 80% of the Total Phosphorous result. The assumed MRP concentrations are shown in the Tables below.

Date	COD (mg/l O^2)	Ammonia (mg/l)	Phosphorus (mg/l)	Nitrate (mg/l)	pH	Dissolved Oxygen (mg/l O_2)	Temp. (deg. C)	Suspended Solids (mg/l)	BOD (mg/l O_2)
14.09.2011	78	2.05	8.39	0	6.41	3.84	12.3	40	15
16.09.2011	29	1.39	10.2	0.1	6.93	4.24	12.2	50	7
21.09.2011	26	0.946	8.9	0.3	7.77	5.47	12	70	6
23.09.2011	34	0.957	6.8	0.2	7.69	4.7	12.5	60	10
28.09.2011	31	1.58	10.5	0	7.22	5.21	15.7	60	9
29.09.2011	29	1.49	8.5	0.4	7.05	4.49	14.8	20	11
Average Value	**38**	**1.40**	**8.88**	**0.2**	**7.18**	**4.66**	**13.3**	**50**	**10**
Calculated Average MRP result (80% of Total P)	-	-	7.10	-	-	-	-	-	-
TV for 'Good Status'	NA	≤0.065 (mean)	***MRP ≤0.035(mean)	NA	**Soft water 4.5<pH<9.0 Hard Water 6.0<pH<9.0	95%ile >80% sat (Lower limit) 95%ile <120% (Upper Limit)	*	NA	≤1.5 (mean)

Table 1 Hydrochemical Results for Unnamed Stream (Downstream of Discharge Location)

*no greater than 1.5 deg C rise in ambient temp outside the mixing
** Soft Water ≤100mg/l $CaCO_3$, Hard Water >100mg/l $CaCO_3$
***for calculations MRP is assumed to be 80% of the Total P results

Date	COD (mg/l O^2)	Ammonia (mg/l)	Phosphorus (mg/l)	Nitrate (mg/l)	pH	Dissolved Oxygen (mg/l O_2)	Temp. (deg. C)	Suspended Solids (mg/l)	BOD (mg/l O_2)
14.09.2011	16	0.193	0.65	0	6.68	9.54	11.7	40	2
16.09.2011	10	0.074	0.47	0.1	7.05	9.95	12.4	20	4
21.09.2011	7	0.073	0.3	0.1	7.98	9.34	11.5	20	2
23.09.2011	13	0.068	0.39	0.1	7.91	9.15	12.1	60	1
28.09.2011	19	0.109	0.5	0.2	7.38	8.87	13.7	50	3
29.09.2011	16	0.067	0.4	0	7.26	8.91	14.3	10	3
Average Value	**14**	**0.10**	**0.45**	**0.1**	**7.38**	**9.29**	**12.6**	**33**	**3**
Calculated Average MRP result (80% of Total P)	-	-	0.36	-	-	-	-	-	-
TV for 'Good Status'	NA	≤0.065 (mean)	***MRP ≤0.035 (mean)	NA	**Soft water 4.5<pH<9.0 Hard Water 6.0<pH<9.0	95%ile >80% sat (Lower limit) 95%ile <120% (Upper Limit)	*	NA	≤1.5 (mean)

Table 2 Hydrochemical Results for Corlattalan Stream (Upstream)

*no greater than 1.5 deg C rise in ambient temp outside the mixing
** Soft Water ≤100mg/l $CaCO_3$, Hard Water >100mg/l $CaCO_3$
***for calculations MRP is assumed to be 80% of the Total P results

Date	COD (mg/l O^2)	Ammonia (mg/l)	Phosphorus (mg/l)	Nitrate (mg/l)	pH	Dissolved Oxygen (mg/l O_2)	Temp. (deg. C)	Suspended Solids (mg/l)	BOD (mg/l O_2)
27.06.2011	2	0.135	0.47	0.3	7.22	9.86	13.2	16	1
06.07.2011	7	0.084	0.56	1	7.21	9.48	14.5	16	1
11.07.2011	5	0.286	0.58	0.2	7.44	9.24	13.5	18	2
13.07.2011	1	0.138	0.48	0.2	7.36	9.65	13.7	26	2
20.07.2011	6	0.144	0.6	0	7.26	9.48	12.9	12	1
27.07.2011	2	0.199	0.67	0.2	7.36	8.81	14.4	22	3
03.08.2011	13	0.152	0.74	0.2	7.21	8.88	13.1	16	1
10.08.2011	25	0.115	0.72	0.2	8.35	8.51	13.7	15	1
16.08.2011	29	0.168	1.01	0.3	7.3	8.79	13.9	30	1
24.08.2011	34	0.912	1.31	0.1	7.73	8.56	13.1	50	2
31.08.2011	59	0.298	1.53	0.1	7.56	9.57	10	10	1
07.09.2011	37	0.072	0.68	0.1	7.52	9.92	12	40	3
Average Value	**18**	**0.23**	**0.78**	**0.2**	**7.46**	**9.23**	**13.2**	**23**	**2**
Calculated Average MRP result (80% of Total P)	-	-	0.62	-	-	-	-	-	-
TV for 'Good Status'	NA	≤0.065 (mean)	***MRP ≤0.035(mean)	NA	**Soft water 4.5<pH<9.0 Hard Water 6.0<pH<9.0	95%ile >80% sat (Lower limit) 95%ile <120% (Upper Limit)	*	NA	≤1.5 (mean)

Table 3 Hydrochemical Results for Corlattalan Stream (Downstream)

*no greater than 1.5 deg C rise in ambient temp outside the mixing
** Soft Water ≤100mg/l $CaCO_3$, Hard Water >100mg/l $CaCO_3$
***for calculations MRP is assumed to be 100% of the Total P results

A comparison of the average results for the unnamed stream and the Corlattalan Stream with the Threshold Values for 'Good ' Status as specified in the Surface Water Regulations, SI No. 272 of 2009 indicates that the water quality with respect to Ammonia and BOD in both surface water bodies currently do not meet the threshold values for 'Good' Status. Based on the assumed Orthophosphate concentrations, it is also likely that the concentrations of this parameter also exceeded the threshold value for good status in the unnamed stream and Corlattalan Stream.

A comparison of the results for the unnamed stream and the treated effluent quality (provided in *Section 5* below) shows that concentrations of COD, Ammonia, Total Phosphorous, Suspended solids and BOD are significantly greater in the unnamed stream than in the effluent discharge. The only parameter, which is lower in the unnamed stream than in the treated effluent, is Nitrate. This would indicate that there are additional pollutant inputs to the unnamed stream between the discharge point and the downstream sampling location (just before confluence with Corlattalan Stream).

A comparison of the results for the upstream and downstream sampling locations on the Corlattalan Stream indicate concentrations of COD, Ammonia, and Total Phosphorous are greater in the downstream sample. The concentrations of BOD and suspended Solids are lower in the downstream sample than in the upstream sample.

5. CHARACTERISTICS OF WASTEWATER EFFLUENT

5.1 Effluent Volume

The maximum licensed volume of wastewater discharge is 480m^3/day (20m^3/hr). The average discharge volume during 2010 was 6.26m^3/hr (146m^3/day). This is approximately 30%of the permitted volume. The maximum permitted discharge volume and average actual volumes for 2010 were used for assimilative capacity calculations.

5.2 Effluent Quality

Ongoing monitoring of effluent quality is undertaken as part of the discharge licence conditions. The most recent monitoring results for the discharge from September 2010 to August 2011 are shown in *Table 4* below.

Date	COD (mg/l O^2)	Ammonia (mg/l)	Phosphorus (mg/l)	Nitrate (mg/l)	pH	Dissolved Oxygen (mg/l O_2)	Temp. (deg. C)	Suspended Solids (mg/l)	BOD (mg/l O_2)
Sep-10	18	0.054	0.21	5.2	7.70	8.53	14.32	9	4
Oct-10	23	0.061	0.50	6.1	7.58	9.37	11.14	9	4
Nov-10	21	0.160	0.72	3.1	7.47	10.77	6.69	9	4
Dec-10	61	0.640	1.43	2.2	7.12	11.87	0.38	11	4
Jan-11	45	0.600	1.37	1.0	7.33	9.12	4.10	12	6
Feb-11	31	0.390	0.59	0.8	7.55	6.32	7.80	8	7
Mar-11	27	0.200	0.53	3.0	7.04	7.45	8.73	6	4
Apr-11	34	0.250	0.89	3.0	6.99	6.34	12.98	8	8
May-11	21	0.080	0.46	3.0	7.08	7.32	13.49	8	2
Jun-11	19	0.076	0.51	1.0	7.20	6.98	15.25	7	2
Jul-11	17	0.080	0.60	0.2	7.04	6.92	16.70	6	2
Aug-11	24	0.080	0.71	0.3	7.46	6.45	15.70	7	1
Averages	**28**	**0.223**	**0.71**	**2.4**	**7.30**	**8.12**	**10.61**	**8**	**4**

Table 4 Effluent Quality Monitoring Results

The average value for each parameter result was used in assimilative capacity calculations.

6. ASSIMILATIVE CAPACITY CALCULATIONS

Using the 95%ile flow, background water quality information and the discharge effluent quality parameters outlined above, an assimilative capacity assessment was undertaken for the following scenarios:

(1) Effluent discharge directly to the Corlattalan Stream (based on the effluent quality data and flow, and upstream water quality data for the Corlattalan Stream). As flow data is not available for the unnamed stream it was not possible to undertake an assimilative capacity assessment for it. Therefore, the assessment was undertaken in respect of effluent discharge to the Corlattalan Stream.

(2) Discharge from unnamed stream to the Corlattalan Stream based on water quality data for the unnamed stream, effluent flow and upstream water quality data for the Corlattalan Stream. As no flow data was available for the unnamed stream the effluent flow data was used for calculations.

The assimilative capacity assessment calculations were undertaken on the basis of the discharge volume of final treated effluent of 480m³/day (licence limit) and 146m³/day (average actual recorded discharge during 2010).

The assimilative capacity assessment was undertaken for the critical water quality parameters of BOD, Ortho-Phosphate (MRP) and Total Ammonia (NH_3). In the absence of actual monitoring data for Orthophosphate (MRP), the concentrations were assumed to be 80% of total Phosphorous data.

The Waste Assimilation Capacity (WAC) at 95%ile is calculated as follows:

$$C_{ds} = \frac{((Q_u \times C_u) + (Q_d \times C_d))}{Q_u + Q_d}$$

Where:

Q_u = the river flow upstream of the discharge (0.005m³/s 95%ile)

C_u = the concentration of pollutant in the river upstream of the discharge

Q_d = the flow of the discharge (0.0056m³/s (discharge limit) & 0.0017m³/s (average actual flow during 2010))

C_d = concentration of pollutant in the discharge

C_{ds} = the concentration of pollutant in the river

Table 5 below summarises the results of the assimilative capacity assessment in consideration of the 95%ile flow in the receiving watercourse (effluent discharge directly to the Corlattalan Stream, based on effluent quality and volume).

Date	Ammonia (mg/l)	Phosphorus (mg/l)	Calculated Average MRP result (80% of Total P)	BOD (mg/l O_2)
Background Water Quality in Corlattalan Stream	0.10	0.45	0.36	3
Average Effluent Quality	0.223	0.71	0.57	4
Predicted concentration after Effluent Discharge (licence limit of 480m^3/day)	0.165	0.59	0.471	3.5
Increase from Background Concentration (licence limit of 480m^3/day)	65%	31%	31%	18%
Predicted concentration after Effluent Discharge (average 2010 volume of 146m^3/day)	0.131	0.52	0.413	3.3
Increase from Background Concentration (average 2010 volume of 146m^3/day)	31%	15%	15%	8%

Table 5 Predicted Water Quality in Corlattalan Stream - Scenario 1

Table 6 below summarises the results of the assimilative capacity assessment in consideration of the 95%ile flow in the receiving watercourse (discharge to the Corlattalan Stream, based on unnamed stream water quality and effluent volume).

Date	Ammonia (mg/l)	Phosphorus (mg/l)	Calculated Average MRP result (80% of Total P)	BOD (mg/l O_2)
Background Water Quality in Corlattalan Stream	0.10	0.45	0.36	3
Average Water Quality in Unnamed Stream	1.4	8.88	7.104	10
Predicted concentration after Unnamed Stream Discharge (licence limit of 480m^3/day)	0.79	4.90	3.923	6.7
Increase from Background Concentration (licence limit of 480m^3/day)	687%	990%	990%	123%
Predicted concentration after Unnamed Stream Discharge (average 2010 volume of 146m^3/day)	0.43	2.59	2.071	4.78
Increase from Background Concentration (average 2010 volume of 146m^3/day)	330%	475%	475%	59%

Table 6 Predicted Water Quality in Corlattalan Stream - Scenario 2

7. CONCLUSIONS

An assimilative capacity assessment was undertaken for the Corlattalan Stream at Emyvale, Co. Monaghan for an existing effluent discharge.

The Corlattalan Stream is currently assessed as being at 'Moderate' Status. Sampling results for the Corlattalan Stream upstream and downstream of the confluence with the unnamed stream (into which the effluent discharges) indicate that the concentrations of Ammonia and BOD exceed the threshold values for 'Good' Status as specified in the Surface Water Regulations 2009. No monitoring data for Orthophosphate was available. However, an assessment of the Total Phosphorous results indicates it is likely that MRP results also exceed the relevant threshold value.

The assimilative capacity assessment was undertaken for the Corlattalan Stream for two scenarios: assimilative capacity based on effluent quality (i.e. direct discharge of the effluent to the Corlattalan Stream) and assimilative capacity based on water quality in the unnamed stream. For both scenarios the volume of discharge was taken to be 480m^3/day (licence limit) and 146m^3/day (average recorded effluent flow for 2010).

Scenario 1 – Effluent Discharge Directly to Corlattalan Stream

Assimilative capacity calculations for the Corlattalan Stream under 95%ile flow conditions with maximum permitted discharge volumes indicate the discharge will result in an increase in concentrations of Ammonia (65%), Total Phosphorous (31%) and BOD (18%). Based on the assumed concentrations of Orthophosphate there will be an increase in concentrations of MRP (31%).

Assimilative capacity calculations for the Corlattalan Stream under 95%ile flow conditions and average recorded discharge volumes indicate the discharge will result in an increase in concentrations of Ammonia (31%), Total Phosphorous (15%) and BOD (8%). Based on the assumed concentrations of Orthophosphate there will be an increase in concentrations of MRP (15%).

Scenario 2 – Unnamed Stream Discharge to Corlattalan Stream

Assimilative capacity calculations for the Corlattalan Stream under 95%ile flow conditions with maximum permitted discharge volumes indicate the discharge will result in an increase in concentrations of Ammonia (687%), Total Phosphorous (990%) and BOD (123%). Based on the assumed concentrations of Orthophosphate there will be an increase in concentrations of MRP (980%).

Assimilative capacity calculations for the Corlattalan Stream under 95%ile flow conditions and average recorded discharge volumes indicate the discharge will result in an increase in concentrations of Ammonia (330%), Total Phosphorous (475%) and BOD (59%). Based on the assumed concentrations of Orthophosphate there will be an increase in concentrations of MRP (475%).

8. REFERENCES

European Communities Environmental Objectives (Surface Waters) Regulations 2009. S.I. No. 272 of 2009.

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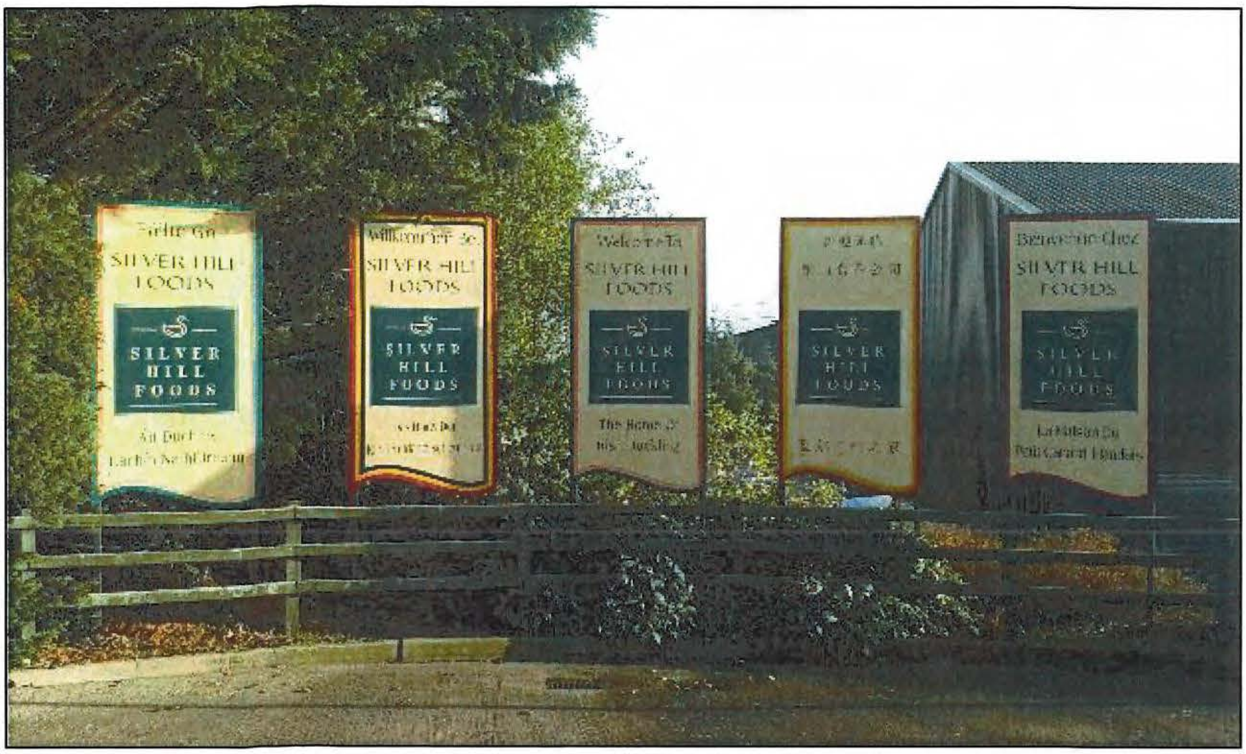
APPENDIX A

Drawing No. IE679-001-B

Draft 13th November, 2013

Assessment of the impact of the Silver Hill
Effluent Discharge
on the Mountain Water River



SILVER HILL FOODS

Licence No: 422-03

IE Consulting /
GES Ltd.
Campus Innovation Centre,
Green Road,
Carlow.
Ph: 059-9130314
Fax: 059-9140499
E-mail: info@iece.ie

ie
IE CONSULTING
CIVIL-WATER-ENVIRONMENTAL

Project Title: Assimilative Capacity Assessment

Project Address: Emyvale, Co. Monaghan

Client: Silver Hill Foods

Dwg. Title: Surface Water Features & Sampling Locations

Dwg. Scale:	Date:	Dwg. No.:	Job No.:	Revision:	Dwg. By:
NTS	12/10/11	IE679-001	IE679	B	AW

IE CONSULTING
CIVIL-WATER-ENVIRONMENTAL

APPENDIX B

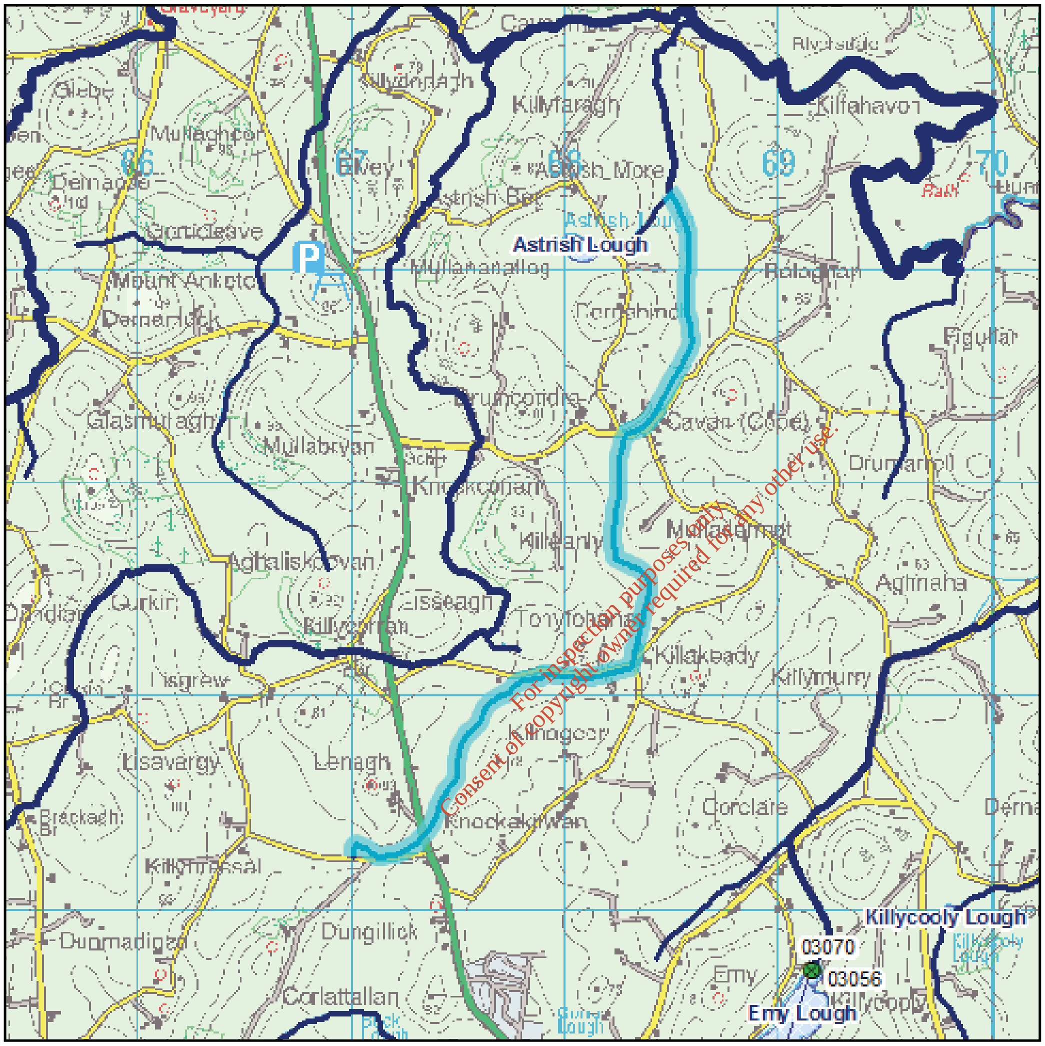
EPA Hydrotool Report for Corlattalan Stream

Environmental Protection Agency

Estimation of Flow Duration Curve for Ungauged Catchment

River Name	(03_252)
XY Location	267723,346008 (ING)

River Segment Map



Disclaimer
The source hydrometric data used to estimate the flow duration curve ordinates for ungauged catchments was obtained from (1) water level data and (2) the rating curve(s) generated for each hydrometric station. The Environmental Protection Agency and the Office of Public Works used these data, respectively, to calculate daily mean flows. The daily mean flows were then used by the Environmental Protection Agency to prepare flow duration curves for each station. Neither body accepts any liability for the subsequent handling of the data.

Disclaimer

The source of hydrometric data used to estimate the flow duration curve ordinates for ungauged catchments was obtained from (1) water level data and (2) the rating curve(s) generated for each hydrometric station. The Environmental Protection Agency and the Office of Public Works used these data, respectively, to calculate daily mean flows. The daily mean flows were then used by the Environmental Protection Agency to prepare flow duration curves for each station. Neither body accepts any liability for the subsequent handling of the data.

The user should familiarise himself/herself with the catchment being studied and confirm that the ungauged site is in a natural catchment where flows conditions are suitable for the use of the model.

It is strongly recommended that the user examine the catchment descriptors contained in the report produced and confirm that the percentages of the various constituent elements are comparable to a natural catchment.

If the flow in a catchment is not entirely natural, the estimation of flows using the model in these catchments could be affected due to:

- existence of local conduit karst within the catchment;
- the selected location itself is on local conduit karst;
- regulation of the river flow on the river channel (e.g. power station, sluice gates etc)
- impacts of abstractions upstream of the selected location or the impact of the discharge associated with the abstraction into the same/different catchment;
- estimates of flow being sought at locations effected by storage effects at, or near, lake outfalls;
- lack of similar catchments with observed flows, ie where catchment descriptors lie outside the range of available gauging station catchments (e.g. the catchment area is under 5 km²);
- any other special circumstances that may affect river flows.

Expert judgement will be required to ensure that the estimate of flow is not unduly affected by any of these influences.

Please note that the model does not provide estimates of flood peaks and, specifically, should not be used for that purpose.

The EPA has also prepared estimates of DWF and long term 95 percentile flows which are also presented on the EPA web site. These data are presented at http://www.epa.ie/whatwedo/monitoring/water/hydrometrics/data/

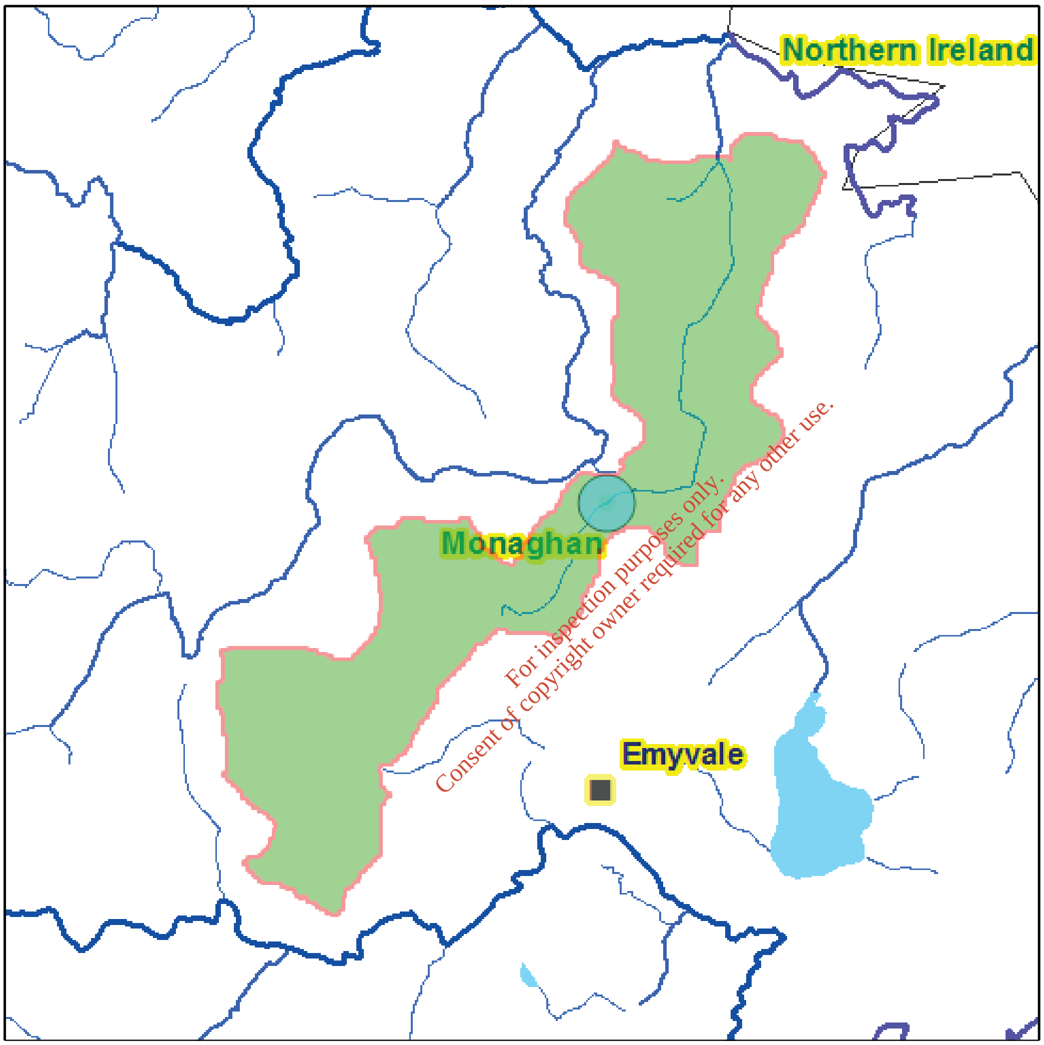
The data produced by the model for specific stations should be compared to the data contained in this file of DWF and long term 95percentile flows.

Disclaimer
The source hydrometric data used to estimate the flow duration curve ordinates for ungauged catchments was obtained from (1) water level data and (2) the rating curve(s) generated for each hydrometric station. The Environmental Protection Agency and the Office of Public Works used these data, respectively, to calculate daily mean flows. The daily mean flows were then used by the Environmental Protection Agency to prepare flow duration curves for each station. Neither body accepts any liability for the subsequent handling of the data.

Estimation of Flow Duration Curve for Ungauged Catchment

River Name	(03_252)
XY Location	267723,346008 (ING)

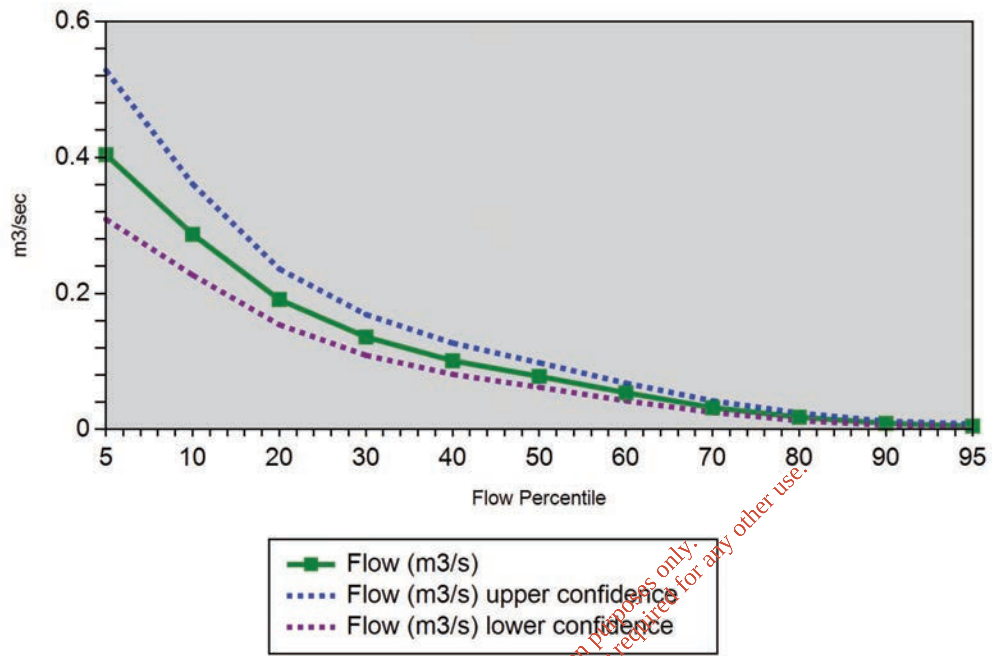
Nested Catchment Map



Disclaimer
The source hydrometric data used to estimate the flow duration curve ordinates for ungauged catchments was obtained from (1) water level data and (2) the rating curve(s) generated for each hydrometric station. The Environmental Protection Agency and the Office of Public Works used these data, respectively, to calculate daily mean flows. The daily mean flows were then used by the Environmental Protection Agency to prepare flow duration curves for each station. Neither body accepts any liability for the subsequent handling of the data.

Estimation of Flow Duration Curve for Ungauged Catchment

Flow Duration Curve (Flow in m3/sec)



%ile	flow(m3/sec)	upper 95% confidence limit m3/sec	lower 95% confidence limit m3/sec
5	0.404	0.528	0.309
10	0.287	0.361	0.227
20	0.191	0.236	0.154
30	0.136	0.169	0.109
40	0.101	0.127	0.081
50	0.078	0.098	0.062
60	0.054	0.068	0.042
70	0.032	0.042	0.025
80	0.018	0.024	0.013
90	0.009	0.012	0.006
95	0.005	0.008	0.003

Estimation of Flow Duration Curve for Ungauged Catchment

Catchment Descriptors		
General		
Descriptor	**Unit**	**Value**
Area	sq km	6.1
Average Annual Rainfall (61-90)	mm/yr	965
Stream Length	km	4.3
Drainage Density	Channel length (km)/catchment area (sqkm)	0.7
Slope	Percent Slope	7.5
FARL	Index (range 0:1)	1

Soil	
Code	**% of Catchment**
Poorly Drained	82.4
Well Drained	6.4
Alluvmin	5.8
Peat	5.1
Water	0.2
Made	0

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Environmental Protection Agency

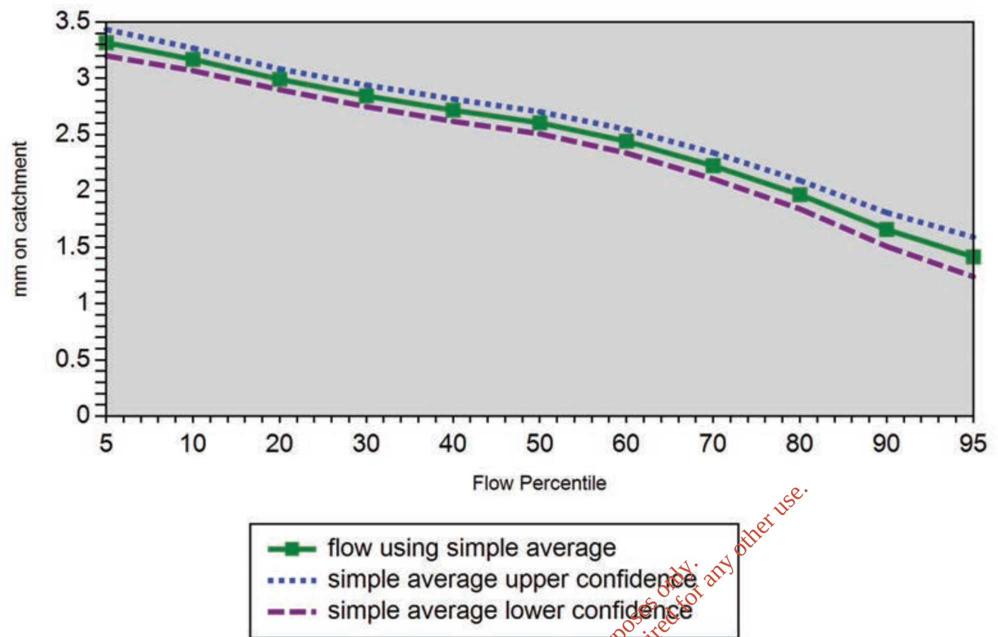
Estimation of Flow Duration Curve for Ungauged Catchment

Subsoil Permeability		
Code	**Explanation**	**% of Catchment**
H	High	2
M	Moderate	4
L	Low	92
ML	Moderate/Low	0
NA	No Subsoil/Bare Rock	1.7

Aquifer		
Code	**Explanation**	**% of Catchment**
LG_RG	LG:Locally important sand-gravel aquifer RG: Regionally important sand-gravel aquifer	0
LL	Locally important aquifer which is moderately productive only in local zones	0
LM_RF	LM: Locally important aquifer which is generally moderately productive RF: Regionally important fissured bedrock aquifer	100
PU_PL	PU: Poor aquifer which is generally unproductive PL: Poor aquifer which is generally unproductive except for local zones	0
RKC_RK	Regionally important karstified aquifer dominated by conduit flow	0
RKD_LK	Regionally important karstified aquifer dominated by diffuse flow	0

Stations in Pooling group			
%ile Flow	**Station 1**	**Station 2**	**Station 3**
5	13003	24022	14033
10	13003	24022	14033
20	13003	24022	14033
30	13003	24022	14033
40	13003	24022	14033
50	36019	36018	36010
60	36019	36018	36010
70	36019	36018	36010
80	36019	36018	07033
90	36019	36018	07033
95	36019	36018	07033

Flow Duration Curve (mm on catchment)



Log Flow (mm on catchment)			
%ile	mm	upper 95% confidence limit	lower 95% confidence limit
5	3.318	3.435	3.201
10	3.169	3.269	3.069
20	2.992	3.084	2.9
30	2.845	2.941	2.749
40	2.718	2.817	2.619
50	2.606	2.704	2.508
60	2.442	2.547	2.337
70	2.224	2.34	2.108
80	1.967	2.093	1.841
90	1.658	1.808	1.508
95	1.415	1.591	1.239

Disclaimer
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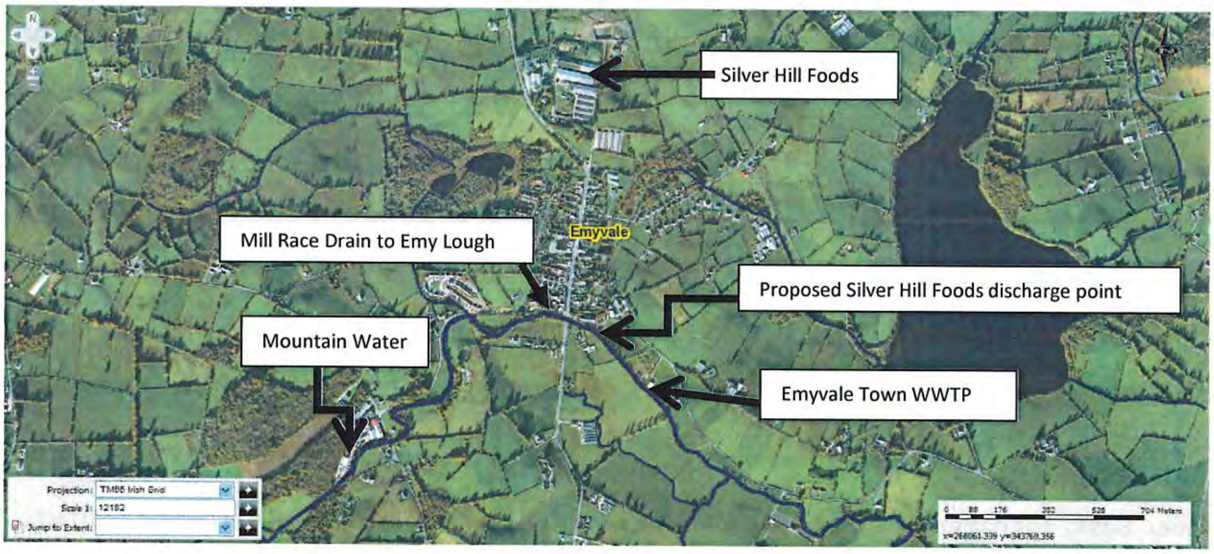
Contents

1. Introduction

Silver Hill Foods of Emyvale, Co. Monaghan, currently discharges its treated effluent (under IPPC license No. 670) to a drain leading to the Corlattalan Stream, a minor tributary of the Ulster Blackwater. Following discussions with the EPA Silver Hill Foods now proposes to change the discharge location to the Mountain Water River at Emyvale, also a tributary of the Ulster Blackwater, but with a larger flow. Map 1 below shows the proposed new discharge location. The Company has been in operation for over 50 years and employs 160 in the breeding and processing of ducks and associated products. The effluent to be discharged arises from the slaughtering of ducks and the preparation of duck products from our onsite processing plant. Slurry from the breeding of the ducks is recycled as fertilizer onto agricultural land.

Map 1



The proposed route for a new effluent pipeline from the Silver Hill premises to the Mountain Water River is currently under discussion with local landowners. To date there aren't any objections from stakeholders involved in the redirection of the discharge. The Company will apply to Monaghan County Council for planning permission for the new pipeline and discharge point pending EPA approval. This report assesses the impact of the proposed new discharge location on the water quality of the Mountain Water River and sensitive areas downstream of the effluent entry point. It was prepared jointly by Dr. Emmet Mc Mahon, environmental consultant and Caitriona Lazdauskas of Silver Hill Foods.

2. The Mountain Water River

The Mountain Water River is a tributary of the Ulster Blackwater, a river within the Neagh-Bann International River Basin District. The confluence between the Mountain Water and the Ulster Blackwater is approximately 8.5 km downstream of Emyvale. In Appendix 1 please find a Map outlining the route of the Mountain Water River across Monaghan and into Northern Ireland.

The Ulster Blackwater

The Mountain Water River is a tributary of the Ulster Blackwater. The latter has a cross-border catchment and is one of six major rivers flowing into Lough Neagh. The total catchment area is 1,480 km^2, across counties Monaghan, Tyrone and Armagh. The landscape of the Blackwater (and Mountain Water River) is dominated by topography of glacial origin (drumlins – small hills of compacted till). Soils have developed on dense clay till and inter-drumlin lakes are a feature of the landscape. Annual rainfall is approx. 800 to 1,000 mm, with up to 70% as annual run-off. Various drainage schemes have been undertaken to improve agricultural land. Land use in the area is typically agricultural with about 95% in grassland managed for pasture and silage. There are a number of small towns and villages throughout the Blackwater catchment, together with some industries that are mainly associated with agriculture. Poultry production is an important activity in this area. Major tributaries of the Blackwater are routinely monitored for chemical and biological indicators of water quality and for hydrometric purposes.

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 Blackwater catchment is within the Neagh-Bann International River Basin District. The RBM Plan (2009-2015) for that catchment rates the overall quality of the Blackwater as poor. In overall terms, the Blackwater is classified as 68% - Poor, 14% - Moderate, 18% - Good. The overall plan establishes four core environmental objectives to be achieved generally by 2015:

- Prevent deterioration
- Restore good status
- Reduce chemical pollution

* Achieve water-related protected areas objectives.

To achieve the above objectives, a series of Water Management Unit (WMU) Action Plans have been drafted for individual sections of the overall catchment, including the Blackwater River and its tributaries. The WMU action plans are the basis for detailed programmes to guide and monitor the progress of implementation between 2009 and 2015. The Action Plan has designated the Mountain Water River as poor status and identified the Emyvale WWTP as requiring the implementation of a "performance management system". The Plan identifies 22 river bodies, including the Mountain Water River, for which the deadline date for achieving Good Status is 2021.

Criteria for Good Status

The quality criteria for good status of a river (as set out in the European Communities Environmental Objectives (Surface Waters) Regulations 2009) are shown in Table 1 below. These Regulations apply to all surface waters and give effect to the measures needed to achieve the environmental objectives established for bodies of surface water by the Water Framework Directive. The Regulations also set standards for many other substances other than those shown in Table 1 but these are not relevant to the discharge from Silver Hill.

Table 1: Good Status Requirements of Surface Waters

	Good Status Requirements
BOD mg/l	<1.5 (mean) or <2.6 (95%ile)
Ammonia mg/l	<0.065 (mean) or <0.140 (95%ile)
O-Phosphate mg/l as P	<0.035 (mean) or <0.075 (95%ile)

Mountain Water River

The Mountain Water River rises in the Slieve Beagh Mountains in County Monaghan and flows eastwards. It passes through agricultural land and among small drumlins meeting a number of tributaries before reaching the town of Emyvale (pop. 1,100). Just above the town there is a weir and a millrace which diverts some of the flow to Emy Lough which is a source of drinking water. Just below Emyvale the river receives an input of treated effluent from the town's wastewater treatment plant (WWTP). The treatments works consists of inlet works, primary settlement, rotating biological contactors and biological filters, and final settlement. It also incorporates a system for removal of phosphorus. The treatment plant is operated to meet the higher standards set out in a wastewater discharge permit issued by the EPA and applicable since January 2013 (see next section for details).

The Mountain Water flows on through agricultural land, receiving flow inputs such as from Emy Lough. The river passes to the north of the village of Glaslough and the nearby estate of Castle Leslie with its attractive lake. It continues to the north-east to meet the River Blackwater about 8.5 km downstream of Emyvale. The Blackwater flows across the border and enters Lough Neagh about 36 km to the north-east. The two lakes in the catchment area of the Mountain River, Emy Lough and Glaslough are protected sources of drinking water. They are on small tributaries which flow into the Mountain Water; the main body of the river does not flow through these lakes (see Map 2 in Appendix 1).

The Mountain Water River is not a designated Salmonid Water (under the European Communities (Quality of Salmonid Waters) Regulations, 1988 nor is it identified as sensitive water in terms of the Urban Waste Water Treatment Regulations 2001. The river is not designated as an SPA, SAC or NHA. The IFI has noted that the river holds good stocks of Brown Trout and has a spawning and nursery habitat throughout. It also contains some stocks of crayfish. The white-clawed crayfish (Austropotamobius pallipes) has been classified as vulnerable in the 2010 IUCN Red List, is listed under Appendix III of the Bern Convention (82/72/EEC) and Annexes II and V of the EU Habitats Directive (92/43/EEC). It has been noted that the white-clawed crayfish is vulnerable to pollution incidents, particularly those involving biocides, silage effluent and suspended solids.

Biological monitoring of water quality in the Mountain Water was carried out in September 2013 by Conservation Services of Killarney, on behalf of Silver Hill Foods. The full report is given in Appendix 2. Sampling was carried out at 2 sites, upstream and downstream of Emyvale, at the locations shown in the map located in Appendix 2 - the Biological Survey Report. The macroinvertebrate fauna recorded at the upstream site merited a Q-rating of Q4 indicating unpolluted conditions and good ecological status. The macroinvertebrate fauna recorded at the downstream site merited a Q-rating of Q3-4 indicating slightly polluted conditions and moderate ecological status. The EPA had carried out biological monitoring in 2007 and 2010 with the following results:

Station 0400 (1.5 km upstream).......... Q3-4

Station 0500 750m downstream...........Q3

The results of the 2013 biological monitoring programme represent a noticeable improvement in the quality of the river compared to earlier assessments.

The Action Plan for the period 2009 to 2015 pointed out that the Mountain Water River at Emyvale was of poor water quality because of suspected sewage and possibly other discharges below the village of Emyvale. Since that time Monaghan County Council has received a wastewater discharge permit from the EPA. This permit set new higher standards for the discharge and these came into operation in January 2013.

In recent EPA documents the average flow at Emyvale was given as 1.49m^3/sec (129,000 m^3/d). In July 2013, the EPA informed Silver Hill that it estimated the 95%ile flow at 0.04m^3/sec (3,456 m^3/d).

The results of monitoring of the Mountain Water River by Monaghan County Council in 2012 and 2013 are given in Table 2.

Table 2: Mountain Water Quality Upstream of Emyvale

Date	BOD mg/l	Ammonia mg/l as N	Ortho-Phosphate mg/l as P
17/02/2012	2	0.037	0.01
26/04/2012	1.2	0.02	0.019
20/06/2012	1.1	0.132	0.006
04/09/2012	2	0.047	0.036
18/10/2012	0.3	0.02	0.03
05/12/2012	2	0.025	0.007
9/04/2013	<1	0.057	0.015
2/05/2013	2	0.024	0.018
13/06/2013	3	0.051	<0.009
01/08/2013	<1	0.093	<0.009
13/09/2013	<1	0.012	0.061
29/10/2013	1.0	0.007	0.009
Average	**<1.47**	**0.044**	**<0.019**
Good Status Criteria	<1.5 (mean) or <2.6 (95%ile)	<0.065 (mean) or <0.140 (95%ile)	<0.035 (mean) or <0.075 (95%ile)

The above results suggest that the river reaching Emyvale meets the requirements of Good Status in terms of Ammonia and Ortho-Phosphate while approaching the threshold for BOD. These results are consistent with the biological monitoring carried out in 2013.

3. Appropriate assessment issues

Appropriate assessment is an obligation in all member states under Article 6.3 of the Habitats Directive which states

> **Any plan or project not directly connected with or necessary to the management of a Natura 2000 site but likely to have a significant effect thereon, either individually or in combination with other plans or projects shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives.**

Plans or projects outside a protected site must be screened and, if necessary, appropriately assessed. As this project relates to the discharge of effluent, the only issue to be considered is the water environment and whether changed water quality at the site is likely to have a significant effect.

Protected areas

A significant proportion of waters in the Neagh Bann River Basin District are protected under existing EU legislation and as such, they require special protection due to their sensitivity to pollution or their particular economic, social or environmental importance. All of the areas requiring special protection in the Neagh Bann IRBD have been identified, mapped and listed in a register of protected areas background document (available at www.wfdireland.ie). They include:

Drinking water sources such as Glaslough Lough,

Shellfish waters such as parts of Carlingford Lough and Dundalk Bay,

Bathing waters such as Seapoint and Clogherhead,

Nutrient sensitive areas such as Lough Muckno and River Blackwater,

Special Areas of Conservation such as Dundalk Bay and Carlingford Shore

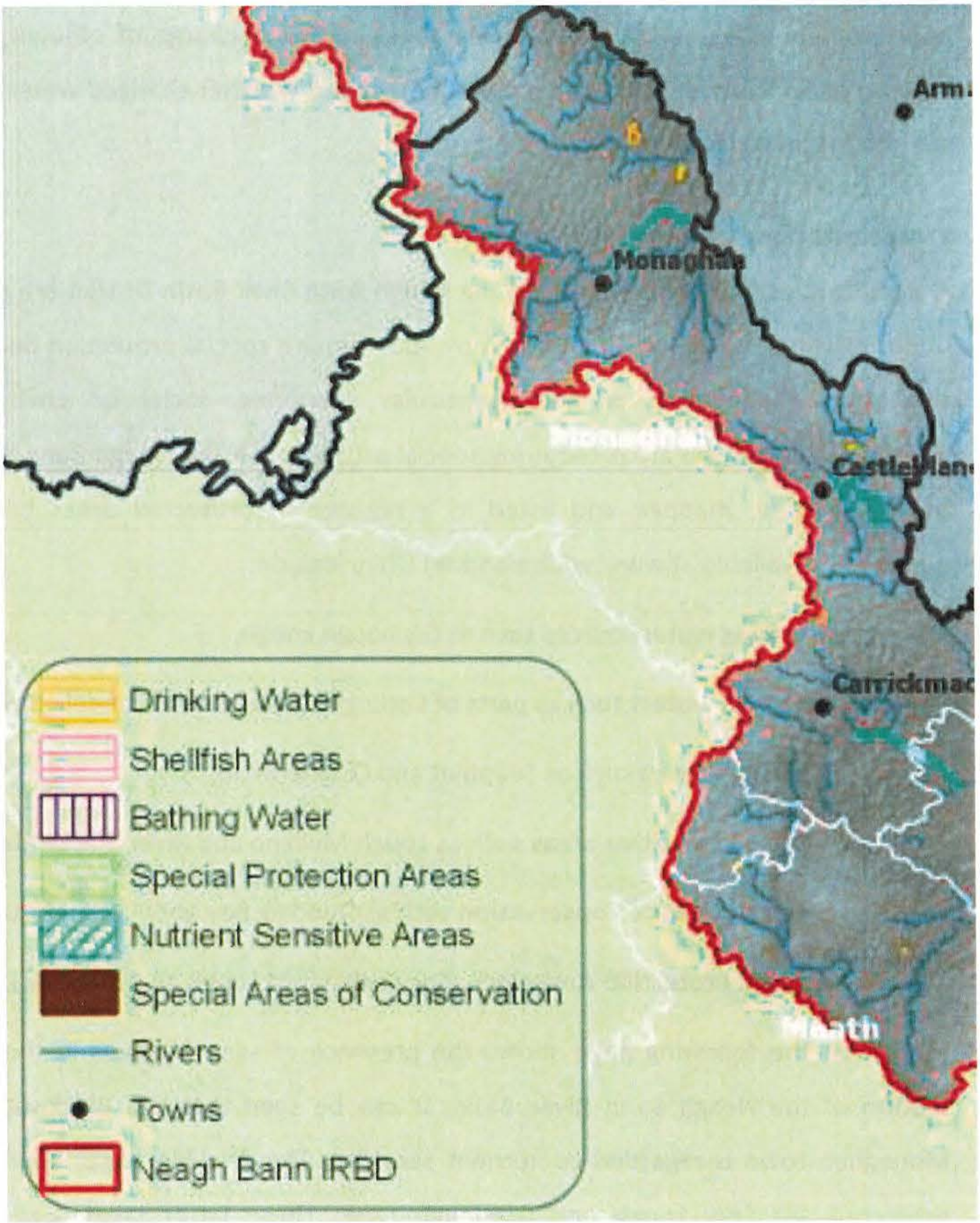
Special Protection Areas including Carlingford Lough and Dundalk Bay.

Map 3 on the following page shows the presence of such features in the relevant section of the Neagh Bann River Basin. It can be seen that the Blackwater below Monaghan town is regarded as nutrient sensitive. The drinking water sources to be protected are Emy Lough and Glaslough Lake. These latter lakes feed into the Mountain River but the effluent from Silver Hill Foods does not enter these lakes, directly or indirectly. Thus the proposed discharge cannot have any impact on these important sources of drinking water. Similarly, as the stretch of the Blackwater River that is characterised as nutrient sensitive does not receive any input of Silver Hill effluent, the proposed discharge cannot have any impact on its status.

Conclusion

It is concluded that an appropriate assessment under the Habitats Directive is not required.

Map 3



4. Characteristics of the Silver Hill Effluent

Its current IPPC Permit allows Silver Hill to discharge effluent within the following limits:

Vol: 480 m3/d

BOD: 10 mg/l

S.S.: 15 mg/l

COD: 100 mg/l

Ammonia: 1 mg/l

Total Phosphorus as P: 2 mg/l

Silver Hill operates its treatment system to keep well below the above maximum limits. The Company analyses its effluent on a regular basis and reports these to the EPA. Each year it submits its monitoring results as a table within its Annual Environmental Report which is available to the public. The EPA visits the plant to independently monitor its performance. The IPPC permit requires that 8 out of 10 consecutive samples must be below the limit set out in the permit and no sample can exceed the permit by a factor greater than 1.2. The daily flow must always remain below the maximum permitted.

The effluent plant consists of the following stages:

Screening

Flow balancing

Activated sludge treatment

Chemical addition for Phosphorus removal

Final settlement

Flow measurement and sampling

Please find attached a schematic of Silver Hill Foods Waste Water Treatment Plant and also a photo of the Current final discharge point into SW1 in Appendix 3.

The monitoring results shown in the Company's 2012 Annual Environmental Report, which are the average results for the year and those for the first 7 months of 2013, are set out in Table 3.

Table 3: SH Average Monitoring Results 2011, 2012 and Jan-July 2013

	Permit Maximum	Monitored Results 2011	Monitored Results 2012	Monitored Results Jan – July 2013	Average All Results	Maximum Monitored values
BOD, mg/l	10	4	2	3	3	8
COD, mg/l	100	26	31	37	31	92
Suspended solids, mg/l	15	7	6	8	7	14
Nitrate, mg/l as N	15	1.35	1	1.7	1.2	8.9
Ammonia (as N), mg/l	1	0.17	0.15	0.17	0.16	0.88
Phosphorus, (tot) mg/l as P	2	0.71	0.78	0.64	0.71	1.49
Fats, Oils, mg/l	10		0	0	0	0

While the effluent criteria sometimes approach the maximum level set out in the permit, it can be seen from the above table that the actual average level of contaminants discharged is very much lower.

The impact of the discharge on water quality in the Mountain Water River should be assessed in regard to the criteria in the Surface Water Regulations of 2009 (see Table 1, page 5) which sets a limit in terms of Orthophosphate as P rather than total Phosphorus as P.

Effluent Volume

A Company such as Silver Hill Foods does not emit its full permitted volume (480 m^3/d) of effluent every day of the year because of production variations during a 3 to 5-day working week. Each year the annual average flow is reported to the EPA as part of the

Company's Annual Environmental Report. In 2011, SH discharged an average daily volume of $208m^3/d$ and, in 2012, $190m^3/d$. During those years the Company mostly operated on a 3-day week. As production is expected to climb to a 5-day week over the next few years the average volume discharged will increase accordingly.

The Company has examined in detail the daily flow variations over the past 18 months so as to estimate its expected volume of effluent for the next 5 years. The Company is currently examining means of reducing the usage of water within the processing plant and any other sources that could contribute to the volume of effluent to be discharged. In addition to the process effluent there is often an inflow of surface water with the result that the effluent volume increases somewhat during rainy periods. Examinations of the records show that while the daily maximum limit ($480m^3/d$) is approached two or three times a year, the average daily flow is much lower. Using the historical records of flows at Silver Hill and applying the results to anticipated future production levels, the expectation is that the average volume to be emitted over a year will be less than $300m^3/d$ with a daily maximum of $420m^3$.

Effluent characteristics

The average concentrations of the contaminants in the effluent have been given in Table 2, page 8. As the Company increases production over the next few years and the loading on the effluent plant increases, it is likely that the final effluent quality will adhere to current low levels and will be within the agreed parameters. In addition, as early assessment of the impact showed that phosphorus was an important issue, Silver Hill is considering reducing their O-Phosphate content to 0.60 mg/l as O-Phosphate (compared with the present 2 mg/l as Total P). Similarly with Ammonia, the Company is considering a reduction from 1 mg/l as N to 0.6 mg/l as N. For the purposes of calculations, we have estimated that the average quality of the discharge in future years could be as shown in Table 4, page 14 which also shows the daily loads of contaminants resulting from such a discharge.

Table 4: Loads at average flow of 300 m^3/d using specified concentrations

	Level in Effluent mg/l	Loads kg/d
BOD	10	3
Ammonia	0.6	0.18
O-Phosphate as P	0.60	0.18

The Company estimates that it may be possible to reduce its maximum daily flow to 420 m^3/d from the current permit level of 480 m^3/d. The average volume discharged, (300 m^3/d) may be regarded as a more realistic basis for assessing the impact on the river. Where a contaminant in an effluent has an immediately impact, such as from a toxic component like copper, then the daily concentration of that parameter is the important figure. In the case of phosphorus, its impact is gradual and it is the average figure over the dry summer months which is more relevant. The input of excessive levels of phosphorus as Ortho Phosphate can lead to excessive plant growth and, in some cases of slow moving waters, to algal blooms. The required 95%ile concentration of 0.075 mg/l of O-P in the river is designed to prevent the occurrence of such a problem.

In practice the final effluent quality will be better than those set out in Table 4 above as no Company operates its treatment plant to the maximum permitted levels. Thus the calculations that follow are conservative in respect of the quality of the effluent and allow a margin of safety.

4. Assessment of Impact on Water Quality

Using the Mean and 95%ile flow values provided by the EPA (129,000 and 3,456 m^3/d, respectively) and the loads to be emitted by Silver Hill (Table 4) it is possible to estimate the increases in the water quality criteria in the Mountain Water River from SH effluent alone – see Table 5 below. After the addition of 300m^3/d from Silver Hill the 95%ile flow in the river will increase to 3,756m^3/d.

Table 5: Estimated increases in river from SH effluent alone

Increase of	River Mean Flow	River 95%ile Flow
BOD, mg/l	**0.02**	**0.8**
Ammonia, mg/l	**0.001**	**0.048**
O-Phosphate, mg/l	**0.001**	**0.048**

These may be compared with the Good Status requirements as set out below.

	Good Status Requirements
BOD, mg/l	<1.5 (mean) or <2.6 (95%ile)
Ammonia, mg/l	<0.065 (mean) or <0.140 (95%ile)
O-Phosphate, mg/l as P	<0.035 (mean) or <0.075 (95%ile)

Impact with entry of SH effluent and Emyvale town effluent

The Emyvale WWTP discharges effluent to the Mountain Water River under a permit issued by the EPA, at a normal flow rate of 184m^3/d. The permit requires that from January, 2013 the WWTP discharge meet the following limits:

BOD: 14 mg/l,

Ammonia: 1 mg/l,

OrthoPhosphate: 0.75 mg/l

However, the quality of the Emyvale treatment plant discharge can be expected to be below the maximum figures in its wastewater permit, as is shown by the monitored performance in 2013 (see Table 6 below).

Table 6: Performance of Emyvale WWTP in 2013

Date	BOD mg/l	Ammonia mg/l	O-Phosphate as P mg/l
9/04/13	6	0.068	0.125
26/04/13	4	0.145	0.088
02/05/13	4	0.147	0.120
13/06/13	9	0.257	0.143
01/08/2013	<1	4.4	<0.045
Average (A)	**5**	1	**0.104**
Permit ELV (B)	**14**	**1**	**0.75**

The above values will result in the discharge of the following quantities into the river.

Table 7: Loads emitted per day from Emyvale WWTP

	BOD kg/d	Ammonia, kg/d	O-Phosphate as P kg/d
(A) **Average emissions**	0.92	0.184	0.019
(B) **Max Permit Limits**	2.58	0.184	0.138

Table 8, page 17 shows the total loads going to the Mountain River from Silver Hill (as per Table 4) and the average (A) emission from Emyvale WWTP and the estimated increase in river water quality parameters resulting from the combined discharge. With the addition of 184m^3/d from the WWTP and 300m^3/d from Silver Hill the 95% flow in the river will increase from 3,4S6m^3/d to 3,940 m^3/d.

Table 8: Estimated increases in the river from SH effluent and Emyvale WWTP

	Emyvale WWTP kg/d (table 7)	SH Annual average kg/d (table 4)	TOTAL kg/d	Increase at mean River Flow mg/l	Increase at 95% Flow mg/l
BOD	0.92	3	3.92	0.03	**1.0**
Ammonia	0.184	0.18	0.364	0.003	**0.092**
O-Phosphate	0.019	0.18	0.199	0.002	**0.051**

The estimated increases in criteria for a **notionally clean river** are given in Tables 9 and 10.

Table 9: Impact on Mountain Water of both Silver Hill and Emyvale WWTP on notional water quality at mean river flow

	Good Status Requirements	Notional River before entry	Increases from both effluents	Notional River after entry
BOD mg/l	<1.5 (mean)	0.26	0.03	**0.29**
Ammonia mg/l as N	<0.065 (mean)	0.005	0.003	**0.008**
O-Phosphate mg/l as P	<0.035 (mean)	0.008	0.002	**0.01**

Table 10: Impact on Mountain Water of both Silver Hill and Emyvale WWTP on notional water quality at 95%ile river flow

	Good Status Requirements	Notional River before entry	Increase of	Notional River after entry
BOD mg/l	<2.6 (95%ile)	0.26	1.0	**1.26**
Ammonia mg/l as N	<0.140 (95%ile)	0.005	0.092	**0.097**
O-Phosphate mg/l as P	<0.075 (95%ile)	0.008	0.051	**0.059**

It is clear from the above that a notionally clean river would continue to comply with Good Status requirements at both the mean and 95%ile flow rates after entry of the Silver Hill and the WWTP effluent.

Impact on Mountain Water River

The quality of the Mountain River is not as high as that of a notionally clean river. The average quality of the river as shown by the Monaghan County Council monitoring results (see Table 2) is: BOD <1.47 mg/l, Ammonia 0.044 mg/l and O-Phosphate 0.019 mg/l. Table 11 below gives estimates of the overall quality of the river after entry of both effluents using the loads shown in Table 8.

Table 11: Impact of both Silver Hill and Emyvale WWTP on monitored water quality of Mountain Water River at mean river flow

	Good Status Requirements	Actual River before entry	Increases from both effluents	River after entry
BOD mg/l	<1.5 (mean)	<1.47	0.03	**<1.50**
Ammonia mg/l as N	<0.065 (mean)	0.044	0.003	**0.047**
O-Phosphate mg/l as P	<0.035 (mean)	<0.019	0.002	**<0.021**

Table 12 below gives estimates of the overall quality of the river after entry of both effluents during the **95%ile** flow.

Table 12: Impact of both Silver Hill and Emyvale WWTP on monitored water quality of Mountain Water River at 95%ile river flow

	Good Status Requirements	Actual River before entry	Increase of	River after entry
BOD mg/l	<2.6 (95%ile)	<1.47	1.0	**<2.47**
Ammonia mg/l as N	<0.140 (95%ile)	0.044	0.092	**0.136**
O-Phosphate mg/l as P	<0.075 (95%ile)	<0.019	0.051	**0.070**

It can be seen from the above tables that the quality of the Mountain Water River would comply with Good Status requirements at both the mean and 95%ile flow rates after entry of the Silver Hill and the WWTP effluent.

6. Monitoring by Silver Hill and proposed permit levels

To increase its understanding of the receiving water Silver Hill undertook a number of sampling exercises in the Mountain Water River at the proposed entry point near the Enterprise Centre in the town of Emyvale. The results of the monitoring are shown in Table 13 below.

Table 13: Monitoring of Mountain Water River by Silver Hill

Date	BOD mg/l	Ammonia mg/l as N	Ortho-Phosphate mg/l as P
23/08/2013	0.65	0.017	0.022
28/08/2013	1.4	0.02	0.05
04/09/2013	1.11		
11/09/2013	1.05	0.017	0.031
18/09/2013	1.81	0.021	0.013
25/09/2013	1.1	0.024	0.081*
03/10/2013	3.2		
04/10/2013			0.033
07/10/2013			0.028
08/10/2013			0.03
09/10/2013	1.5	0.012	0.018
10/10/2013	1.7	0.027	0.023
15/10/2013		0.007	0.004
16/10/2013		0.006	0.012
Average	**1.5**	**0.017**	**0.028**
Monaghan Co.Co. Results (Table 4)	**<1.47**	**0.044**	**0.019**
Good Status	<1.5 (mean) or <2.6 (95%ile)	<0.065 (mean) or <0.140 (95%ile)	<0.035 (mean) or <0.075 (95%ile)

*Possible error? It is out of line with all other results. The average without this value is 0.024

There is close agreement between the Monaghan County Council results and the results of samples taken by Silver Hill. Taking all the results into account the picture presented is that of a river which is impacted by intermittent diffuse discharges. This has been recognized in the Water Management Unit Action Plan that requires action in regard to the Mountain River water so that it can achieve Good Status by 2021.

In view of the need to protect the water quality in the Mountain Water River, Silver Hill has reviewed its effluent discharge standards and is willing to accept a reduction in some critical parameters of its current permit. The existing and proposed future permit levels are set out in Table 14 below.

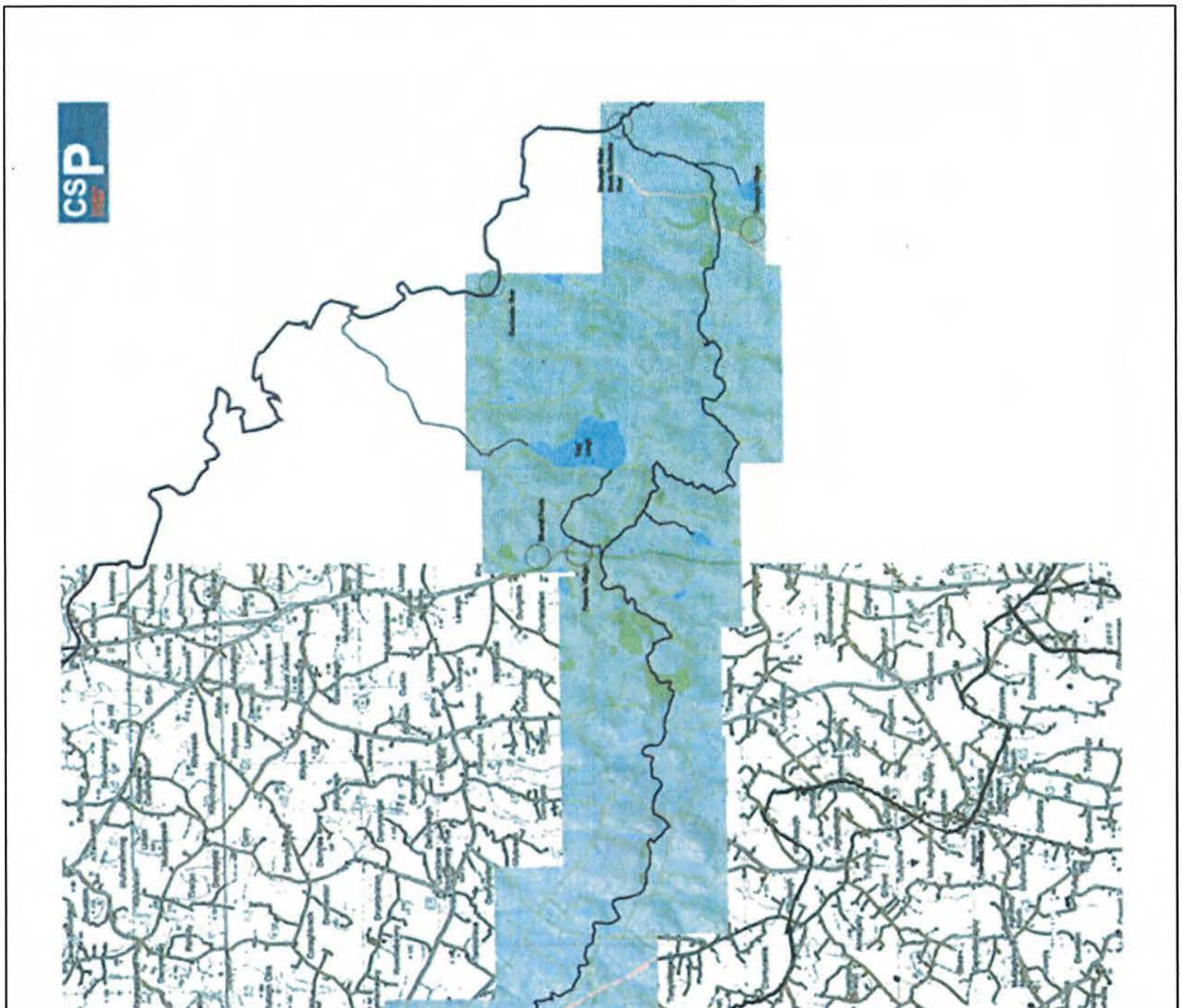
Table 14: Existing and proposed permit limits

	Existing Permit	**Proposed Permit**
Volume m3/d	480	420
BOD mg/l	10	10
COD mg/l	100	100
Suspended solids mg/l	15	15
Ammonia, mg/as N,	1	0.6*
Nitrate mg/l as N	15	15
Total Phosphate, mg/l as P	2	Replaced by the O-Phosphate parameter
O-Phosphate, mg/l as P		0.6*
Fats, oils, greases mg/l	10	5

* Weekly average. All others daily max.

Appendix 1

Map of Mountain Water River



Appendix 2

Biological monitoring Report of Mountain Water River

BIOLOGICAL MONITORING OF WATER QUALITY IN THE VICINITY OF SILVERHILL FOODS, COUNTY MONAGHAN

Mountain Water

September 2013

CS Conservation Services, Tullaha, Glenflesk, Killarney, Co. Kerry

Tel/Fax 064 6630130 e-mail cs@conservation-services.ie

CONTENTS

1. INTRODUCTION

Conservation Services, Ecological & Environmental Consultants have been commissioned by Fitz Scientific to carry out biological sampling and water quality assessment in accordance with EPA Q-rating methodology at two sites on the Mountain Water in the vicinity of Emyvale, County Monaghan.

Sampling was carried out on 9th September 2013.

2. METHODOLOGY

2.1. SITE LOCATIONS

Biological sampling and water quality assessment was carried out at the following sites specified by Fitz Scientific. Grid references were recorded at each site using a GPS.

WATERCOURSE	SITE	GRID REFERENCE (GPS)
MOUNTAIN WATER	MW-1 Upstream	H 67086 43351
	MW-2 Downstream	H 68464 43140

The location of the sites is shown on Map 1.

2.2. HABITAT ASSESSMENT

Habitat assessment was carried out at each of the sites selected for invertebrate/water quality assessment. These sites were assessed in terms of:

- Stream width and depth
- Substrate type, listing substrate fractions in order of dominance, i.e. large rocks, cobble, gravel, sand, mud etc.

- Flow type, listing percentage of riffle, glide and pool in the sampling area

- Instream vegetation, listing plant species occurring and their percentage coverage of the stream bottom at the sampling site

- Dominant bankside vegetation, listing the main species overhanging the stream

- Estimated summer cover by bankside vegetation, giving percentage shade of the sampling site

- Rating of the site as habitat for trout adult, nursery and spawning on a scale of Poor/Fair/Good/Very Good/Excellent. This rating assesses the physical suitability of the habitat; the presence/absence/density of salmonids at the site will also depend on present and historical water quality and accessibility of the site to fish.

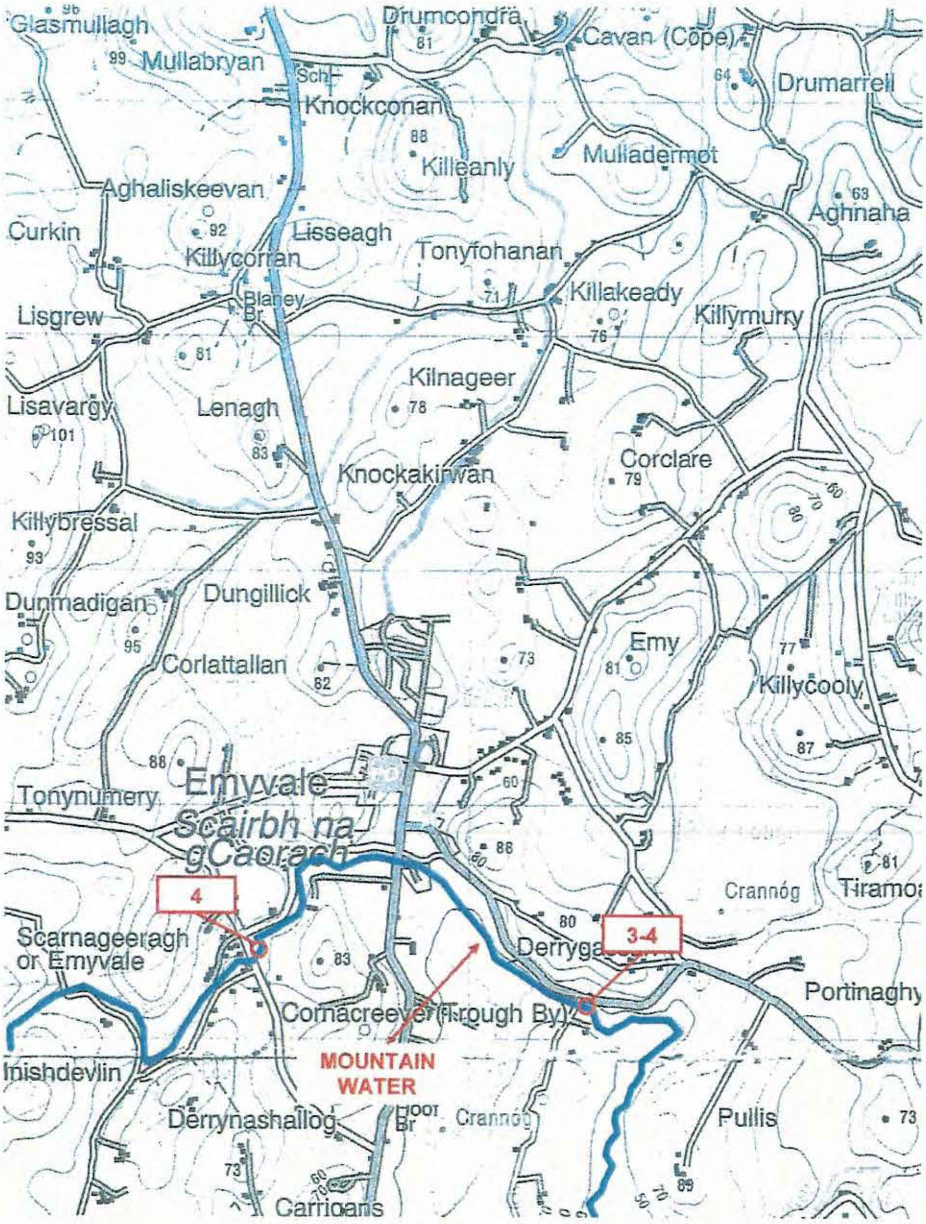
To illustrate habitat quality, photographs were taken at each site using a digital camera.

2.3. INVERTEBRATE SAMPLING AND WATER QUALITY ASSESSMENT

A kick and stone wash invertebrate sample was taken at each site (ISO 7828:1985) using standard methodology employed by EPA. Each sample was retained in a large plastic bag at the sampling site. Sample processing and preservation was carried out under laboratory conditions within 24 hours of sampling. Mud was removed from each sample by sieving under running water through a 500μ sieve. Sieved samples were then live sorted for 30 minutes in a white plastic sorting tray under a bench lamp (ISO 5667-3:1994) and if necessary using a magnifying lens. Macroinvertebrates were stored in 70% alcohol. Preserved invertebrates were identified to the level required for the EPA Q-rating method (McGarrigle *et al*, 2002) using high-power and low-power binocular microscopes when necessary. The preserved samples were archived for future examination or verification. Based on the relative abundance of indicator species, a biotic index (Q-rating) was determined for each site in accordance with the biological assessment procedure used by the Environmental Protection Agency (Statutory Instruments No. 258 of 1998) and more detailed unpublished methodology (McGarrigle, Clabby and Lucey pers. comm.)

Biotic Index	**Water Framework Directive Ecological Status**	**Quality Status**
Q5	High	Unpolluted Waters
Q4-5	High	
Q4	Good	
Q3-4	Moderate	Slightly Polluted Waters
Q3	Poor	Moderately Polluted Waters
Q2-3	Poor	
Q2	Bad	Seriously Polluted Waters
Q1-2	Bad	
Q1	Bad	

MAP 2 Q-RATINGS AT BIOLOGICAL ASSESSMENT SITES



3. RESULTS

Habitat descriptions, including site photographs, are given in Appendix 1.

3.1. MOUNTAIN WATER: SITE MW-1

The macroinvertebrate fauna recorded at the site merits a Q-rating of Q4 indicating unpolluted conditions and good ecological status.

INDICATOR GROUP	TAXON	Number
Group A: Very Pollution Sensitive	*Ecdyonurus sp.*	6
	Heptagenia sp.	3
	Heptageniidae (small/damaged)	3
	Rhithrogena sp.	1
Group B: Moderately Pollution Sensitive	*Silo sp.*	1
Group C: Moderately Pollution Tolerant	*Austropotamobius pallipes*	5
	Gammarus duebeni	77
	Gammarus pulex	57
	Baetis rhodani	34
	Hydropsyche sp.	8
	Polycentropus sp.	3
	Rhyacophila sp.	6
	Elmidae	15
	Hydraena sp.	1
	Chironomidae	2
	Simuliidae	1
	Tipulidae (Pediciidae)	6
Group D: Very Pollution Tolerant	None recorded	
Group E: Most Pollution Tolerant	Tubificidae	1

3.2. MOUNTAIN WATER: SITE MW-2

The macroinvertebrate fauna recorded at the site merits a Q-rating of Q3-4 indicating slightly polluted conditions and moderate ecological status.

INDICATOR GROUP	TAXON	Number
Group A: Very Pollution Sensitive	*Ecdyonurus sp.*	4
	Heptagenia sp.	1
Group B: Moderately Pollution Sensitive	*Agapetus sp.*	1
	Silo sp.	1
Group C: Moderately Pollution Tolerant	*Ancylus fluviatilis*	4
	Potamopyrgus antipodarum	2
	Austropotamobius pallipes	3
	Gammarus pulex	c.800
	Baetis rhodani	11
	Hydropsyche sp.	16
	Polycentropus sp.	1
	Rhyacophila sp.	12
	Elmidae	c.90
	Gyrinidae	1
	Chironomidae	2
	Simuliidae	4
	Tipulidae (Pediciidae)	4
Group D: Very Pollution Tolerant	None recorded	
Group E: Most Pollution Tolerant	Tubificidae	1
Taxa not assigned to an Indicator Group	Lumbriculidae	2

4. CONCLUSIONS

The results of the present survey indicate unpolluted conditions and good ecological status at Site MW-1 upstream of Emyvale, and slightly polluted conditions and moderate ecological status at Site MW-2 downstream of Emyvale.

Signed on behalf of Conservation Services

____

Bill Quirke B.Sc., M.Sc., MCIEEM

25 October 2013

5. REFERENCES

McGarrigle, M. ***et al*** **(2002)** Water Quality in Ireland 1998-2000. EPA.

APPENDIX 1

HABITAT ASSESSMENT AT SAMPLING SITES

Site Code	MW-1
Grid Reference	H 67086 43351
Site Location	d/s Bridge and Weir
Site Photograph	
Channel Width (m)	10-15
Depth (cm)	10-20
Substrate (in order of dominance)	Large rocks, Cobble, Gravel, Sand, Mud (Heavy siltation)
Flow Type	Riffle 40% Glide 60%
Instream Vegetation	Filamentous algae 5% Bryophytes 5%
Dominant Bankside Vegetation	Ash, Alder
Summer Shade of Stream by Bankside Vegetation	20%
Trout Adult Habitat	Good
Trout Nursery Habitat	Good
Trout Spawning Habitat	Fair-Poor

Site Code	MW-2
Grid Reference	H 68464 43140
Site Location	d/s Bridge
Site Photograph	
Channel Width (m)	4-6
Depth (cm)	10-15
Substrate (in order of dominance)	Cobble, Gravel, Sand, Mud (Heavy siltation)
Flow Type	Riffle 15% Glide 85%
Instream Vegetation	Filamentous algae 20%
Dominant Bankside Vegetation	Hawthorn, Alder, Nettle, Bramble
Summer Shade of Stream by Bankside Vegetation	<5%
Trout Adult Habitat	Fair
Trout Nursery Habitat	Fair
Trout Spawning Habitat	Poor

Appendix 3

Silver Hill Foods Wastewater Treatment Plant Schematic

and Photo of current final discharge point

Silver Hill Foods WWTP Schematic

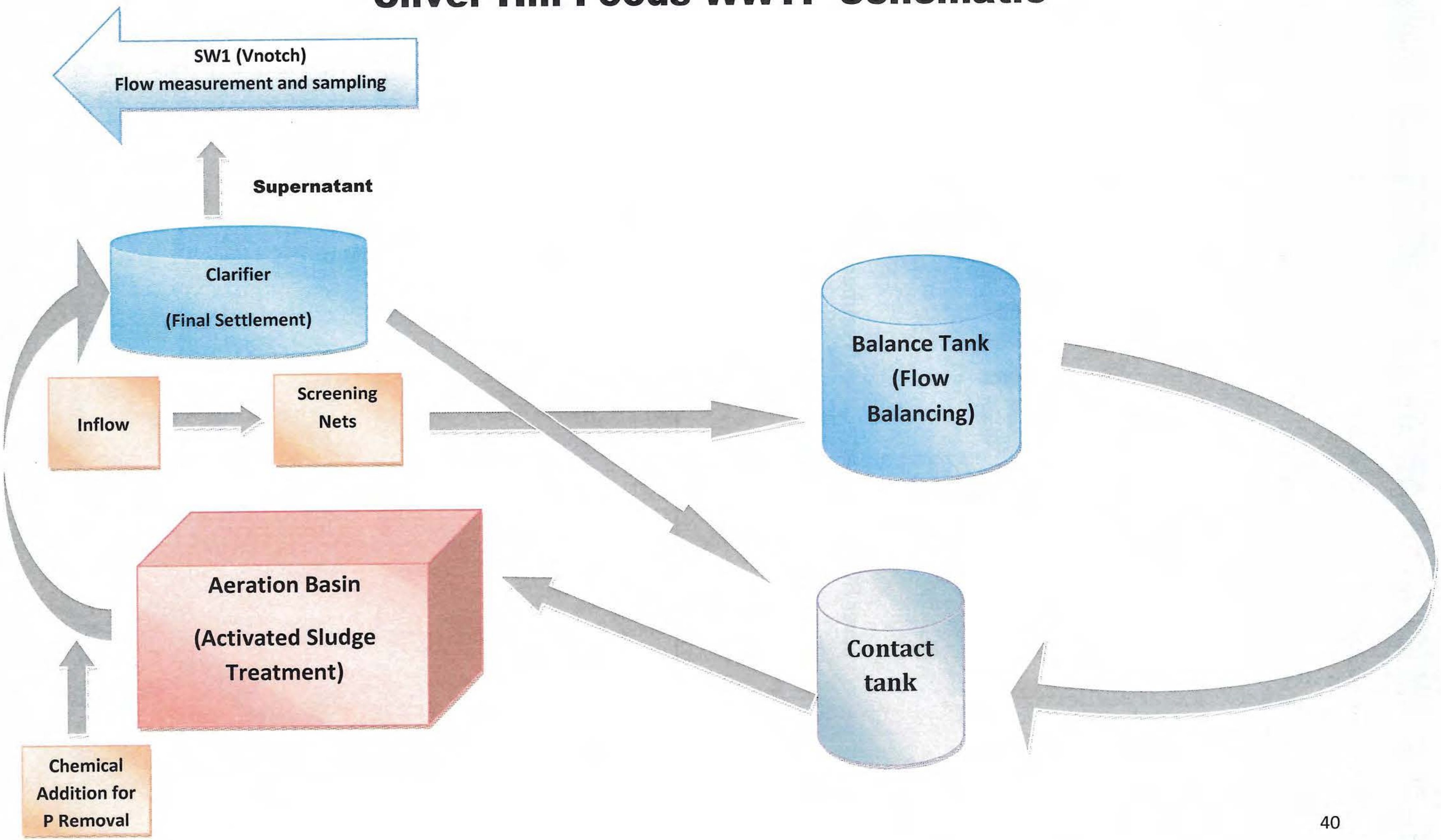


Photo of current final discharge point SW1 (Vnotch)

Reply to: Sixmilebridge Our ref: RF
Your ref: Date: 5th December, 2016

Ms Denise Jordan,
Silver Hill Foods,
Emyvale,
Co. Monaghan.

Re:- Site Assessment for Proposed Drip Irrigation System at Silver Hill Foods.

Dear Denise,

With reference to above-mentioned and prior discussions with Joe Walsh of Ash Environmental Technologies I confirm that I attended on site to carry out site assessment study of the existing lands for determination of suitability for dispersal of treated wastewater using a drip irrigation system and report as follows:-

Scope of Works:

To determine the type and classification of soils/subsoils on site, the depth of soils/subsoils, and the depth to water table.

Purpose of Works:

To enable a decision on the suitability of the lands for dispersal of treated wastewater using a drip irrigation system.

Assessment Parameters:

It was decided following discussions with Joe Walsh of Ash Environmental Technologies to adapt measures outlined in the EPA Code of Practice Wastewater Treatment and Disposal Systems Serving Single Houses 2009, using the British Standard BS5930:1999 for soil classification and the Percolation Test procedure for the percolating properties of the soils.

Assessment Requirements:

Based on the parameters set, a three day period of assessment was required. It was agreed that I would attend on site on Monday 28th, Tuesday 29th and Wednesday 30th November, 2016 to carry out the assessment. Joe Walsh had advised that he would attend on site from the commencement of the assessment and that a suitable machine and sufficient water would be provided by Silver Hill Foods to enable me to carry out the assessment.

Assessment Process:

It was decided, given the expanse and location of the lands identified for possible dispersal, to excavate a number of trial holes throughout the land at varying locations and field positions. It was also decided to excavate a Percolation Test Hole at each trial hole location.

Trial Holes:

A total of 15 trial holes were excavated throughout the lands, each to a depth of 1.5m. The location points for the trial holes are marked as approximate on the attached site location map (Appendix 1). Each of these trial holes were assessed as follows:-

(i) Soil layers/type/classification
(ii) Depth to water ingress when excavated
(iii) Depth to water table after 24 hours
(iv) Depth to water table after 48 hours
(v) Depth to bedrock

Trial hole assessment results are detailed individually and marked as trial holes 1 to 15 attached (Appendix 2).

Percolation Test Holes:

A total of 15 percolation test holes were excavated throughout the lands, adjacent to each trial hole. The dimensions of each hole was 300mm x 300mm x 400mm deep. Each of these holes were pre-soaked twice on Tuesday 29th November, 2016 at 10am and 4pm. In order to achieve an indication of any percolation qualities of the soils it was decided that pre-soaking would be carried out twice and the level of water remaining in the hole prior to testing on the 30th November, 2016 would be recorded.

Percolation test hole results are detailed individually and marked as P-Test holes 1 to 15 attached (Appendix 3).

General Findings:

My assessment concluded that there is a wide and varied range of soils and subsoils throughout the lands. A common trend concluded that the soils generally are shallow poorly drained soils with mottling evident suggesting a seasonally adjusting water table.

There were some locations identified on the lands where heavy livestock poaching was evident and associated surface water ponding. These locations were few in numbers and, given the recorded depth to water table and percolation properties of the soils, did not reflect permeability. I can only assume that over intensification of agricultural activity has resulted in excessive compaction in locations where soils are of a clay nature.

A good depth of soil was recorded above recorded water table levels, ranging from 0.85m to in excess of 1.5m., and the predominant soil type recorded was silty in nature with sand and gravel content common.

Conclusion:

I would be of the opinion that such soils would be acceptable for a drip irrigation system, given the depth to water table, the seasonal nature of the water table, and the percolating quality of the soils. The use of drip irrigation in Ireland is relatively new and has tended thus far to be used as an option where percolating qualities are poor. The presence of mottling in the trial holes would suggest that there may be occasions during wet periods where complete sub-surface drainage may prove difficult in some areas, and these areas may need to be avoided.

However, the low levels of water in trial holes after 48 hours and the complete absence in some, combined with the low loading rates envisaged in the region of 3 litres/m^2 would seem to indicate that sub-surface infiltration aided by horizontal movement in the upper soil horizons should be achieved. In addition, the removal of the build-up of vegetation from the existing drains in the lands so that surface water can move more freely, would assist the drainage of the lower lying areas.

Comment:

This report as is our normal practice is for the benefit of the addressee only and should not be relied upon in whole or in part by any third party without the consent of the undersigned.

Please do revert should you have any questions or require any further particulars.

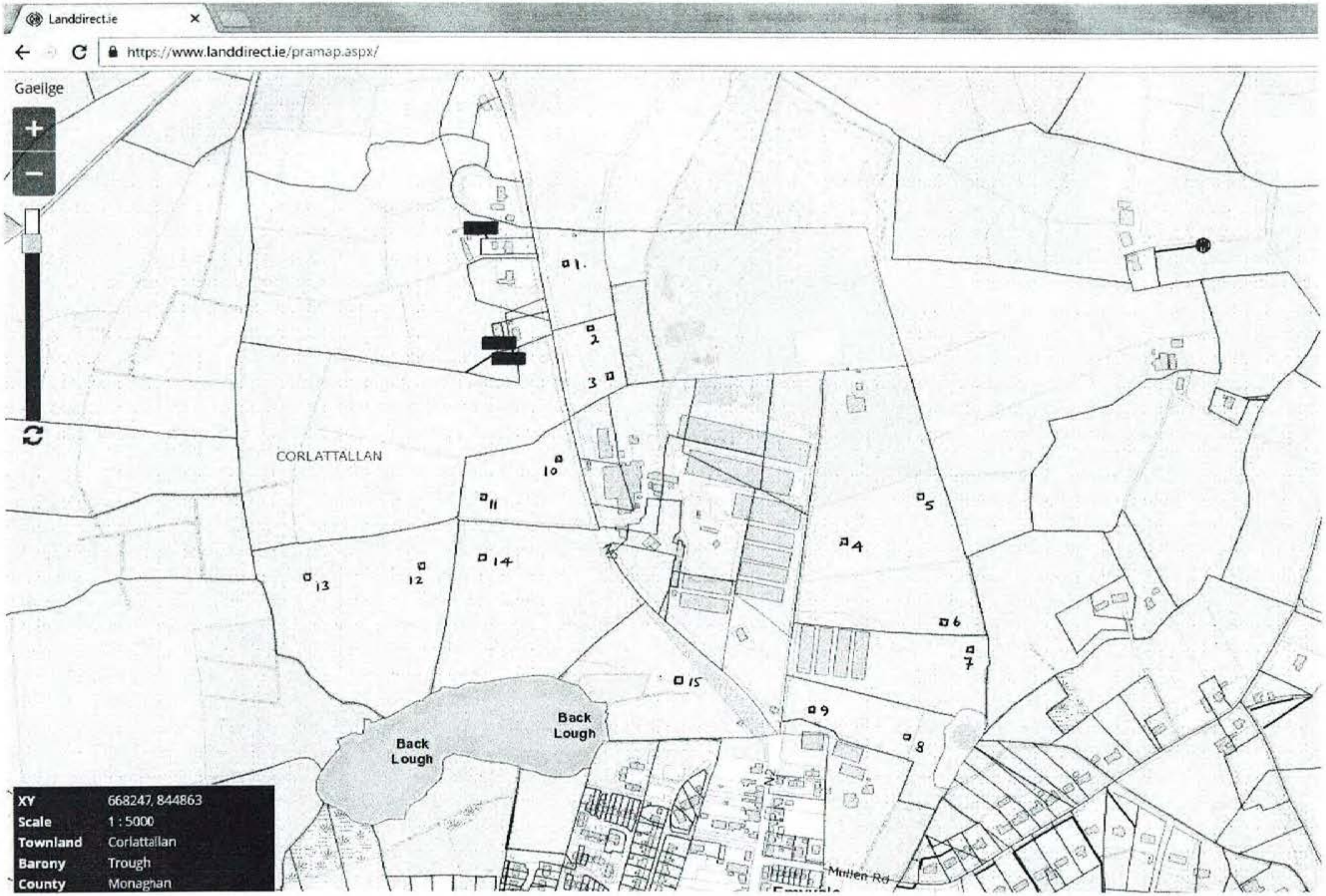
Yours sincerely,

____

Richard Flynn,
Flynn & Shaw.

Land owned by silver Hill in the Corlattalan townland

TRIAL HOLE LOCATIONS (APPROX.)



SILVER HILL FOODS, EMYVALE, CO. MONAGHAN. P-TEST HOLE NO. 1.

3.3(b) Percolation ("P") Test for Shallow Soil / Subsoils and/or Water Table

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0mm		
Depth from ground surface to base of hole (mm)	400mm		
Depth of hole (mm)	400mm		
Dimensions of hole [length x breadth (mm)]	300mm x 300mm	x	x

Step 2: Pre-Soaking Test Holes

	1		2		3	
Date and Time pre-soaking started	29-11-2016	AM.				

Each hole should be pre-soaked twice before the test is carried out. Each hole should be empty before refilling.

P-TEST HOLE CONTAINED 100mm OF WATER AFTER BEING SOAKED TWICE BEFORE TESTING.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	30-11-2016		
Time filled to 400 mm	8.08AM		
Time water level at 300 mm	9.55AM		
Time to drop 100 mm (P_{100})	107		
Average P_{100}			107

~~If P_{100} > 300 minutes then P-value >90 – site unsuitable for discharge to ground~~
~~If P_{100} ≤ 210 minutes then go to Step 4;~~
~~If P_{100} > 210 minutes then go to Step 5;~~

NOTE:- AT 3.40PM WATER LEVEL HAD DROPPED A FURTHER 100mm.

SILVER HILL FOODS, EMYVALE, Co. MONAGHAN.   P-TEST HOLE No. 2

3.3(b) Percolation ("P") Test for Shallow Soil / Subsoils and/or Water Table

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0mm		
Depth from ground surface to base of hole (mm)	400mm		
Depth of hole (mm)	400mm		
Dimensions of hole [length x breadth (mm)]	300mm X 300mm	x	x

Step 2: Pre-Soaking Test Holes

Date and Time pre-soaking started	1		2		3	
	29-11-2016	AM.				

Each hole should be pre-soaked twice before the test is carried out. Each hole should be empty before refilling.

P-TEST HOLE CONTAINED 200mm OF WATER AFTER BEING SOAKED TWICE BEFORE TESTING.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	30-11-2016		
Time filled to 400 mm	8.11AM.		
Time water level at 300 mm	12.30pm		
Time to drop 100 mm (P_{100})	259		
Average P_{100}			259

~~If P_{100} > 300 minutes then P-value >90 - site unsuitable for discharge to ground~~
~~If P_{100} ≤ 210 minutes then go to Step 4;~~
~~If P_{100} > 210 minutes then go to Step 5;~~

NOTE:- AT 3.38PM. WATER LEVEL HAD DROPPED A FURTHER 15mm.

SILVER HILL FOODS, EMYVALE, Co. MONAGHAN.   P-TEST HOLE No. 3

3.3(b) Percolation ("P") Test for Shallow Soil / Subsoils and/or Water Table

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0 mm		
Depth from ground surface to base of hole (mm)	400 mm		
Depth of hole (mm)	400 mm		
Dimensions of hole [length x breadth (mm)]	300mm X 300mm	x	x

Step 2: Pre-Soaking Test Holes

	1		2		3	
Date and Time pre-soaking started	29-11-2016	AM.				

Each hole should be pre-soaked twice before the test is carried out. Each hole should be empty before refilling.

P-TEST HOLE CONTAINED 200mm OF WATER AFTER BEING SOAKED TWICE BEFORE TESTING.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	30-11-2016		
Time filled to 400 mm	8·13AM.		
Time water level at 300 mm	10·10AM.		
Time to drop 100 mm (P_{100})	117		
Average P_{100}			117

~~If P_{100} > 300 minutes then P-value >90 – site unsuitable for discharge to ground~~
~~If P_{100} ≤ 210 minutes then go to Step 4;~~
~~If P_{100} > 210 minutes then go to Step 5;~~

NOTE:- AT 3·37PM WATER LEVEL HAD DROPPED A FURTHER 40mm.

SILVER HILL FOODS, EMYVALE, Co. MONAGHAN.   P-TEST HOLE No. 4

3.3(b) Percolation ("P") Test for Shallow Soil / Subsoils and/or Water Table

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0mm		
Depth from ground surface to base of hole (mm)	400mm		
Depth of hole (mm)	400mm		
Dimensions of hole [length x breadth (mm)]	300mm X 300mm	x	x

Step 2: Pre-Soaking Test Holes

	1		2		3	
Date and Time pre-soaking started	29-11-2016	AM.				

Each hole should be pre-soaked twice before the test is carried out. Each hole should be empty before refilling.

P-TEST HOLE WAS DRY AFTER BEING SOAKED TWICE BEFORE TESTING.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	30-11-2016		
Time filled to 400 mm	8.21 AM.		
Time water level at 300 mm	10.12 AM		
Time to drop 100 mm (P_{100})	111		
Average P_{100}			111

~~If P_{100} > 300 minutes then P-value >90 – site unsuitable for discharge to ground~~
~~If P_{100} ≤ 210 minutes then go to Step 4;~~
~~If P_{100} > 210 minutes then go to Step 5;~~

NOTE:- AT 2.48PM WATER LEVEL HAD DROPPED A FURTHER 100mm AND WAS REFILLED TO THE 300mm LEVEL AT 2.49PM
AT 3.50PM WATER LEVEL HAD DROPPED A FURTHER 30mm.

SILVER HILL FOODS, EMYVALE, Co. MONAGHAN.   P-TEST HOLE No. 5

3.3(b) Percolation ("P") Test for Shallow Soil / Subsoils and/or Water Table

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0 mm		
Depth from ground surface to base of hole (mm)	400 mm		
Depth of hole (mm)	400 mm		
Dimensions of hole [length x breadth (mm)]	300mm x 300mm	x	x

Step 2: Pre-Soaking Test Holes

	1		2		3	
Date and Time pre-soaking started	29-11-2016	AM.				

Each hole should be pre-soaked twice before the test is carried out. Each hole should be empty before refilling.

P-TEST HOLE CONTAINED 250mm OF WATER AFTER BEING SOAKED TWICE BEFORE TESTING.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	30-11-2016		
Time filled to 400 mm	8.23 AM		
Time water level at 300 mm	WATER LEVEL 345mm @ 3.52 PM.		
Time to drop 100 mm (P_{100})	>450		
Average P_{100}			>450

~~If P_{100} > 300 minutes then P-value >90 – site unsuitable for discharge to ground~~
~~If P_{100} ≤ 210 minutes then go to Step 4;~~
~~If P_{100} > 210 minutes then go to Step 5;~~

SILVER HILL FOODS, EMYVALE, Co. MONAGHAN. P-TEST HOLE No. 6

3.3(b) Percolation ("P") Test for Shallow Soil / Subsoils and/or Water Table

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0mm		
Depth from ground surface to base of hole (mm)	400mm		
Depth of hole (mm)	400mm		
Dimensions of hole [length x breadth (mm)]	300mm x 300mm	x	x

Step 2: Pre-Soaking Test Holes

Date and Time pre-soaking started						
	29-11-2016	AM.				

Each hole should be pre-soaked twice before the test is carried out. Each hole should be empty before refilling.

P-TEST HOLE CONTAINED 150mm OF WATER AFTER BEING SOAKED TWICE BEFORE TESTING.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	30-11-2016		
Time filled to 400 mm	8.27AM		
Time water level at 300 mm	12.52 PM		
Time to drop 100 mm (P_{100})	265		
Average P_{100}			265

~~If P_{100} > 300 minutes then P value >90 – site unsuitable for discharge to ground~~
~~If P_{100} ≤ 210 minutes then go to Step 4;~~
~~If P_{100} > 210 minutes then go to Step 5;~~

NOTE:- AT 3.57PM WATER LEVEL HAD DROPPED A FURTHER 30mm.

SILVER HILL FOODS, EMYVALE, Co. MONAGHAN. P-TEST HOLE No. 7

3.3(b) Percolation ("P") Test for Shallow Soil / Subsoils and/or Water Table

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0 mm		
Depth from ground surface to base of hole (mm)	400 mm		
Depth of hole (mm)	400 mm		
Dimensions of hole [length x breadth (mm)]	300mm x 300mm	x	x

Step 2: Pre-Soaking Test Holes

Date and Time pre-soaking started	1		2		3	
	29-11-2016	AM.				

Each hole should be pre-soaked twice before the test is carried out. Each hole should be empty before refilling.

P-TEST HOLE WAS DRY AFTER BEING SOAKED TWICE BEFORE TESTING.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	30-11-2016		
Time filled to 400 mm	8.29 AM.		
Time water level at 300 mm	10.27 AM		
Time to drop 100 mm (P_{100})	118		
Average P_{100}			118

~~If P_{100} > 300 minutes then P value >90 – site unsuitable for discharge to ground~~
~~If P_{100} ≤ 210 minutes then go to Step 4;~~
~~If P_{100} > 210 minutes then go to Step 5;~~

NOTE:- AT 3.59PM. WATER LEVEL HAD DROPPED A FURTHER 100mm.

SILVER HILL FOODS, EMYVALE, Co. MONAGHAN.   P-TEST HOLE No. 8

3.3(b) Percolation ("P") Test for Shallow Soil / Subsoils and/or Water Table

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0mm		
Depth from ground surface to base of hole (mm)	400mm		
Depth of hole (mm)	400mm		
Dimensions of hole [length x breadth (mm)]	300mm X 300mm	x	x

Step 2: Pre-Soaking Test Holes

	1		2		3	
Date and Time pre-soaking started	29-11-2016	AM.				

Each hole should be pre-soaked twice before the test is carried out. Each hole should be empty before refilling.

P-TEST HOLE WAS DRY AFTER BEING SOAKED TWICE BEFORE TESTING.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	30-11-2016		
Time filled to 400 mm	8·34AM		
Time water level at 300 mm	10·34AM		
Time to drop 100 mm (P_{100})	120		
Average P_{100}			120

~~If P_{100} > 300 minutes then P-value >90 – site unsuitable for discharge to ground~~
~~If P_{100} ≤ 210 minutes then go to Step 4;~~
~~If P_{100} > 210 minutes then go to Step 5;~~

NOTE:- AT 4·02PM. WATER LEVEL HAD DROPPED A FURTHER 100mm.

SILVER HILL FOODS, EMYVALE, Co. MONAGHAN. P-TEST HOLE No. 9.

3.3(b) Percolation ("P") Test for Shallow Soil / Subsoils and/or Water Table

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0mm		
Depth from ground surface to base of hole (mm)	400mm		
Depth of hole (mm)	400mm		
Dimensions of hole [length x breadth (mm)]	300mm X 300mm	x	x

Step 2: Pre-Soaking Test Holes

Date and Time pre-soaking started	29-11-2016	AM.				

Each hole should be pre-soaked twice before the test is carried out. Each hole should be empty before refilling.

P-TEST HOLE CONTAINED 200mm OF WATER AFTER BEING SOAKED TWICE BEFORE TESTING.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	30-11-2016		
Time filled to 400 mm	8.38AM.		
Time water level at 300 mm	10.50AM		
Time to drop 100 mm (P_{100})	132		
Average P_{100}			132

~~If P_{100} > 300 minutes then P-value >90 – site unsuitable for discharge to ground~~
~~If P_{100} ≤ 210 minutes then go to Step 4;~~
~~If P_{100} > 210 minutes then go to Step 5;~~

NOTE:- AT 4.04PM WATER LEVEL HAD DROPPED A FURTHER 40mm.

SILVER HILL FOODS, EMYVALE, Co. MONAGHAN. P-TEST HOLE No. 10

3.3(b) Percolation ("P") Test for Shallow Soil / Subsoils and/or Water Table

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0 mm		
Depth from ground surface to base of hole (mm)	400 mm		
Depth of hole (mm)	400 mm		
Dimensions of hole [length x breadth (mm)]	300 mm X 300 mm	x	x

Step 2: Pre-Soaking Test Holes

	1		2		3	
Date and Time pre-soaking started	29-11-2016	AM.				

Each hole should be pre-soaked twice before the test is carried out. Each hole should be empty before refilling.

P-TEST HOLE CONTAINED 170mm OF WATER AFTER BEING SOAKED TWICE BEFORE TESTING.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	30-11-2016		
Time filled to 400 mm	9.01 AM		
Time water level at 300 mm	12.20 PM		
Time to drop 100 mm (P_{100})	199		
Average P_{100}			199

~~If P_{100} > 300 minutes then P-value >90 – site unsuitable for discharge to ground~~
~~If P_{100} ≤ 210 minutes then go to Step 4;~~
~~If P_{100} > 210 minutes then go to Step 5;~~

NOTE:- AT 3.31 PM WATER LEVEL HAD DROPPED A FURTHER 40 mm.

SILVER HILL FOODS, EMYVALE, Co. MONAGHAN. P-TEST HOLE No. 11

3.3(b) Percolation ("P") Test for Shallow Soil / Subsoils and/or Water Table

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0mm		
Depth from ground surface to base of hole (mm)	400mm		
Depth of hole (mm)	400mm		
Dimensions of hole [length x breadth (mm)]	300mm x 300mm	x	x

Step 2: Pre-Soaking Test Holes

	1		2		3	
Date and Time pre-soaking started	29-11-2016	AM.				

Each hole should be pre-soaked twice before the test is carried out. Each hole should be empty before refilling.

P-TEST HOLE CONTAINED 30mm OF WATER AFTER BEING SOAKED TWICE BEFORE TESTING.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	30-11-2016		
Time filled to 400 mm	8.59AM		
Time water level at 300 mm	WATER LEVEL 350mm @ 3:28pm.		
Time to drop 100 mm (P_{100})	>389		
Average P_{100}			>389

~~If P_{100} > 300 minutes then P value >90 – site unsuitable for discharge to ground~~
~~If P_{100} ≤ 210 minutes then go to Step 4;~~
~~If P_{100} > 210 minutes then go to Step 5;~~

SILVER HILL FOODS, EMYVALE, Co. MONAGHAN. P-TEST HOLE No. 12

3.3(b) Percolation ("P") Test for Shallow Soil / Subsoils and/or Water Table

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0mm		
Depth from ground surface to base of hole (mm)	400mm		
Depth of hole (mm)	400mm		
Dimensions of hole [length x breadth (mm)]	300mm x 300mm	x	x

Step 2: Pre-Soaking Test Holes

Date and Time pre-soaking started						
	29-11-2016	AM.				

Each hole should be pre-soaked twice before the test is carried out. Each hole should be empty before refilling.

P-TEST HOLE CONTAINED 200mm OF WATER AFTER BEING SOAKED TWICE BEFORE TESTING.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	30-11-2016		
Time filled to 400 mm	8.50AM		
Time water level at 300 mm	11.30 AM		
Time to drop 100 mm (P_{100})	160		
Average P_{100}			160

~~If P_{100} > 300 minutes then P-value >90 – site unsuitable for discharge to ground~~
~~If P_{100} ≤ 210 minutes then go to Step 4;~~
~~If P_{100} > 210 minutes then go to Step 5;~~

NOTE:- AT 3.19PM WATER LEVEL HAD DROPPED A FURTHER 30mm.

SILVER HILL FOODS, EMYVALE, CO. MONAGHAN.   P-TEST HOLE NO. 13

3.3(b) Percolation ("P") Test for Shallow Soil / Subsoils and/or Water Table

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0mm		
Depth from ground surface to base of hole (mm)	400mm		
Depth of hole (mm)	400mm		
Dimensions of hole [length x breadth (mm)]	300mm x 300mm	x	x

Step 2: Pre-Soaking Test Holes

	1		2		3	
Date and Time pre-soaking started	29-11-2016	AM.				

Each hole should be pre-soaked twice before the test is carried out. Each hole should be empty before refilling.

P-TEST HOLE WAS DRY AFTER BEING SOAKED TWICE BEFORE TESTING.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	30-11-2016		
Time filled to 400 mm	8.52AM		
Time water level at 300 mm	10.50AM		
Time to drop 100 mm (P_{100})	118		
Average P_{100}			118

~~If P_{100} > 300 minutes then P-value >90 – site unsuitable for discharge to ground~~
~~If P_{100} ≤ 210 minutes then go to Step 4;~~
~~If P_{100} > 210 minutes then go to Step 5;~~

NOTE:- AT 3.22PM WATER LEVEL HAD DROPPED A FURTHER 100mm.

SILVER HILL FOODS, EMYVALE, CO. MONAGHAN. P-TEST HOLE NO. 14

3.3(b) Percolation ("P") Test for Shallow Soil / Subsoils and/or Water Table

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0mm		
Depth from ground surface to base of hole (mm)	400mm		
Depth of hole (mm)	400mm		
Dimensions of hole [length x breadth (mm)]	300mm x 300mm	x	x

Step 2: Pre-Soaking Test Holes

	1		2		3	
Date and Time pre-soaking started	29-11-2016	AM.				

Each hole should be pre-soaked twice before the test is carried out. Each hole should be empty before refilling.

P-TEST HOLE CONTAINED 300mm OF WATER AFTER BEING SOAKED TWICE BEFORE TESTING.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	30-11-2016		
Time filled to 400 mm	8.48AM		
Time water level at 300 mm	WATER LEVEL 320mm @ 3.17pm		
Time to drop 100 mm (P_{100})	> 389		
Average P_{100}			> 389.

~~If P_{100} > 300 minutes then P-value >90 – site unsuitable for discharge to ground~~
~~If P_{100} ≤ 210 minutes then go to Step 4;~~
~~If P_{100} > 210 minutes then go to Step 5;~~

SILVER HILL FOODS, EMYVALE, CO. MONAGHAN.   P-TEST HOLE No. 15

3.3(b) Percolation ("P") Test for Shallow Soil / Subsoils and/or Water Table

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0mm		
Depth from ground surface to base of hole (mm)	400mm		
Depth of hole (mm)	400mm		
Dimensions of hole [length x breadth (mm)]	300mm x 300mm	x	x

Step 2: Pre-Soaking Test Holes

	1		2		3	
Date and Time pre-soaking started	29-11-2016	AM.				

Each hole should be pre-soaked twice before the test is carried out. Each hole should be empty before refilling.

P-TEST HOLE WAS DRY AFTER BEING SOAKED TWICE BEFORE TESTING.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	30-11-2016		
Time filled to 400 mm	8.44AM		
Time water level at 300 mm	10.05 AM		
Time to drop 100 mm (P_{100})	81		
Average P_{100}			81

~~If P_{100} > 300 minutes then P-value >90 – site unsuitable for discharge to ground~~
~~If P_{100} ≤ 210 minutes then go to Step 4;~~
~~If P_{100} > 210 minutes then go to Step 5;~~

NOTE:- AT 3.10PM WATER LEVEL HAD DROPPED A FURTHER 150mm.

SILVER HILL FOODS, EMYVALE, Co. MONAGHAN. TRIAL HOLE No. 1.

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas, which are at or adjacent to significant sites (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 1.5M. VULNERABILITY - LOW. AQUIFER - LOCALLY IMPORTANT.

Depth from ground surface to bedrock (m) (if present): > 1.5M.

Depth from ground surface to water table (m) (if present): 1.1M.

Depth of water ingress: 1.5M.

Rock type (if present): NONE ENCOUNTERED.

Date and time of excavation: 28-11-2016 AM.

Date and time of examination: 30-11-2016 AM.

		Depth of P/T Test*	Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
	0.1 m		TOPSOIL -	6+ THREADS 70/90 RIBBON				ROOTLETS TO 200/250mm.
	0.2 m		SILTY CLAY LOAM	DILATES WITH DIFFICULTY	CRUMB	FRIABLE	BROWN	
	0.3 m			RASPY				
INVERT OF P-TEST HOLE.	0.4 m	▽ P						
	0.5 m		Sandy SILT	1 THREAD 40/50 RIBBON DILATES WITH DIFFICULTY	ANGULAR	SOFT	GREY BROWN	NONE EVIDENT.
	0.6 m			3 THREADS				
	0.7 m			60/70 RIBBON				
	0.8 m			DILATES WITH DIFFICULTY				
	0.9 m		Sandy SILT	RASPY	ANGULAR	VERY SOFT	ORANGE BROWN	NONE EVIDENT.
	1.0 m							
	1.1 m				WATER	LEVEL @ 48 HOURS		
	1.2 m			WATER LEVEL	@ 24 HOURS			
	1.3 m							
	1.4 m							
	1.5 m							
	1.6 m				BASE	OF HOLE.		
	1.7 m							
	1.8 m							
	1.9 m							
	2.0 m							
	2.1 m							
	2.2 m							
	2.3 m							
	2.4 m							
	2.5 m							
	2.6 m							
	2.7 m							
	2.8 m							
	2.9 m							
	3.0 m							

Likely T value:

Note: *Depth of percolation test holes should be indicated on log above. (Enter P or T at depts as appropriate).
** See Appendix E for BS 5930 classification.
*** 3 samples to be tested for each horizon and results should be entered above for each horizon.
**** All signs of mottling should be recorded.

NOTE:- MOTTLING EVIDENT BELOW TOPSOIL LAYER (> 400mm)

SILVER HILL FOODS, EMYVALE, CO. MONAGHAN. TRIAL HOLE No. 2.

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas, which are at or adjacent to significant sites (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 1.5M. VULNERABILITY - LOW. AQUIFER - LOCALLY IMPORTANT.

Depth from ground surface to bedrock (m) (if present): >1.5M.

Depth from ground surface to water table (m) (if present): 1.2M.

Depth of water ingress: 0.95M. Rock type (if present): NONE ENCOUNTERED.

Date and time of excavation: 28-11-2016 AM. Date and time of examination: 30-11-2016 AM.

	Depth of P/T Test*	Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
0.1 m		Topsoil -	6+THREADS 60/80RIBBON				
0.2 m		SILTY CLAY LOAM	DILATES WITH DIFFICULTY.	CRUMB	FRIABLE	BROWN	ROOTLETS TO 300MM
0.3 m							
0.4 m	▽ P.		2 THREADS				
0.5 m			60/80RIBBON				
0.6 m		Sandy	DILATENT	GRANULAR/	LOOSE/SOFT	ORANGE	NONE EVIDENT.
0.7 m		SILT	very raspy	ANGULAR		BROWN	
0.8 m		MOTTLED.					
0.9 m							
1.0 m							
1.1 m			6+THREADS				
1.2 m			110+RIBBON NOT DILATENT	WATER	LEVEL @48 HOURS		
1.3 m		gravelly		MASSIVE	STIFF	BLUE	NONE EVIDENT.
1.4 m		CLAY	LOT OF GRAVEL CONTENT.				
1.5 m		MOTTLED.					
1.6 m				BASE	OF HOLE.		
1.7 m							
1.8 m							
1.9 m							
2.0 m							
2.1 m							
2.2 m							
2.3 m							
2.4 m							
2.5 m							
2.6 m							
2.7 m							
2.8 m							
2.9 m							
3.0 m							

INVERT OF P-TEST HOLE.

Likely T value:

Note: *Depth of percolation test holes should be indicated on log above. (Enter P or T at depts as appropriate).
** See Appendix E for BS 5930 classification.
*** 3 samples to be tested for each horizon and results should be entered above for each horizon.
**** All signs of mottling should be recorded.

SILVER HILL FOODS, EMYVALE, CO. MONAGHAN. TRIAL HOLE No. 3.

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas, which are at or adjacent to significant sites (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 1.5M. VULNERABILITY - LOW. AQUIFER - LOCALLY IMPORTANT.

Depth from ground surface to bedrock (m) (if present): > 1.5M.

Depth from ground surface to water table (m) (if present): 0.85M.

Depth of water ingress: 1.5m

Rock type (if present): NONE ENCOUNTERED.

Date and time of excavation: 28-11-2016 AM

Date and time of examination: 30-11-2016 AM.

		Depth of P/T Test*	Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
	0.1 m		TOPSOIL - GRAVELLY CLAY LOAM.	6+ THREADS 50/70 RIBBON DILATES WITH DIFFICULTY	CRUMB	FRIABLE	DARK BROWN	ROOTLETS TO 300MM
	0.2 m							
	0.3 m							
INVERT OF P-TEST HOLE.	0.4 m	▽ P.	gravelly sandy SILT.	1/2 THREADS 30/50 RIBBON DILATENT VERY RASPY.	GRANULAR	LOOSE	YELLOW BROWN	THROU' COBBLES AND BOULDERS.
	0.5 m							
	0.6 m							
	0.7 m							
	0.8 m				WATER	LEVEL @ 48 HOURS		
	0.9 m							
	1.0 m			WATER	LEVEL @ 24	HOURS		
	1.1 m		LOTS OF COBBLES SOME BOULDERS MOTTLED					
	1.2 m							
	1.3 m							
	1.4 m							
	1.5 m		gravelly CLAY	6+ THREAD 110+ RIBBON	MASSIVE	STIFF (NOT DILATENT)	BLUE GREY	NONE EVIDENT.
	1.6 m				BASE	OF HOLE.		
	1.7 m							
	1.8 m							
	1.9 m							
	2.0 m							
	2.1 m							
	2.2 m							
	2.3 m							
	2.4 m							
	2.5 m							
	2.6 m							
	2.7 m							
	2.8 m							
	2.9 m							
	3.0 m							

Likely T value:

Note: *Depth of percolation test holes should be indicated on log above. (Enter P or T at depts as appropriate).

** See Appendix E for BS 5930 classification.

*** 3 samples to be tested for each horizon and results should be entered above for each horizon.

**** All signs of mottling should be recorded.

SILVER HILL FOODS, EMYVALE, Co. MONAGHAN. TRIAL HOLE No. 4.

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas, which are at or adjacent to significant sites (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 1.7M VULNERABILITY - LOW. AQUIFER - LOCALLY IMPORTANT.

Depth from ground surface to bedrock (m) (if present): >1.7M.

Depth from ground surface to water table (m) (if present): >1.7M.

Depth of water ingress: NONE RECORDED Rock type (if present): NONE ENCOUNTERED

Date and time of excavation: 28-11-2016 AM. Date and time of examination: 30-11-2016 AM.

		Depth of P/T Test*	Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
	0.1 m		TOPSOIL -	3/5 THREADS				
	0.2 m		SILTY LOAM.	30/50 RIBBON	CRUMB	FRIABLE	BROWN	ROOTLETS TO 300MM
INVERT OF	0.3 m			DILATENT				
P-TEST	0.4 m	▽ P.		1/2 THREADS				
HOLE.	0.5 m			30/40 RIBBON				
	0.6 m			DILATENT				
	0.7 m							
	0.8 m							
	0.9 m		gravelly		GRANULAR	LOOSE	ORANGE	
	1.0 m		sandy				BROWN	NONE EVIDENT.
	1.1 m		SILT					
	1.2 m							
	1.3 m		POCKETS OF					
	1.4 m		MOTTLING.					
	1.5 m							
	1.6 m							
	1.7 m							
	1.8 m				BASE	OF HOLE.		
	1.9 m							
	2.0 m							
	2.1 m							
	2.2 m							
	2.3 m							
	2.4 m							
	2.5 m							
	2.6 m							
	2.7 m							
	2.8 m							
	2.9 m							
	3.0 m							

Likely T value:

Note: *Depth of percolation test holes should be indicated on log above. (Enter P or T at depts as appropriate).
** See Appendix E for BS 5930 classification.
*** 3 samples to be tested for each horizon and results should be entered above for each horizon.
**** All signs of mottling should be recorded.

SILVER HILL FOODS, EMYVALE, CO. MONAGHAN. TRIAL HOLE No. 5.

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas, which are at or adjacent to significant sites (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 1.5m. VULNERABILITY – LOW. AQUIFER – LOCALLY IMPORTANT.

Depth from ground surface to bedrock (m) (if present): 1.5M.

Depth from ground surface to water table (m) (if present): 1.2M.

Depth of water ingress: 1.4M. Rock type (if present): MIXED SANDSTONES

Date and time of excavation: 28-11-2016 AM Date and time of examination: 30-11-2016 AM.

		Depth of P/T Test*	Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
	0.1 m		Topsoil –	2 THREADS				
	0.2 m			50/60 RIBBON				ROOTLETS TO
INVERT OF	0.3 m		SANDY SILTY LOAM	DILATENT	CRUMB	FRIABLE	BROWN	300MM
P-TEST	0.4 m	▽P.		VERY RASPY				
HOLE.	0.5 m			0/1 THREAD				
	0.6 m			30/40 RIBBON				
	0.7 m		Very gravelly	DILATENT				
	0.8 m		Sandy		GRANULAR	LOOSE	YELLOW BROWN	NONE EVIDENT
	0.9 m		SILT.					
	1.0 m		MOTTLED.					
	1.1 m				WATER	LEVEL @ 48 HOURS		
	1.2 m							
	1.3 m							
	1.4 m							
	1.5 m							
	1.6 m				BEDROCK.			
	1.7 m							
	1.8 m							
	1.9 m							
	2.0 m							
	2.1 m							
	2.2 m							
	2.3 m							
	2.4 m							
	2.5 m							
	2.6 m							
	2.7 m							
	2.8 m							
	2.9 m							
	3.0 m							

Likely T value:

Note: *Depth of percolation test holes should be indicated on log above. (Enter P or T at depts as appropriate).
** See Appendix E for BS 5930 classification.
*** 3 samples to be tested for each horizon and results should be entered above for each horizon.
**** All signs of mottling should be recorded.

SILVER HILL FOODS, EMYVALE, CO. MONAGHAN. TRIAL HOLE No 6

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas, which are at or adjacent to significant sites (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 1.5M. VULNERABILITY - LOW. AQUIFER - LOCALLY IMPORTANT.

Depth from ground surface to bedrock (m) (if present): > 1.5M.

Depth from ground surface to water table (m) (if present): > 1.5M.

Depth of water ingress: NONE RECORDED. Rock type (if present): NONE ENCOUNTERED.

Date and time of excavation: 28-11-2016 AM. Date and time of examination: 30-11-2016 AM.

	Depth	Depth of P/T Test*	Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
	0.1 m		TOPSOIL - SANDY SILTY LOAM.	3/5 THREADS 50/60 RIBBON DILATENT	CRUMB	FRIABLE	BROWN	ROOTLETS TO 300mm
	0.2 m							
INVERT OF P-TEST HOLE.	0.3 m							
	0.4 m	▽ P.	Sandy SILT.	1 THREAD 30/40 RIBBON DILATENT	GRANULAR	LOOSE	GREY BROWN	
	0.5 m		gravelly Sandy SILT LOTS OF COBBLES SOME BOULDERS MOTTLED.	2 THREADS 40/50 RIBBON DILATENT	GRANULAR	LOOSE	ORANGE BROWN	THROU' COBBLES AND BOULDERS.
	0.6 m							
	0.7 m							
	0.8 m							
	0.9 m							
	1.0 m							
	1.1 m							
	1.2 m							
	1.3 m							
	1.4 m							
	1.5 m							
	1.6 m				BASE	OF HOLE.		
	1.7 m							
	1.8 m							
	1.9 m							
	2.0 m							
	2.1 m							
	2.2 m							
	2.3 m							
	2.4 m							
	2.5 m							
	2.6 m							
	2.7 m							
	2.8 m							
	2.9 m							
	3.0 m							

Likely T value:

Note: *Depth of percolation test holes should be indicated on log above. (Enter P or T at depts as appropriate).

** See Appendix E for BS 5930 classification.

*** 3 samples to be tested for each horizon and results should be entered above for each horizon.

**** All signs of mottling should be recorded.

SILVER HILL FOODS, EMYVALE, CO. MONAGHAN. TRIAL HOLE No. 7.

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas, which are at or adjacent to significant sites (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 1·5M. VULNERABILITY - LOW. AQUIFER - LOCALLY IMPORTANT.

Depth from ground surface to bedrock (m) (if present): > 1·5M. Depth from ground surface to water table (m) (if present): 0·9 M.

Depth of water ingress: 1·2M. Rock type (if present): NONE ENCOUNTERED.

Date and time of excavation: 28-11-2016 AM. Date and time of examination: 30-11-2016 AM.

		Depth of P/T Test*	Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
	0.1 m		TOPSOIL - SANDY CLAY LOAM	6+ THREADS 40/50 RIBBON DILATES WITH DIFFICULTY	CRUMB	FRIABLE	BROWN	ROOTLETS TO 250MM
	0.2 m							
	0.3 m			0 THREADS 0 RIBBONS DILATENT				
INVERT OF P-TEST HOLE.	0.4 m	▽ P.						
	0.5 m		Sandy GRAVEL					
	0.6 m				GRANULAR	LOOSE	GREY BROWN	
	0.7 m							NONE EVIDENT
	0.8 m							
	0.9 m				WATER	LEVEL @ 48 HOURS		
	1.0 m		POCKETS OF MOTTLING					
	1.1 m							
	1.2 m			0 THREADS 0 RIBBONS DILATENT				
	1.3 m		SAND		GRANULAR	LOOSE	YELLOW BROWN	NONE EVIDENT.
	1.4 m		POCKETS OF MOTTLING					
	1.5 m							
	1.6 m				BASE	OF HOLE.		
	1.7 m							
	1.8 m							
	1.9 m							
	2.0 m							
	2.1 m							
	2.2 m							
	2.3 m							
	2.4 m							
	2.5 m							
	2.6 m							
	2.7 m							
	2.8 m							
	2.9 m							
	3.0 m							

Likely T value:

Note: *Depth of percolation test holes should be indicated on log above. (Enter P or T at depts as appropriate).
** See Appendix E for BS 5930 classification.
*** 3 samples to be tested for each horizon and results should be entered above for each horizon.
**** All signs of mottling should be recorded.

SILVER HILL FOODS, EMYVALE, CO. MONAGHAN. TRIAL HOLE No. 8.

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas, which are at or adjacent to significant sites (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 1.5m. VULNERABILITY - LOW. AQUIFER - LOCALLY IMPORTANT.

Depth from ground surface to bedrock (m) (if present): > 1.5m.

Depth from ground surface to water table (m) (if present): > 1.5m.

Depth of water ingress: NONE RECORDED

Rock type (if present): NONE ENCOUNTERED.

Date and time of excavation: 28-11-2016 AM.

Date and time of examination: 30-11-2016 AM.

		Depth of P/T Test*	Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
	0.1 m		TOPSOIL -	3 THREADS 50/60 RIBBON DILATENT				ROOTLETS TO 300mm
	0.2 m							
INVERT OF P-TEST HOLE.	0.3 m		SILTY LOAM		CRUMB	FRIABLE	DARK BROWN	
	0.4 m	▽ P.						
	0.5 m							
	0.6 m							
	0.7 m			6+ THREADS 110+ RIBBON NOT DILATENT				
	0.8 m							
	0.9 m						GREY/YELLOW BROWN	NONE EVIDENT.
	1.0 m		CLAY		MASSIVE	STIFF		
	1.1 m							
	1.2 m							
	1.3 m		MOTTLED					
	1.4 m							
	1.5 m							
	1.6 m				BASE	OF HOLE.		
	1.7 m							
	1.8 m							
	1.9 m							
	2.0 m							
	2.1 m							
	2.2 m							
	2.3 m							
	2.4 m							
	2.5 m							
	2.6 m							
	2.7 m							
	2.8 m							
	2.9 m							
	3.0 m							

Likely T value:

Note: *Depth of percolation test holes should be indicated on log above. (Enter P or T at depts as appropriate).
** See Appendix E for BS 5930 classification.
*** 3 samples to be tested for each horizon and results should be entered above for each horizon.
**** All signs of mottling should be recorded.

Silver Hill Foods, Emyvale, Co. Monaghan. Trial Hole No 9.

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas, which are at or adjacent to significant sites (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 1.5m. Vulnerability - Low. Aquifer - Locally Important.

Depth from ground surface to bedrock (m) (if present): > 1.5m.

Depth from ground surface to water table (m) (if present): 0.85m.

Depth of water ingress: 1.2m.

Rock type (if present): None Encountered.

Date and time of excavation: 28-11-2016 Am.

Date and time of examination: 30-11-2016 Am.

		Depth of P/T Test*	Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
	0.1 m		Topsoil -	4/5 threads 50/60 ribbon dilatent				Rootlets to 300mm
	0.2 m							
Invert of	0.3 m		Silty clay loam		Crumb	Friable	Brown	
P. Test Hole.	0.4 m	▽ P.						
	0.5 m		Very gravelly	3/5 threads 90 ribbon Not dilatent				
	0.6 m		SILT/CLAY					
	0.7 m				Angular	Soft	Yellow Brown	None evident.
	0.8 m				Water	level @ 48 hours		
	0.9 m							
	1.0 m							
	1.1 m							
	1.2 m							
	1.3 m							
	1.4 m		Mottled					
	1.5 m							
	1.6 m				Base	of Hole.		
	1.7 m							
	1.8 m							
	1.9 m							
	2.0 m							
	2.1 m							
	2.2 m							
	2.3 m							
	2.4 m							
	2.5 m							
	2.6 m							
	2.7 m							
	2.8 m							
	2.9 m							
	3.0 m							

Likely T value:

Note: *Depth of percolation test holes should be indicated on log above. (Enter P or T at depts as appropriate).
** See Appendix E for BS 5930 classification.
*** 3 samples to be tested for each horizon and results should be entered above for each horizon.
**** All signs of mottling should be recorded.

SILVER HILL FOODS, EMYVALE, CO. MONAGHAN. TRIAL HOLE No. 10.

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas, which are at or adjacent to significant sites (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 1.5m. VULNERABILITY - LOW. AQUIFER - LOCALLY IMPORTANT.

Depth from ground surface to bedrock (m) (if present): > 1.5M.

Depth from ground surface to water table (m) (if present): 1.1m.

Depth of water ingress: NONE RECORDED

Rock type (if present): NONE ENCOUNTERED.

Date and time of excavation: 28-11-2016 PM.

Date and time of examination: 30-11-2016 PM.

		Depth of P/T Test*	Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
	0.1 m		TOPSOIL -	6+ THREADS				
	0.2 m			90 RIBBON				ROOTLETS TO 400MM
	0.3 m		SILTY CLAY LOAM.	NOT DILATENT	CRUMB	FRIABLE	LIGHT BROWN	
INVERT OF P-TEST HOLE.	0.4 m	▽ P.		1/2 THREADS				
	0.5 m			50/60 RIBBON				
	0.6 m		gravelly	DILATENT				
	0.7 m		Sandy					
	0.8 m		SILT	RASPY	GRANULAR	LOOSE	RED BROWN	NONE EVIDENT.
	0.9 m		POCKETS OF					
	1.0 m		MOTTLING					
	1.1 m				WATER	LEVEL @ 48 HOURS		
	1.2 m							
	1.3 m							
	1.4 m							
	1.5 m							
	1.6 m				BASE	OF HOLE.		
	1.7 m							
	1.8 m							
	1.9 m							
	2.0 m							
	2.1 m							
	2.2 m							
	2.3 m							
	2.4 m							
	2.5 m							
	2.6 m							
	2.7 m							
	2.8 m							
	2.9 m							
	3.0 m							

Likely T value:

Note: *Depth of percolation test holes should be indicated on log above. (Enter P or T at depts as appropriate).
** See Appendix E for BS 5930 classification.
*** 3 samples to be tested for each horizon and results should be entered above for each horizon.
**** All signs of mottling should be recorded.

SILVER HILL FOODS, EMYVALE, CO. MONAGHAN. TRIAL HOLE NO. 11.

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas, which are at or adjacent to significant sites (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 1.5M. VULNERABILITY - LOW. AQUIFER - LOCALLY IMPORTANT.

Depth from ground surface to bedrock (m) (if present): >1.5m.

Depth from ground surface to water table (m) (if present): 1.1M.

Depth of water ingress: 0.9M. Rock type (if present): NONE ENCOUNTERED.

Date and time of excavation: 28-11-2016 PM. Date and time of examination: 30-11-2016 PM.

	Depth of P/T Test*	Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
0.1 m		TOPSOIL - SILTY CLAY LOAM	3/5 THREADS 50/70 RIBBON DILATES WITH DIFFICULTY	CRUMB	FRIABLE	DARK BROWN	ROOTLETS TO 250MM
0.2 m							
0.3 m		CLAY MOTTLED	6+ THREADS 110+ RIBBON NOT DILATENT	MASSIVE	STIFF	ORANGE BROWN	
0.4 m (INVERT OF P-TEST HOLE.)	▽ P.						
0.5 m							
0.6 m		gravelly CLAY MOTTLED	6+ THREADS 110+ RIBBON NOT DILATENT	BLOCKY/ MASSIVE	STIFF	LIGHT BROWN	NONE EVIDENT.
0.7 m							
0.8 m							
0.9 m							
1.0 m							
1.1 m				WATER	LEVEL @ 48 HOURS		
1.2 m							
1.3 m							
1.4 m							
1.5 m				BASE	OF HOLE.		
1.6 m							
1.7 m							
1.8 m							
1.9 m							
2.0 m							
2.1 m							
2.2 m							
2.3 m							
2.4 m							
2.5 m							
2.6 m							
2.7 m							
2.8 m							
2.9 m							
3.0 m							

Likely T value:

Note: *Depth of percolation test holes should be indicated on log above. (Enter P or T at depts as appropriate).
** See Appendix E for BS 5930 classification.
*** 3 samples to be tested for each horizon and results should be entered above for each horizon.
**** All signs of mottling should be recorded.

SILVER HILL FOODS, EMYVALE, CO. MONAGHAN. TRIAL HOLE NO. 12.

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas, which are at or adjacent to significant sites (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 1.5M. VULNERABILITY - LOW. AQUIFER - LOCALLY IMPORTANT.

Depth from ground surface to bedrock (m) (if present): >1.5M. Depth from ground surface to water table (m) (if present): 1.3M.

Depth of water ingress: 1.45M. Rock type (if present): NONE ENCOUNTERED.

Date and time of excavation: 28-11-2016 PM. Date and time of examination: 30-11-2016 PM.

INVERT OF P-TEST HOLE

	Depth of P/T Test*	Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
0.1 m		TOPSOIL -	4/5 THREADS				ROOTLETS TO
0.2 m			40/50 RIBBON				250MM
0.3 m		SANDY SILTY LOAM.	DILATES WITH DIFFICULTY	CRUMB	FRIABLE	BROWN	
0.4 m	▽ P.		RASPY				
0.5 m			6+ THREADS				
0.6 m			110+ RIBBON				
0.7 m		gravelly					
0.8 m		CLAY		BLOCKY	STIFF	YELLOW BROWN	NONE EVIDENT
0.9 m							
1.0 m							
1.1 m		MOTTLED					
1.2 m							
1.3 m				WATER	LEVEL @ 48 HOURS		
1.4 m							
1.5 m							
1.6 m				BASE	OF HOLE		
1.7 m							
1.8 m							
1.9 m							
2.0 m							
2.1 m							
2.2 m							
2.3 m							
2.4 m							
2.5 m							
2.6 m							
2.7 m							
2.8 m							
2.9 m							
3.0 m							

Likely T value:

Note: *Depth of percolation test holes should be indicated on log above. (Enter P or T at depts as appropriate).
** See Appendix E for BS 5930 classification.
*** 3 samples to be tested for each horizon and results should be entered above for each horizon.
**** All signs of mottling should be recorded.

SILVER HILL FOODS, EMYVALE, CO. MONAGHAN. TRIAL HOLE No. 13.

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas, which are at or adjacent to significant sites (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 1.5M. VULNERABILITY - LOW. AQUIFER - LOCALLY IMPORTANT.

Depth from ground surface to bedrock (m) (if present): >1.5M.

Depth from ground surface to water table (m) (if present): >1.5M.

Depth of water ingress: NONE RECORDED

Rock type (if present): NONE ENCOUNTERED.

Date and time of excavation: 28-11-2016 PM.

Date and time of examination: 30-11-2016 PM.

	Depth of P/T Test*	Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
0.1 m		TOPSOIL - VERY SANDY LOAM.	2 THREADS 30/40 RIBBON DILATENT	CRUMB	FRIABLE	BROWN	ROOTLETS TO 250MM
0.2 m							
0.3 m							
0.4 m	▽ P.	Very Sandy SILT.	0/1 THREADS 20 RIBBON DILATENT	GRANULAR	LOOSE	YELLOW BROWN	NONE EVIDENT.
0.5 m							
0.6 m							
0.7 m							
0.8 m							
0.9 m		gravelly SAND POCKETS OF MOTTLING	0 THREADS 0 RIBBON DILATENT	GRANULAR	LOOSE	LIGHT BROWN	NONE EVIDENT.
1.0 m							
1.1 m							
1.2 m							
1.3 m							
1.4 m							
1.5 m				BASE	OF HOLE.		
1.6 m							
1.7 m							
1.8 m							
1.9 m							
2.0 m							
2.1 m							
2.2 m							
2.3 m							
2.4 m							
2.5 m							
2.6 m							
2.7 m							
2.8 m							
2.9 m							
3.0 m							

INVERT OF P-TEST HOLE.

Likely T value:

Note: *Depth of percolation test holes should be indicated on log above. (Enter P or T at depts as appropriate).
** See Appendix E for BS 5930 classification.
*** 3 samples to be tested for each horizon and results should be entered above for each horizon.
**** All signs of mottling should be recorded.

SILVER HILL FOODS, EMYVALE, CO. MONAGHAN.   TRIAL HOLE No. 14.

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas, which are at or adjacent to significant sites (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 1.5m.   VULNERABILITY - LOW.   AQUIFER - LOCALLY IMPORTANT.

Depth from ground surface to bedrock (m) (if present): >1.5M.   Depth from ground surface to water table (m) (if present): 1.4M.

Depth of water ingress: NONE RECORDED   Rock type (if present): NONE ENCOUNTERED.

Date and time of excavation: 28-11-2016 PM.   Date and time of examination: 30-11-2016 PM.

		Depth of P/T Test*	Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
	0.1 m		TOPSOIL - SILTY LOAM.	6+ THREADS 60/80 RIBBON DILATENT RAPID	CRUMB	FRIABLE	BROWN	ROOTLETS TO 350mm
	0.2 m							
INVERT OF	0.3 m							
P-TEST HOLE.	0.4 m	▽ P.	gravelly sandy SILT.	3 THREADS 50/60 RIBBON DILATENT	GRANULAR	LOOSE	YELLOW BROWN	
	0.5 m							
	0.6 m							
	0.7 m		very gravelly CLAY.	6+ THREADS 110+ RIBBON NOT DILATENT	BLOCKY	STIFF	GREY BROWN	NONE EVIDENT.
	0.8 m							
	0.9 m							
	1.0 m							
	1.1 m							
	1.2 m		MOTTLED					
	1.3 m							
	1.4 m				WATER LEVEL @ 48 HOURS			
	1.5 m				BASE OF HOLE.			
	1.6 m							
	1.7 m							
	1.8 m							
	1.9 m							
	2.0 m							
	2.1 m							
	2.2 m							
	2.3 m							
	2.4 m							
	2.5 m							
	2.6 m							
	2.7 m							
	2.8 m							
	2.9 m							
	3.0 m							

Likely T value:

Note: *Depth of percolation test holes should be indicated on log above. (Enter P or T at depts as appropriate).
** See Appendix E for BS 5930 classification.
*** 3 samples to be tested for each horizon and results should be entered above for each horizon.
**** All signs of mottling should be recorded.

SILVER HILL FOODS, EMYVALE, Co. MONAGHAN.   TRIAL HOLE No. 15.

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas, which are at or adjacent to significant sites (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 1.5M.   VULNERABILITY - LOW.   AQUIFER - LOCALLY IMPORTANT.

Depth from ground surface to bedrock (m) (if present): >1.5M.   Depth from ground surface to water table (m) (if present): >1.5M.

Depth of water ingress: NONE RECORDED   Rock type (if present): NONE ENCOUNTERED.

Date and time of excavation: 28-11-2016 PM   Date and time of examination: 30-11-2016 PM.

		Depth of P/T Test*	Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
	0.1 m		TOPSOIL -	6+ THREADS				ROOTLETS TO
	0.2 m			40/60 RIBBON				250mm.
	0.3 m		SILTY CLAY LOAM	DILATENT.	CRUMB	FRIABLE	BLACK	
INVERT OF P-TEST HOLE.	0.4 m	▽ P						
	0.5 m			0 THREADS				
	0.6 m			10 RIBBON				
	0.7 m		Very Sandy	DILATENT				
	0.8 m		SILT		GRANULAR	LOOSE	YELLOW BROWN	NONE EVIDENT
	0.9 m							
	1.0 m							
	1.1 m							
	1.2 m		MOTTLED.					
	1.3 m							
	1.4 m							
	1.5 m							
	1.6 m				BASE	OF HOLE.		
	1.7 m							
	1.8 m							
	1.9 m							
	2.0 m							
	2.1 m							
	2.2 m							
	2.3 m							
	2.4 m							
	2.5 m							
	2.6 m							
	2.7 m							
	2.8 m							
	2.9 m							
	3.0 m							

Likely T value:

Note: *Depth of percolation test holes should be indicated on log above. (Enter P or T at depts as appropriate).
** See Appendix E for BS 5930 classification.
*** 3 samples to be tested for each horizon and results should be entered above for each horizon.
**** All signs of mottling should be recorded.

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Hydrogeological Assessment of Proposed Drip Irrigation System

Silver Hill Foods, Emyvale, Co. Monaghan (IE Licence No. P0422-02)

Prepared for

Silver Hill Foods
Emyvale
Co. Monaghan
H18 FK10

Prepared by
Geosyntec Consultants Ltd
Innovation House
DCU Alpha
Old Finglas Road
Dublin, D11 KXN4

Project Number GCU0237001

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FINAL

Geosyntec
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Co. Monaghan

Issued By: Geosyntec Consultants Ltd
Innovation House
DCU Alpha
Old Finglas Road
Dublin, D11 KXN4

Document Production / Approval Record

	Name	**Signature**	**Date**	**Position**
Prepared by	Dr. John Weatherill		18th Aug 2017	Hydrogeologist
Approved by	Graham Webb		18th Aug 2017	Project Director

LIMITATION

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Unless otherwise stated in this Report, the assessments made assume that the site and facilities will continue to be used for their current purpose without significant change. The conclusions and recommendations contained in this Report are based upon information provided by others and upon the assumption that all relevant information has been provided by those parties from whom it has been requested. Information obtained from third parties has not been independently verified by Geosyntec, unless otherwise stated in the Report.

Where assessments of works or costs required to reduce or mitigate any environmental liability identified in this Report are made, such assessments are based upon the information available at the time and may be subject to further investigations or information which may become available. It is therefore possible that cost estimates, where provided, may vary outside stated ranges. Where assessments of works or costs necessary to achieve compliance have been made these are based upon measures which, in Geosyntec's experience could normally be negotiated with the relevant authorities under present legislation and enforcement practice, assuming a pro-active and reasonable approach by site management.

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1 INTRODUCTION

1.1 General Introduction

This report presents a hydrogeological assessment of the proposed drip irrigation system at the Silver Hill Foods facility in Emyvale, Co. Monaghan (the site). The site location is shown in Figure 1. Silver Hill Foods operates a poultry rearing and processing facility at the site. The facility operates under an Industrial Emissions (IE) licence (register number P0422-02), which was granted by the Environmental Protection Agency (EPA) in October 2005.

Process effluent from the facility is treated in an on-site waste water treatment plant. Effluent from the waste water treatment plant currently discharges to an unnamed stream located in the northern area of the facility. This unnamed stream discharges to the Corlattalan Stream approximately 1.2 km northeast of the facility and the Corlattalan Stream in turn discharges to the River Blackwater approximately 5.6 km northeast of the facility. Due to a possible lack of assimilative capacity in the unnamed stream and in the Corlattalan Stream, an alternative means of discharging treated process effluent from the facility may be required. Drip irrigation has been identified by Silver Hill Foods as a viable solution.

The proposed drip irrigation system will be regarded by the EPA as an indirect discharge to groundwater. Under the Groundwater Regulations[1] indirect discharges of effluent to groundwater are permitted provided they do not contain substances that are hazardous in groundwater, and provided there is no adverse impact on nearby receptors, such as groundwater abstraction wells or surface water courses that receive groundwater baseflow.

This hydrogeological assessment has been prepared with reference to the EPA's publication "*Guidance on the Authorisation of Discharges to Groundwater*" (version 1, December 2011 - hereafter referred to as 'EPA 2011'). The assessment takes into consideration available information on the local geology and hydrogeology of the site, as well as characteristics of the planned discharge.

1.2 Objectives

The primary objective of this hydrogeological assessment is to assess whether the discharge of treated process effluent from the proposed drip irrigation system will comply with the Groundwater Regulations[1]. The Groundwater Regulations aim to give effect to the measures needed to achieve the environmental objectives established for groundwater by the Water Framework Directive (WFD). Quoting from Regulation 2 of the Groundwater Regulations, the objectives of the WFD include the following:

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[1] European Communities Environmental Objectives (Groundwater) Regulations (S. I. No. 9 of 2010, as amended)

- prevent or limit the input of pollutants into groundwater and to prevent the deterioration of the status of all bodies of groundwater,
- protect, enhance and restore all bodies of groundwater and to ensure a balance between abstraction and recharge of groundwater, with the aim of achieving good groundwater status by not later than 22 December 2015,
- the reversal of any significant and sustained upward trend in the concentration of any pollutant resulting from the impact of human activity in order to progressively reduce pollution of groundwater.

1.3 Approach to Assessment

As outlined in EPA 2011, the assessment of a discharge to groundwater activity should be risk-based and focused on potential impacts on local receptors such as groundwater, surface water and users of these resources. The recommended approach is to follow a 'source-pathway-receptor' (SPR) model and to assess the potential impact of viable SPR linkages.

The main aspects that need to be considered in the assessment are:

- Source characterisation – what are the constituents of potential concern (COPCs) in the discharge and what is the expected rate of discharge?
- Pathways analysis – what pathway will the treated effluent take following discharge? To what extent will the COPCs be expected to attenuate? Is there a potential pathway linking the source to a local receptor?
- Receptor identification – who or what could potentially be affected by the discharge?

1.4 Available Information

The hydrogeological assessment presented in this report has drawn on information on the environmental setting of the Emyvale area available from the Geological Survey of Ireland (GSI), the EPA and Ordnance Survey Ireland (OSI). In addition, the following information was provided by Silver Hill Foods:

- Data on treated effluent quality and flow rate;
- Results from a series of percolation tests completed within lands in the vicinity of the site in November 2016;
- Driller's log for abstraction well AGW3;
- Groundwater monitoring data;
- Preliminary design information on the proposed drip irrigation system.

2 ENVIRONMENTAL SITE SETTING

2.1 Site Description

The Silver Hills Foods facility is located in a rural area of Co. Monaghan on the northern outskirts of Emyvale. The N2 Dublin to Derry road runs approximately north-south adjacent to the western boundary of the site.

The main production area is occupied mainly by buildings and internal roadways. The waste water treatment plant and a slurry storage tank are located in a low-lying area north-east of the main production area.

To the east, south and west of the site are areas of pasture land. To the north of the site is an area of scrub land beyond which is pasture land. Much of the pasture land that borders the site is understood to be owned by Silver Hill Foods (refer to Figure 2).

The town of Emyvale is located close to the southern boundary of the site.

The main production area lies at an elevation of approximately 70 metres above Ordnance Datum (m AOD) on an area of relatively level ground. Ground elevations dip down beyond the main production area towards the area of scrub land to the north, and also towards the pasture land east and south of the site. There is a local high point (drumlin) immediately to the west of the site with an elevation of approximately 80 m AOD. Ground levels dip down in all directions from this local high point.

2.2 Site Geology

2.2.1 Bedrock

Most of the site is reported by the GSI to be underlain by the Carrickaness Sandstone Formation, which comprises interbedded sandstones, siltstones and mudstones. The sandstone is fine to medium-grained and quartz dominant. This formation is shown to run in a relatively thin strip along an east-north-east to west-south-west trending synclinal axis. To the north and south of this unit is the Maydown Limestone Formation, which comprises various lithologies, ranging from argillaceous limestone, through silty limestone and laminated calcareous siltstone to calcareous shale.

A driller's log is available for abstraction well AGW3, which is located within pasture land east of the main site (refer to Appendix A). Depth to bedrock at this location was 90 ft (27m) and the driller logged the bedrock at this location as limestone. The static groundwater table was observed at a depth of 55 ft (17m). The depth of the well is stated to be 504 ft (154 m).

2.2.2 Overburden

GSI mapping indicates that soil type under the site is made ground, and that in the pasture lands close to the site the soil type is predominantly glacial till derived from the local sandstone bedrock. A localised area of gravels is shown on GSI mapping in the area close to the north-eastern site boundary, in the vicinity of the wastewater treatment plant and the slurry storage lagoon (refer to Appendix B).

Observations made during a programme of percolation testing completed during November 2016 confirmed that the predominant soil type across the pasture lands surrounding the site is sandy silt with some areas of clay soil also present. Suspected bedrock was encountered in one trial hole at a depth of 1.5m; this trial hole was located in the area of low-lying pasture land east of the site.

2.3 Site Hydrogeology

Both the Carrickness Sandstone Formation and the Maydown Limestone Formation are classified by the GSI as "*Locally Important aquifers – bedrock which is generally moderately productive (Lm)*". The GSI has classified the vulnerability of these aquifers as "*low*" across most of the site and the surrounding pasture land, with localised areas of "*moderate*" or "*high*" vulnerability indicated close to the north-eastern site boundary.

The site is located over the Aughnacloy Groundwater Body (GWB). According to information in the EPA's Envision database, the status of the GWB under the Water Framework Directive (WFD) for the period 2010-2015 was "*Good*" and it has a current risk score under the WFD scoring system of "*Strongly expected to achieve good status*".

There are three groundwater abstraction wells in the vicinity of the site which supply water that is used in the licensed activity. The locations of these wells are shown on the attached Figure 3. Groundwater elevations measured in these wells in 2011 indicated that the rest water table in the bedrock aquifer lies at a depth of 20 – 30 m below ground level and that the groundwater flow direction in the bedrock aquifer under the site is towards the south-east.

During the soil percolation tests undertaken in November 2016 (i.e. during the wetter period of the year), groundwater was observed in the trial excavations at depths ranging from 0.85m to 1.2m below ground level. In a number of the excavations groundwater was not observed, implying a depth to groundwater at these locations of greater than the depth of excavation of 1.5 - 1.7m. These observations indicate that there may be non-continuous perched groundwater bodies within the glacial till.

2.4 Surface Water Features

The site is located close to a saddle between two local surface water catchments. The area north of the site drains generally northward to the Corlattalan Stream, which discharges into the River Blackwater approximately 5.6 km north-east of the site. The central and southern areas of the site and much of the surrounding pasture land drains generally towards the east and south, with run-off from this area discharging to the Mountain Water. The Mountain Water flows generally eastward through Emyvale town and discharges to the River Blackwater approximately 8 km east of the site.

The current WFD status of the Mountain Water down-stream of Emyvale is "*poor*" and the risk status is "*at risk of not achieving good status*". The EPA state in a report dated 2013 that ecological conditions in the Mountain Water downstream of Emyvale were poor, with point source influences, agricultural and mixed rural influences as the suspected causes.

3 PROPOSED DRIP IRRIGATION SYSTEM

Silver Hill Foods is proposing to install a drip irrigation system within the pasture lands surrounding the site as a means of discharging treated effluent from the site. The report on the percolation tests completed in November 2016 for Silver Hill Foods concluded that the soils underlying the pasture land where the tests were performed would be acceptable for a drip irrigation system, taking into consideration the depth to the water table, seasonal variations in the water table and the percolating quality of the soils.

Drip irrigation involves the controlled discharge of effluent into soil typically at a depth of 150 – 200mm below ground level via a network of pressurised pipes. The effluent is discharged into the soil via a series of "emitters" within the pipe wall, which enable the flow rate across the pipe network to be controlled and distributed evenly. The pipes are installed directly into the soil using a mole plough fitted to a standard agricultural tractor. No filter gravel is required around the pipes. The typical spacing between pipes is 600mm.

Drip irrigation systems are commonly used in situations where point source discharges to surface water are not possible due to the environmental sensitivity of the receiving streams. They are also commonly used at sites where conventional percolation systems are not appropriate due to the presence of low permeability soils or sloping ground.

Based on past experience from sites with similar soil type, the supplier of the drip irrigation system has recommended a preliminary application rate of 3 litres of treated effluent per square metre per day (3 litres/m^2/day). Currently 150 – 300 m^3 of treated effluent is generated at the site per day. At the proposed preliminary application rate of 3 litres/m^2/day, the drip irrigation system will need to cover an area of approximately 10 hectares. However, the site is currently expanding and it is understood that site management wishes to install a drip irrigation system that is capable of discharging up to 600 m^3/day. At an application rate of 3 litres/m^2/day, the drip irrigation system will need to cover an area of approximately 20 hectares.

The current concept put forward by the supplier of the drip irrigation system is to install a series of independent "drip-fields", each containing multiple zones of drip irrigation pipes of the order of 2,000 m^2 in area.

4 CONCEPTUAL SITE MODEL (CSM)

In this section, the proposed drip irrigation system is presented in the context of a Conceptual Site Model. The planned indirect discharge of treated effluent to groundwater is characterised in terms of hydraulic loading and contaminant loading. SPR linkages that potentially link the indirect discharge to local receptors are also considered.

A schematic representation of the CSM is illustrated in Figure 4.

4.1 Source Characterisation

The waste water treatment plant at the site is a biological plant that utilises activated sludge technology to reduce the organic content of the influent water. The treatment system has the following stages:

Primary treatment: This involves screening to remove gross solids, flow balancing and a dissolved air flotation (DAF) unit, which removes oils, fats and greases and suspended solids. The sludge and solids removed from the DAF unit are spread on designated land banks.

Secondary treatment: This stage comprises an activated sludge system. The effluent passes through an initial anoxic contact tank where the effluent is mixed with activated sludge from the final stage of the process. The effluent then passes to the aerobic tank, where it is actively managed to optimise BOD removal. Retention time in the aerobic tank is 3 - 4 days. Activated sludge needs to be removed from the system on a daily basis in order to maintain treatment performance. The sludge that is removed is spread on designated land banks.

The effluent is then dosed with a flocculant before passing to a clarifier, where the solid biomass is allowed to settle from the treated effluent. The sludge is retained in the clarifier and the treated water discharges from the plant via a V-notch weir.

The plant consistently meets the Emission Limit Values specified in the site's IE licence.

The flow rate of treated effluent discharging from the waste water treatment is typically in the range 150 – 300 m^3/day, with an average of approximately 230 m^3/day.

The monitoring data available from effluent samples analysed during the period January – May 2017 is summarised in the following table, focusing on those parameters for which Groundwater Threshold Values (GTVs) are specified in the Groundwater Regulations.

The discharge is not expected to contain substances that are considered hazardous in groundwater.

Parameter	**GTV***	**Range of weekly averages (Jan – May 2017)**	**Average over period (Jan – May 2017)**
Ammoniacal nitrogen (mg/l)	0.065 – 0.175	0.04 – 0.6	0.15
Total Phosphorus	0.035**	0.6 – 1.1 mg/l	0.84 mg/l
Nitrate (mg/l)	37.5	0.2 – 6 mg/l	1.2 mg/l

Notes: * - S. I. No. 9 of 2010 as amended

** - GTV is for Molybdate Reactive Phosphorus (MRP)

From the perspective of compliance with the Groundwater Regulations, the key parameters to consider in relation to the proposed indirect discharge are ammoniacal nitrogen (total ammonia) and MRP.

With regard to ammoniacal nitrogen, the GTV of 0.065 mg/l is applicable when considering potential impacts on surface water bodies from groundwater inputs, whereas the GTV of 0.175 mg/l is applicable when considering whether the ability of groundwater in a GWB to support human uses has been significantly impaired.

With regard to phosphorus, the GTV is for MRP rather than total phosphorus. The GTV for MRP of 0.035 mg/l is applicable when considering potential impacts on surface water bodies from groundwater inputs.

It is recognised that pathogenic micro-organisms may be present in the treated effluent. Although there is no applicable GTV for pathogens, the potential for pathogens to be present in the treated effluent has been considered in the assessment.

4.2 Migration Pathways

Treated effluent that enters the subsurface via the proposed drip irrigation system can be expected to follow one of two pathways:

- The treated effluent may be drawn into the root zone of plants growing in the topsoil and emitted as water vapour to the atmosphere via the process of transpiration;
- The proportion of the treated effluent that is not drawn into the root zone of the plants can be expected to migrate vertically down through the unsaturated zone soils to the water table, which based on available data lies close to the interface between the glacial till and the underlying bedrock.

Because each of the "drip-fields" is expected to be laterally extensive, the lateral migration of treated effluent within the shallow soils around the periphery of each drip-field is not expected to be significant in terms of volumetric flow; i.e. the predominant flow direction of the discharged water is expected to be downward.

Treated effluent migrating down through the glacial till is expected to discharge to the underlying limestone aquifer. The rate of migration can be expected to be relatively slow given the predominantly silty nature of the till; the travel time may be of the order of one year (based on a permeability of 0.01 m/day, porosity of 0.2 and thickness of overburden of 20m). Lateral flow of groundwater within the glacial till can be expected to be limited, and for the purposes of this assessment has be ignored.

Once in the bedrock aquifer, indications from site measurements are that groundwater in the bedrock aquifer flows generally towards the south-east.

4.3 Potential Receptors

The bedrock aquifer underlying the site and the area down-gradient of the site is considered the key environmental receptor potentially at risk of impact from the drip irrigation system. Users of groundwater from the aquifer down-gradient of the site have also been considered potential receptors in the risk assessment.

The bedrock aquifer in the vicinity of the site has been classified by the GSI as "locally important". There are three wells located close to the site, which are used by Silver Hill Foods for water supply to the site. These three wells are included on GSI well records for the area of the site. Whilst there are a number of other wells on the GSI's well records within a 2 km radius of the site, none of these is located down-gradient (south-east) of the site.

It should be noted that the GSI's well records may not be complete and it is possible there are private wells in the area south-east of the site that are not included in the GSI's records.

It is possible that the Mountain Water receives groundwater baseflow from the bedrock aquifer under the site; however, the contribution of groundwater from the site to the river is likely to be small relative to the flow rate in the river. As a result, the Mountain Water is not considered to be at risk of impact from the drip irrigation system and it has not been considered a receptor in the risk assessment.

4.4 Potential Pollutant Linkages

A CSM for the site that incorporates the local geology and hydrogeology, and the indirect discharge to groundwater from the proposed drip irrigation system, is presented in cross section in Figure 4.

The potential pollutant linkages that have been considered in this assessment are as follows:

- Migration of effluent from the drip irrigation system via the glacial till to the bedrock aquifer. The focus of this potential pollutant linkage is on whether it is compliant with the Groundwater Regulations;
- Migration of effluent from the drip irrigation system via the glacial till to local groundwater abstraction wells. The only known wells down-gradient of the site are operated by Silver Hill Foods; however, there may be other wells that are not on the GSI's well database. The focus of this potential pollutant linkage is on the potential impacts on water quality in abstraction wells located down-gradient of the site.

4.5 Appropriate Tier of Assessment

Section 4 of EPA 2011 recommends that a tiered approach be taken to the assessment of potential impacts on groundwater and other potential receptors.

The key risk factors associated with the drip irrigation are listed below:

- Groundwater vulnerability – the GSI classification is "low" with a localised area of "high" vulnerability in the north-east area of the site;
- Chemical load – the quality of the treated effluent is good and the key constituents of potential concern are non-hazardous in groundwater. The waste water treatment system consistently meets the ELVs specified in the IE licence;
- Chemical status of the GWB – currently "good";
- Hydraulic loading – the proposed hydraulic loading is relatively high for a drip irrigation system. The system is expected to cover several hectares of land due to the silty nature of the overburden in the vicinity of the site and the anticipated low application rate.

A key concern with the proposed drip irrigation system is considered to be the ability to reliably discharge the treated effluent into the ground without causing water logging or "break-out" at ground surface. With this risk factor in mind, and the scale of the proposed discharge, it is considered appropriate that a Tier 2 assessment is undertaken.

5 TIER 2 RISK ASSESSMENT

With reference to EPA 2011, the following aspects have been considered in the Tier 2 risk assessment:

- Infiltration capacity;
- Subsoil characterisation;
- Groundwater characterisation;
- Assessment of potential impacts.

5.1 Infiltration capacity

During the soil percolation tests undertaken in November 2016, groundwater was observed in the trial excavations at depths ranging from 0.85m to 1.2m below ground level. In a number of the excavations groundwater was not observed, implying a depth to groundwater at these locations of greater than the depth of excavation of 1.5 - 1.7m. These observations indicate that there may be non-continuous perched groundwater bodies within the glacial till.

The percolation test results in terms of "P" value (i.e. the time it took for the water level in the trial holes to drop 25mm) were varied. Approximately half of the P values were in the range 27 – 30 (there was one low result of 20), which is consistent with the clayey silt/silty clay soils observed at these locations. The remainder of the tests gave P values greater than 60, indicating clay-dominated soil.

It is clearly important that the rate of input of treated effluent into the glacial till does not exceed the rate that groundwater is able to drain from the till into the underlying limestone aquifer. If the rate of input of treated effluent is too high, there is potential for excessive mounding of the water table to take place. This could potentially result in the water table intersecting the ground surface, resulting in water logging or ponding. On areas of sloping ground, this could result in effluent migrating down-slope as uncontrolled run-off.

As such, establishing an optimal application rate for the drip irrigation system is important. This aspect needs to be considered in the detailed design of the system and during commissioning of the system. It should be noted that the optimal application rate can be expected to vary by area, depending on the permeability of the glacial till and also on the depth to groundwater.

Additional permeability testing of soil in the areas that have already been assessed is not considered necessary; rather, it is considered appropriate that once each drip-field is established, they are monitored over a period using a range of application rates to assess their hydraulic performance. Based on the results of these trials an optimum application rate can be determined for each drip-field.

The preliminary application rate of 3 $l/m^2/day$ is expected to be conservative for the areas of land where P values of up to 30 were observed and it is likely in some areas a higher application rate will be sustainable. It is possible that in areas of more clayey soil an application rate less than 3 $l/m^2/day$ will be achievable.

It is recommended that the north-east area of the site is assessed for possibly inclusion in the overall drip irrigation system; this includes the area around the slurry storage lagoon, and the areas west and south of the lagoon. Indications from GSI mapping are that these areas may be underlain by gravelly soils, which can be expected to have significantly higher infiltration capacity than the silts and clays observed elsewhere.

Regardless of the application rate that can be achieved in each drip-field, the degree of groundwater mounding that occurs in response to the discharge of effluent also needs to be considered. This may be the controlling factor in terms of application rate, particularly in areas where the water table is relatively shallow.

With a view to monitoring the degree of mounding in the water table over time, it is recommended that a groundwater monitoring well is installed within each drip-field. These wells will provide useful information that can be used to assist with system optimisation during the initial period of operation, and to monitor the performance of the drip-fields on an ongoing basis.

5.2 Subsoil Characterisation

As outlined earlier, GSI mapping indicates that soil type under the pasture lands close to the site is predominantly glacial till derived from the local sandstone bedrock. A localised area of gravels is indicated in the vicinity of the wastewater treatment plant and the slurry storage lagoon (refer to Appendix B). Observations made during the percolation tests confirmed that the predominant soil type across the pasture lands is sandy silt with some areas of clay soil also present.

Overburden thickness at the location of abstraction well AGW3 was observed during its installation to be approximately 90ft (27m). This well is located within pasture land close to a local high point (drumlin) west of the main site (refer to Figure 3).

In the area east of the site, the overburden is expected to be thinner. Suspected bedrock was encountered in one of the percolation test trial holes at a depth of 1.5m; this trial hole (No. 5) was located in the area of low-lying pasture land close to an open land drain. This area is reported to be water-logged during the winter months and it is not planned to use this area (or other areas with similar characteristics) for drip irrigation.

5.3 Groundwater Characterisation

As outlined earlier the bedrock formations that underlie the site are classified by the GSI as "Locally Important aquifers – bedrock which is generally moderately productive (Lm)". The GSI has classified the vulnerability of these aquifers as "low" across most of the site and the surrounding pasture land, with localised areas of "moderate" or "high" vulnerability indicated close to the north-eastern site boundary.

Static groundwater elevations across the three abstraction wells used by Silver Hill Foods were observed to be in the range 44 – 50 m above Ordnance Datum (2011 data), i.e. 20 – 30 m below ground level. Groundwater flow direction in the bedrock aquifer based on these measurements was inferred to be towards the south-east (refer to Figure 3). This is consistent with the axis of the Mountain Water catchment.

The driller's log for AGW3 indicates that this well has a relatively high yield of approximately 900 m^3/day. This was based on measurements taken during well development and may not reflect the sustainable yield of the well; however, it does indicate that the aquifer is productive in the vicinity of the site and that it can be expected to be of significantly higher permeability than the overburden soils.

It can be expected that the groundwater flow regime will be altered when one or more of the groundwater abstraction wells is operating, and it is possible that at least some of the areas of proposed drip irrigation will lie within the zone of contribution to the abstraction wells.

Water quality in the bedrock aquifer is monitored by Silver Hill Foods on a monthly basis. The following table summarises the results for June 2016.

Groundwater Quality, 2016

		June 2016			December 2016		
		AGW1	**AGW2**	**AGW3**	**AGW1**	**AGW2**	**AGW3**
COD	mg/l	3	3	4	4	4	3
Nitrate	mg/l	0.7	0.8	0.4	0.6	0.7	0.6
Total ammonia	mg/l	0.10	0.11	0.12	0.09	0.11	0.11
Faecal coliforms	counts/ 100 ml	0	0	0	0	0	0
Total coliforms	counts/ 100 ml	0	0	0	0	0	0

The results indicate that groundwater quality in the bedrock aquifer is good, with concentrations of nitrate and total ammonia below the respective GTVs. There were no indications of microbial contamination in any of the wells during 2016.

5.4 Risks to Receptors

The vulnerability of the bedrock aquifer is classified as "low" by the GSI across all areas where the drip irrigation system is currently proposed. This reflects both the thickness of the overburden in the areas of interest, as well as the relatively low permeability of the soils of the area. The low vulnerability classification is supported by the driller's log for AGW3 where the overburden thickness was observed to be 27m.

Added to this, the levels of key COPCs in the treated effluent discharging from the waste water treatment plant are not particularly high relative to those observed in the groundwater. For example, average concentrations of total ammonia appear to be similar to background levels in the bedrock aquifer.

Concentrations of key COPCs can be expected to attenuate as the effluent migrates down through the overburden, and an element of dilution can be expected as the effluent discharges from the overburden into the bedrock aquifer. The degree of attenuation that will be observed is difficult to estimate with any accuracy.

With regard to pathogens, the travel time for the treated effluent to migrate vertically down to the bedrock aquifer can be expected to be approximately one year (based on a permeability of 0.01 m/day, porosity of 0.2, and an overburden thickness of 20m). It is unlikely that pathogens present in the treated effluent as it discharges to the drip-fields will survive that long in the subsurface.

It is understood that groundwater abstracted for use at the Silver Hill Farm facility is chlorinated prior to use, and as such even if some pathogens were present in groundwater abstracted from the bedrock aquifer, they would be removed via on-site treatment.

As outlined earlier, the risk to water quality in the surface waters down-gradient of the drip-fields is considered low.

6 GROUNDWATER COMPLIANCE MONITORING

The site's current IE licence includes the requirement to monitor groundwater quality in AGW01, AGW02 and AGW03 biannually. Monitoring of these three wells is considered adequate for the purposes of compliance monitoring of the current operations at the site.

Additional groundwater monitoring is considered necessary linked to operation of the proposed drip irrigation system. The aims of this monitoring would be as follows:

- To monitor the degree of groundwater mounding within the overburden in each drip-field and to use measurements from this monitoring to optimise application rates across each drip-field;
- To monitor groundwater quality in the overburden for key COPCs. The analytical suite should include total ammonia and indicator pathogens E. Coli, total coliforms and faecal coliforms.

7 CONCLUSIONS

Based on the CSM presented herein, the following conclusions can be drawn:

- Any impact on the bedrock aquifer as a result of the proposed discharge in terms of increases in COPC concentrations is expected to be minor. Exceedance of GTVs for the key COPCs is not expected at any point within the aquifer;
- The discharge is not expected to have a significant impact on groundwater quality in the three abstraction wells currently used by Silver Hill Foods; however, on-going chlorination of the water prior to use is advised as a precautionary measure;
- The discharge is not expected to have an impact on local surface waters, provided application rates are monitored and controlled;

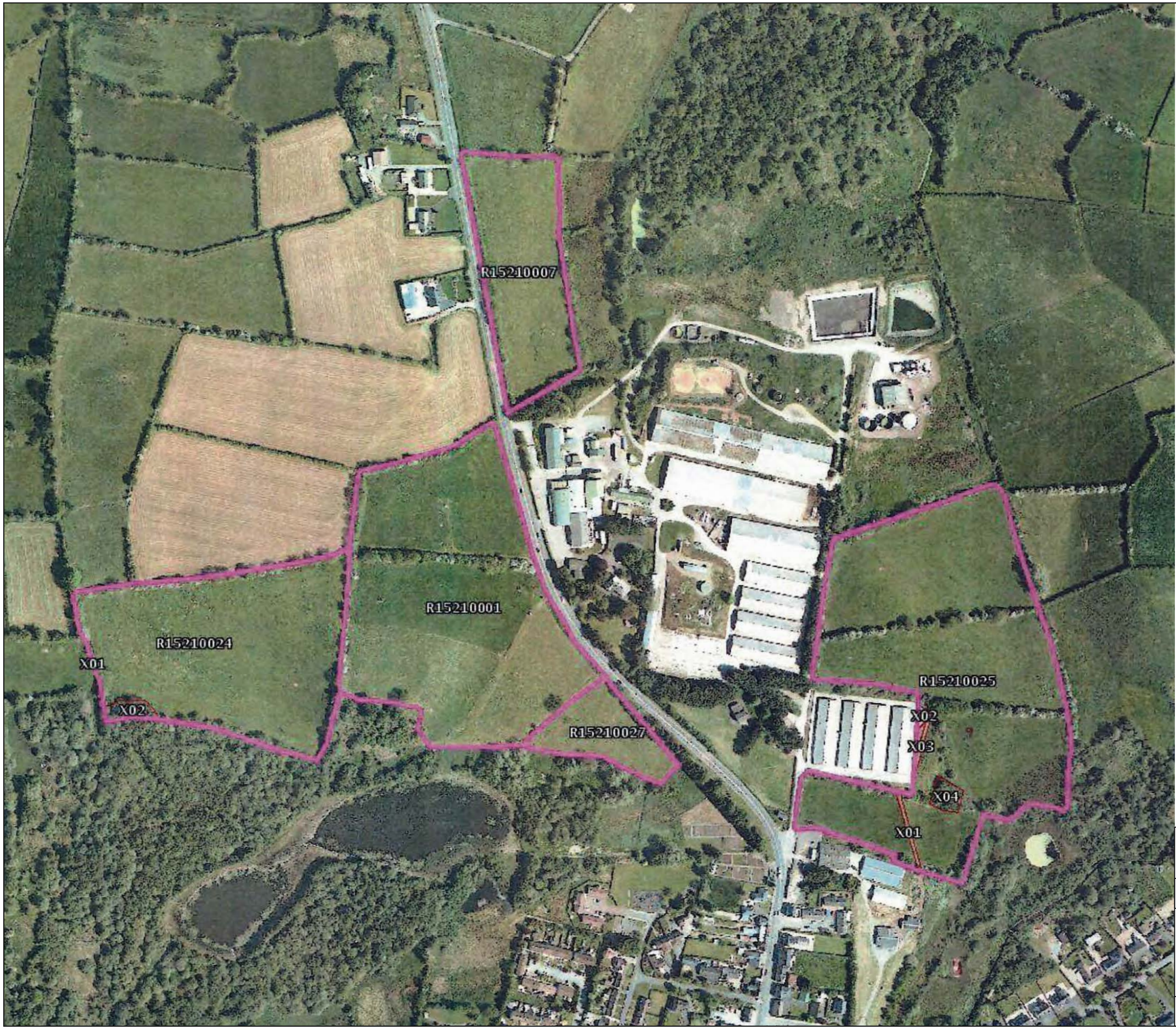
In summary, it is expected that the indirect discharge of effluent from the proposed drip irrigation system will be compliant with the Groundwater Regulations.

FIGURES

0 km 1 km 2 km

Approximate scale

Site Location		
Emyvale, County Monaghan	GCU0237001	
Geosyntec consultants	Silver Hill Foods	Figure 1
Dublin	July 2017	



N

Silver Hill Foods landholding Kilnagullion, Emyvale, Co. Mongaghan outlined in pink

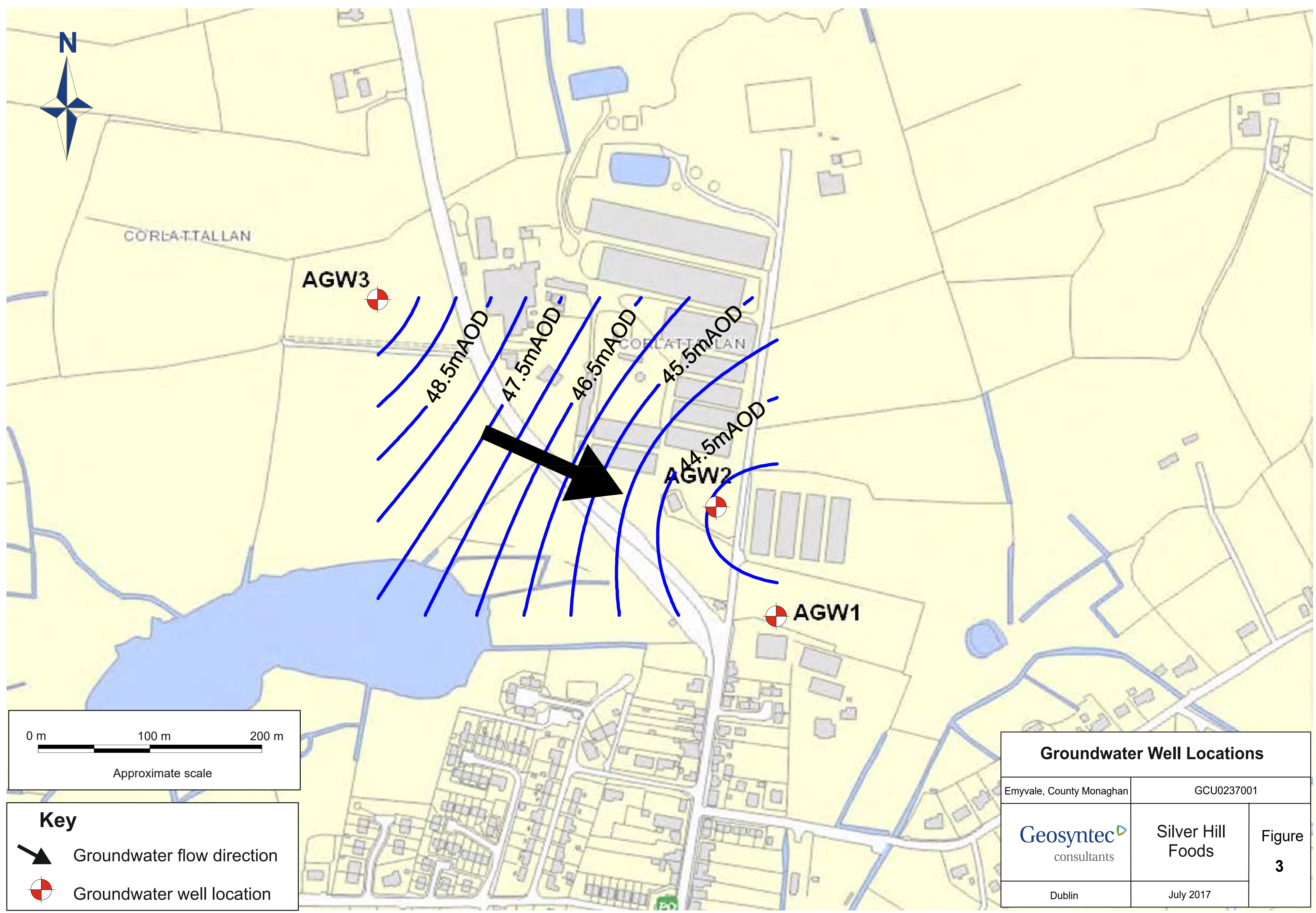
0 m 100 m 200 m

Approximate scale

Site Layout

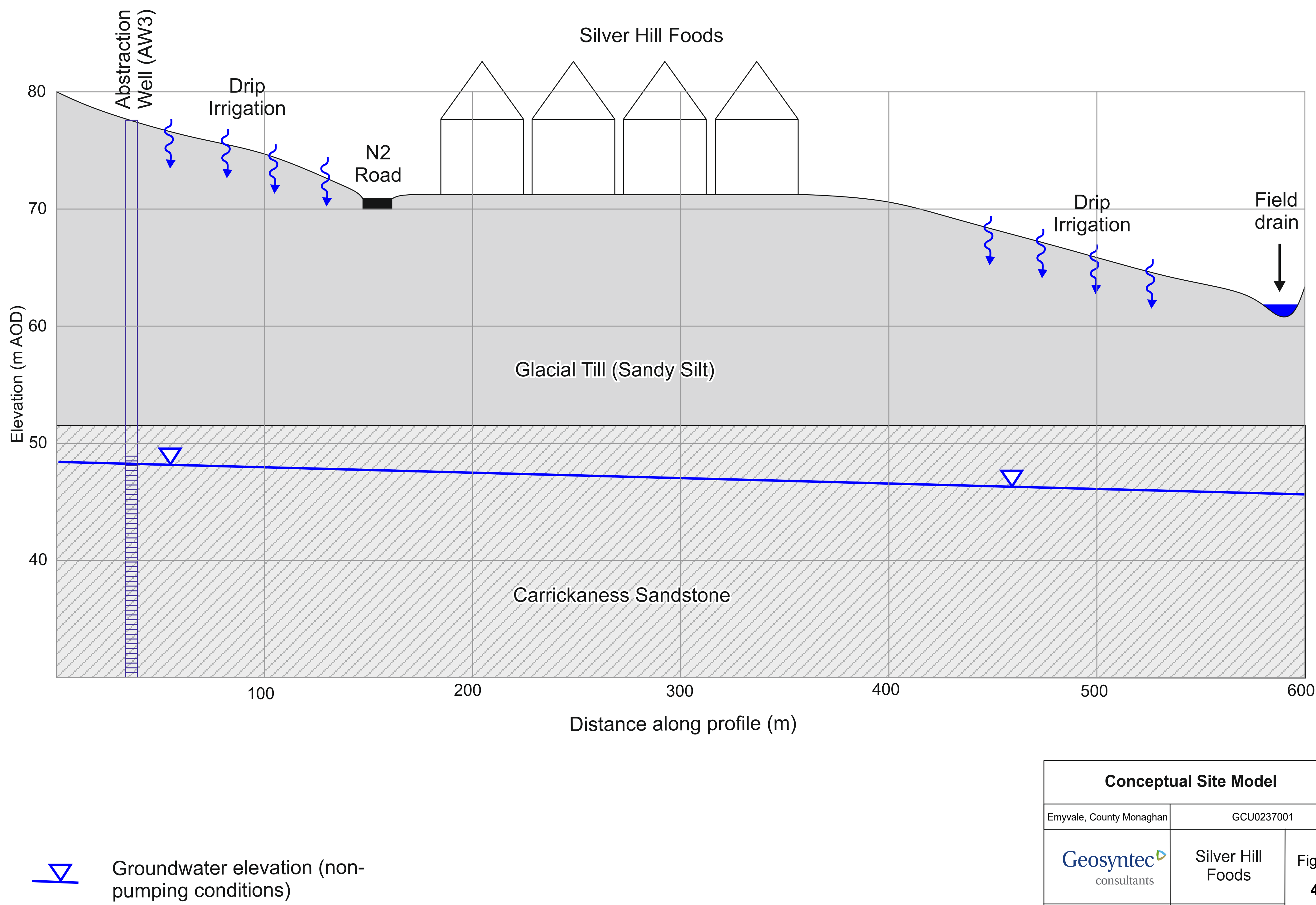
Emyvale, County Monaghan	GCU0237001
Geosyntec consultants	Silver Hill Foods
Dublin	July 2017

Figure 2



Groundwater Well Locations

Emyvale, County Monaghan	GCU0237001	
Geosyntec consultants	Silver Hill Foods	Figure 3
Dublin	July 2017	



Conceptual Site Model		
Emyvale, County Monaghan	GCU0237001	
Geosyntec consultants	Silver Hill Foods	Figure 4
Dublin	July 2017	

APPENDIX A
Borehole Log – AGW3

Water Well Log

Des Meehan & Co. Ltd.

Blackrock,
Co. Louth.
Tel 042-9321767
Mobile 086-8122333

Enniskillen,
Co.Fermanagh.
Tel 028-66322205
Mobile 07860-812233

Website: - www.meehandrilling.com

Borehole No **870** Date of Drilling: **20-08-01**

Name of Client: **Silver Hill Foods Ltd**

Nearest Town: **Emyvale** County: **Monaghan**

Address: **Hillcrest (New Borehole in Hill Field opposite Plant)**

Farm / Private / Factory / Etc.: Poultry Farm & Processing Plant

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Drilling Method: Hammer / Odex or Rotary / Etc.: **Hammer**

Depth of Borehole: 504ft **Depth of Overburden: 90 ft.**

Type of Overburden: **Clay/Sand/Gravel**

Steel Casing to Bedrock Depth: **40 ft 10"&. 104 ft. 8"** Diameter: **8" & 10"**

Grouted to bedrock: **Yes**

Estimated Maximum Safe Yield: **8,500 Gallons per Hour after 5 hours development.**

Static Water Level Below Ground: 55ft

MAIN WATER ENTRY LEVELS

1. **134 ft 200 Gals per hr**
2. **155 ft. 650 Gals per hr**
3. **310 ft. 3000+ Gals per hr**
4. **435 ft. 8500+ Gals per hr.**

ROCK TYPE

TOP: **Limestone**
BASE: **Limestone**

WATER QUALITY

(e.g. clear/cloudy/etc.): **85%**

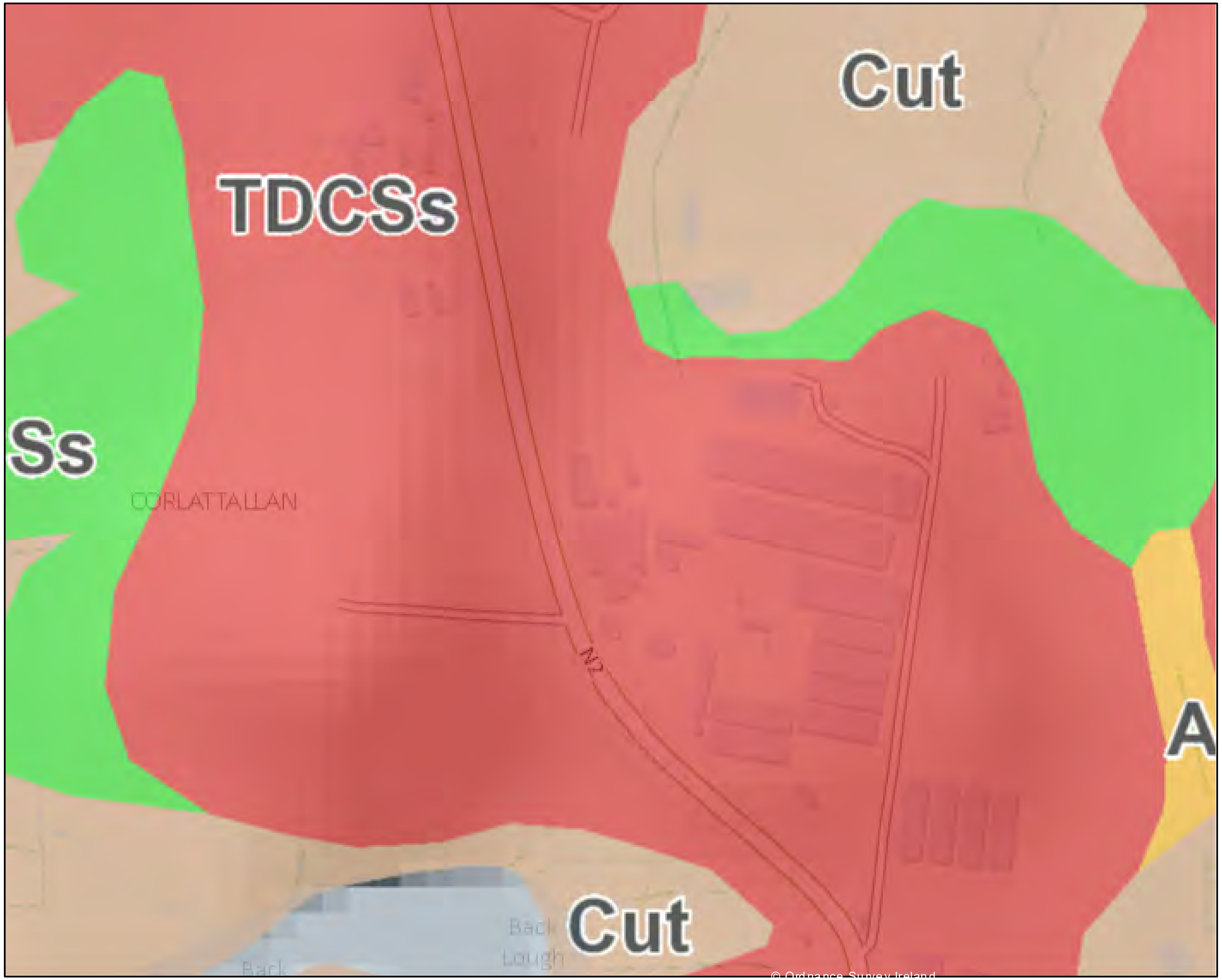
COMMENTS (e.g. any unusual features):

I suggest a 7 day pumping test of this borehole in order to ascertain the correct size of permanent pump and pipe size suitable for the application.

Reviewed by, for Des Meehan: ____________

APPENDIX B
Geological Survey Maps

Quarternary Sediments - Emyvale



Legend

QUATERNARY_SEDIM...

- A, Alluvium
- Ac, Alluvium (clayey)
- AcEsk, Eskers comprised of gravels of acidic reaction
- Ag, Alluvium (gravelly)
- Airfield/Airport
- As, Alluvium (sandy)
- Asi, Alluvium (silty)
- BasEsk, Eskers comprised of gravels of basic reaction
- BktPt, Blanket Peat
- Causeway, Causeway
- Crannog, Crannog
- Cut, Cut over raised peat
- Dam
- Embankment
- FenPt, Fen Peat
- Fill, Made ground
- GBi, Gravels derived from basic igneous rocks
- GCSsS, Gravels derived from Cambrian sandstones and shales
- GCh, Gravels derived from chert
- GDCSs, Gravels derived from Devonian and Carboniferous sandstones
- GDSs, Gravels derived from Devonian sandstones
- GGr, Gravels derived from granite
- GLCSsS, Gravels derived from Carboniferous sandstones and shales
- GLPDSs, Gravels derived from Lower

Scale: 1:5,000

Geological Survey Ireland

0 0.035 0.07 0.14 mi

0 0.05 0.1 0.2 km

Map Centre Coordinates (ITM) 667,512 844,687

Snapshot Date: July 5, 2017

APPENDIX C
Report on Percolation Tests – November 2016

Reply to: Sixmilebridge Our ref: RF
Your ref: Date: 5th December, 2016

Ms Denise Jordan,
Silver Hill Foods,
Emyvale,
Co. Monaghan.

Re:- Site Assessment for Proposed Drip Irrigation System at Silver Hill Foods.

Dear Denise,

With reference to above-mentioned and prior discussions with Joe Walsh of Ash Environmental Technologies I confirm that I attended on site to carry out site assessment study of the existing lands for determination of suitability for dispersal of treated wastewater using a drip irrigation system and report as follows:-

Scope of Works:

To determine the type and classification of soils/subsoils on site, the depth of soils/subsoils, and the depth to water table.

Purpose of Works:

To enable a decision on the suitability of the lands for dispersal of treated wastewater using a drip irrigation system.

Assessment Parameters:

It was decided following discussions with Joe Walsh of Ash Environmental Technologies to adapt measures outlined in the EPA Code of Practice Wastewater Treatment and Disposal Systems Serving Single Houses 2009, using the British Standard BS5930:1999 for soil classification and the Percolation Test procedure for the percolating properties of the soils.

Assessment Requirements:

Based on the parameters set, a three day period of assessment was required. It was agreed that I would attend on site on Monday 28th, Tuesday 29th and Wednesday 30th November, 2016 to carry out the assessment. Joe Walsh had advised that he would attend on site from the commencement of the assessment and that a suitable machine and sufficient water would be provided by Silver Hill Foods to enable me to carry out the assessment.

Assessment Process:

It was decided, given the expanse and location of the lands identified for possible dispersal, to excavate a number of trial holes throughout the land at varying locations and field positions. It was also decided to excavate a Percolation Test Hole at each trial hole location.

Trial Holes:

A total of 15 trial holes were excavated throughout the lands, each to a depth of 1.5m. The location points for the trial holes are marked as approximate on the attached site location map (Appendix 1). Each of these trial holes were assessed as follows:-

- (i) Soil layers/type/classification
- (ii) Depth to water ingress when excavated
- (iii) Depth to water table after 24 hours
- (iv) Depth to water table after 48 hours
- (v) Depth to bedrock

Trial hole assessment results are detailed individually and marked as trial holes 1 to 15 attached (Appendix 2).

Percolation Test Holes:

A total of 15 percolation test holes were excavated throughout the lands, adjacent to each trial hole. The dimensions of each hole was 300mm x 300mm x 400mm deep. Each of these holes were pre-soaked twice on Tuesday 29th November, 2016 at 10am and 4pm. In order to achieve an indication of any percolation qualities of the soils it was decided that pre-soaking would be carried out twice and the level of water remaining in the hole prior to testing on the 30th November, 2016 would be recorded.

Percolation test hole results are detailed individually and marked as P-Test holes 1 to 15 attached (Appendix 3).

General Findings:

My assessment concluded that there is a wide and varied range of soils and subsoils throughout the lands. A common trend concluded that the soils generally are shallow poorly drained soils with mottling evident suggesting a seasonally adjusting water table.

There were some locations identified on the lands where heavy livestock poaching was evident and associated surface water ponding. These locations were few in numbers and, given the recorded depth to water table and percolation properties of the soils, did not reflect permeability. I can only assume that over intensification of agricultural activity has resulted in excessive compaction in locations where soils are of a clay nature.

A good depth of soil was recorded above recorded water table levels, ranging from 0.85m to in excess of 1.5m., and the predominant soil type recorded was silty in nature with sand and gravel content common.

Conclusion:

I would be of the opinion that such soils would be acceptable for a drip irrigation system, given the depth to water table, the seasonal nature of the water table, and the percolating quality of the soils. The use of drip irrigation in Ireland is relatively new and has tended thus far to be used as an option where percolating qualities are poor. The presence of mottling in the trial holes would suggest that there may be occasions during wet periods where complete sub-surface drainage may prove difficult in some areas, and these areas may need to be avoided.

However, the low levels of water in trial holes after 48 hours and the complete absence in some, combined with the low loading rates envisaged in the region of 3 litres/m^2 would seem to indicate that sub-surface infiltration aided by horizontal movement in the upper soil horizons should be achieved. In addition, the removal of the build-up of vegetation from the existing drains in the lands so that surface water can move more freely, would assist the drainage of the lower lying areas.

Comment:

This report as is our normal practice is for the benefit of the addressee only and should not be relied upon in whole or in part by any third party without the consent of the undersigned.

Please do revert should you have any questions or require any further particulars.

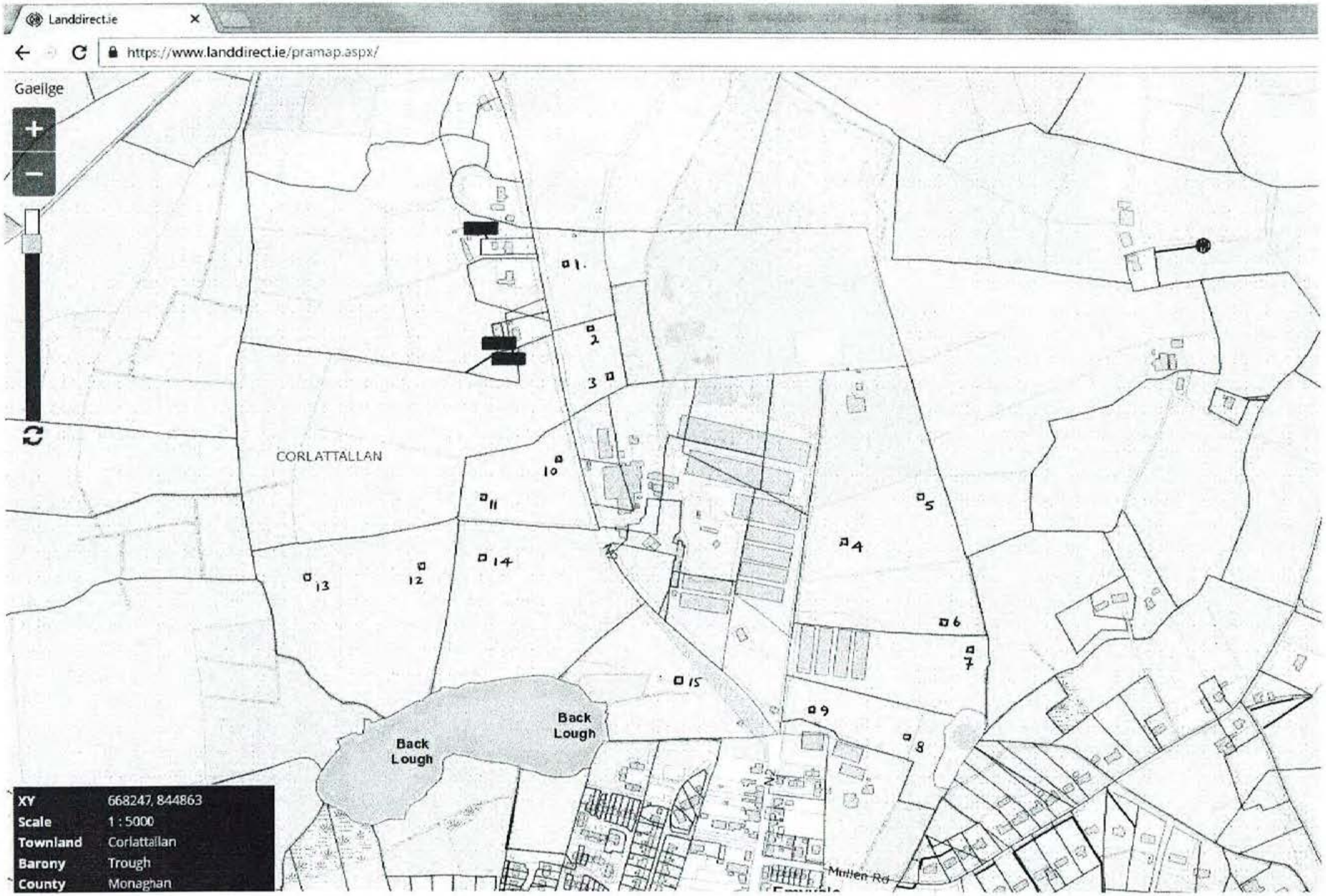
Yours sincerely,

____

Richard Flynn,
Flynn & Shaw.

Land owned by silver Hill in the Corlattalan townland

TRIAL HOLE LOCATIONS (APPROX.).



SILVER HILL FOODS, EMYVALE, Co. MONAGHAN. P-TEST HOLE No. 1.

3.3(b) Percolation ("P") Test for Shallow Soil / Subsoils and/or Water Table

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0 mm		
Depth from ground surface to base of hole (mm)	400 mm		
Depth of hole (mm)	400 mm		
Dimensions of hole [length x breadth (mm)]	300mm x 300mm	x	x

Step 2: Pre-Soaking Test Holes

Date and Time pre-soaking started						
	29-11-2016	AM.				

Each hole should be pre-soaked twice before the test is carried out. Each hole should be empty before refilling.

P-TEST HOLE CONTAINED 100mm OF WATER AFTER BEING SOAKED TWICE BEFORE TESTING.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	30-11-2016		
Time filled to 400 mm	8.08AM		
Time water level at 300 mm	9.55AM		
Time to drop 100 mm (P_{100})	107		
Average P_{100}			107

~~If P_{100} > 300 minutes then P-value >90 – site unsuitable for discharge to ground~~
~~If P_{100} ≤ 210 minutes then go to Step 4;~~
~~If P_{100} > 210 minutes then go to Step 5;~~

NOTE:- AT 3.40PM WATER LEVEL HAD DROPPED A FURTHER 100mm.

SILVER HILL FOODS, EMYVALE, Co. MONAGHAN.   P-TEST HOLE No. 2

3.3(b) Percolation ("P") Test for Shallow Soil / Subsoils and/or Water Table

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0mm		
Depth from ground surface to base of hole (mm)	400mm		
Depth of hole (mm)	400mm		
Dimensions of hole [length x breadth (mm)]	300mm x 300mm	x	x

Step 2: Pre-Soaking Test Holes

	1		2		3	
Date and Time pre-soaking started	29-11-2016	AM.				

Each hole should be pre-soaked twice before the test is carried out. Each hole should be empty before refilling.

P-TEST HOLE CONTAINED 200mm OF WATER AFTER BEING SOAKED TWICE BEFORE TESTING.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	30-11-2016		
Time filled to 400 mm	8.11AM.		
Time water level at 300 mm	12.30pm		
Time to drop 100 mm (P_{100})	259		
Average P_{100}			259

~~If P_{100} > 300 minutes then P-value >90 - site unsuitable for discharge to ground~~
~~If P_{100} ≤ 210 minutes then go to Step 4;~~
~~If P_{100} > 210 minutes then go to Step 5;~~

NOTE:- AT 3.38PM. WATER LEVEL HAD DROPPED A FURTHER 15mm.

SILVER HILL FOODS, EMYVALE, Co. MONAGHAN. P-TEST HOLE No. 3

3.3(b) Percolation ("P") Test for Shallow Soil / Subsoils and/or Water Table

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0mm		
Depth from ground surface to base of hole (mm)	400mm		
Depth of hole (mm)	400mm		
Dimensions of hole [length x breadth (mm)]	300mm X 300mm	x	x

Step 2: Pre-Soaking Test Holes

	1		2		3	
Date and Time pre-soaking started	29-11-2016	AM.				

Each hole should be pre-soaked twice before the test is carried out. Each hole should be empty before refilling.

P-TEST HOLE CONTAINED 200mm OF WATER AFTER BEING SOAKED TWICE BEFORE TESTING.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	30-11-2016		
Time filled to 400 mm	8·13AM.		
Time water level at 300 mm	10·10AM.		
Time to drop 100 mm (P_{100})	117		
Average P_{100}			117

~~If P_{100} > 300 minutes then P-value >90 – site unsuitable for discharge to ground~~
~~If P_{100} ≤ 210 minutes then go to Step 4;~~
~~If P_{100} > 210 minutes then go to Step 5;~~

NOTE:- AT 3·37PM WATER LEVEL HAD DROPPED A FURTHER 40mm.

SILVER HILL FOODS, EMYVALE, Co. MONAGHAN. P-TEST HOLE No. 4

3.3(b) Percolation ("P") Test for Shallow Soil / Subsoils and/or Water Table

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0mm		
Depth from ground surface to base of hole (mm)	400mm		
Depth of hole (mm)	400mm		
Dimensions of hole [length x breadth (mm)]	300mm X 300mm	x	x

Step 2: Pre-Soaking Test Holes

Date and Time pre-soaking started						
	29-11-2016	AM.				

Each hole should be pre-soaked twice before the test is carried out. Each hole should be empty before refilling.

P-TEST HOLE WAS DRY AFTER BEING SOAKED TWICE BEFORE TESTING.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	30-11-2016		
Time filled to 400 mm	8.21 AM.		
Time water level at 300 mm	10.12 AM		
Time to drop 100 mm (P_{100})	111		
Average P_{100}			111

~~If P_{100} > 300 minutes then P-value >90 – site unsuitable for discharge to ground~~
~~If P_{100} ≤ 210 minutes then go to Step 4;~~
~~If P_{100} > 210 minutes then go to Step 5;~~

NOTE:- AT 2.48PM WATER LEVEL HAD DROPPED A FURTHER 100mm AND WAS REFILLED TO THE 300mm LEVEL AT 2.49PM
AT 3.50PM WATER LEVEL HAD DROPPED A FURTHER 30mm.

SILVER HILL FOODS, EMYVALE, Co. MONAGHAN. P-TEST HOLE No. 5

3.3(b) Percolation ("P") Test for Shallow Soil / Subsoils and/or Water Table

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0mm		
Depth from ground surface to base of hole (mm)	400mm		
Depth of hole (mm)	400mm		
Dimensions of hole [length x breadth (mm)]	300mm x 300mm	x	x

Step 2: Pre-Soaking Test Holes

	1		2		3	
Date and Time pre-soaking started	29-11-2016	AM.				

Each hole should be pre-soaked twice before the test is carried out. Each hole should be empty before refilling.

P-TEST HOLE CONTAINED 250mm OF WATER AFTER BEING SOAKED TWICE BEFORE TESTING.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	30-11-2016		
Time filled to 400 mm	8.23AM		
Time water level at 300 mm	WATER LEVEL 345mm @ 3.53pm.		
Time to drop 100 mm (P_{100})	>450		
Average P_{100}			>450

~~If P_{100} > 300 minutes then P-value >90 – site unsuitable for discharge to ground~~
~~If P_{100} ≤ 210 minutes then go to Step 4;~~
~~If P_{100} > 210 minutes then go to Step 5;~~

SILVER HILL FOODS, EMYVALE, Co. MONAGHAN.   P-TEST HOLE No. 6

3.3(b) Percolation ("P") Test for Shallow Soil / Subsoils and/or Water Table

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0 mm		
Depth from ground surface to base of hole (mm)	400 mm		
Depth of hole (mm)	400 mm		
Dimensions of hole [length x breadth (mm)]	300mm x 300mm	x	x

Step 2: Pre-Soaking Test Holes

	1		2		3	
Date and Time pre-soaking started	29-11-2016	AM.				

Each hole should be pre-soaked twice before the test is carried out. Each hole should be empty before refilling.

P-TEST HOLE CONTAINED 150mm OF WATER AFTER BEING SOAKED TWICE BEFORE TESTING.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	30-11-2016		
Time filled to 400 mm	8.27 AM		
Time water level at 300 mm	12.52 PM		
Time to drop 100 mm (P_{100})	265		
Average P_{100}			265

~~If P_{100} > 300 minutes then P value >90 – site unsuitable for discharge to ground~~
~~If P_{100} ≤ 210 minutes then go to Step 4;~~
~~If P_{100} > 210 minutes then go to Step 5;~~

NOTE:- AT 3.57PM WATER LEVEL HAD DROPPED A FURTHER 30mm.

SILVER HILL FOODS, EMYVALE, Co. MONAGHAN.

P-TEST HOLE No. 7

3.3(b) Percolation ("P") Test for Shallow Soil / Subsoils and/or Water Table

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0mm		
Depth from ground surface to base of hole (mm)	400mm		
Depth of hole (mm)	400mm		
Dimensions of hole [length x breadth (mm)]	300mm x 300mm	x	x

Step 2: Pre-Soaking Test Holes

	1		2		3	
Date and Time pre-soaking started	29-11-2016	AM.				

Each hole should be pre-soaked twice before the test is carried out. Each hole should be empty before refilling.

P-TEST HOLE WAS DRY AFTER BEING SOAKED TWICE BEFORE TESTING.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	30-11-2016		
Time filled to 400 mm	8.29AM.		
Time water level at 300 mm	10.27AM		
Time to drop 100 mm (P_{100})	118		
Average P_{100}			118

~~If P_{100} > 300 minutes then P value >90 – site unsuitable for discharge to ground~~
~~If P_{100} ≤ 210 minutes then go to Step 4;~~
~~If P_{100} > 210 minutes then go to Step 5;~~

NOTE:- AT 3.59PM. WATER LEVEL HAD DROPPED A FURTHER 100mm.

SILVER HILL FOODS, EMYVALE, Co. MONAGHAN.　　P-TEST HOLE No. 8

3.3(b) Percolation ("P") Test for Shallow Soil / Subsoils and/or Water Table

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0mm		
Depth from ground surface to base of hole (mm)	400mm		
Depth of hole (mm)	400mm		
Dimensions of hole [length x breadth (mm)]	300mm X 300mm	x	x

Step 2: Pre-Soaking Test Holes

	1		2		3	
Date and Time pre-soaking started	29-11-2016	AM.				

Each hole should be pre-soaked twice before the test is carried out. Each hole should be empty before refilling.

P-TEST HOLE WAS DRY AFTER BEING SOAKED TWICE BEFORE TESTING.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	30-11-2016		
Time filled to 400 mm	8·34AM		
Time water level at 300 mm	10·34AM		
Time to drop 100 mm (P_{100})	120		
Average P_{100}			120

~~If P_{100} > 300 minutes then P-value >90 – site unsuitable for discharge to ground~~
~~If P_{100} ≤ 210 minutes then go to Step 4;~~
~~If P_{100} > 210 minutes then go to Step 5;~~

NOTE:- AT 4·02PM. WATER LEVEL HAD DROPPED A FURTHER 100mm.

SILVER HILL FOODS, EMYVALE, Co. MONAGHAN. P-TEST HOLE No. 9.

3.3(b) Percolation ("P") Test for Shallow Soil / Subsoils and/or Water Table

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0mm		
Depth from ground surface to base of hole (mm)	400mm		
Depth of hole (mm)	400mm		
Dimensions of hole [length x breadth (mm)]	300mm x 300mm	x	x

Step 2: Pre-Soaking Test Holes

Date and Time pre-soaking started						
	29-11-2016	AM.				

Each hole should be pre-soaked twice before the test is carried out. Each hole should be empty before refilling.

P-TEST HOLE CONTAINED 200mm OF WATER AFTER BEING SOAKED TWICE BEFORE TESTING.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	30-11-2016		
Time filled to 400 mm	8.38Am.		
Time water level at 300 mm	10.50AM		
Time to drop 100 mm (P_{100})	132		
Average P_{100}			132

~~If P_{100} > 300 minutes then P-value >90 – site unsuitable for discharge to ground~~
~~If P_{100} ≤ 210 minutes then go to Step 4;~~
~~If P_{100} > 210 minutes then go to Step 5;~~

NOTE:- AT 4.04PM WATER LEVEL HAD DROPPED A FURTHER 40mm.

SILVER HILL FOODS, EMYVALE, Co. MONAGHAN. P-TEST HOLE No.10

3.3(b) Percolation ("P") Test for Shallow Soil / Subsoils and/or Water Table

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0mm		
Depth from ground surface to base of hole (mm)	400mm		
Depth of hole (mm)	400mm		
Dimensions of hole [length x breadth (mm)]	300mm X 300mm	x	x

Step 2: Pre-Soaking Test Holes

	1		2		3	
Date and Time pre-soaking started	29-11-2016	AM.				

Each hole should be pre-soaked twice before the test is carried out. Each hole should be empty before refilling.

P-TEST HOLE CONTAINED 170mm OF WATER AFTER BEING SOAKED TWICE BEFORE TESTING.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	30-11-2016		
Time filled to 400 mm	9·01AM		
Time water level at 300 mm	12·20PM		
Time to drop 100 mm (P_{100})	199		
Average P_{100}			199

~~If P_{100} > 300 minutes then P-value >90 – site unsuitable for discharge to ground~~
~~If P_{100} ≤ 210 minutes then go to Step 4;~~
~~If P_{100} > 210 minutes then go to Step 5;~~

NOTE:- AT 3·31PM WATER LEVEL HAD DROPPED A FURTHER 40mm.

SILVER HILL FOODS, EMYVALE, Co. MONAGHAN. P-TEST HOLE No.11

3.3(b) Percolation ("P") Test for Shallow Soil / Subsoils and/or Water Table

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0mm		
Depth from ground surface to base of hole (mm)	400mm		
Depth of hole (mm)	400mm		
Dimensions of hole [length x breadth (mm)]	300mm x 300mm	x	x

Step 2: Pre-Soaking Test Holes

Date and Time pre-soaking started	29-11-2016	AM.				

Each hole should be pre-soaked twice before the test is carried out. Each hole should be empty before refilling.

P-TEST HOLE CONTAINED 30mm OF WATER AFTER BEING SOAKED TWICE BEFORE TESTING.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	30-11-2016		
Time filled to 400 mm	8.59AM		
Time water level at 300 mm	WATER LEVEL 350mm @ 3.28pm.		
Time to drop 100 mm (P_{100})	>389		
Average P_{100}			>389

~~If P_{100} > 300 minutes then P value >90 – site unsuitable for discharge to ground~~
~~If P_{100} ≤ 210 minutes then go to Step 4;~~
~~If P_{100} > 210 minutes then go to Step 5;~~

SILVER HILL FOODS, EMYVALE, Co. MONAGHAN. P-TEST HOLE No. 12

3.3(b) Percolation ("P") Test for Shallow Soil / Subsoils and/or Water Table

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0 mm		
Depth from ground surface to base of hole (mm)	400 mm		
Depth of hole (mm)	400 mm		
Dimensions of hole [length x breadth (mm)]	300mm x 300mm	x	x

Step 2: Pre-Soaking Test Holes

Date and Time pre-soaking started	1	2	3
	29-11-2016 AM.		

Each hole should be pre-soaked twice before the test is carried out. Each hole should be empty before refilling.

P-TEST HOLE CONTAINED 200mm OF WATER AFTER BEING SOAKED TWICE BEFORE TESTING.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	30-11-2016		
Time filled to 400 mm	8.50AM		
Time water level at 300 mm	11.30 AM		
Time to drop 100 mm (P_{100})	160		
Average P_{100}			160

~~If P_{100} > 300 minutes then P-value >90 – site unsuitable for discharge to ground~~
~~If P_{100} ≤ 210 minutes then go to Step 4;~~
~~If P_{100} > 210 minutes then go to Step 5;~~

NOTE:- AT 3.19PM WATER LEVEL HAD DROPPED A FURTHER 30mm.

SILVER HILL FOODS, EMYVALE, Co. MONAGHAN.   P-TEST HOLE No. 13

3.3(b) Percolation ("P") Test for Shallow Soil / Subsoils and/or Water Table

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0 mm		
Depth from ground surface to base of hole (mm)	400 mm		
Depth of hole (mm)	400 mm		
Dimensions of hole [length x breadth (mm)]	300mm X 300mm	x	x

Step 2: Pre-Soaking Test Holes

Date and Time pre-soaking started	1		2		3	
	29-11-2016	AM.				

Each hole should be pre-soaked twice before the test is carried out. Each hole should be empty before refilling.

P-TEST HOLE WAS DRY AFTER BEING SOAKED TWICE BEFORE TESTING.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	30-11-2016		
Time filled to 400 mm	8.52 AM		
Time water level at 300 mm	10.50 AM		
Time to drop 100 mm (P_{100})	118		
Average P_{100}			118

~~If P_{100} > 300 minutes then P-value >90 – site unsuitable for discharge to ground~~
~~If P_{100} ≤ 210 minutes then go to Step 4;~~
~~If P_{100} > 210 minutes then go to Step 5;~~

NOTE:- AT 3.22 PM WATER LEVEL HAD DROPPED A FURTHER 100 mm.

SILVER HILL FOODS, EMYVALE, Co. MONAGHAN.   P-TEST HOLE No. 14

3.3(b) Percolation ("P") Test for Shallow Soil / Subsoils and/or Water Table

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0mm		
Depth from ground surface to base of hole (mm)	400mm		
Depth of hole (mm)	400mm		
Dimensions of hole [length x breadth (mm)]	300mm X 300mm	x	x

Step 2: Pre-Soaking Test Holes

Date and Time pre-soaking started	1		2		3	
	29-11-2016	AM.				

Each hole should be pre-soaked twice before the test is carried out. Each hole should be empty before refilling.

P-TEST HOLE CONTAINED 300mm OF WATER AFTER BEING SOAKED TWICE BEFORE TESTING.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	30-11-2016		
Time filled to 400 mm	8.48 AM		
Time water level at 300 mm	WATER LEVEL 320mm @ 3.17pm		
Time to drop 100 mm (P_{100})	> 389		
Average P_{100}			> 389.

~~If P_{100} > 300 minutes then P-value >90 – site unsuitable for discharge to ground~~
~~If P_{100} ≤ 210 minutes then go to Step 4;~~
~~If P_{100} > 210 minutes then go to Step 5;~~

SILVER HILL FOODS, EMYVALE, CO. MONAGHAN. P-TEST HOLE No. 15

3.3(b) Percolation ("P") Test for Shallow Soil / Subsoils and/or Water Table

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0mm		
Depth from ground surface to base of hole (mm)	400mm		
Depth of hole (mm)	400mm		
Dimensions of hole [length x breadth (mm)]	300mm x 300mm	x	x

Step 2: Pre-Soaking Test Holes

	1		2		3	
Date and Time pre-soaking started	29-11-2016	AM.				

Each hole should be pre-soaked twice before the test is carried out. Each hole should be empty before refilling.

P-TEST HOLE WAS DRY AFTER BEING SOAKED TWICE BEFORE TESTING.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test	30-11-2016		
Time filled to 400 mm	8.44AM		
Time water level at 300 mm	10.05 AM		
Time to drop 100 mm (P_{100})	81		
Average P_{100}			81

~~If P_{100} > 300 minutes then P-value >90 – site unsuitable for discharge to ground~~
~~If P_{100} ≤ 210 minutes then go to Step 4;~~
~~If P_{100} > 210 minutes then go to Step 5;~~

NOTE:- AT 3.10PM WATER LEVEL HAD DROPPED A FURTHER 150mm.

SILVER HILL FOODS, EMYVALE, CO. MONAGHAN. TRIAL HOLE No. 1.

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas, which are at or adjacent to significant sites (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 1.5M.

VULNERABILITY - LOW. AQUIFER - LOCALLY IMPORTANT.

Depth from ground surface to bedrock (m) (if present): > 1.5M.

Depth from ground surface to water table (m) (if present): 1.1M.

Depth of water ingress: 1.5M.

Rock type (if present): NONE ENCOUNTERED.

Date and time of excavation: 28-11-2016 AM.

Date and time of examination: 30-11-2016 AM.

	Depth of P/T Test*	Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
0.1 m		TOPSOIL - SILTY CLAY LOAM	6+ THREADS 70/90 RIBBON DILATES WITH DIFFICULTY RASPY	CRUMB	FRIABLE	BROWN	ROOTLETS TO 200/250MM.
0.2 m							
0.3 m							
INVERT OF P-TEST HOLE. 0.4 m	∇ P						
0.5 m		Sandy SILT	1 THREAD 40/50 RIBBON DILATES WITH DIFFICULTY	ANGULAR	SOFT	GREY BROWN	NONE EVIDENT.
0.6 m		Sandy SILT	3 THREADS 60/70 RIBBON DILATES WITH DIFFICULTY RASPY	ANGULAR	VERY SOFT	ORANGE BROWN	NONE EVIDENT.
0.7 m							
0.8 m							
0.9 m							
1.0 m							
1.1 m				WATER	LEVEL @ 48 HOURS		
1.2 m			WATER LEVEL	@ 24 HOURS			
1.3 m							
1.4 m							
1.5 m							
1.6 m				BASE	OF HOLE.		
1.7 m							
1.8 m							
1.9 m							
2.0 m							
2.1 m							
2.2 m							
2.3 m							
2.4 m							
2.5 m							
2.6 m							
2.7 m							
2.8 m							
2.9 m							
3.0 m							

Likely T value:

Note: *Depth of percolation test holes should be indicated on log above. (Enter P or T at depts as appropriate).
** See Appendix E for BS 5930 classification.
*** 3 samples to be tested for each horizon and results should be entered above for each horizon.
**** All signs of mottling should be recorded.

NOTE:- MOTTLING EVIDENT BELOW TOPSOIL LAYER (> 400mm)

SILVER HILL FOODS, EMYVALE, CO. MONAGHAN. TRIAL HOLE No. 2.

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas, which are at or adjacent to significant sites (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 1.5M. VULNERABILITY - LOW. AQUIFER - LOCALLY IMPORTANT.

Depth from ground surface to bedrock (m) (if present): >1.5M.

Depth from ground surface to water table (m) (if present): 1.2M.

Depth of water ingress: 0.95M. Rock type (if present): NONE ENCOUNTERED.

Date and time of excavation: 28-11-2016 AM. Date and time of examination: 30-11-2016 AM.

	Depth of P/T Test*	Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
0.1 m		Topsoil - Silty Clay Loam	6+ threads 60/80 ribbon Dilated with difficulty.	Crumb	Friable	Brown	Rootlets to 300mm
0.2 m							
0.3 m							
0.4 m (INVERT OF P-TEST HOLE.)	▽ P.	Sandy SILT Mottled.	2 threads 60/80 ribbon Dilatent very raspy	Granular/ Angular	Loose/soft	Orange Brown	None evident.
0.5 m							
0.6 m							
0.7 m							
0.8 m							
0.9 m							
1.0 m							
1.1 m		gravelly CLAY Mottled.	6+ threads 110+ ribbon Not dilatent Lot of gravel content.	Massive	Stiff	Blue	None evident.
1.2 m				Water level @ 48 hours			
1.3 m							
1.4 m							
1.5 m				Base of hole.			
1.6 m							
1.7 m							
1.8 m							
1.9 m							
2.0 m							
2.1 m							
2.2 m							
2.3 m							
2.4 m							
2.5 m							
2.6 m							
2.7 m							
2.8 m							
2.9 m							
3.0 m							

Likely T value:

Note: *Depth of percolation test holes should be indicated on log above. (Enter P or T at depts as appropriate).
** See Appendix E for BS 5930 classification.
*** 3 samples to be tested for each horizon and results should be entered above for each horizon.
**** All signs of mottling should be recorded.

SILVER HILL FOODS, EMYVALE, Co. MONAGHAN.   TRIAL HOLE No. 3.

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas, which are at or adjacent to significant sites (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 1.5M.   VULNERABILITY - LOW. AQUIFER - LOCALLY IMPORTANT.

Depth from ground surface to bedrock (m) (if present): > 1.5M.   Depth from ground surface to water table (m) (if present): 0.85M.

Depth of water ingress: 1.5m   Rock type (if present): NONE ENCOUNTERED.

Date and time of excavation: 28-11-2016 AM   Date and time of examination: 30-11-2016 AM.

	Depth of P/T Test*	Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
0.1 m		TOPSOIL - GRAVELLY CLAY LOAM.	6T THREADS 50/70 RIBBON DILATES WITH DIFFICULTY	CRUMB	FRIABLE	DARK BROWN	ROOTLETS TO 300MM
0.2 m							
0.3 m							
INVERT OF P-TEST HOLE. 0.4 m	▽ P.	gravelly sandy SILT.	1/2 THREADS 30/50 RIBBON DILATENT VERY RASPY.	GRANULAR	LOOSE	YELLOW BROWN	THROUGH COBBLES AND BOULDERS.
0.5 m							
0.6 m							
0.7 m							
0.8 m				WATER	LEVEL @ 48 HOURS		
0.9 m							
1.0 m			WATER	LEVEL @ 24	HOURS		
1.1 m		LOTS OF COBBLES SOME BOULDERS MOTTLED					
1.2 m							
1.3 m							
1.4 m							
1.5 m		gravelly CLAY	6T THREAD 110+ RIBBON	MASSIVE	STIFF (NOT DILATENT)	BLUE GREY	NONE EVIDENT.
1.6 m				BASE	OF HOLE.		
1.7 m							
1.8 m							
1.9 m							
2.0 m							
2.1 m							
2.2 m							
2.3 m							
2.4 m							
2.5 m							
2.6 m							
2.7 m							
2.8 m							
2.9 m							
3.0 m							

Likely T value:

Note: *Depth of percolation test holes should be indicated on log above. (Enter P or T at depts as appropriate).
** See Appendix E for BS 5930 classification.
*** 3 samples to be tested for each horizon and results should be entered above for each horizon.
**** All signs of mottling should be recorded.

SILVER HILL FOODS, EMYVALE, CO. MONAGHAN. TRIAL HOLE NO. 4.

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas, which are at or adjacent to significant sites (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 1.7M VULNERABILITY - LOW. AQUIFER - LOCALLY IMPORTANT.

Depth from ground surface to bedrock (m) (if present): >1.7M.

Depth from ground surface to water table (m) (if present): >1.7M.

Depth of water ingress: NONE RECORDED

Rock type (if present): NONE ENCOUNTERED

Date and time of excavation: 28-11-2016 AM.

Date and time of examination: 30-11-2016 AM.

	Depth of P/T Test*	Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
0.1 m		TOPSOIL - SILTY LOAM.	3/5 THREADS 30/50 RIBBON DILATENT	CRUMB	FRIABLE	BROWN	ROOTLETS TO 300MM
0.2 m							
INVERT OF P-TEST HOLE. 0.3 m							
0.4 m	∇ P.	gravelly sandy SILT POCKETS OF MOTTLING.	1/2 THREADS 30/40 RIBBON DILATENT	GRANULAR	LOOSE	ORANGE BROWN	NONE EVIDENT.
0.5 m							
0.6 m							
0.7 m							
0.8 m							
0.9 m							
1.0 m							
1.1 m							
1.2 m							
1.3 m							
1.4 m							
1.5 m							
1.6 m							
1.7 m				BASE	OF HOLE.		
1.8 m							
1.9 m							
2.0 m							
2.1 m							
2.2 m							
2.3 m							
2.4 m							
2.5 m							
2.6 m							
2.7 m							
2.8 m							
2.9 m							
3.0 m							

Likely T value:

Note: *Depth of percolation test holes should be indicated on log above. (Enter P or T at depts as appropriate).
** See Appendix E for BS 5930 classification.
*** 3 samples to be tested for each horizon and results should be entered above for each horizon.
**** All signs of mottling should be recorded.

SILVER HILL FOODS, EMYVALE, Co. MONAGHAN. TRIAL HOLE No. 5.

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas, which are at or adjacent to significant sites (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 1.5m. VULNERABILITY - LOW. AQUIFER - LOCALLY IMPORTANT.

Depth from ground surface to bedrock (m) (if present): 1.5M.

Depth from ground surface to water table (m) (if present): 1.2M.

Depth of water ingress: 1.4M. Rock type (if present): MIXED SANDSTONES

Date and time of excavation: 28 - 11 - 2016 AM Date and time of examination: 30 - 11 - 2016 AM.

INVERT OF P-TEST HOLE.

	Depth of P/T Test*	Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
0.1 m		Topsoil –	2 THREADS 50/60 RIBBON				
0.2 m							ROOTLETS TO
0.3 m		SANDY SILTY LOAM	DILATENT	CRUMB	FRIABLE	BROWN	300MM
0.4 m	▽P.		VERY RASPY				
0.5 m			0/1 THREAD 30/40 RIBBON				
0.6 m			DILATENT				
0.7 m		Very gravelly					
0.8 m		Sandy SILT.		GRANULAR	LOOSE	YELLOW BROWN	NONE EVIDENT
0.9 m							
1.0 m		MOTTLED.					
1.1 m							
1.2 m				WATER	LEVEL @ 48 HOURS		
1.3 m							
1.4 m							
1.5 m							
1.6 m				BEDROCK.			
1.7 m							
1.8 m							
1.9 m							
2.0 m							
2.1 m							
2.2 m							
2.3 m							
2.4 m							
2.5 m							
2.6 m							
2.7 m							
2.8 m							
2.9 m							
3.0 m							

Likely T value:

Note: *Depth of percolation test holes should be indicated on log above. (Enter P or T at depts as appropriate).
** See Appendix E for BS 5930 classification.
*** 3 samples to be tested for each horizon and results should be entered above for each horizon.
**** All signs of mottling should be recorded.

SILVER HILL FOODS, EMYVALE, Co. MONAGHAN.   TRIAL HOLE No 6.

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas, which are at or adjacent to significant sites (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 1.5M.   VULNERABILITY - LOW. AQUIFER - LOCALLY IMPORTANT.

Depth from ground surface to bedrock (m) (if present): > 1.5M.   Depth from ground surface to water table (m) (if present): > 1.5M.

Depth of water ingress: NONE RECORDED.   Rock type (if present): NONE ENCOUNTERED.

Date and time of excavation: 28-11-2016 AM.   Date and time of examination: 30-11-2016 AM.

		Depth of P/T Test*	Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
	0.1 m		TOPSOIL - SANDY SILTY LOAM.	3/5 THREADS 50/60 RIBBON DILATENT	CRUMB	FRIABLE	BROWN	ROOTLETS TO 300mm
	0.2 m							
INVERT OF	0.3 m		Sandy SILT.	1 THREAD 30/40 RIBBON DILATENT	GRANULAR	LOOSE	GREY BROWN	
P-TEST HOLE.	0.4 m	▽ P.						
	0.5 m		gravelly Sandy SILT LOTS OF COBBLES SOME BOULDERS MOTTLED.	2 THREADS 40/50 RIBBON DILATENT	GRANULAR	LOOSE	ORANGE BROWN	THROU' COBBLES AND BOULDERS.
	0.6 m							
	0.7 m							
	0.8 m							
	0.9 m							
	1.0 m							
	1.1 m							
	1.2 m							
	1.3 m							
	1.4 m							
	1.5 m				BASE	OF HOLE.		
	1.6 m							
	1.7 m							
	1.8 m							
	1.9 m							
	2.0 m							
	2.1 m							
	2.2 m							
	2.3 m							
	2.4 m							
	2.5 m							
	2.6 m							
	2.7 m							
	2.8 m							
	2.9 m							
	3.0 m							

Likely T value:

Note: *Depth of percolation test holes should be indicated on log above. (Enter P or T at depts as appropriate).
** See Appendix E for BS 5930 classification.
*** 3 samples to be tested for each horizon and results should be entered above for each horizon.
**** All signs of mottling should be recorded.

SILVER HILL FOODS, EMYVALE, CO. MONAGHAN. TRIAL HOLE No. 7.

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas, which are at or adjacent to significant sites (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 1.5M. VULNERABILITY - LOW. AQUIFER - LOCALLY IMPORTANT.

Depth from ground surface to bedrock (m) (if present): > 1.5M. Depth from ground surface to water table (m) (if present): 0.9 M.

Depth of water ingress: 1.2M. Rock type (if present): NONE ENCOUNTERED.

Date and time of excavation: 28-11-2016 AM. Date and time of examination: 30-11-2016 AM.

		Depth of P/T Test*	Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
	0.1 m		TOPSOIL - SANDY CLAY LOAM	6+ THREADS 40150 RIBBON DILATES WITH DIFFICULTY	CRUMB	FRIABLE	BROWN	ROOTLETS TO 250MM
	0.2 m							
	0.3 m							
INVERT OF P-TEST HOLE.	0.4 m	∇ P.		0 THREADS 0 RIBBONS DILATENT				
	0.5 m		Sandy GRAVEL					
	0.6 m				GRANULAR	LOOSE	GREY BROWN	NONE EVIDENT
	0.7 m							
	0.8 m							
	0.9 m				WATER	LEVEL @ 48 HOURS		
	1.0 m		POCKETS OF MOTTLING					
	1.1 m							
	1.2 m			0 THREADS 0 RIBBONS DILATENT				
	1.3 m		SAND POCKETS OF MOTTLING		GRANULAR	LOOSE	YELLOW BROWN	NONE EVIDENT.
	1.4 m							
	1.5 m							
	1.6 m				BASE	OF HOLE.		
	1.7 m							
	1.8 m							
	1.9 m							
	2.0 m							
	2.1 m							
	2.2 m							
	2.3 m							
	2.4 m							
	2.5 m							
	2.6 m							
	2.7 m							
	2.8 m							
	2.9 m							
	3.0 m							

Likely T value:

Note: *Depth of percolation test holes should be indicated on log above. (Enter P or T at depts as appropriate).
** See Appendix E for BS 5930 classification.
*** 3 samples to be tested for each horizon and results should be entered above for each horizon.
**** All signs of mottling should be recorded.

SILVER HILL FOODS, EMYVALE, CO. MONAGHAN.   TRIAL HOLE No. 8.

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas, which are at or adjacent to significant sites (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 1.5m.   VULNERABILITY - LOW. AQUIFER - LOCALLY IMPORTANT.

Depth from ground surface to bedrock (m) (if present): > 1.5m.

Depth from ground surface to water table (m) (if present): > 1.5m.

Depth of water ingress: NONE RECORDED

Rock type (if present): NONE ENCOUNTERED.

Date and time of excavation: 28-11-2016 AM.

Date and time of examination: 30-11-2016 AM.

	Depth of P/T Test*	Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
0.1 m		TOPSOIL -	3 THREADS 50/60 RIBBON DILATENT				ROOTLETS TO 300mm
0.2 m							
0.3 m		SILTY LOAM		CRUMB	FRIABLE	DARK BROWN	
0.4 m	∇ P. (INVERT OF P-TEST HOLE.)						
0.5 m							
0.6 m							
0.7 m			6+ THREADS 110+ RIBBON NOT DILATENT				
0.8 m							
0.9 m						GREY/YELLOW BROWN	NONE EVIDENT.
1.0 m		CLAY		MASSIVE	STIFF		
1.1 m							
1.2 m							
1.3 m		MOTTLED					
1.4 m							
1.5 m				BASE	OF HOLE.		
1.6 m							
1.7 m							
1.8 m							
1.9 m							
2.0 m							
2.1 m							
2.2 m							
2.3 m							
2.4 m							
2.5 m							
2.6 m							
2.7 m							
2.8 m							
2.9 m							
3.0 m							

Likely T value:

Note: *Depth of percolation test holes should be indicated on log above. (Enter P or T at depts as appropriate).
** See Appendix E for BS 5930 classification.
*** 3 samples to be tested for each horizon and results should be entered above for each horizon.
**** All signs of mottling should be recorded.

SILVER HILL FOODS, EMYVALE, CO. MONAGHAN.   TRIAL HOLE No 9.

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas, which are at or adjacent to significant sites (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 1.5m.   VULNERABILITY - LOW.   AQUIFER - LOCALLY IMPORTANT.

Depth from ground surface to bedrock (m) (if present): > 1.5m.   Depth from ground surface to water table (m) (if present): 0.85m.

Depth of water ingress: 1.2m.   Rock type (if present): NONE ENCOUNTERED.

Date and time of excavation: 28-11-2016 AM.   Date and time of examination: 30-11-2016 AM.

	Depth of P/T Test*	Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
0.1 m		TOPSOIL -	4/5 THREADS 50/60 RIBBON DILATENT				ROOTLETS TO 300mm
0.2 m							
0.3 m		SILTY CLAY LOAM		CRUMB	FRIABLE	BROWN	
0.4 m (INVERT OF P. TEST HOLE.)	▽ P.						
0.5 m		Very gravelly	3/5 THREADS 90 RIBBON NOT DILATENT				
0.6 m		SILT/CLAY					
0.7 m				ANGULAR	SOFT	YELLOW BROWN	NONE EVIDENT.
0.8 m				WATER	LEVEL @ 48 HOURS		
0.9 m							
1.0 m							
1.1 m							
1.2 m							
1.3 m							
1.4 m		MOTTLED					
1.5 m				BASE	OF HOLE.		
1.6 m							
1.7 m							
1.8 m							
1.9 m							
2.0 m							
2.1 m							
2.2 m							
2.3 m							
2.4 m							
2.5 m							
2.6 m							
2.7 m							
2.8 m							
2.9 m							
3.0 m							

Likely T value:

Note: *Depth of percolation test holes should be indicated on log above. (Enter P or T at depts as appropriate).
** See Appendix E for BS 5930 classification.
*** 3 samples to be tested for each horizon and results should be entered above for each horizon.
**** All signs of mottling should be recorded.

SILVER HILL FOODS, EMYVALE, CO. MONAGHAN. TRIAL HOLE NO. 10.

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas, which are at or adjacent to significant sites (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 1.5m. VULNERABILITY - LOW. AQUIFER - LOCALLY IMPORTANT.

Depth from ground surface to bedrock (m) (if present): > 1.5M. Depth from ground surface to water table (m) (if present): 1.1m.

Depth of water ingress: NONE RECORDED Rock type (if present): NONE ENCOUNTERED.

Date and time of excavation: 28-11-2016 PM. Date and time of examination: 30-11-2016 PM.

	Depth of P/T Test*	Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
0.1 m		TOPSOIL - SILTY CLAY LOAM.	6+ THREADS 90 RIBBON NOT DILATENT	CRUMB	FRIABLE	LIGHT BROWN	ROOTLETS TO 400MM
0.2 m							
0.3 m							
0.4 m (INVERT OF P-TEST HOLE.)	▽ P.	gravelly Sandy SILT POCKETS OF MOTTLING	1/2 THREADS 50/60 RIBBON DILATENT RASPY	GRANULAR	LOOSE	RED BROWN	NONE EVIDENT.
0.5 m							
0.6 m							
0.7 m							
0.8 m							
0.9 m							
1.0 m							
1.1 m				WATER	LEVEL @ 48 HOURS		
1.2 m							
1.3 m							
1.4 m							
1.5 m				BASE	OF HOLE.		
1.6 m							
1.7 m							
1.8 m							
1.9 m							
2.0 m							
2.1 m							
2.2 m							
2.3 m							
2.4 m							
2.5 m							
2.6 m							
2.7 m							
2.8 m							
2.9 m							
3.0 m							

Likely T value:

Note: *Depth of percolation test holes should be indicated on log above. (Enter P or T at depts as appropriate).
** See Appendix E for BS 5930 classification.
*** 3 samples to be tested for each horizon and results should be entered above for each horizon.
**** All signs of mottling should be recorded.

SILVER HILL FOODS, EMYVALE, CO. MONAGHAN. TRIAL HOLE NO. 11.

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas, which are at or adjacent to significant sites (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 1·5M. VULNERABILITY - LOW. AQUIFER - LOCALLY IMPORTANT.

Depth from ground surface to bedrock (m) (if present): >1·5m.

Depth from ground surface to water table (m) (if present): 1·1m.

Depth of water ingress: 0·9M. Rock type (if present): NONE ENCOUNTERED.

Date and time of excavation: 28-11-2016 PM. Date and time of examination: 30-11-2016 PM.

		Depth of P/T Test*	Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
	0.1 m		TOPSOIL -	3/5 THREADS			DARK	ROOTLETS TO
	0.2 m		SILTY CLAY LOAM	50/70 RIBBON DILATES WITH DIFFICULTY	CRUMB	FRIABLE	BROWN	250mm
INVERT OF	0.3 m		CLAY	6+ THREADS			ORANGE	
P-TEST HOLE.	0.4 m	∇ P.		110+ RIBBON NOT DILATENT	MASSIVE	STIFF	BROWN.	
	0.5 m		MOTTLED					
	0.6 m		gravelly	6+ THREADS				
	0.7 m		CLAY	110+ RIBBON NOT DILATENT	BLOCKY/		LIGHT	
	0.8 m		MOTTLED		MASSIVE	STIFF	BROWN	NONE EVIDENT.
	0.9 m							
	1.0 m							
	1.1 m				WATER	LEVEL @ 48 HOURS		
	1.2 m							
	1.3 m							
	1.4 m							
	1.5 m							
	1.6 m				BASE	OF HOLE.		
	1.7 m							
	1.8 m							
	1.9 m							
	2.0 m							
	2.1 m							
	2.2 m							
	2.3 m							
	2.4 m							
	2.5 m							
	2.6 m							
	2.7 m							
	2.8 m							
	2.9 m							
	3.0 m							

Likely T value:

Note: *Depth of percolation test holes should be indicated on log above. (Enter P or T at depts as appropriate).
** See Appendix E for BS 5930 classification.
*** 3 samples to be tested for each horizon and results should be entered above for each horizon.
**** All signs of mottling should be recorded.

SILVER HILL FOODS, EMYVALE, CO. MONAGHAN. TRIAL HOLE NO. 12.

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas, which are at or adjacent to significant sites (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 1.5M. VULNERABILITY - LOW. AQUIFER - LOCALLY IMPORTANT.

Depth from ground surface to bedrock (m) (if present): >1.5M. Depth from ground surface to water table (m) (if present): 1.3M.

Depth of water ingress: 1.45M. Rock type (if present): NONE ENCOUNTERED.

Date and time of excavation: 28-11-2016 PM. Date and time of examination: 30-11-2016 PM.

		Depth of P/T Test*	Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
	0.1 m		TOPSOIL -	4/5 THREADS				ROOTLETS TO
	0.2 m			40/50 RIBBON				250MM
INVERT OF	0.3 m		SANDY SILTY LOAM.	DILATES WITH DIFFICULTY	CRUMB	FRIABLE	BROWN	
P-TEST	0.4 m	∇ P.		RASPY				
HOLE	0.5 m			6+ THREADS				
	0.6 m			110+ RIBBON				
	0.7 m		Gravelly				YELLOW	
	0.8 m		CLAY		BLOCKY	STIFF	BROWN	NONE EVIDENT
	0.9 m							
	1.0 m							
	1.1 m		MOTTLED					
	1.2 m							
	1.3 m				WATER LEVEL @ 48 HOURS			
	1.4 m							
	1.5 m							
	1.6 m				BASE	OF HOLE		
	1.7 m							
	1.8 m							
	1.9 m							
	2.0 m							
	2.1 m							
	2.2 m							
	2.3 m							
	2.4 m							
	2.5 m							
	2.6 m							
	2.7 m							
	2.8 m							
	2.9 m							
	3.0 m							

Likely T value:

Note: *Depth of percolation test holes should be indicated on log above. (Enter P or T at depts as appropriate).
** See Appendix E for BS 5930 classification.
*** 3 samples to be tested for each horizon and results should be entered above for each horizon.
**** All signs of mottling should be recorded.

SILVER HILL FOODS, EMYVALE, CO. MONAGHAN.   TRIAL HOLE NO. 13.

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas, which are at or adjacent to significant sites (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 1.5M.   VULNERABILITY - LOW.   AQUIFER - LOCALLY IMPORTANT.

Depth from ground surface to bedrock (m) (if present): >1.5M.   Depth from ground surface to water table (m) (if present): >1.5M.

Depth of water ingress: NONE RECORDED   Rock type (if present): NONE ENCOUNTERED.

Date and time of excavation: 28-11-2016 PM.   Date and time of examination: 30-11-2016 PM.

	Depth of P/T Test*	Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
0.1 m		TOPSOIL - VERY SANDY LOAM.	2 THREADS 3 0/40 RIBBON DILATENT	CRUMB	FRIABLE	BROWN	ROOTLETS TO 250MM
0.2 m							
INVERT OF P-TEST HOLE. 0.3 m							
0.4 m	▽ P.	Very sandy SILT.	0/1 THREADS 20 RIBBON DILATENT	GRANULAR	LOOSE	YELLOW BROWN	NONE EVIDENT.
0.5 m							
0.6 m							
0.7 m							
0.8 m							
0.9 m		gravelly SAND POCKETS OF MOTTLING	0 THREAD 0 RIBBON DILATENT	GRANULAR	LOOSE	LIGHT BROWN	NONE EVIDENT.
1.0 m							
1.1 m							
1.2 m							
1.3 m							
1.4 m							
1.5 m				BASE	OF HOLE.		
1.6 m							
1.7 m							
1.8 m							
1.9 m							
2.0 m							
2.1 m							
2.2 m							
2.3 m							
2.4 m							
2.5 m							
2.6 m							
2.7 m							
2.8 m							
2.9 m							
3.0 m							

Likely T value:

Note: *Depth of percolation test holes should be indicated on log above. (Enter P or T at depts as appropriate).
** See Appendix E for BS 5930 classification.
*** 3 samples to be tested for each horizon and results should be entered above for each horizon.
**** All signs of mottling should be recorded.

SILVER HILL FOODS, EMYVALE, CO. MONAGHAN. TRIAL HOLE No. 14.

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas, which are at or adjacent to significant sites (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 1·5m. VULNERABILITY - LOW. AQUIFER - LOCALLY IMPORTANT.

Depth from ground surface to bedrock (m) (if present): >1·5M.

Depth from ground surface to water table (m) (if present): 1·4M.

Depth of water ingress: NONE RECORDED Rock type (if present): NONE ENCOUNTERED.

Date and time of excavation: 28-11-2016 PM. Date and time of examination: 30-11-2016 PM.

Depth	Depth of P/T Test*	Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
0.1 m – 0.3 m		TOPSOIL - SILTY LOAM.	6+ THREADS 60/80 RIBBON DILATENT RAPID	CRUMB	FRIABLE	BROWN	ROOTLETS TO 350mm
INVERT OF P-TEST HOLE. 0.4 m – 0.6 m	▽ P. (0.4 m)	gravelly sandy SILT.	3 THREADS 50/60 RIBBON DILATENT	GRANULAR	LOOSE	YELLOW BROWN	
0.7 m – 1.5 m		very gravelly CLAY. MOTTLED	6+ THREADS 110+ RIBBON NOT DILATENT	BLOCKY	STIFF	GREY BROWN	NONE EVIDENT.
1.4 m				WATER LEVEL @ 48 HOURS			
1.5 m				BASE	OF HOLE.		
1.6 m							
1.7 m							
1.8 m							
1.9 m							
2.0 m							
2.1 m							
2.2 m							
2.3 m							
2.4 m							
2.5 m							
2.6 m							
2.7 m							
2.8 m							
2.9 m							
3.0 m							

Likely T value:

Note: *Depth of percolation test holes should be indicated on log above. (Enter P or T at depts as appropriate).
** See Appendix E for BS 5930 classification.
*** 3 samples to be tested for each horizon and results should be entered above for each horizon.
**** All signs of mottling should be recorded.

SILVER HILL FOODS, EMYVALE, CO. MONAGHAN.   TRIAL HOLE NO. 15.

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas, which are at or adjacent to significant sites (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 1.5M.   VULNERABILITY - LOW.   AQUIFER - LOCALLY IMPORTANT.

Depth from ground surface to bedrock (m) (if present): >1.5M.   Depth from ground surface to water table (m) (if present): >1.5M.

Depth of water ingress: NONE RECORDED   Rock type (if present): NONE ENCOUNTERED.

Date and time of excavation: 28-11-2016 PM   Date and time of examination: 30-11-2016 PM.

	Depth of P/T Test*	Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
0.1 m		TOPSOIL -	6+ THREADS				ROOTLETS TO
0.2 m			40/60 RIBBON				25mm.
0.3 m		SILTY CLAY LOAM	DILATENT.	CRUMB	FRIABLE	BLACK	- - - - - - -
INVERT OF P-TEST HOLE. 0.4 m	▽ P						
0.5 m			0 THREADS				
0.6 m			10 RIBBON				
0.7 m		Very Sandy	DILATENT				
0.8 m		SILT		GRANULAR	LOOSE	YELLOW	NONE EVIDENT
0.9 m						BROWN	
1.0 m							
1.1 m							
1.2 m		MOTTLED.					
1.3 m							
1.4 m							
1.5 m							
1.6 m				BASE	OF HOLE.		
1.7 m							
1.8 m							
1.9 m							
2.0 m							
2.1 m							
2.2 m							
2.3 m							
2.4 m							
2.5 m							
2.6 m							
2.7 m							
2.8 m							
2.9 m							
3.0 m							

Likely T value:

Note: *Depth of percolation test holes should be indicated on log above. (Enter P or T at depts as appropriate).
** See Appendix E for BS 5930 classification.
*** 3 samples to be tested for each horizon and results should be entered above for each horizon.
**** All signs of mottling should be recorded.

Proposal for a wastewater Drip Irrigation System pilot project for Silver Hill Foods, Emyvale, Co. Monaghan

Date: 16/01/2018

Silver Hill Foods project plan for a drip irrigation pilot project installation in conjunction with Ash Environmental

Introduction

General Introduction

A proposal for a phased implementation of plans for an alternative method of discharging the treated factory production effluent sub-surface to grounds bordering the facility was requested by the EPA representatives from Silver Hill Foods at a meeting held on 1st September 2017.

The meeting included a presentation on the Geoflow drip distribution (irrigation) system by Ash Environmental Technologies which is proposed to be used on the lands adjoining the Silver Hill Foods processing facility at Emyvale, Co. Monaghan. The meeting included a discussion on the Hydrogeological Assessment of the proposed drip system report prepared by Geosyntec consultants.

Summary Findings from the Geosyntec report

The proposed drip distribution system will be regarded by the EPA as an indirect discharge to groundwater. Overall the hydrogeological report found that the drip proposal is expected to be compliant with groundwater regulations. The discharge is not expected to have an impact on groundwater or local surface waters, provided application rates are monitored and controlled.

However, referring to the infiltration capacity of the soil, the report noted that it is important that the rate of application of effluent to the soil does not exceed the rate that groundwater is able to drain from the till into the underlying limestone aquifer. This is to avoid any adverse impact on nearby receptors such as groundwater abstraction wells or surface water courses.

Request for a phased Approach and Initial Pilot Scale Installation

The representatives from the EPA were generally satisfied with the drip proposal following the presentation and subsequent discussions. However, uncertainty remained over the feasibility and operational aspects of a drip system on site due to the lack of Irish experience with drip systems and the site challenges raised in the Geosyntec hydrogeological assessment. Specific concerns identified were to avoid hydraulic issues that could cause adverse impacts on nearby receptors.

As a result the EPA representatives requested that Silver Hill Foods propose a phased approach starting with a pilot scale installation.

In addition the pilot project should:

1. Take account of the site challenges and the risks identified in the Geosyntec report
2. Establish infiltration rates for different soil types and conditions on the site
3. Present a proposal on this basis to the EPA
4. Prove the suggested infiltration rates during a phased installation

Pilot Project Proposal Plan

Location

An area of ground has been selected by Silver Hill Foods to carry out this Pilot Project. The decision on selecting this area of ground was based on the concept that it should ideally include all the site challenges that the full project would meet as well as the ranges in soil permeability likely to be encountered in the full scale project.

We believe the area of ground we have selected to carry out the pilot project represents the following:

1. It is large enough to be a representative of all the areas and challenges of the site to be utilised during full scale operation
2. It is large enough to allow assessment of the most conservative application rate envisaged
3. It is a good representative of the ranges in soil permeability of the full site.

The location we have selected to carry out this pilot project can be seen in both Fig. 1 and Fig. 2 below. In Fig.1 the area of ground is highlighted as Area 4 just slightly north of the processing facility. It is also in quite close proximity to our current discharge point which I have marked in Fig. 1 as SW1.

Fig.2 below is a map of the site and surrounding land sourced from Ordnance Survey Ireland. The selected area for the pilot project can once more be seen again just north of the current processing facility. It is marked on the map as 4. This area covers approximately 4 acres which equates to 16,184 metres squared.

Fig. 1: Aerial photograph of site with surrounding grounds (Area 4 has been selected to carry out this pilot project)

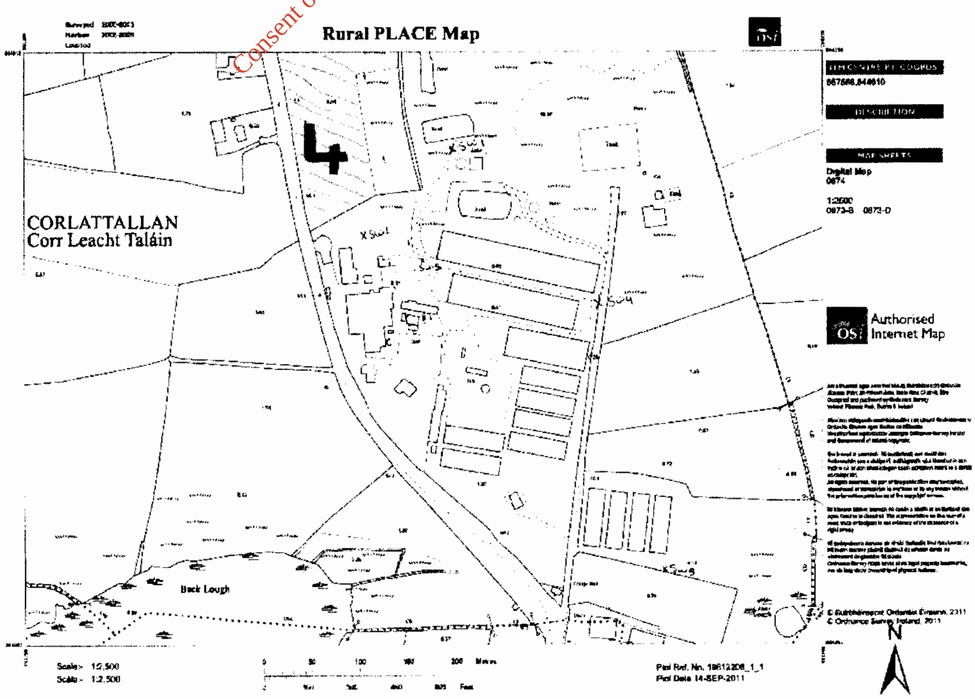


Fig.2: OSI map of with surrounding land.

A site visit to the lands proposed for the full drip distribution project has already been made by the Meath based soils consultant Euro-geologist Dr. Robert (Robbie) Meehan. Robbie has extensive knowledge of the geology of the soils in Monaghan and from his knowledge and auguring of the soils he was able to identify significant pockets of land that should be capable of assimilating higher loading rates of water than initially envisaged.
As a result and subject to further investigation, these pockets of more permeable soils should be capable of absorbing much of the anticipated future flows from the factory. This may mean that a smaller area of the total lands than previously envisaged may now be required for the full scale drip project.
One of these more permeable pockets of soil is located in Area 4 were we have selected to carry out this Pilot Project.
The previously envisaged application rate was uniform 3 litres/metre squared for the entire site. This application rate could very easily be increased in the pockets identified by Robbie Meehan.

Duration of the Pilot Project:
It is proposed to commence the Pilot Project as soon as possible to allow sufficient time for project evaluation. Due to a limited window of time for dry weather installation of a drip system a few months delay can miss the dry soils necessary for mole ploughing and result in the loss of a further year before the installation can occur. Therefore we would be hoping to carry out the installation phase of the pilot project during the summer months of this year 2018.

Between now and planned installation a number of studies will be carried out:

- A topographical survey of the area must be prepared to identify site contours, dimensions and features. This is required by Geoflow the suppliers of the irrigation piping.
- A further site assessment will be required to split the identified area into multiple zones based on contour, soil profile and soil texture. The aim of this is to propose suitable application rates to each zone. This assessment will be carried out by Dr Robbie Meehan along with expert Dr Jerry Tyler consultant soil scientist from the US.
- Photograph the site and record wet conditions and wet areas as a baseline for the final assessment of the pilot project.

We believe the pilot project should last approximately 18 months. This would really give us a good representation/understanding/clarity of suitable application rates throughout both wet and dry seasons.

Project Monitoring:

Throughout this 18 month Pilot project an intense monitoring period will be required. Regular visual inspection and monitoring by Silver Hill Foods with fortnightly monitoring by Ash Environmental Technologies is envisaged. The following are areas which we feel will have to be closely watched:

1. Groundwater monitoring well(s)
2. Remote monitoring alarm system on pumping systems
3. Site inspections, visual hydraulic evaluation – frequency to be decided.
4. Sampling of groundwater, surface waters.
5. Rainfall data and weather events to be logged and included in reporting
6. Effluent sample data to be available and recorded daily
7. Any issues to be notified immediately to interested parties and recorded together with any corrective action
8. Ongoing inspection to be recorded and available to interested parties
9. Any changes to design parameters such as dosing volumes of water to particular zones must be noted and recorded.
10. Any system maintenance carried out should be recorded

Pilot Project Measurable Targets:

Suggested targets to be met include:

- Compliance with Groundwater regulations.
- No significant impact on groundwater quality in the three abstraction wells currently used by Silver Hill Foods
- No Significant impact on local surface waters.