Contents – Technical Appendices

SEI Technical Appendix 3.1: Outline Construction Environmental Management Plan (CEMP)

Uisenis Wind Farm

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Making Sustainability Happen

Revision Record

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Basis of Report

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Acronyms and Abbreviations

CAR Regulations	The Water Environment (Controlled Activities) (Scotland) Regulations 2011 as amended
CnES	Comhairle nan Eilean Siar (Western Isles Council)
CDM	Construction (Design and Management)
CEMP	Construction Environmental Management Plan
ECoW	Ecological Clerk of Works
EnvCoW	Environmental Clerk of Works
EIA	Environmental Impact Assessment
EPPP	Emergency Pollution Prevention Plan
EPS	European Protected Species
LOLER	Lifting Operations & Lifting Equipment Regulations
PPE	Personal Protective Equipment
QA	Quality Assurance
SAC	Special Areas of Conservation
SEMP	Site Environmental Management Plan
SEPA	Scottish Environment Protection Agency
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
SWMP	Site Waste Management Plan
TCC	Temporary Construction Compound
TMP	Traffic Management Plan
TRL	Temporary Reception Laydown Area

1.0 Introduction

1.1 Background

This document presents an outline Construction Environmental Management Plan (CEMP) for Uisenis Wind Farm which sets out the principles and procedures for environmental management during construction of the Wind Farm (hereafter referred to as the proposed development). This document supersedes **Technical Appendix 3.1: Outline CEMP**, submitted with the EIA Report.

Should consent be granted, this outline CEMP would be revised and updated to a CEMP, the content of which would be agreed with Comhairle nan Eilean Siar (CnES) through consultation, and enforced via a planning condition. The CEMP would be used by the Contractor to ensure appropriate environmental management is implemented throughout the construction phase of the proposed development.

The outline CEMP has been prepared to take account of Good Practice during Windfarm Construction (NatureScot, 2019); Guidelines for Onshore and Offshore Windfarms (2010); Research and guidance on restoration and decommissioning of onshore windfarms (NatureScot 2013); and provides the construction activities methodology pertinent to the Environmental Impact Assessment (EIA).

The document should be read in conjunction with **Chapter 2: Site Description and Design Evolution**, **Chapter 3: Description of Development**, and **Chapter 17: Schedule of Commitments** of the EIA Report and the Supplementary Environmental Information (SEI) Report.

The CEMP is a fluid document that would evolve during the different phases of the project. As such it would be subject to constant review to address:

- any conditions required in the consent;
- to ensure it reflects best practice at the time of construction;
- to ensure it incorporates the findings of pre-construction site investigations;
- changes resulting from the construction methods used by the contractor(s); and
- unforeseen conditions encountered during construction.

1.2 Aims and Objectives

The CEMP would be maintained and updated on site and would be augmented by associated design specifications and Construction (Design and Management) (CDM) 2015 Regulations documentation such as the Principal Contractor’s Construction Phase Plan.

Where appropriate, the CEMP, or plans within the CEMP, would form part of the Site induction which would be mandatory for all employees, contractors and visitors attending the site. All employees and contractors would need to familiarise themselves with the relevant contents of the CEMP and supporting appendices as directed.

Management practices and mitigation measures have been developed for those aspects of the construction works that could potentially affect the environment.

The objectives of the CEMP are to:

- outline the proposed mechanisms for ensuring the delivery of environmental measures to avoid or reduce environmental effects identified;

- ensure procedures are in place so that there is a prompt response to effects requiring remediation, including reporting and any additional mitigation measures required to prevent a recurrence;
- provide an outline of the content that would be supplied in the construction method statements and strategies that would be prepared in order to secure mitigation measures in relation to different design aspects of the proposed development;
- ensure compliance with legislation and identify where it would be necessary to obtain authorisation from relevant statutory bodies;
- ensure that appropriate proposed development monitoring and reporting would be in place;
- provide a framework for reporting, compliance auditing and inspection to ensure environmental aims would be met; and
- set out the applicant’s expectations to guide contractors on their requirements with regards to environmental commitments and environmental management.

1.3 Site Setting

The Site is centred on NGR NB 31366 12772, with this centre being located approximately 20km south west of Stornoway and approximately 17.9km north east of Tarbert, on the Isle of Lewis, within the Comhairle nan Eilean Siar (CnES) administrative boundary. The Site is located on moorland and grazing land which is also currently utilised recreationally for hunting, fishing and deer stalking, and measures approximately 1,647ha.

Access to the Site is expected to be from the A859, travelling south east along the public road towards Eishken lodge. Consideration is being given to use of a berthing facility on the north shore of Loch Sealg, in order to bring large components e.g. turbine blades, on to Site. This would avoid the need to transport abnormal loads via the road network (A859) from the Port of Arnish. A separate planning application for the berthing facility is being considered and if deemed appropriate, a planning application may be submitting in 2024.

The Site is characterised by gently rolling open moorland with some areas of steep slopes and rocky outcrops, particularly in the west of the Site. There are numerous lochans and watercourses across the Site, draining to Loch Seaforth to the north and west, Loch Sealg to the east and Loch Claigh and Loch Bhrolluim to the south. The Site comprises numerous ridges and elevated landform, including the summits of Creag na Beirighe (236m AOD) and Cleit Catriona (139m AOD) in the south of the Site. Topography rises from sea level in the south, reaching a high point of approximately 270m AOD in the north west. The summits of Feiriosbhal (326m AOD), Cleit na Cerdaich (168m AOD) and Beinn Mheadhanach (288m AOD) are located outside of the Site boundary but are within close proximity to the northwestern site boundary.

There are no statutory environmental designations within the Site boundary.

The proposed development has been designed with an operational life of up to 30 years - at the end of which it would be decommissioned, or an application may be submitted to repower the Site.

The proposed abnormal load route required to transport turbine components to the Site would be from the Port of Arnish, via the A859 to Site. The main Site area (turbine locations) would be reached via new track that spurs off the existing Eishken Road. As such the Eishken Road would be upgraded in line with required track specification (5m wide).

The closest residential properties are the Eishken Lodge and associated properties.

1.4 Project Description

It is anticipated that the proposed development would consist of the following main components:

- 25 turbines with a max tip height of 200m;
- 25 reinforced concrete gravity turbine foundations (approximately 22.8m circular base);
- internal transformers will be incorporated into each turbine (25No.);
- permanent crane hardstandings adjacent to each turbine, and will have an estimated permanent footprint of approximately 50m x 20m with 1m depth, with additional areas for temporary crane pad hardstanding. The actual crane pad design and layout would be determined by the turbine supplier according to their preferred erection method;
- 29.46km of existing and new track with a typical 6m running width. Made up of: 12.1km of existing track to be upgraded and used. 17.36km of new track to be built. 2.60km (of the 17.36km of new track) to be floating;
- two onsite substations which would collect electricity from different parts of the Site. The southern substation footprint would be 100m x 75m, 0.75ha, with the northern substation footprint being 85m x 145m, 1.23ha;
- underground power cables linking the turbines, laid underground from each wind turbine, alongside onsite tracks to the substation;
- up to seven borrow pits (approximating a total area of 5.05ha);
- three temporary construction compounds (TCC) comprising 0.64ha (TCC1), 0.28ha (TCC2), and 0.63ha (TCC3) respectively and associated infrastructure including temporary modular building to be used as a Site office, welfare facilities, parking for construction staff and visitors, reception area, fuelling point or mobile fuel bowser, secure storage areas for tools, and waste storage facilities;
- two permanent met masts up to 122.5m in height. The met masts would have a main foundation area of 3m x 3m, as well as four anchor points for supporting guy wires; and
- A number of new onsite water crossing points, which are detailed in EIA Report **Chapter 10** and **Technical Appendix 10.4: Schedule of Water Course Crossings**.

2.0 Implementation

2.1 Schedule of Implementation

Chapter 17: Schedule of Commitments within the EIA Report and SEI Report summarises the various mitigation measures that have been proposed to offset the potential impacts of the proposed development.

Alongside each mitigation measure identified, the proposed mechanism by which it would be adopted, implemented or enforced has been provided as well as the period by which the mitigation measure would be undertaken.

These mitigation measures would be required to be implemented prior to or during construction of the proposed development.

2.2 Implementation and Control

Compliance with the CEMP is the key control measure required during construction to mitigate environmental impact. It documents the principles and processes to be followed to implement all relevant agreed environmental mitigation.

The Principal Contractor would be required to prepare a series of method statements. These method statements would detail how the contractor intends to implement the mitigation set out in the CEMP and would be integrated with their detailed Construction Method Statements.

If any significant changes are required to due to changing environmental sensitivities, results of pre-construction surveys, unforeseen events or for any other reason, these would be discussed and agreed with statutory bodies in advance of any amended works being carried out.

3.0 Roles and Responsibilities

During construction there would be key responsibilities for the applicant, the Principal Contractor and their teams. Establishing roles and responsibilities in relation to construction would be important in order to ensure the successful construction of the proposed development, including the implementation of the CEMP. The personnel, who would implement, monitor and respond to the CEMP, would be the applicant construction team and the Principal Contractor.

3.1 Health and Safety

The construction works would be undertaken in accordance with primary health and safety legislation, namely:

- Health and Safety at Work Act 1974; and
- Construction (Design and Management) (CDM) Regulations 2015.

The construction works for the proposed development would fall under the CDM Regulations 2015. As such, the Principal Contractor would provide a Construction Phase (Health & Safety) Plan in accordance with the CDM regulations. This plan would include (but not be limited to) a construction programme, emergency procedures, Site layouts and fire plans, method statements and details of the proposed induction programme. This induction programme would include both the Principal Contractor's Site specific rules as well as the Client's requirements, and would include instructions to all staff regarding the Emergency Pollution Prevention Plan (EPPP) and relevant procedures.

An induction would be required for all workers (permanent / temporary / contractor / subcontractor), Site visitors, applicant representatives or other 3rd parties. Inductions would be documented.

All site activities will follow a safe system of work, with specific tasks having Risk Assessment Method Statements (RAMS) detailing:

- how the task will be carried out;
- identifying potential hazards and evaluating the risk on the basis of how likely hazards are to occur and what the consequences there could be in the event of an incident;
- mitigation measures to be implemented to reduce the risks of the task, which will follow the Hierarchy of Controls in the following order, with elimination being the most effective and PPE being the least effective:
  - Elimination – physically remove the hazard;
  - Substitution – replace the hazard;
  - Engineering controls – isolate people from the hazard;
  - Administrative controls – change the way people work;
  - PPE – protect the worker with equipment;

RAMS will be recorded, monitored and reviewed at appropriate intervals. If works change in a manner not anticipated by the RAMS, works would be stopped until the risk can be appropriately evaluated.

Plant operators and construction staff would be trained by the Principal Contractor with regard to spill prevention/mitigation measures and procedures and in the use of relevant mitigation material (e.g. spill kits).

Staff and subcontractors employed by the Principal Contractor would be trained and have to prove certification for any plant, vehicle or use of specialist equipment such as electrical and hot works.

3.2 Construction Management Team

The applicant would appoint a Construction Management Team, led by a Construction Site Manager. The team would include, as a minimum, a Resident Engineer.

Prior to appointment of a Principal Contractor, the applicant would own the CEMP and the document would become uncontrolled copies when printed.

It would be the team's responsibility to ensure that the Principal Contractor adheres to and complies with the principles of the CEMP and their Method Statements. This would likely be the responsibility of the Resident Engineer, the EnvCoW and the applicant Construction Manager. The team would also be responsible for:

- regular liaison with the Principal Contractor's Site Manager;
- maintaining environmental risk registers;
- communicating with regulators and consultees such as SEPA and the local planning authority regarding any changes that need to be made to the CEMP including the Schedule of Mitigation; and
- ensuring that any required changes are approved and updated within the CEMP.

The applicant Construction Manager and Resident Engineer would have the power to stop works at any stage should it be deemed necessary, i.e. if there were risks posed to environmental receptors from construction that could not be mitigated immediately.

3.2.1 Environmental Clerk of Works (EnvCoW)

An Environmental Clerk of Works (EnvCoW), which would incorporate the role of the Ecological Clerk of Works (ECoW), would be appointed during the period of construction and post-construction restoration. The appointment of the EnvCoW would be approved by Comhairle nan Eilean Siar (CnES).

The purpose of the EnvCoW would be to provide environmental advice and monitor compliance, not implement measures. The EnvCoW would have a number of different tasks to carry out during construction and prior to the outset of each construction phase. They would be required to keep an active register of all issues that arise during the works and report as required to CnES, NatureScot and SEPA.

The EnvCoW would have sufficient powers to:

- oversee construction work and identify where mitigation measures are required;
- authorise temporary stoppage of works if required; and
- to review working methods and advise whether alternative or more appropriate working methods require to be adopted.

The EnvCoW would undertake the following activities:

- to work with the Principal Contractor to induct all site personnel with regards to key environmental sensitivities and mitigation measures to be applied during construction. Toolbox talks shall be given by the EnvCoW throughout the construction period in the event that additional unforeseen issues arise that require alternative working methods

- undertaking site walkovers, ensuring implementation of the water management plan with reference to water quality protection and appropriate locations for fuel and oil stores;
- liaising with contractors during the construction phase;
- inspecting working areas and ensuring compliance with the CEMP;
- undertaking water quality monitoring;
- providing advice on sediment and drainage management;
- communicating with all site personnel regarding any environmental issues and mitigation measures;
- oversee the need for all necessary licenses regarding protected species are obtained, if required and facilitating with the support of suitably qualified and experienced Ecologists; and
- documenting and reporting any environmental issues and incidents as required to the applicant, CnES, NatureScot and SEPA.

All works would be undertaken in accordance with the SEPA guidance documents (Pollution Prevention Guidelines and Guidance for Pollution Prevention) and Prevention of Pollution from Civil Engineering Contracts [SEPA, Version 2, June 2006]. In addition, the appointed contractor would be familiar with and take due regard to the other related guidance documents as listed in Section 12.

3.2.2 Resident Engineer

The applicant would appoint a Resident Engineer for the construction of the proposed development. The Resident Engineer would provide support to the applicant Construction Management Team and would have day to day responsibility for monitoring the proposed development onsite on behalf of the Construction Manager.

The Resident Engineer would have a wide range of duties including but not limited to:

- overseeing construction works to ensure conformance with the specification, monitoring quality and progress and most importantly ensure that health, safety and the environment is given a high priority at all times. The Resident Engineer would effectively be Developer’s eyes and ears on the Site and would report directly to the applicant Construction Manager;
- authority to stop the construction works in the case of a health and safety, environmental or quality issue. This would be applicable where to delay would cause additional or prolonged risk or damage;
- daily visual inspections of working areas to identify possible construction issues from a quality, environmental, programme and safety perspective. Any issues would be raised directly with the contractor;
- working closely with the EnvCoW to ensure that ecological and environmental requirements dictated by the CEMP, best practice and the planning conditions were adhered to by the works contractors;
- reviewing construction related documents from all contractors – including method statements and risk assessments and providing comments directly onsite to the Principal Contractor; and

- reporting all environmental or health and safety incidents and near misses to the Construction Manager in a form and timescale required by the Construction Management Team.

3.3 Principal Contractor

The Principal Contractor would be required to comply with and regularly review the CEMP throughout the construction period. This would include being aware of any changes or updates to the CEMP following the identification or any new environmental sensitivity or any proposed development changes. These changes would be controlled and implemented by the applicant Construction Management Team, as required.

The Principal Contractor and their team (including any sub-contractors) would be responsible for:

- undertaking their duties in accordance with CDM 2015;
- liaising with the applicant's Construction Management Team;
- completing the construction of the proposed development in a manner which complies with all relevant laws, rules and regulations;
- acquiring licenses and permits as necessary for their works;
- ensuring that all method statements in line with the principals set out in the CEMP have been provided;
- planning, managing, monitoring and coordinating all pertinent activities relating to construction;
- liaising with and providing justification to the regulators and consultees such as the EA and CnES if any significant changes are required from the Schedule of Mitigations;
- developing and implementing an Environmental Incident Response Plan and ensuring that all personnel (including sub-consultants and sub-contractors) understand and are aware of procedures to be undertaken should an environmental incident occur. This would sit as an additional appendix in the final CEMP;
- ensuring that all personnel receive training and are aware of the potential to damage to sensitive environmental receptors and procedures required to be implemented to avoid, minimise and mitigate against such damage;
- verifying the competence and resources of all personnel working on the proposed development and any sub-consultants and sub-contractors that were engaged on the proposed development; and
- implementing the Schedule of Mitigation.

3.4 All Site Personnel

All Site personnel, including all members of the applicant and Principal Contractor's teams, all sub-contractors and sub-consultants would be required to:

- attend all inductions and Site specific training including toolbox talks carried out by the EnvCoW; and
- implement control measures throughout the site, as required.

3.5 Communication

Prior to the commencement of construction, the applicant would inform CnES prior to any construction starting on Site and communication would be maintained with updates of any incidents or significant changes notified within one week of occurrence. The applicant would provide contact details to the CnES of:

- the Resident Engineer – who would be on Site for the majority of the construction phase.
- the applicant's Construction Project Manager; and
- the applicant's communication contact.

Any resident who has a question regarding the construction of the proposed development would be directed to one of these contacts. All questions would be logged and responded to within a specified number of days.

Careful monitoring of any complaints received, including recording details of the location of the affected party, time of the disturbance and nature of the issue would assist with managing the works to reduce the likelihood of further incidents.

3.5.1 Noticeboards

The Contractor would provide and maintain project environmental notice board(s) which are positioned to ensure that all operatives have the opportunity to review a notice board on a daily basis. As a minimum this will include one notice board to be placed in each compound.

The environmental notice boards are maintained by the Contractor's Site Environmental Representative and shall be updated at least monthly. As a minimum, the notice boards would contain:

- description of the key environmental risks and intended risk mitigation measures;
- accompanying Environmental Constraints Map illustrating the location of the key risks and required exclusion zones / buffer zones and location of emergency response equipment, as required by the CEMP; and
- key contact numbers and responsible personnel identified within the Environmental Incident and Emergency Response Plan (EIERP)"

3.6 Environmental Audits

Audits may be completed at any time by the Employer, but at least one per quarter. The Principal Contractor will undertake a programme of environmental audits to satisfy conformance with CEMP principals, including audits of their sub-contractors. All completed audit forms (and records of corrective action and close outs) must be filed.

4.0 Construction Staging

4.1 Site Access

Construction activity is proposed to take place between the hours of 07:00 to 19:00 Monday to Friday and 07:00 to 16:00 on Saturdays and no Sunday or Public holiday working without prior written approval of the local authority. It should be noted that out of necessity some activities, for example abnormal load deliveries, concrete deliveries during foundation pours and also the lifting of the turbine components, may occur outside the specified hours stated, although would not be undertaken without prior approval from CnES.

The Site Manager will be responsible for developing and implementing a Site Traffic Management Plan in accordance with HSG144 as set out in **Chapter 12: Site Access, Traffic and Transport** and **Technical Appendix 12.1**. The applicant will work in partnership with CnES and the supply chain to reduce the impact of the development on the local community.

Parking for staff and contractors will be situated within the boundary of the site for the duration of the works as far as is reasonably practicable. All vehicles will reverse park to improve safety of the site.

An appropriate speed limit would apply for vehicles onsite and would be selected, monitored and enforced by the Principal Contractor. Maximum vehicle load capacities would not be exceeded.

4.2 Construction

The following phases would be taken into consideration for the construction works:

- Phase 1 – Site set-up:
    - access road improvements and reinstatement
    - construction of site entrance, including works to the junction with Kirton Farm Road;
    - site compound set-up, including installation of welfare facilities;
- Phase 2 – Construction:
    - construction of access tracks;
    - construction of turbine foundations and crane hardstandings;
    - construction of substation, including all civil and electrical works;
    - installation of wind farm cabling;
- Phase 3 – Commissioning:
    - turbine delivery and construction;
    - wind farm commissioning;
    - turbine and wind farm reliability run;
- Phase 4 – Demobilisation:
    - take over;
    - snagging; and
    - decommissioning of temporary compounds / structures and restoration of the Site.

A detailed construction programme would be provided by the Principal Contractor as part of the final CEMP and the Construction Phase Plan. The proposed development would be constructed over a period of up to 36 months.

4.3 Post Construction Reinstatement

Good practice techniques for vegetation and habitat reinstatement would be adopted and implemented on areas subject to disturbance during construction as soon as practicable.

The following reinstatement works would be considered:

- re-use of turves;
- re-use of topsoil/peat where appropriate; and
- reseeding with appropriate species.

For clarity, the following are definitions for the different soil make-up of the natural ground between the surface and rockhead (from top down):

(a) Vegetation:

This is typically plant matter that can be removed/stripped above the ground level (i.e. does not include roots/topsoil). This can vary depending on the nature of the vegetation encountered on site.

(b) Turf/Turves:

This is typically a layer of matted earth formed by grass and plant roots. The matted earth layer would normally be 30-50mm thick.

(c) Topsoil:

The upper layer of soil usually containing significantly more organic matter than is found in lower layers. This can vary in depth but is typically 200mm thick. This can be excavated with the turf and depends on whether the turf is required elsewhere, or the topsoil needs to exclude the turf.

(d) Superficial Soils:

This is a generic term used for all material between topsoil and rockhead. This can vary in depth and content throughout the depth profile at any location.

(e) Weathered Rock:

This is a layer that may exist above rockhead that is neither rock nor superficial material but a mixture of both. It can be mostly fractured rockhead as a result of physical and chemical weathering processes. When excavated it may have elements of fractured rock and superficial material as the boundary can be difficult to distinguish.

In some cases this can provide suitable engineering material for construction of foundations, embankments, tracks etc.

(f) Rockhead:

This is a naturally occurring solid aggregate of minerals which lies beneath the superficial soils.

5.0 General Construction Good Practice

5.1 Handling of Excavated Materials

The construction of tracks, turbine foundations and crane hardstanding areas as well as the establishment of the construction compound, control building compound would require the stripping and excavation of soil and its reuse or temporary storage. Excavations would generate material comprising peat, soil and rock. Management of soils and peat during the construction phase is discussed in **SEI Technical Appendix 10.2: Peat Management Plan**. Soils and peat would be used for reinstatement works associated with access tracks, cable trenches, turbine foundations, crane hardstandings and the temporary construction area. The upper vegetated turves would be used to dress infrastructure edges and to replace stripped and stored turves.

Excavated material would be used as soon as practicable and as close as possible to the area it was excavated from, however some temporary storage would be required. Soils in areas taken for temporary use will ideally be stockpiled close to excavation location.

5.2 Materials Storage

Granular, non-organic material required to be stored temporarily would be compacted, to reduce the potential for erosion and transfer of sediment, and stockpiled in designated areas at least 50m from a watercourse. Temporary stockpiles would need to be appropriately sited away from marshy grassland, bog or heath where possible, with the locations agreed in advance with the EnvCoW.

Where soils could not be transferred immediately to an appropriate restoration area, short term storage would be required. In this case, the following good practice would apply:

- soil would be stored around the turbine perimeters at a sufficient distance from the cut face to prevent overburden induced failure;
- local gullies, diffuse drainage lines (or very wet ground) and locally steep slopes would be avoided for storage;
- stored upper turves (incorporating vegetation) would be reinstated adjacent to similar habitats as advised by the EnvCoW;
- monitoring of stockpiles/excavation areas would occur during and following rainfall events; and
- if material is stockpiled on a slope, silt fences shall be utilised to reduce sediment transport in accordance with CIRIA guidance C532. Additional measures may also be necessary to control flow of water and sediment transport on site in accordance with this guidance.

Material excavated during new and upgraded access track construction would be stored adjacent to the track and Granular, non-organic material compacted in order to limit instability and erosion potential. Peat would not be allowed to dry out, through rewetting and monitored irrigation.

Silt fences shall be employed in combination with the measures described in 'CIRIA Control of water pollution from construction sites. Guidance for consultants and contractors (C532)' where required to minimise sediment levels in run-off.

All soils stripped from the borrow pit(s) would be retained in clearly demarcated stockpiles of no greater than 3m height in locations immediately around the edges of borrow pit excavation.

5.3 The Management and Movement of Concrete

5.3.1 Accidental Spillage

An appropriately sized spill kit(s) would be provided and maintained onsite, consideration would be given to suitable locations across the active areas of the site and to having vehicles including plant carry a spill kit. This kit would contain materials, such as absorbent granules and pads, absorbent booms and collection bags. These are designed to halt the spread of spillages and would be deployed, as necessary, should a spillage occur elsewhere within the construction compound.

A speed limit of 15mph would apply for vehicles onsite and would be monitored and enforced by the Principal Contractor. Maximum vehicle load capacities would not be exceeded.

5.3.2 Vehicle Washing

There would be a wash-out facility within the construction compound consisting of a sump overlain with a geosynthetic membrane. The geosynthetic membrane would filter out the concrete fines leaving water to pass through to the sump. The sump water would either be pumped to a licenced carrier and taken offsite for approved disposal, or it would be discharged to surrounding vegetated surfaces where such discharge meets the requirements of NatureScot and SEPA. No washing of concrete-associated vehicles would be undertaken outside the wash out facility, and the area would be signposted, with all site contractors informed of the locations.

5.3.3 Concrete Pouring for Turbine Foundations

To prevent pollution it is important that all concrete pours are planned and specific procedures would be adopted in accordance with Construction Industry Research and Information Association (CIRIA) C532 Control of water pollution from construction sites: guidance for consultants and contractors. These procedures would include:

- ensuring that all excavations are sufficiently dewatered before concrete pours begin and that dewatering continues while the concrete cures. Construction good practice would be followed to ensure that fresh concrete is isolated from the dewatering system;
- ensuring that covers are available for freshly placed concrete to avoid the surface of the concrete washing away during heavy precipitation; and
- perimeter drains with silt traps.

The excavated area would be back-filled with compacted layers of graded material from the original excavation, where this is suitable, and capped with peat or soil. The finished surface around the base of the turbine, would be capped with crushed aggregate providing a walkway to allow for safe personnel access.

5.4 Surplus and Waste Material

5.4.1 Introduction

Initiated as part of the Defra Red Tape Challenge, aiming to reduce bureaucracy for business, the Site Waste Management Plans Regulations 2008 (SWMP) were repealed on 01 December 2013. However, it has been adopted as good practice to produce a Waste Management Plan (WMP) for large scale construction sites and to append planning applications and as such are recommended to be adopted in this project.

The SWMP would detail how all waste materials would be managed, including the management and definition of excavated materials.

The Principal Contractor would take all reasonable steps to ensure that all waste from the site is dealt with in accordance with the requirements under the Environmental Protection (Duty of Care) Regulations 1991 (and amendments) and that materials would be handled efficiently and waste managed appropriately.

Appropriate waste management, disposal and waste carrier documentation and licences would be obtained (e.g. complete waste transfer notes prior to waste leaving site, ensure all waste carriers have a valid waste carrier's registration certificate, ensure wastes are disposed of at a correctly licensed site, complete notification for hazardous waste to SEPA).

Waste streams would include wastes generated by plant, machinery and construction workers over the period of the works, for example waste oils, sewage, refuse (paper, carton, plastic etc.), wooden pallets, waste batteries, fluorescent tubes etc.

5.4.2 Soils and Spoils

It is planned that any materials excavated on site in the course of the construction works would be stored on site ideally close to the excavation location and re-used where it is appropriate to do so. As such, offsite disposal of this material is not anticipated.

5.4.3 Hazardous and Other Wastes

Table 5-1 lists some of the waste types that may be generated during the construction works. Although some waste types may be generated in locations other than the construction compounds such waste materials would be stored within the construction compounds only. Waste materials generated outside the construction compounds would be taken to the compounds on a daily basis to be managed thereafter.

Table 5-1: Common Construction Wastes

EWC Code	Description
13 01 10*	Used mineral hydraulic oil (non-chlorinated)
13 02 08*	Other waste engine, gear or lube oil
13 02 05*	Waste engine, gear or lube oil (non-chlorinated)
13 02 08*	Other waste engine, gear or lube oil
16 01 07*	Oil filters
20 01 23*	Discarded equipment containing CFCs e.g. waste fridges & freezers
16 06 01*	Lead batteries
16 07 08*	Oily waste from transport and storage tanks
16 10 01*	Hazardous liquid wastes to be treated off-site
20 01 21*	Fluorescent tubes and other mercury-containing waste
20 01 33*	Hazardous batteries and accumulators that are collected separately
15 02 02*	Absorbents, filter materials, wiping cloths, clothing contaminated by dangerous substances
15 01 01	Cardboard or paper packaging
15 01 02	Plastic packaging e.g. toner & ink cartridges, polythene sheeting
15 01 03	Wooden packaging e.g. timber pallets

15 01 04	Metallic packaging e.g. drink cans, paint tins
16 01 03	Tyres
16 01 15	Antifreeze fluids that do not contain dangerous substances e.g. Coolants
16 01 17	Ferrous metal from vehicles e.g. car parts
16 02 14	Non-hazardous waste electricals e.g. washing machines, power tools
16 05 05	Gases in pressure containers i.e. gas cylinders
17 01 01	Concrete
17 02 01	Wood from construction or demolition e.g. timber trusses, supports, frames, doors
17 04 11	Cables that do not contain dangerous substances e.g. electric cabling
20 01 01	Paper & card similar to that from households e.g. office paper, junk mail
20 01 30	Non-hazardous detergent e.g. flushing agent/universal cleaner
20 01 39	Separately collected plastics e.g. plastic containers, bottles
20 03 01	Mixed waste similar to that from households e.g. mixed office, kitchen & general waste
20 03 04	Septic tank sludge

*Denotes Hazardous Waste, as categorised by the European Waste Catalogue.

Foul water from the onsite facilities at the construction works compound would be removed from site by an appropriately licensed contractor (see also Section 7.4.4).

5.4.4 Regulatory Compliance

Waste would need to be transferred to a licensed waste management site or site with a waste exemption. The Principal Contractor would need to check that the site is licensed and that the licence permits the site to take the type and quantity of waste involved. Copies of the waste management licence or waste exemption license would need to be held on file.

A ‘Waste Transfer Note’ must be completed by all parties involved and must be retained for a period of two years. Sub-contractors excavating and hauling waste offsite must complete their own Waste Transfer Notes and copy them to the Principal Contractor. It is not necessary to have a Waste Transfer Note for each load of waste and a Waste Transfer Note can be issued weekly or monthly as a season ticket.

It would be the responsibility of the Principal Contractor to ensure that other parties involved in the transport, storage and disposal of waste were legally entitled to carry out their duties.

5.5 Dust Mitigation

Good practice measures as listed in **Table 5-2** would be adopted during construction to control the generation and dispersion of dust such that significant impacts on neighbouring habitats should not occur. The hierarchy for mitigation would be prevention – suppression – containment.

Table 5-2: Dust Mitigation Measures

Site Application	Mitigation Measures
Highly Recommended	
Communications	Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.
	Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
	Display the head or regional office contact information.
	Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk, and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site.
Monitoring	Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked.
	Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
	Agree dust deposition, dust flux, or real-time PM10 continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction.
Operating Vehicle/Machinery and Sustainable Travel	Ensure all vehicles switch off engines when stationary - no idling vehicles.
	Avoid the use of diesel- or petrol-powered generators and use mains electricity or battery powered equipment where practicable.
	Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.
Operations	Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
	Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
	Use enclosed chutes and conveyors and covered skips.
	Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
	Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
Preparing and Maintaining the Site	Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.

	Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
	Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.
	Avoid site runoff of water or mud.
	Keep site fencing, barriers and scaffolding clean using wet methods.
	Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.
	Cover, seed or fence stockpiles to prevent wind whipping.
Site Management	Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
	Make the complaints log available to the local authority when asked.
	Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the log book.
	Hold regular liaison meetings with other high risk construction sites within 500m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport deliveries which might be using the same strategic road network routes.
Waste Management	Avoid bonfires and burning of waste materials.
Desirable	
Construction	Avoid scabbling (roughening of concrete surfaces) if possible.
	Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
Earthworks	Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.
	Use Hessian, mulches or tackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable
	Only remove the cover in small areas during work and not all at once.
Monitoring	Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of site boundary, with cleaning to be provided if necessary.
	With respect to operating vehicle/machinery and sustainable travel:
	Impose and signpost a maximum-speed-limit on surfaced and on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).
	Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).

Trackout	Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.
	Avoid dry sweeping of large areas.
	Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
	Record all inspections of haul routes and any subsequent action in a site log book.
	Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).

5.6 Noise Management

The sources of construction noise are temporary and vary both in location and their duration as the different elements of the site are constructed, and arise primarily through the operation of large items of plant and equipment such as bulldozers, diesel generators, vibration plates, concrete mixer trucks, rollers etc. Noise also arises due to the temporary increase in construction traffic near the Site. The level of noise varies depending on the different elements of the site being constructed.

BS 5228-1:2009 'Noise control on construction and open sites; Part 1 – Noise' is identified as being suitable for the purpose of giving guidance on appropriate methods for minimising noise from construction activities.

For all activities, measures shall be taken to reduce noise levels with due regard to practicality and cost as per the concept of 'best practicable means' as defined in Section 72 of the Control of Pollution Act 1974.

5.7 Site Lighting

Temporary Site lighting may be occasionally required for specific activities to ensure safe working conditions, during periods of limited natural light but would be carried out within the limits of the permissible working hours. It is intended the type of lighting would be non-intrusive and specifically designed to negate or minimise any effect to local properties and any other environmental considerations.

Given the proposed size and scope of the development, it is most likely that the construction timetable would require elements of the works to be undertaken during periods of the year when natural daylight is limited.

The use of artificial lighting may therefore be required in order to facilitate the works, such as vehicle and plant headlights; construction and compound lighting; office complex lighting; and localised floodlights/mobile lighting units. There would be fewer requirements for artificial lighting in the summer months when natural lighting would be present during normal working hours. There are no known issues with regards to the limit of lighting levels in this area, but lighting would be provided to meet the required lighting levels for the respective works which are being undertaken, especially where there is plant and machinery involved. Any issues identified with regards to limiting the lighting levels, either the lux values, or the time/duration of the lighting would be taken into consideration as part of the developed construction method statement.

5.8 Vehicle Storage

Appropriate areas would be provided adjacent to or within the Site compound to allow staff and visitor vehicles to be parked. In addition, appropriate provision would be made for the layover of HGV traffic, to ensure that the adjacent road remains clear and available for use at all times. The track design incorporates spurs and crane pads which from time to time could be required to temporarily store vehicles i.e. as waiting areas.

6.0 Pollution Prevention Measures

6.1 Environmental Incident Response Plan

The Principal Contractor would be responsible for developing and implementing an Environmental Incident Response Plan. The plan would provide reference to procedures to be followed in the event of a specific incident. In general, if an environmental incident was to occur, the following would take place immediately:

- mitigation would be implemented to stop or reduce impacts from the incident;
- if these were ineffective, work in the area would cease immediately;
- if necessary, monitoring would be undertaken to identify the source of the incident;
- work would only recommence once it is considered that it would not continue to adversely impact sensitive environmental receptors; and
- provision of a full report by the Principal Contractor and separately by the EnvCoW to the applicant following an incident occurring.

The Environmental Incident Response Plan would reflect site-specific conditions/issues. The Principal Contractor would submit the detailed Plan to the applicant for approval prior to any construction works commencing onsite. The Plan would provide:

- a summary of local environmental sensitivities, e.g. environmentally designated areas, protected species or habitats and high amenity areas;
- an outline of the construction works and appropriate references to other environmental plans and construction method statements;
- an inventory of stored materials and emergency response spill kits;
- details on training requirements, evidence of training of Site staff / plant operators in emergency response procedures including inclusion of Environmental Incident and Response training in Site inductions and tool box talks; and key staff contacts for environmental management and emergency response;
- detailed procedures to be taken in the event of an incident or emergency (including procedures for positioning and movement of plant) and identification of relevant personnel who would be responsible for implementing such procedures; and
- contact telephone numbers for the emergency services and SEPA Pollution Hotline (0800 80 70 60).

A plan of the Site would also be provided, detailing:

- all areas of potential pollution sources including the locations of car parks, delivery and fuel / chemical storage areas, oil separator equipment, excavations, and any other high risk areas that could give rise to pollution;
- the location of potential sensitive environmental receptors, including sensitive habitats or species, surface watercourses, drains or culverts where pollution may travel to; and
- the location of spill kits and other pollution control or emergency response equipment.
- The procedures for responding to a major pollution incident would be a regular topic at onsite tool box talks and management meetings in order to ensure that the incident response plan is fully understood by all personnel, and that all involved know their

role in it. Any lessons learnt from any response to real incidents would be fed back into the plan to ensure that best practice is followed.

6.2 Re-Fuelling of Vehicles, Plant and Machinery

Generally, re-fuelling of mobile plant and machinery would be carried out at a designated location within the Site.

Vehicle re-fuelling would take place either at a dedicated impermeable refuelling pad or by mobile double bunded bowsers at their place of work. The refuelling pad would have an impermeable base and bund with a capacity of 110% with sumps provided such that they do not drain directly into the surface water drains. Where practicable, drainage will be passed through oil interceptors prior to discharge. Refuelling would be carried out using an approved mobile fuel bowser with a suitable pump and hose. Absorbent material (spill kits) would be available onsite and would be deployed to contain drips and small spillages.

All other fuels, oils and potential contaminants, as well as waste oils, would be stored in secure, fit for purpose containers within bunded containment as appropriate and in accordance with SEPA guidance. The bunded containment would have a capacity of 110% of the volume to be stored and would have impervious, secured walls and base. Maintenance of mobile plant would take place within the construction compounds only and would comply with SEPA PPG 7 [18] (The safe operation of refuelling facilities, July 2011).

There would be no fuel storage outside the contractors designated site. Plant would be maintained in good operational order and any fuel/oil leaks recorded for attention. Absorbent pads/granules in the case of an accidental leak/spillage would be available at the temporary construction compound.

6.3 Emergency Pollution Prevention Plan

Spillage of fuel, oil and chemicals would be minimised by implementation of an Emergency Pollution Prevention Plan (EPPP) which would be prepared by the Principal Contractor. In the event of any spillage or pollution of any watercourse the emergency spill procedures as described in the EPPP would be implemented immediately. Procedures developed in the EPPP will be adhered to for storage of fuels and other potentially contaminative materials to minimise the potential for accidental spillage.

6.4 Other Storage

Stone material stockpiles would generally be limited to within work areas. This material would be transported and deposited directly to the point of use from the storage point.

Stripped topsoil/superficial soil would be stockpiled in a suitable location away from the area of movement of heavy vehicles, machinery and equipment, to minimise compaction of soil. Stockpiling of excavated material would be managed such that the potential contamination of down slope water supplies and/or natural drainage systems is mitigated / minimised.

Low mound stockpiles would be formed from excavated material, adjacent to construction areas, away from open drains.

Waste storage and raw material would be at the construction works compound and will be suitably stockpiled in a safe manner that prevents any migration of silts/contamination.

6.5 Prevention of Mud and Debris on Public Roads

Plant and wheel washing facilities and road sweepers would be provided as required to prevent mud and deposits from being transferred from Site onto the public roads.

Plant and wheel washing, where provided, would be located within the designated hard standings at least 10m from the nearest watercourse or surface water drain. Runoff from the facilities would be captured within a purpose designed system for recycling and re-use where possible within the site. Settled solids would be regularly removed and disposed of by an appropriately licensed contractor. This facility would be located and designed in consultation with SEPA.

6.6 Cement

It is anticipated that typically ready-mixed concrete would be brought onto the construction Site from an offsite source for use as required.

Any bagged cement would be stored within a soil bunded area on pallets above the ground and covered with secured plastic sheeting to minimise the risk of wind-blown cement and uncontrolled washout occurring.

Any spilled cement would be removed by shovelling/excavator and suitably disposed offsite.

6.7 Waste and Litter

Waste storage/recycling materials would be stored at the designated location on site. Section 5.4 details principles for waste minimisation, recycling and disposal of waste streams.

With respect to the control of litter on site, all such waste would be collected and stored within sealed containers within the Site compound and serviced by a registered waste carrier. No disposal of litter would be permitted at other locations.

6.8 Hydrocarbon Contamination

6.8.1 Vehicle Maintenance

As noted in Section 5.0, plant and machinery would be regularly maintained to ensure that the potential for fuel or oil leaks/spillages is minimised. All maintenance would be conducted on suitable absorbent spill pads to minimise the potential for groundwater and surface water pollution. All machinery would be equipped with drip pans to contain minor fuel spillage or equipment leakages.

6.8.2 Chemical Storage

All fuels, oils and other chemicals would be stored in secure, fit for purpose containers within bunded containment as appropriate and in accordance with SEPA guidance. The bunded containment would have a capacity of 110% of the volume to be stored and would have impervious, secured walls and base.

The bunded area would be underlain by an impermeable ground membrane layer to reduce the potential pathways for contaminants to enter watercourses and groundwater.

7.0 Drainage and Surface Water Management

7.1 Introduction

Control of water is of great importance during construction to prevent exposed soils eroding and silting up surrounding drainage channels and watercourses. It is essential that the works have little or no impact on the existing hydrology in order to minimise potential impact on ecology and environmental quality of the surrounding area.

The following principles are intended to demonstrate measures that could be used across the Site to adequately protect hydrological, and related, resources. Detailed proposals for such measures would be documented prior to construction, and would provide the same or greater protection for the water environment as those described in this document. The measures are proportionate to the risk and, where greater risk is highlighted at specific locations prior to construction, specific measures would be agreed for those locations.

7.2 Site Induction and Training

All employees and contractors would undergo a Site induction to ensure that they were familiar with the Site rules prior to any work commencing on site. In addition, the Principal Contractor would ensure that all operatives and contractors responsible for handling fuel, oil, concrete or cement or other potential pollutants undergo a thorough induction programme with respect to the relevant proposed pollution control measures. The relevant programme would include, as a minimum, the following:

- waste management;
- emergency response procedures;
- materials management;
- habitat and species protection,
- surface water management;
- potential sources of pollution and their effects on the environment;
- requirements of the contract and legislation with respect to pollution;
- the Principal Contractor’s pollution avoidance plan;
- traffic management and routing, including areas where access is not permitted; and
- training in the use of pollution control equipment.

7.3 Site Drainage

During the construction phase of the proposed development, measures would be adopted, in order to prevent silt, chemicals and/or other contaminants from being washed into existing watercourses. Areas exposed due to the removal of existing structures and/or vegetation are more susceptible to erosion during heavy rainfall so areas would be reinstated as soon as possible to minimise this effect.

This would include specific guidance in relation to drainage (and control of pollution to the water environment) around the following aspects of Site infrastructure:

- access routes;
- foundations;
- hardstanding areas and new structures

The appropriate methodologies to cover water control and the means of drainage from all hard surfaces and structures within the Site are described in the following sections.

7.4 Management of Sediment and Surface Waters

Good practice construction techniques would be adopted for the management of sediment and surface water run-off generated during the construction phase of the proposed development. Sustainable Drainage Systems (SuDS) would be used where applicable.

Drainage from the Site would include elements of SuDS design. SuDS replicate natural drainage patterns and have a number of benefits:

- SuDS would attenuate run-off, thus reducing peak flow and any flooding issues that might arise downstream; and
- SuDS would treat run-off, which can reduce sediment and pollutant volumes in run-off before discharging back into the water environment; and
- SuDS measures, such as lagoons or retention ponds, where appropriate and correctly implemented would produce suitable environments for wildlife.

In addition, a wet weather protocol would be implemented to manage activities during periods of heavy and prolonged precipitation to be approved by CnES in consultation with SEPA.

Heavy or prolonged rainfall during construction and operation may lead to sediment transport or vegetation causing blockage to infrastructure drainage channels or any temporary watercourse crossing structures. Regular monitoring and prompt maintenance of these assets will ensure that the drainage system continues to function as designed.

Typical details of Silt Management Techniques are shown in **Annex 1.0**,

7.5 Foul Drainage

Effluent and waste from onsite construction personnel would be either be treated at a package sewage treatment plant or captured and stored for offsite disposal by a licensed contractor, where there is no connection to the public foul sewer. The system would be designed for approval by SEPA prior to the construction phase of the proposed development.

8.0 Water Quality Monitoring and Contingency

8.1 Water Quality Monitoring

Water quality monitoring during the construction phase would be undertaken for the surface water catchments that serve the Site, to ensure that none of the tributaries of the main channels are carrying pollutants or suspended solids. Monitoring would be carried out at a specified frequency on these catchments.

With regard to the protection of the water environment the following risks would be addressed:

- siltation of watercourses;
- discolouration of raw water; potential pollution from construction traffic due to diesel spillage or similar;
- •alteration of raw water quality resulting from imported track construction material;
- excavation and earthworks
- use of large quantities of concrete;
- site compound and associated drainage/foul drainage and diesel spill issues; and
- the Principal Contractor would compile a monitoring and maintenance plan for the drainage system and surface water runs which would as a minimum include:
  - visual monitoring/inspections
  - during site works including and water crossing construction works, the relevant drainage/surface water runs potentially being impacted by these works would be inspected on a daily basis by the ECoW while works are ongoing in this area.

A Water Quality Monitoring Plan (WQMP) will be developed to form part of the Construction Method Statement (CMS), which would be submitted to the appropriate planning authorities and bodies such as SEPA prior to construction and development. The WQMP will be implemented to monitor surface water quality, fish populations and macroinvertebrate community prior to, during and post-construction. A robust baseline of water quality in surface watercourses / drainage channels downstream of construction works will be established prior to construction commencing and used a benchmark of water quality for the construction phase monitoring.

The purpose of the WQMP is to:

- ensure that the commitments put forward in the EIA Report are fulfilled with regards to identified ground and surface water receptors;
- provide a specification for monitoring prior to, during and after construction;
- provide a record of water quality across the site that can be compared to rainfall and site activities;
- provide reassurance of the effectiveness of pollution prevention measures installed to protect surface watercourses throughout the construction period; and
- provide data to identify any potential pollution incidents, and to inform a structured approach to manage and control such incidences.

The WQMP will outline details for the monitoring of surface watercourses down gradient of works areas including watercourse crossings (as set out within **Technical Appendix 10.4**

Schedule of Watercourse Crossings), access tracks, turbine foundations and borrow pits and at control sites (up gradient of works areas), and will include:

- indicative monitoring locations;
- frequency of monitoring prior to, during and after construction;
- parameters for field hydrochemistry testing and laboratory analysis including as a minimum pH, electrical conductivity, suspended solids, dissolved metals, nutrients and hydrocarbons;
- sampling and analysis protocols;
- relevant environmental quality standards (EQS);
- responsibilities for monitoring – it is expected that the ECoW will be responsible for daily monitoring of watercourses particularly around active works areas and watercourse crossings (as set out in **Technical Appendix 10.4 Schedule of Watercourse Crossings**). Further monitoring on a less frequent basis (i.e. monthly) may be done by an external party;
- procedures to be followed in the event of an environmental incident; and
- recording and communicating of results.

A Private Water Supply (PWS) Action Plan, informed by a Private Water Supply Risk Assessment (**Technical Appendix 10.5**) would be developed and would include details regarding all water monitoring and reporting, pollution incident reporting and emergency mitigation measures to address a temporary or permanent material change in either the quality or quantity of an existing private water supply. The PWS Action plan shall include as a minimum:

- the provision of an emergency hotline telephone number for householders so that they can contact the project with any concern regarding water quality or quantity;
- the contact details of householders downgradient of work areas to alert in the event of a pollution incident;
- the provision of an alternative water supply, if required, during any periods of PWS disruption; and/or
- to supply affected properties with filters for particulate removal.

8.2 Laboratory Analysis

This monitoring would involve laboratory analysis of water samples taken at agreed locations across the site and would continue throughout the construction phase and immediately following construction. Monitoring would be used to allow a rapid response to any pollution incident as well as assess the impact of good practice or remedial measures. Monitoring frequency would increase during the construction phase if remedial measures to improve water quality would be required. Detailed water quality monitoring plans would be developed during detailed design in consultation with THC and SEPA.

The performance of the good practice measures would be kept under constant review by the water monitoring schedule, based on a comparison of data taken during the construction phase with a baseline data set, sampled prior to the construction period and through the observance of any trends in water quality change over time.

8.3 EnvCoW WQMP Duties

In addition to the monitoring and analysis, it is proposed that daily watercourse inspections would be undertaken by the EnvCoW in areas selected in the field by the EnvCoW determined by where construction is taking place. As daily inspection points they would need to be readily accessible points close to infrastructure.

The daily inspections would include, but not be limited to:

- regular visual inspection of the sediment control structures and oil interceptors;
- investigation of problem areas (e.g. those causing silty run-off) to try to establish the cause and locate the source;
- management of the Principal Contractor to comply with method statement activities;
- development of a clear line of communication with site staff to address issues promptly;
- prioritisation of issues so that site staff know how to react to incidents; and
- regular hydrological reporting - daily records and monthly reports.

8.4 Incident Response

Drainage networks provide a conduit for rapid transport of silty water and potential contamination from surface spills of fuels / oils, concrete or chemicals. A pollution incident would include any discharge to the drainage network that could potentially cause environmental damage. Examples of pollution incidents include:

- fuel drips or spills during refuelling;
- leaking plant or equipment;
- leaks from fuel or chemical containers;
- contaminated water or sediment / silt entering a watercourse or drainage network;
- windblown dust and waste;
- excess silt deposition in drainage ditches, channels, culverts following heavy rainfall events;
- operational failures of pumps and pipelines; and
- failures of treatment or sediment controls.

The Principal Contractor would be required to prepare an Environmental Incident Response Plan (Section 6.1) which would provide emergency response contacts, reporting procedures, and procedures for dealing with all potential pollution incidents during the construction of the proposed development.

8.5 Specific Measures for Protecting Groundwater Receptors

Areas of potential Ground Water Dependent Terrestrial Ecosystems (GWDTE) are sustained by surface water and rainfall rather than by groundwater. Measures would be required to sustain surface water flow paths to maintain these habitats, and would be informed by the findings of **Technical Appendix 10.6: Groundwater Dependent Terrestrial Ecosystems Assessment**.

9.0 Construction Phase

9.1 Introduction

This section describes in more detail the key components of construction and the impact they may have on the environment.

The overall site design has been developed in accordance with recommendations adopted from the EIA Report and to reflect the requirements and specifications for transporting wind turbine components to the proposed turbine locations.

9.2 Temporary Compounds

The works would include the construction of three Temporary Construction Compounds (TCCs), located at NB 31862, 13371 (TCC1), 130217,911582 (TCC2) and NB 32556, 14299 (TCC3).

The temporary construction compounds would have a footprint of 0.64ha (TCC1), 0.28ha (TCC2) and 0.63ha (TCC3), and would be likely to contain the following:

- temporary modular building(s) to be used as a site office;
- welfare facilities;
- parking for construction staff and visitors;
- reception area;
- fuelling point or mobile fuel bowser;
- secure storage areas for tools; and
- waste storage facilities.

Welfare facilities would be provided for the duration of the construction period in accordance with the Construction (Design and Management) Regulations 2015. Facilities for waste management, refuelling, power, water supply and chemical/material storage would be provided.

Where and when compound lighting is required, it would be designed to minimise light pollution to the surrounding area. All lights would face inwards.

The compound would also be used as a storage compound for various components, fuels and materials required for construction.

The compound would be built by stripping topsoil and regrading, then laying geotextile and an imported stone layer. The stripped topsoil would be stored adjacent to the compound in a linear bund typically no greater than 2m in elevation. Superficial soil would be stripped and stored separately from the topsoil. This would be stored in a similar manner to the topsoil, but would depend on the volume which is required to be excavated.

It is proposed that uncontaminated surface run-off from the compound is accommodated in a swale or soakaway which would be constructed as a perimeter ditch to avoid contamination of watercourses should there be a spillage and from fines washout. All other run-off from the site would follow natural drainage patterns and newly installed drainage routes.

The compound area would be reinstated at the end of the construction period. Reinstatement would involve removal of the imported material and underlying geotextile. The exposed substrate would be gently ripped and the stored superficial soil and topsoil replaced. The surface would be re-seeded as required using the same seed mix as that used for the reinstatement of track verges and batter (in consultation with NatureScot).

Alternatively, if the ground conditions permit, all inert materials such as the imported stone could be retained, and the stored superficial soil and topsoil replaced. This area would be kept on record and could be used as the temporary construction compound during the decommissioning phase.

9.3 Welfare Facilities and Services

Welfare facilities would be provided in accordance with the Construction (Design and Management) Regulations 2015 during the construction period and would include mobile toilets with provision for sealed waste storage and removal. Sewage waste would be either be tankered offsite by a licensed approved waste contractor or, a septic tank could be installed and maintained for the duration of the works in accordance with SEPA's GPP 4 (Section 7.4.4), including regular emptying by an approved contractor.

Potable water would be imported as bottled water. The water would be used for messing purposes during the construction phase.

The welfare facilities will most likely have in-built water bowsers to provide a water supply for sanitation etc.

Electricity would be provided by onsite generators. All electrical equipment and its installation and maintenance would be undertaken by a qualified and competent person.

9.4 Transport Routes

Both construction workers and materials needed for the construction works would be delivered to site using the public road network. A Construction Traffic Management Plan (CTMP) would be developed following appointment of the Principal Contractor and identification of the material supply points and included in the final CEMP.

Chapter 12: Site Access, Traffic and Transport of the EIA Report describes the transport route in full.

Once consent has been received and prior to construction, the route would be further inspected by suitable engineers, in conjunction with the police and the relevant highway authorities, with a view to finalising the TMP and to obtaining a suitable licence for the movement of abnormal loads.

The TMP would include (but not be limited to):

- a delivery schedule to ensure impacts on the road network are minimised;
- detailed design of temporary and permanent road improvements; and
- assessment of existing street furniture and bridge classifications and preparation of a schedule of temporary works along the access route.

9.5 Borrow Pits

9.5.1 General

In order to construct the access tracks, passing places and formation of new hardstanding areas such as crane pads, site construction compounds and laydown areas, crushed rock is required. It is proposed to source this material from seven onsite borrow pits, to reduce the need to import materials. It is anticipated that the total area attributed to borrow pit search areas will be approximately 5.05ha.

The Quarry Regulations 1999 state that any excavations undertaken for the sole purpose of supplying materials for use on site are excluded from the Regulations. Therefore, the development of the borrow pits and their reinstatement would be agreed through the planning process.

In general, these borrow pits would be stripped back of topsoil which would be stored adjacent to the respective borrow pit site for future reinstatement.

9.5.2 Materials Storage

Prior to the excavation of the borrow pit(s) and following construction of appropriate SuDS measures, vegetation and soils would be removed and stored in overburden stockpiles. Overburden stockpiles would be located adjacent to the borrow pit(s) and compacted in order to limit instability and erosion potential. Silt fences would be employed to minimise sediment levels in runoff from the stockpiles.

Rock stockpiles would be stored in already-worked areas of the borrow pit(s) or, before these are available, stockpiles would be located on safe and stable designated areas approved by a qualified engineer, identified on a plan of the working area of the borrow pit(s) and agreed with the EnvCoW.

Overburden or rock stockpiles would be stored at least 50m from watercourses in order to reduce the potential for sediment to be transferred into the wider hydrological system.

9.5.3 Surface Water Management

Temporary interception bunds and drainage ditches would be constructed upslope of the borrow pit(s) to prevent surface water runoff from entering the excavation. Swales would also be implemented to convey and attenuate excess surface water flow away from borrow pit(s). These methods would be kept to a minimal depth and gradient, with check dams, silt traps and buffer strips also utilised where possible to minimise erosion and sedimentation at peak flows.

Infiltration trenches would also be placed downslope of the borrow pit(s) and overburden and rock stockpiles and would be designed to treat run-off before discharging back into the drainage network. Silt fences would be used to intercept sediment-laden surface run-off in addition to infiltration trenches.

9.5.4 Borrow Pit Dewatering

Limited dewatering of the borrow pit(s) may be necessary. Water would be treated by a settlement lagoon(s) and by discharge onto vegetated surfaces.

Outflow from settlement lagoon(s) in proximity to the borrow pit(s) would discharge to surface water drains.

It is unlikely that groundwater ingress would be significant. However, the floors of the borrow pit(s) would have a gravity drain design. All floor water would drain to an adequately sized sump to allow sediment to settle out before discharge to surrounding vegetated surfaces.

Excavation machinery would be regularly maintained to ensure that there is minimal potential for fuel or oil leaks/spillages to occur. All maintenance would be conducted on suitable absorbent spill pads to minimise the potential for groundwater and surface water pollution.

9.6 Access Tracks

9.6.1 General

The extent of construction disturbance would be limited to around the perimeter of, and adjacent to, access track alignments, including associated earthworks, and would be monitored by the EnvCoW as required.

As part of the design mitigation the majority of proposed infrastructure has been sited at least 50m from any watercourse, except where tracks cross a watercourse. The only exceptions are small areas of proposed clearance area and temporary hardstanding at Turbines No.1, No.3 and No.10, and a small area of proposed clearance and both temporary and permanent hardstanding at Turbine No.24.

It is anticipated that access tracks would largely be constructed from aggregate won from onsite borrow pits and would be constructed to the best practices for wind farm access tracks.

Access tracks would be constructed to a running width of 5.0m (for the Eishken road upgrades) and 6m for new access track, plus shoulders of approximately 1m on either side, to accommodate the maximum transport requirements. Track shoulders may be up to a width of 2-3m to accommodate cabling along the access track alignment.

The access tracks for the proposed development have been carefully designed. The tracks have been designed to follow the existing contours to minimise the requirement for cut and fill and would be formed to minimise the gradient. The access tracks would be a minimum of approximately 6m wide (straight sections) with appropriate widening on bends with additional provision of inter-visible passing places at track junctions and crane hardstandings. The average working corridor for the construction of access tracks (and where relevant cable trenches) would be 14m.

For the construction of tracks topsoil would be stored beside the track for use in reinstatement of shoulders at the end of the construction period where appropriate. The material would be stored/stockpiled in accordance with good practice so that it would be reused for reinstatement.

Track restoration works would be undertaken in accordance with NatureScot good practice guide Constructed tracks in the Scottish Uplands 2nd Edition [Scottish National Heritage, updated September 2016].

9.6.2 Existing Tracks/Road

There are approximately 12.1km of existing track/road within the Site, which would be upgraded as required and utilised as part of the proposed development.

9.6.3 New Tracks

There is approximately 12.1km of upgraded access track/road, and 17.36km of new track required within the Site. 2.60km (of the 17.36km of new track) is anticipated to be floating.

Access tracks would be formed on suitable underlying material (superficial soil or rock with sufficient bearing capacity) in the following manner:

- stripping of surface vegetation (turves) and careful stockpiling of this material;
- excavating the remaining superficial soil materials and stockpiling this material;
- where different superficial materials are present these would be stored according to type. This material would be monitored and watered (as appropriate) to be retained for reinstatement purposes;

- the exposed suitable track formation would have rock fill material tipped from dumper trucks directly onto the proposed access track alignment; and
- this material would then be either spread by a dozer or placed by a hydraulic excavator and compacted in layers, typically using vibratory rollers.

Access tracks would be formed from a sub-base of general fill, and finished off with a cap-stone / wearing course of graded crushed rock to provide a nominal Type-2 (Series 800) finish. Wearing course stone would be of a suitable material that is not susceptible to breaking down / weathering to a high fines content material.

Maintenance of the running surface would be carried out on a regular basis, as required, to prevent undue deterioration. Loose track material generated during the use of access tracks would be prevented from reaching watercourses by maintaining an adequate cross fall on the tracks. Periodic maintenance of tracks by way of brushing or scraping would be carried out to minimise the generation of wheel ruts, which could lead to some track material being washed away. In dry weather, dust suppression methods may be required for track and hardstanding areas. The site access tracks, hardstandings and trackside drains would be inspected on a regular basis by the Contractor.

Figure 3.4 (Indicative Track Details) illustrates typical track construction details.

9.6.4 Cut Tracks and Drainage

In areas where the soil is wet the track formation would be created by a cut (and fill) or by a cut operation where the side slope is severe. A lateral drain would be established on the uphill side of the track to drain water from the slopes and cross drains would be established at intervals of no less than 30m, or to suit the profile of the track/ditch to facilitate drainage. Topsoil, where present, would be stored beside the track for use in re-instatement of track shoulders where appropriate. Consideration would be given to the potential for entrapment of snow and water in their placement.

9.6.5 Management of Surface Water

New access tracks would be designed to have adequate cross fall or camber to avoid ponding of rainwater and surface run-off. Run-off from the access tracks and existing drainage ditches would be directed into swales that would be designed to intercept, filtrate and convey the runoff.

Check dams would be installed within the swales and existing drainage ditches where required in order to increase the attenuation of run-off and allow sediment to drop out.

Permanent swales and drainage ditches adjacent to access tracks would have outlets at required intervals to reduce the volume of water collected in a single channel and, therefore, reduce the potential for erosion. Outfall pipes would drain into a bunded section of the drainage ditch to allow suspended solids to settle. Further measures would include the use of flocculent to further facilitate the settlement of suspended solids, if required.

The Principal Contractor would be responsible for the management of all surface water runoff, including the design and management of a drainage scheme compliant with SuDS principles. Typical details for track drainage are shown in **Annex 2.0**.

9.6.6 Protection of Watercourse Crossings

Upgraded watercourse crossings (as detailed within **Technical Appendix 10.4: Schedule of Watercourse Crossings**) would be appropriately designed so that they do not alter the natural drainage and can accommodate flow. Authorisation from SEPA under Controlled

Activities Regulations (CAR) would be obtained prior to construction of the watercourse crossings. They would have a conveyance capacity of at least a 200 year flood.

Typical details for Water Course Crossing Techniques are shown in **Annex 3.0**.

9.6.7 Loose Track Material

Loose material from the use of access tracks would be prevented from entering watercourses by utilising the following measures:

- silt fences would be erected between areas at risk of erosion and watercourses;
- silt fences and swales would be inspected daily and cleaned out as required to ensure their continued effectiveness;
- excess silt would be disposed of in designated areas at least 50m away from any watercourses or drainage ditches;
- water bars would be implemented on slopes greater than 1 in 20;
- culverts, swales and drains would be checked after periods of heavy precipitation;
- the inlets and outlets of settlement lagoons, retention basins and extended detention basins would be checked on a daily basis for blockages; and
- the access tracks would be inspected on a daily basis for areas where water collects and ponds.

9.6.8 Floating Tracks and Drainage

It is anticipated that approximately 2.66km of floating track would be required, where consistent peat depths of 0.5m or greater are identified, the tracks would follow topography in the area (below 5%), to ensure that the risk of failure due to landslip is mitigated.

Floating track construction essentially comprises the laying of a geosynthetic (geotextile mat or geogrid reinforcement) across the superficial soils prior to constructing the track. Where necessary, risk from run-off would be mitigated by directing drainage to settlement ponds. Erosion processes on the track side embankments and cuttings would be mitigated by ensuring that gradients are below stability thresholds, which would also enable effective regeneration of vegetation or reseeding with appropriate species. Sediment traps would be required in the early years following construction until natural regeneration/ reseeding is established. Should significant erosion or sedimentation, (which is not expected) take place at any location it would be addressed by re-grading of slopes.

Figure 3.4 (Indicative Track Details) illustrates a typical floating track construction detail.

9.6.9 Onsite Vehicle Movements

Access tracks would be designed to be single track, 6m wide including the provision of intervisible passing places at appropriate locations taking account of horizontal and vertical track alignments. Additional widening would be provided on bends to facilitate the movement of the large delivery vehicles associated with turbine tower and blade delivery, and these would double as passing places where appropriate.

During the periods of delivery of the large components, the Contractor would use appropriate site communications and access control techniques to enable safe one way operation of the tracks.

The presence of crane pads within the construction compound would facilitate traffic movement onsite. Internal track junctions would also be used to facilitate multiple options for construction traffic movement. This would allow vehicle to move more direct between construction locations and double as passing places.

9.6.10 Unstable Ground

Unstable ground is herein considered to be any ground conditions encountered along the proposed alignment, or within the immediate vicinity and influence, of the access tracks that has insufficient strength in its existing state to support the proposed load conditions.

If any unstable ground is encountered during access track construction, the following procedure would be adopted:

- access track construction in the immediate area of the unstable ground would cease with immediate effect;
- the Principal Contractor would immediately assess the situation and develop a solution; and
- if relocation within the approved 75m micrositing allowance of the proposed access track alignment is possible and acceptable to the ECoW, without potential for further ground instability to occur, then construction may recommence along the newly agreed alignment, and any stabilisation / mitigation measures that may be required of the unstable ground would occur in parallel.

9.6.11 Signage

Sufficient signage would be employed onsite, for both Site personnel and the public, to clearly define the boundary of the works where they coincide with areas accessible to the public.

9.7 Turbine Foundations

9.7.1 General

A total of 25 turbines would be erected on reinforced concrete gravity foundations.

Proposed turbine foundation locations would be inspected by the EnvCoW to ensure that all potential environmental constraints have been identified, demarcated and/or mitigated for prior to the on-set of construction in that area. The final location of the turbines would be within approved micrositing allowances of the consented positions in accordance with Planning Conditions. The regularity of inspections (daily, weekly, as appropriate) during construction would be determined in advance for each particular section, based on anticipated ground conditions, known environmental sensitive receptors, prevailing weather conditions, and anticipated rate of progress.

9.7.2 Construction of Turbine Foundations

Construction of the turbine foundations would be the responsibility of the Contractor.

The limits of each of the foundation excavations would be surveyed and pegged out in advance of any proposed works, and the EnvCoW would be consulted to ensure all necessary pre-construction checks have been completed.

The volume of concrete required for each turbine foundation would be approximately 400m^3 and would be batched onsite using imported cement and aggregates either imported or sourced from the borrow pits. Each turbine would also require steel reinforcement which would be delivered to Site on a flatbed vehicle and then connected together to provide the reinforcing cage (see **Figure 3.3**).

The turbines require reinforced concrete foundations that measure approximately 22.8m in diameter. To facilitate the construction of this, an area up to 3m wider around the perimeter would be required e.g. approximately 25.8m total diameter to create a working area.

Depending on the stability of the material being excavated for the turbine bases, an additional area may be graded back from the foundation working area to ensure that the excavation remains stable during construction.

EIA Report **Figure 3.3** shows a typical turbine foundation design.

The typical construction activities associated with the turbine foundations are detailed as follows:

- stripping of surface vegetation (turves) and careful stockpiling of this material as per CEMP requirements;
- excavating the remaining superficial soil and rock materials and stockpiling of this material as per CEMP requirements;
- the stockpiled materials are to be retained for restoration purposes;
- soil would be excavated until a suitable formation can be achieved. Where rock is encountered this would most likely be removed by mechanical excavation to the required depth and material stockpiled as described above. The potential impacts associated with the use of hydraulic breakers or other such vibratory equipment in the vicinity of sensitive ecological receptors or watercourses would be assessed and appropriate mitigation measures implemented where required in consultation with the EnvCoW;
- the foundation design is based on the most efficient use of materials and local ground conditions;
- temporary fencing would be erected at locations where there are safety implications for any persons likely to be present on the site e.g. around open excavations. Signage would be displayed clearly to indicate deep excavations and any other relevant hazards associated with the foundation excavation works;
- cut-off ditches would be used at the perimeter of foundation excavations to divert the clean water away from the work areas thereby reducing the volume of water potentially requiring pumping/treatment in silt traps/settlement lagoons. It is not anticipated that large scale dewatering would be required during the excavations. Water from dewatering of excavations would be pumped via surface silt traps to ensure that sediment does not enter surrounding watercourses. Settlement lagoons would be employed in areas where the level of runoff is likely to exceed levels normally contained within a silt trap, however it is considered unlikely that these would be required. Wash-out areas at each base, (if required) would be lined and contained to prevent wash-out water entering drainage/surface waters. The material from the wash-out would be disposed of appropriately offsite;
- following excavation, levels would be set to allow the blinding concrete to be placed and finished to the required line and level;
- the steel reinforcement would then be finished to the required design specification. The steel reinforcement would then be delivered to site and stockpiled adjacent to the respective turbine base;
- the formwork would be pre-fabricated of sufficient quality and robustness to allow repeated use. Formwork would be cleaned after each use and re-sprayed or painted with mould oil within the blinded foundation excavation prior to being fixed in place. The placement of containers with mould oil would be strictly monitored to ensure that

storage is only in bunded areas (i.e. in the TCC) on sealed hardstanding. Spraying of mould oil and storage of such sprayed materials would be undertaken in such a way as to avoid pollution;

- sulphate resistant concrete or other suitable concrete, as appropriate for the prevailing ground conditions, would be used in the turbine base. Prior to pouring the base concrete, the overall quality of the steel fixing would be checked to ensure there is sufficient rigidity to cope with the weight of personnel and small plant during the pour. The quantity, size and spacing of the reinforcement bars would be checked against the construction drawings to ensure compliance with the design detail. The position of the foundation insert, or other appropriately designed foundation mechanism supplied by the turbine manufacturer would be checked to ensure that the level is within the prescribed tolerances. A check would also be carried out to make sure the correct cover from edge of reinforcement to edge of concrete is maintained throughout the structure. A splay would be formed on all external corners;
- cable ducts would be checked so as not to leave sharp corners that would cause cable snagging and that all bend radius comply with the design illustrated on the construction drawing. All earthing cable or strip connections would also be examined to prove their adequacy to withstand the rigors of the concrete placing process;
- concrete would be batched onsite. As with all concrete deliveries, a record would be kept against each turbine to indicate the source of supply, type and consistency of the mix. A record would also be kept of the personnel involved, the time and date the pour commenced and finished;
- the concrete pour would commence after the blinding concrete has been cleaned of debris and other loose material. Vibrating pokers would have been checked to ensure they are fuelled by compressed air and in good working order. The pour would proceed under the control of the Contractor. Personal Protective Equipment (PPE) would be worn by the site operatives and as detailed in the Construction Phase Plan. Pouring would follow best working practice procedures and fresh concrete would be protected from hot and cold weather as required;
- shutters would be carefully loosened, removed and cleaned no earlier than 24 hours from the finish of the pour; and
- backfilling to the turbine base would proceed in layers of approximately 0.3m with compaction as necessary. Further layers of material would be laid until the original till level is attained. Soil would be replaced from the appropriate storage area until the original ground level is reached, or a shallow mound (up to 500mm above existing ground level) is formed. In the event that there is limited onsite material to compact above the turbine foundation, then imported material may be required. This would typically be a well graded granular product.

A checklist for each foundation would be prepared to show compliance with the documents of each step of the installation process. These lists, once completed, would be stored in the contractor’s QA file along with relevant cube test results, and be available for inspection at all times.

Following the completion of all construction activities, the area surrounding the base would be reinstated.

9.8 Crane Pads

Crane pads would be required to allow installation and removal of the turbine components. Location and orientation would be optimised to make best use of the existing topography, prevailing wind conditions (to enable safe lifting) and the chosen erection procedure. Additionally, the crane pad orientation would take account of environmental constraints. As with access tracks, topsoil and superficial soil would be removed wherever possible and stored separately adjacent to the removal area for later reinstatement up to the edge of the hardstanding.

The area would be set out to the required dimensions and excavated to a suitable formation. Coarse rock fill would then be placed and compacted in layers using compaction equipment. Geotextile may be used depending on the suitability of the underlying strata. The final surface would be formed from selected granular material and trimmed to allow surface water run-off to drainage ditches. The crane pad would remain in-situ for the operational life of the proposed development.

EIA report **Figure 3.5** shows an indicative crane hardstanding layout.

9.9 Substations and Control Buildings

9.9.1 Substations

The Eurowind substation compound would include an area for car parking and High Voltage (HV) equipment, such as transformers and circuit breakers and a control building. The control building would likely be a single storey blockwork structure or pre-fabricated panels, built on a pre-cast concrete base measuring approximately 16m x 30m and typically 8m high. It is proposed that the buildings would have a rendered finish; the final external finishes would be agreed with CnES. The main control building would be used as a control room for the electrical switchgear.

The Scottish Hydro Electric Transmission Limited (SHETL) substation compound would have a footprint is 85m x 145m (1.23ha). The compound would include an area for car parking and High Voltage (HV) equipment, such as transformers and circuit breakers and a control building. The control building would likely be a single storey blockwork structure or pre-fabricated panels, built on a pre-cast concrete base measuring approximately 16m x 30m and typically 8m high. It is proposed that the buildings would have a rendered finish; the final external finishes would be agreed with CnES. The main control building would be used as a control room for the electrical switchgear.

The grid connection point for the proposed development is subject to confirmation by the network operator. The precise route of the grid connection cabling has not yet been determined and its effects are not identifiable/assessable because it has yet to be designed and an application has not yet been made.

9.9.2 Control Buildings

A typical control building elevation is shown on EIA report **Figure 3.8**.

Welfare facilities including a toilet would be provided in the control building for the duration of the operation of the proposed development. Sewage waste would be tankered offsite by a licensed approved waste contractor. Alternatively, a septic tank could be installed and maintained for the duration of the works in accordance with SEPA’s GPP 4 (see Section 4), including regular emptying by an approved contractor.

A rainwater collection and purification system would be installed to service the welfare room, and electricity would be provided from a local electricity connection or a back-up diesel generator.

Lighting would be limited within the compound and would be limited to emergency flood lights around the switchgear, security/motion sensor lights to building, and then any internal lighting within the building.

9.10 Cable Laying

The grid connection is likely to require separate consent under Section 37 of the Electricity Act 1989. The grid connection application would be made by Scottish and Southern Energy Electricity Networks (SSEN) who are responsible for the Transmission Grid in the area of the proposed development and who would own assets beyond the site substation.

Underground power cables would run from each turbine location to the onsite substation. The cables would typically be buried in the track verges. Cables would be laid in a trenching operation. Single cable trenches would likely be 450mm wide; whilst double cable trenches could extend to 1300-1640mm wide. Trenches would be 1075-1205mm deep. Indicative cable trench arrangements are shown on EIA report **Figure 3.6**.

Electrical cabling is typically buried or ducted adjacent to the access track network. Cable trenches would either be excavated into existing ground, made ground (such as access track verges) or areas consisting of shallow peat. Irrespective, the cable trenches would require excavation, laying of the cables and backfilling with original material from the point of origin.

The position of trenches would be marked out and the line stripped of turves and superficial soils and set aside for reinstatement. Ecologically sensitive areas would be avoided by construction plant or vehicles. The majority of cable run installation would be undertaken adjacent to and within the track construction zone, to minimise intrusion into the surrounding areas. Where topography or environmental constraints dictate (over limited sections), the cables would be installed in ducts within the existing track corridor. In areas of trenching, the vegetation layer and topsoil would be removed and segregated from the removed superficial soil for use in reinstatement. If necessary where depth allows, further segregation of the vegetation layer and topsoil would be undertaken to prevent burying of the upper vegetation layers in deeper soil upon replacement.

Where the depth of the original topsoil layer is very thin there may be insufficient material for reinstatement.

Where cables cross open gullies and ditches they would be installed in ducts. Alternatively, they would be incorporated in the access track crossing points. During installation operations, these would be temporarily dammed and a filter placed downstream to avoid pollution of the downstream watercourse by suspended solids.

Following testing, the trench would be backfilled and compacted in layers with suitable material and reinstated with previously excavated superficial soils (from which stones would have been removed). Sand would be imported to Site and would be placed around the cables as protection. Suitable duct marker tape would be installed in the trench prior to backfilling.

Clay bunds would be placed at intervals to prevent longitudinal drainage.

9.11 Soil Storage

Superficial soils would be excavated and stored temporarily. It is anticipated that most of the soil resources within areas directly affected by construction activities would be able to be stored and reinstated as close as possible to where they were excavated in accordance with best practice; so that the site would be restored with minimal movement of material from its original location.

At turbine foundations topsoil would be stripped keeping the top 200mm of turf intact. This material would be stored adjacent to the base working area and would be limited in height to 2m to minimise the risk of overheating. Superficial soil would then be stripped and stored, keeping this material separate from the topsoil.

Following excavation of the turbine foundation area and construction of the foundation (concrete/reinforced steel) the area would be backfilled with spoil. The area would be reinstated using the retained topsoil/turf where appropriate materials are available. Where required a gravel area would be left around the tower base for access. Reinstatement at turbine foundations would begin as soon as possible after foundation and plinth installation is complete.

The risk of water pollution from excavation works in terms of sediment loss would be prevented / mitigated by the following measures:

- careful location of turbine bases and track line to minimise excavation where applicable;
- stripped topsoil/superficial soil would not be stored adjacent or in close proximity to watercourses, where a construction area requiring soil stripping is close to a watercourse the soil would be stored a suitable distance from the watercourse;
- soil would be stored in accordance with best practice in order to remain intact as the soil would be essential to the site reinstatement;
- where turf requires excavation for track construction an excavator would lift turf and place it to the side leaving space between the edge of the track and the embankment to be constructed. The excavator would then lift out the soil and would place it to the side of the proposed track. The soil stored by the side of the access track would be graded by an excavator and the turves would be replaced by the excavator over the graded soil beside the track. The timescale for this operation is short and the methodology has been successfully applied at other wind farms; and
- excavated soil would not be placed onto water reservoirs or placed where it would block established surface or drainage channels.

9.12 Watercourses

9.12.1 General

As part of the design mitigation, all wind turbines and associated infrastructure (with the exception of tracks) have been sited with a minimum separation of 50m from watercourses where possible. The only exceptions are small areas of proposed clearance area and temporary hardstanding at Turbines No.1, No.3 and No.10, and a small area of proposed clearance and both temporary and permanent hardstanding at Turbine No.24.

Tracks have been routed to minimise any crossing of the watercourses, where possible. However, if track crossings are required, then the these would be designed and constructed appropriately.

Chapter 10: Hydrology, Hydrogeology, and Geology of the EIA Report and **Technical Appendix 10.4 Schedule of Watercourse Crossings** include details and location of watercourse crossings.

The Contractor is required to produce a detailed Watercourse Crossing Plan prior to commencement of the works. This plan would be submitted to the EnvCoW and SEPA for review and approval where appropriate.

The Contractor is responsible for liaising with and obtaining from SEPA all relevant consents, licenses and authorisations relating to construction of the watercourse crossing at the Site.

All construction works on the Site, and specifically construction works to be undertaken within and in the vicinity of the watercourse, would be completed in compliance with current legislation and best practice as detailed within this document.

The EnvCoW would be consulted on all watercourse crossing works. Surveys by the EnvCoW would be carried out immediately prior to construction of the crossing to identify areas of ecological interest and more specifically, mammal and fish activity in watercourses to ensure that adequate mitigation is built into the design.

9.12.2 Design Philosophy

The Water Environment (Controlled Activities) (Scotland) Regulations 2011, as amended (CAR Regulations) require that all new river, loch and wetland engineering activities, including river crossings and culverting for the watercourse shown on the Ordnance Survey 1:50,000 scale map, would require authorisation by SEPA, which may include (depending on the nature of the works) Registration with, or a Licence from, SEPA. Even if a proposed crossing does not require a Registration or Licence, due to its compliance with a General Binding Rule (GBR), as defined in the CAR, SEPA are still required to be notified.

General good practice in watercourse crossing design is detailed below:

- where appropriate, the watercourse would be routed through culverts appropriately sized and designed not to impede the flow of water and would allow safe passage for wildlife, such as fish, water voles, otters etc. (i.e. the crossings would have a capacity well in excess of the design flow);
- when installing culverts, care would be taken to ensure that the construction does not pose a permanent obstruction to migrating species of fish, or riparian mammals (i.e. the crossing would make provision for fish and wildlife migration);
- culverts would be sized so that they do not interfere with the bed of the stream during construction, (i.e. the crossing would leave the watercourse in as natural condition as possible);
- culverts with a single orifice would be used in preference to a series of smaller culverts that may be more likely to become blocked with flotsam and create erosion (i.e. the crossing would not constrict the channel);
- ease and speed of construction are important to minimise disruption to the watercourse and surrounding habitat;
- designed for the life of the project;
- low maintenance; and
- visually in keeping with the surroundings.

In accordance with CAR guidance, the watercourse crossing would be designed on a case by case basis to be appropriate for the width of watercourse being crossed, and the prevailing ecological and hydrological situation (i.e. the “sensitivity” of the watercourse). A number of factors, both environmental and engineering would influence the selection of structure type and the design of the crossing.

The river crossing would be designed to convey a minimum 1 in 200 year plus climate change return period flood event, and individually sized and designed to suit the specific requirements and constraints of its location.

The watercourse crossing would include splash boards and run-off diversion measures to prevent direct siltation of watercourses.

9.12.3 Structural Design

Design of a watercourse crossing needs to consider:

- bearing capacity of foundations (and variability of capacity);
- design loadings – likely to be larger during construction and decommissioning of the wind farm; and
- design options such as bridges or culverts.

9.12.4 Culverts

Medium to large culverts or large Armco culverts would be used where a culverted solution is desirable or where a small piped culvert is not appropriate for environmental or capacity reasons.

Depending on size, a natural stone headwall would be provided upstream and downstream to protect the track embankment where necessary. Further protection would be provided to the banks using soft engineering techniques as much as possible.

9.12.5 Relevant Mitigation

The following is a summary of the relevant mitigation measures and general good practice associated with the development of watercourse crossing:

- appropriate care would be given to the construction of the crossing and all loose materials left from construction would be collected and disposed accordingly;
- site track crossings would be constructed with granular materials, which would limit the production of surface runoff and the direct discharge of sediment into the watercourse;
- the methods of drainage proposed for the site tracks prevent the significant discharge of surface runoff and suspended solids into the watercourse adjacent to the tracks. This is owing to the runoff being collected within the upslope ditch, the presence of peat dams and culverts at appropriate intervals so as to limit longitudinal flow and the discharging of water to the downslope ground. There would therefore be no long runs of ditches that directly discharge into watercourse;
- the watercourse crossing would be designed to avoid disruption and / or habitat loss to aquatic systems or to affect free passage of fish; and
- minimum buffer strip of 50m should be kept free from development from the top of the banks of any watercourse/waterbody.

10.0 Pre-Construction Surveys, Protected Species and Monitoring

10.1 Pre-Construction Surveys

10.1.1 Water Quality Monitoring

Prior to the works commencing, baseline water quality monitoring would be undertaken by an appropriately qualified and experienced independent consultant to establish the water quality prior to any interference from the works.

This would be undertaken in accordance with the proposed water quality monitoring developed by the Principal Contractor and as detailed within Section 8.0.

This water quality monitoring is to be agreed and reviewed by the applicant in advance of the works commencing to ensure that the conditions during the monitoring and the testing undertaken are representative and allow a suitable benchmark to be established.

10.1.2 Land Quality

Prior to the commencement of works at the proposed development a preliminary Land Quality Assessment would be undertaken to identify the risk of contaminated land.

As a minimum, the developer/contractor would maintain a watching brief during groundworks and be diligent for the presence of previously unidentified contamination. Should the developer encounter potentially hazardous materials work should cease in that area and the matter be referred to an appropriate environmental consultant.

10.1.3 Geotechnical Investigations

In addition to the requirement for geotechnical investigations to inform the design of permanent works, geotechnical ground information would be used to inform the design of temporary works and inform the risk of unstable ground being encountered, if necessary, the Principal Contractor would undertake addition GI to inform temporary works and construction activities.

10.1.4 Archaeology/Heritage

As a minimum the developer/contractor would undertake a preliminary Archaeological assessment to determine if any further works are required. Depending on findings further intrusive investigations may be required.

10.1.5 Ecology

Prior to the commencement of works at the proposed development, preconstruction habitat and protected/ notable species surveys would be required to inform appropriate management and protection plans. Additional surveys for protected species will be undertaken by a suitably qualified Ecologist in tune with the locations and programme of works. Survey outcomes will inform the designers/engineers in selecting appropriate working methods.

11.0 Reinstatement

During construction of the infrastructure elements (detailed in Section 9), the vegetated layer will be stripped over the area of the excavation and stored locally with the growing side up. The remaining organic topsoil and subsoils will be excavated down to formation level, or a suitable stratum, and again will be stored local to the point of excavation but shall remain segregated to avoid mixing of materials.

For all reinstated areas, immediate aftercare provision would include an inspection of reinstated areas after completion of the reinstatement work at each location. In addition, the operator would make regular maintenance visits to the site and would visually monitor the success of re-vegetation.

Erosion processes on embankments and cuttings would be mitigated by appropriate design, including suitable gradients and stabilization measures, which would also enable effective regeneration of vegetation or establishment of areas which are reseeded. Sediment traps would be required in the early years following construction until natural regeneration is / reseeding areas are established. Should significant erosion or sedimentation, which is not expected, take place at any location it would be addressed by re-grading. Any disturbed ground situated along the edges of tracks would be reinstated to match adjoining ground as soon as practicable to avoid unsightly scarring of the landscape, particularly along the main access track.

Reinstatement would be undertaken either by re-use of onsite vegetation and soil using turf/ clodding methods, by natural regeneration, or by reseeding with appropriate species, which may include heather in moorland areas. Proposed methods would be finally agreed and confirmed with CnES/NatureScot following appointment of the Principal Contractor. If seeding is required, this would be via cutting and strewing of heather brash or via the use of treated heather seeds only.

The progression of vegetation recovery and survival on restored areas would be monitored to ensure satisfactory development and to allow early identification of any remedial measures required, in accordance with the associated Habitat Management Plan.

12.0 References

12.1 Reference Documents

Table 12-1: Reference Documents

Doc Ref	Reference Documents
1	Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors, CIRIA, 532, 2001
2	Non-Statutory Guidance for Site Waste Management Plans, April 2008.
3	Prevention of Pollution from Civil Engineering Contracts: Special Requirements, Version 2 June 2006
4	Prevention of Pollution from Civil Engineering Contracts: Guidelines for the Special Requirements, Version 2 June 2006
5	Guidance for Pollution Prevention (GPPs) http://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/
6	PPG1 Understanding your environmental responsibilities – good environmental practices: PPG 1, July 2013
7	GPP2 Above Ground Oil Storage Tanks: GPP 2, January 2018
8	PPG3 Use and design of oil separators in surface water drainage systems: PPG 3, April 2006
9	GPP4 Treatment and disposal of wastewater where there is no connection to the public sewer: GPP 4, November 2017
10	GPP5 Works and maintenance in or near water: GPP 5, January 2017
11	PPG6 Working at Construction and Demolition Sites: PPG6, 2012
12	PPG7 Safe Storage – The safe operation of refuelling facilities: PPG 7, July 2011
13	GPP 8 Safe storage and disposal of used oils: GPP 8, July 2017
14	GPP21 Pollution incident response planning: GPP 21, July 2017
15	PPG26 Safe Storage – drums and intermediate bulk containers: PPG 26, March 2011
16	Technical Flood Risk Guidance for stakeholders (section 4.3) [SEPA, 24/4/11].

Annex 01: Silt Management Techniques

SEI Technical Appendix 3.1: Outline Construction Environmental Management Plan (CEMP)

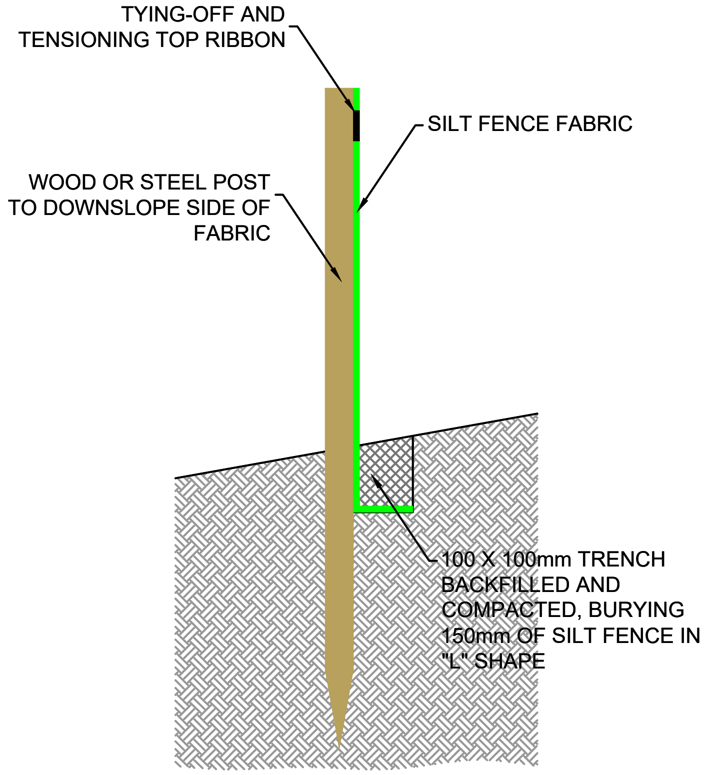
Uisenis Wind Farm

Uisenis Power Limited

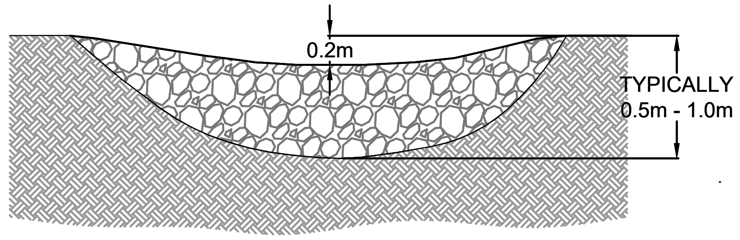
SLR Project No.: 428.013221.00001

4 June 2024

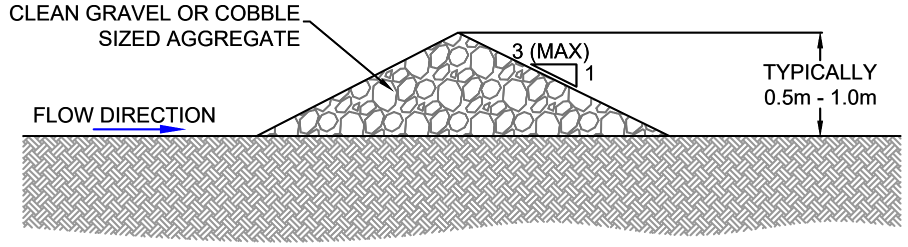
EXAMPLE OF INSTALLED SILT FENCING



TYPICAL SILT FENCE DETAIL



IN CHANNEL ROCK CHECK DAM ELEVATION



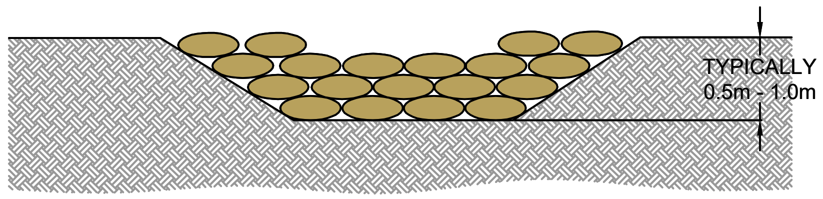
IN CHANNEL ROCK CHECK DAM SECTION

STRAW BALE TEMPORARY SILT TRAP

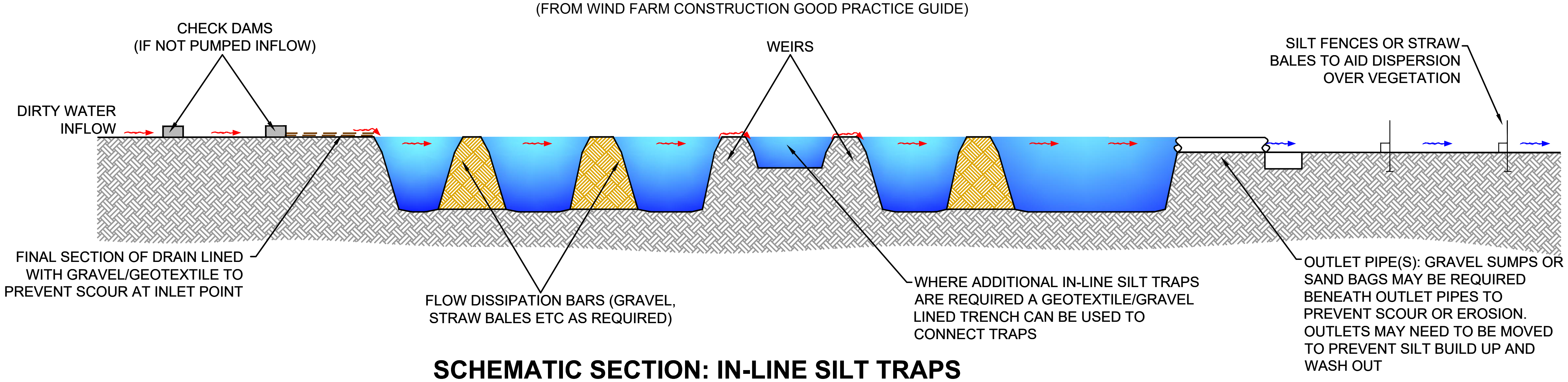
(FROM WIND FARM CONSTRUCTION GOOD PRACTICE GUIDE)

EXAMPLE OF CONSTRUCTED IN-LINE SILT TRAPS

(FROM WIND FARM CONSTRUCTION GOOD PRACTICE GUIDE)



IN CHANNEL SAND BAG CHECK DAM SECTION



SCHEMATIC SECTION: IN-LINE SILT TRAPS

NOTES

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UISENIS WIND FARM

CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP)

SILT MANAGEMENT TECHNIQUES

ANNEX 1

Scale	Date
N.T.S. @ A3	AUGUST 2023

405.V64341.00001.APP-2.0_Silt Management Techniques.dwg

Annex 02: Track Drainage Techniques

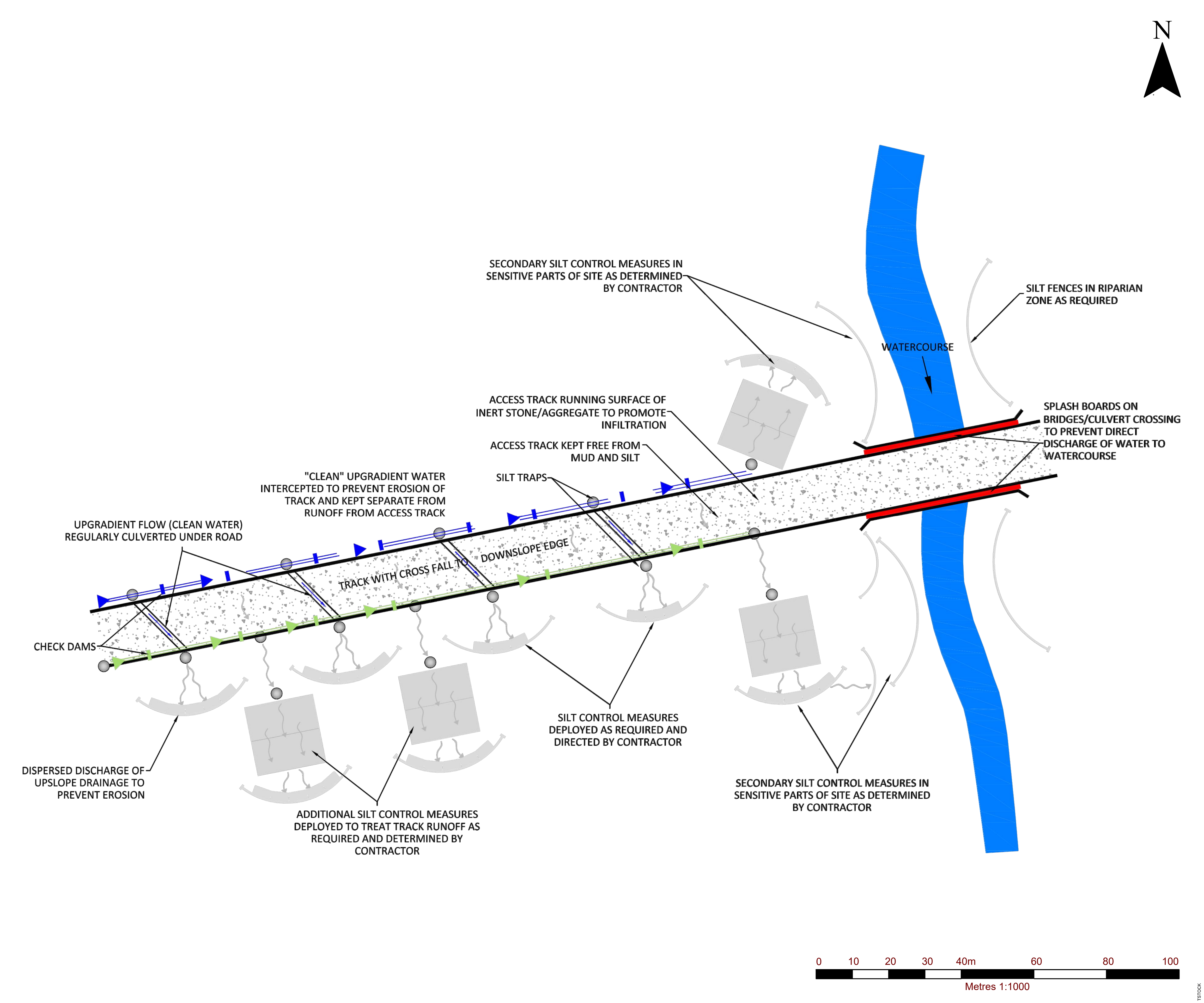
SEI Technical Appendix 3.1: Outline Construction Environmental Management Plan (CEMP)

Uisenis Wind Farm

Uisenis Power Limited

SLR Project No.: 428.013221.00001

4 June 2024



NOTES

LEGEND

	SILTY WATER
	CLEAN WATER
	SILT TRAP WITH AGGREGATE OR SAND BAG SURROUND (OR SIMILAR)
	SECONDARY SILT TRAP WITH SILT FENCE AND STRAW BALES (AS REQUIRED)

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UISENIS WIND FARM

CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP)

TRACK DRAINAGE TECHNIQUES

ANNEX 2

Scale: 1:1000 @ A3

Date: AUGUST 2023

405.V64341.00001.APP-1.0_Track Drainage Techniques.dwg

Annex 03: Water Course Crossing Techniques

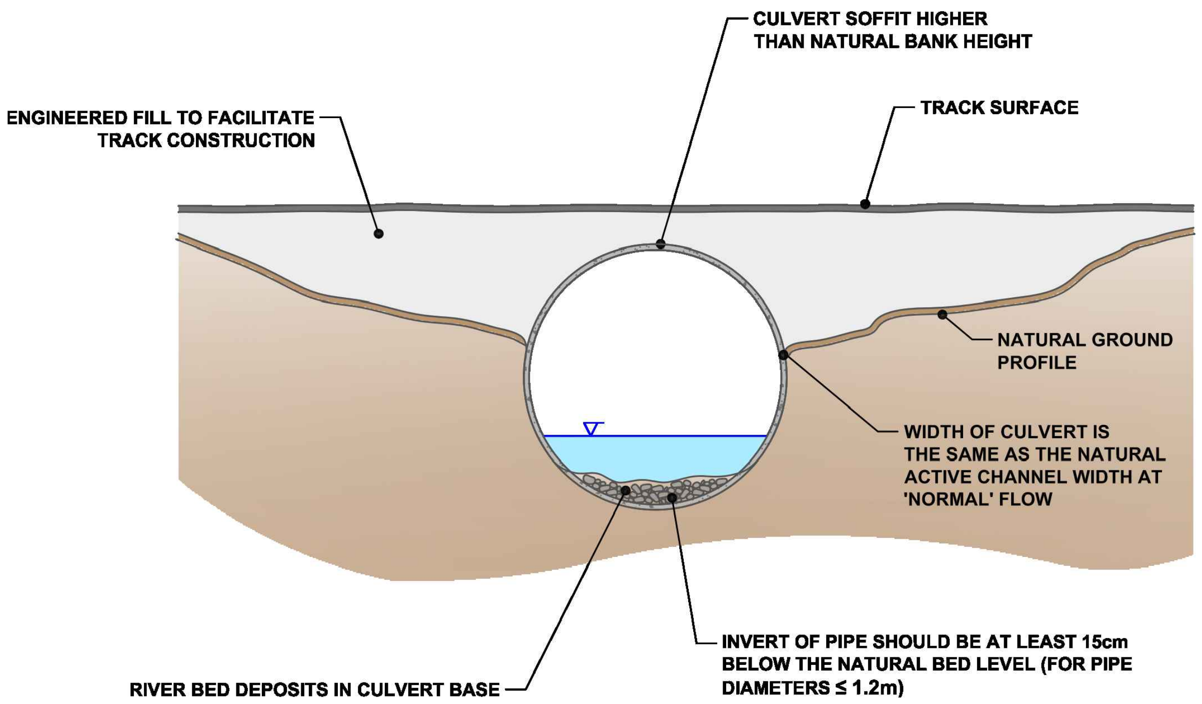
SEI Technical Appendix 3.1: Outline Construction Environmental Management Plan (CEMP)

Uisenis Wind Farm

Uisenis Power Limited

SLR Project No.: 428.013221.00001

4 June 2024



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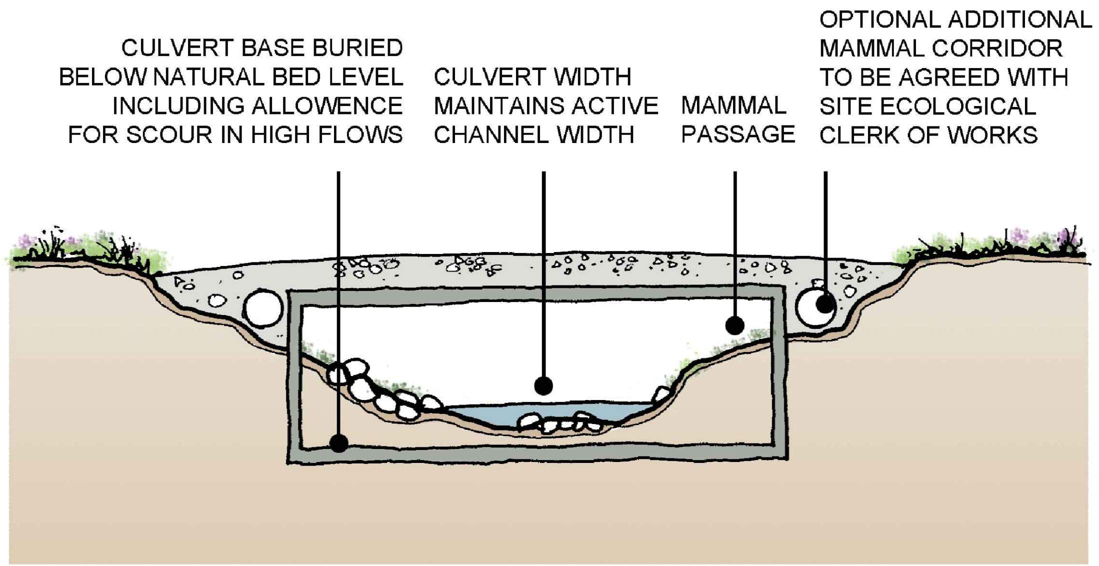
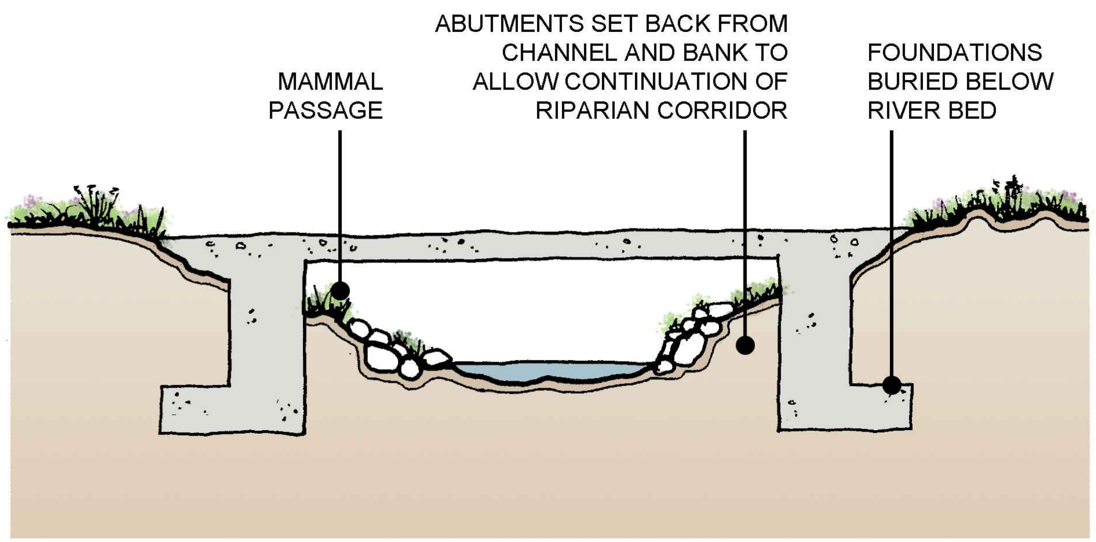
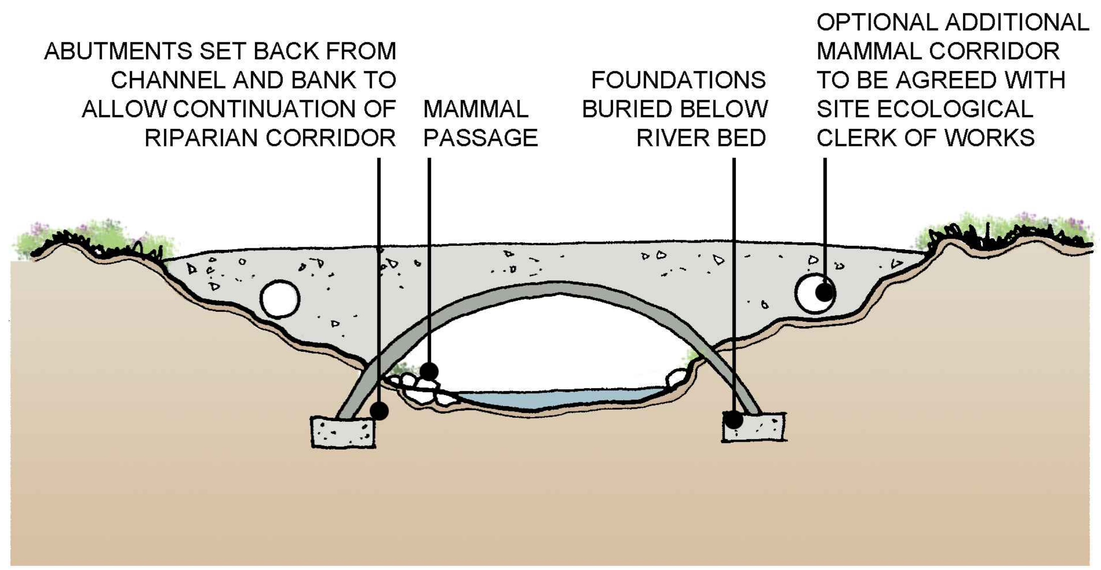


CLOSED CULVERT



TYPICAL BRIDGE



ARCH CULVERT

NOTES

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UISENIS WIND FARM

CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP)

WATER COURSE CROSSING TECHNIQUES

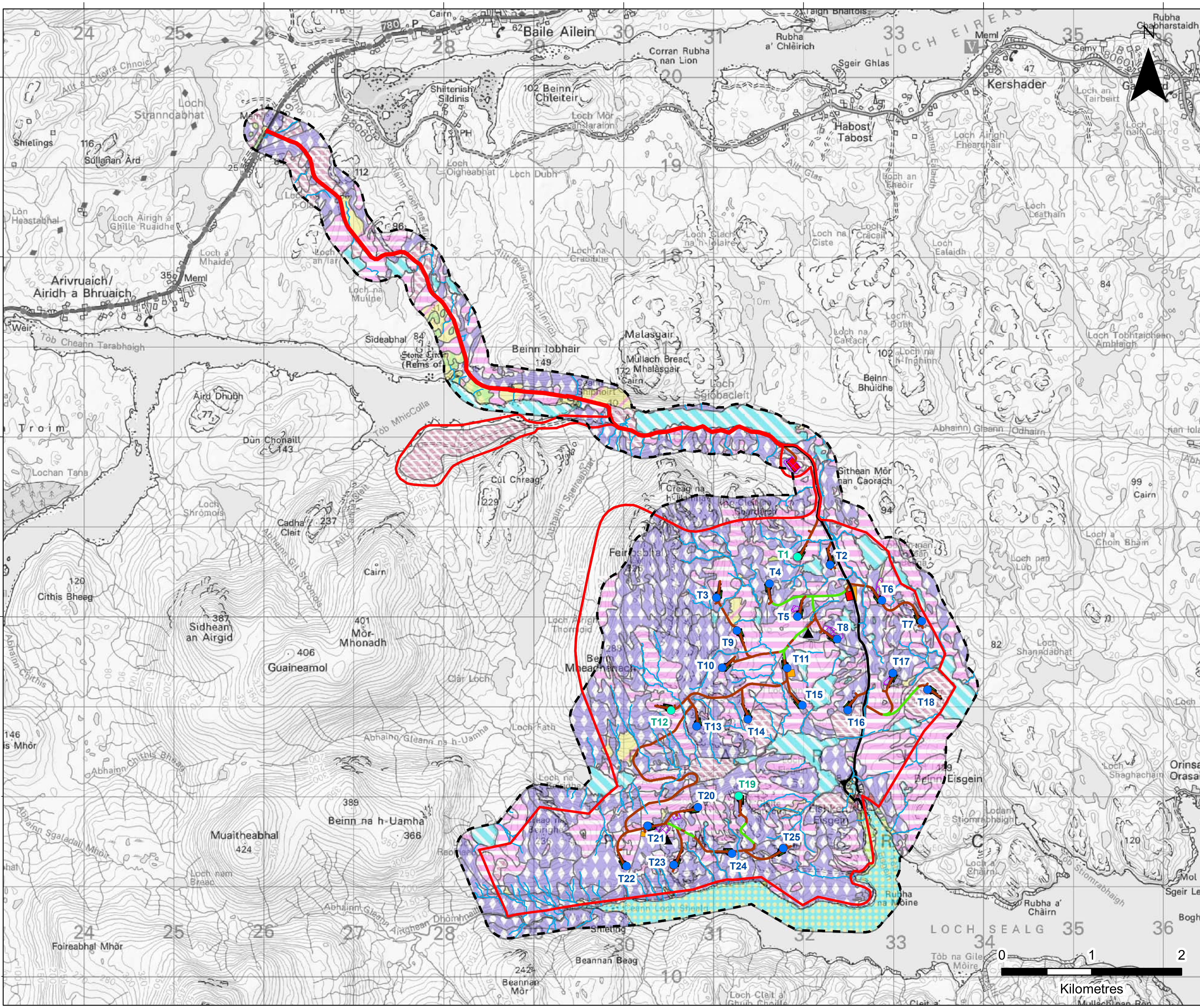
ANNEX 3

Scale	Date
N.T.S. @ A3	AUGUST 2023

TSTOCK

405.V64341.00001.APP-3.0_Water Course Crossing Techniques.dwg

Making Sustainability Happen



LEGEND

- Application Boundary
- Proposed Turbine Location (180 m Blade Tip Height)
- Proposed Turbine Location (200 m Blade Tip Height)
- Proposed Permanent Met Mast
- Proposed Bespoke Hardstanding Envelope
- Proposed Permanent Substation
- Proposed Permanent Hardstanding
- Proposed Temporary Hardstanding
- Proposed Temporary Bridge Alignment
- Proposed Temporary Construction Compound
- Proposed Clearance Area
- Potential Borrow Pit
- Proposed Access Track / Turning Head
- Proposed Floating Access Track
- Existing Road (To Be Upgraded)
- Survey Area 250 m Buffer
- Watercourse

UKHabitat Classification Legend shown on SEI Figure 8.2i.

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UISENIS WIND FARM - SEI

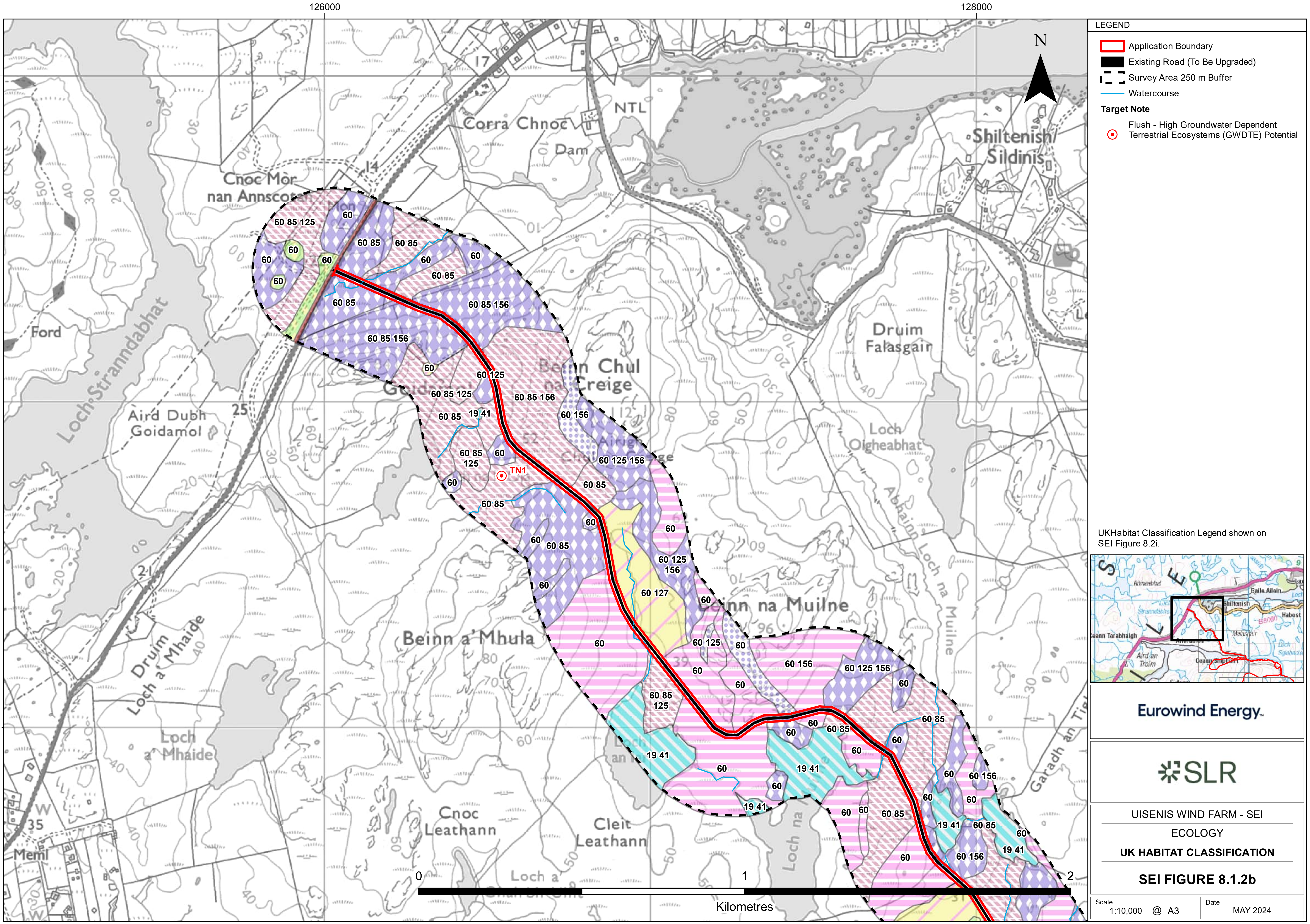
ECOLOGY

UK HABITAT CLASSIFICATION

SEI FIGURE 8.1.2a

Scale	Date
1:40,000 @ A3	MAY 2024

406.00004.00001.0204.1 UK Habitat Classification0


LEGEND
Application Boundary
Existing Road (To Be Upgraded)
Survey Area 250 m Buffer
Watercourse
Target Note
Flush - High Groundwater Dependent Terrestrial Ecosystems (GWDTE) Potential
UKHabitat Classification Legend shown on SEI Figure 8.2i.
Eurowind Energy
SLR
UISENIS WIND FARM - SEI
ECOLOGY
UK HABITAT CLASSIFICATION
SEI FIGURE 8.1.2b
Scale 1:10,000 @ A3
Date MAY 2024
Kilometres
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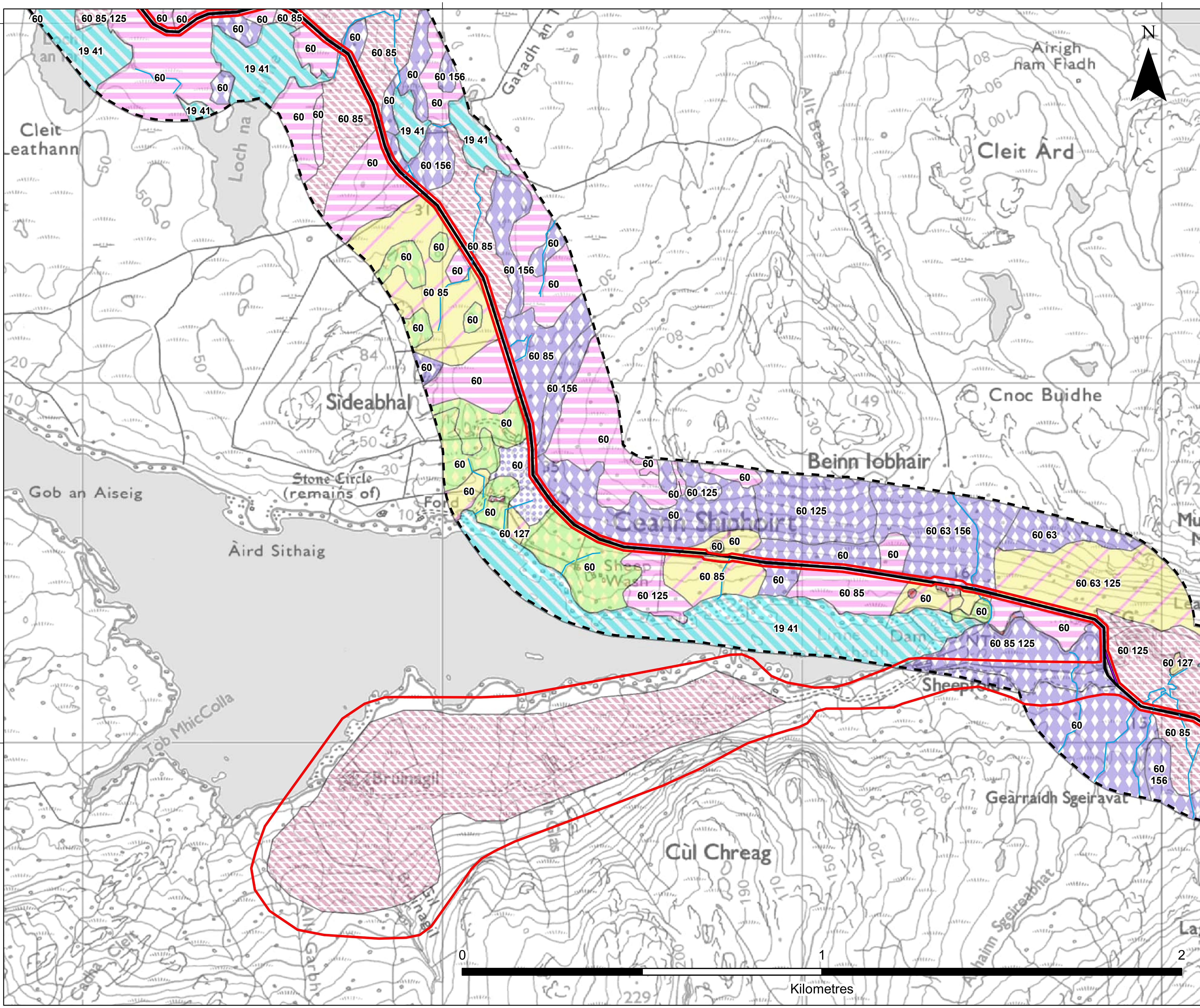
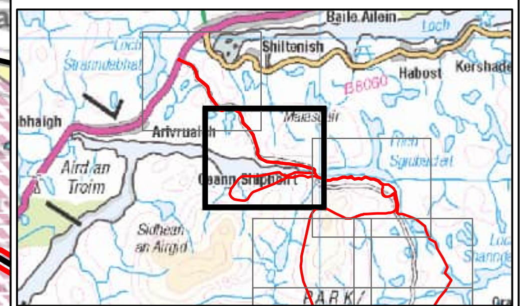


LEGEND

- Application Boundary
- Proposed Temporary Bridge Alignment
- Existing Road (To Be Upgraded)
- Survey Area 250 m Buffer
- Watercourse

UKHabitat Classification Legend shown on SEI Figure 8.2i.



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UISENIS WIND FARM - SEI

ECOLOGY

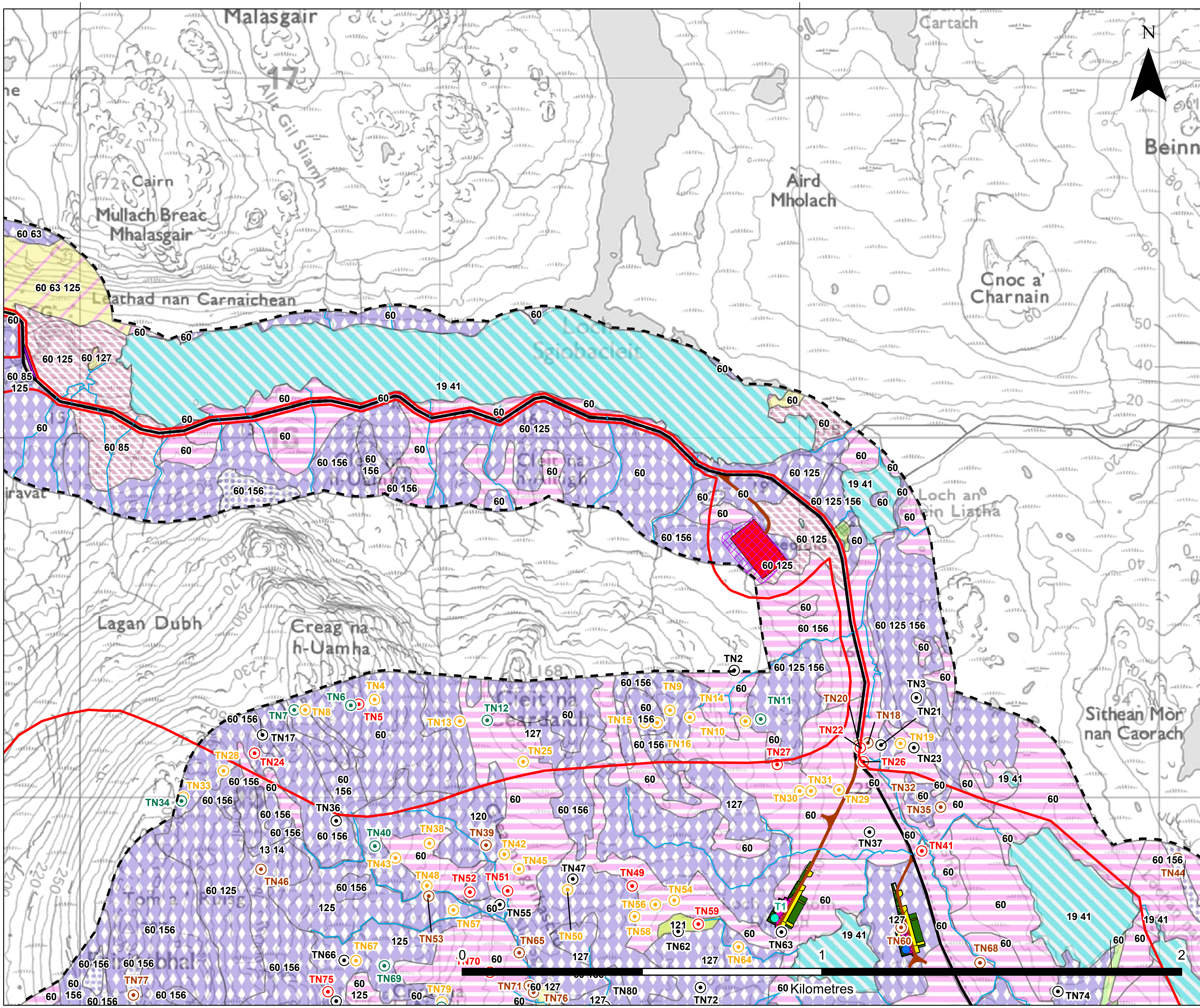
UK HABITAT CLASSIFICATION

SEI FIGURE 8.1.2c

Scale	Date
1:10,000 @ A3	MAY 2024

406.00004.00001.0204.1 UK Habitat Classification

130000 132000



406.000004.00001.0204.1 UK Habitat Classification0

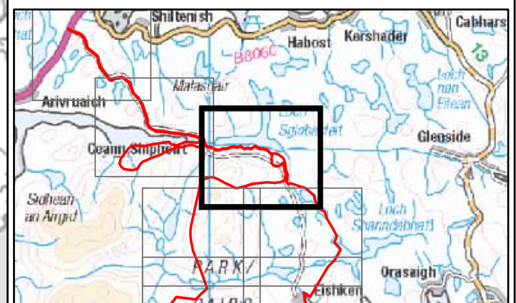
LEGEND

- Application Boundary
- Proposed Turbine Location (180 m Blade Tip Height)
- Proposed Turbine Location (200 m Blade Tip Height)
- Proposed Bespoke Hardstanding Envelope
- Proposed Permanent Substation
- Proposed Permanent Hardstanding
- Proposed Temporary Hardstanding
- Proposed Temporary Bridge Alignment
- Proposed Clearance Area
- Potential Borrow Pit
- Proposed Access Track / Turning Head
- Existing Road (To Be Upgraded)
- Survey Area 250 m Buffer
- Watercourse

Target Note

- Flush - High Groundwater Dependent Terrestrial Ecosystems (GWDTE) Potential
- Flush - Moderate Groundwater Dependent Terrestrial Ecosystems (GWDTE) Potential
- Bog Pool
- Erosion
- Small Habitat Patch

UKHabitat Classification Legend shown on SEI Figure 8.2i.



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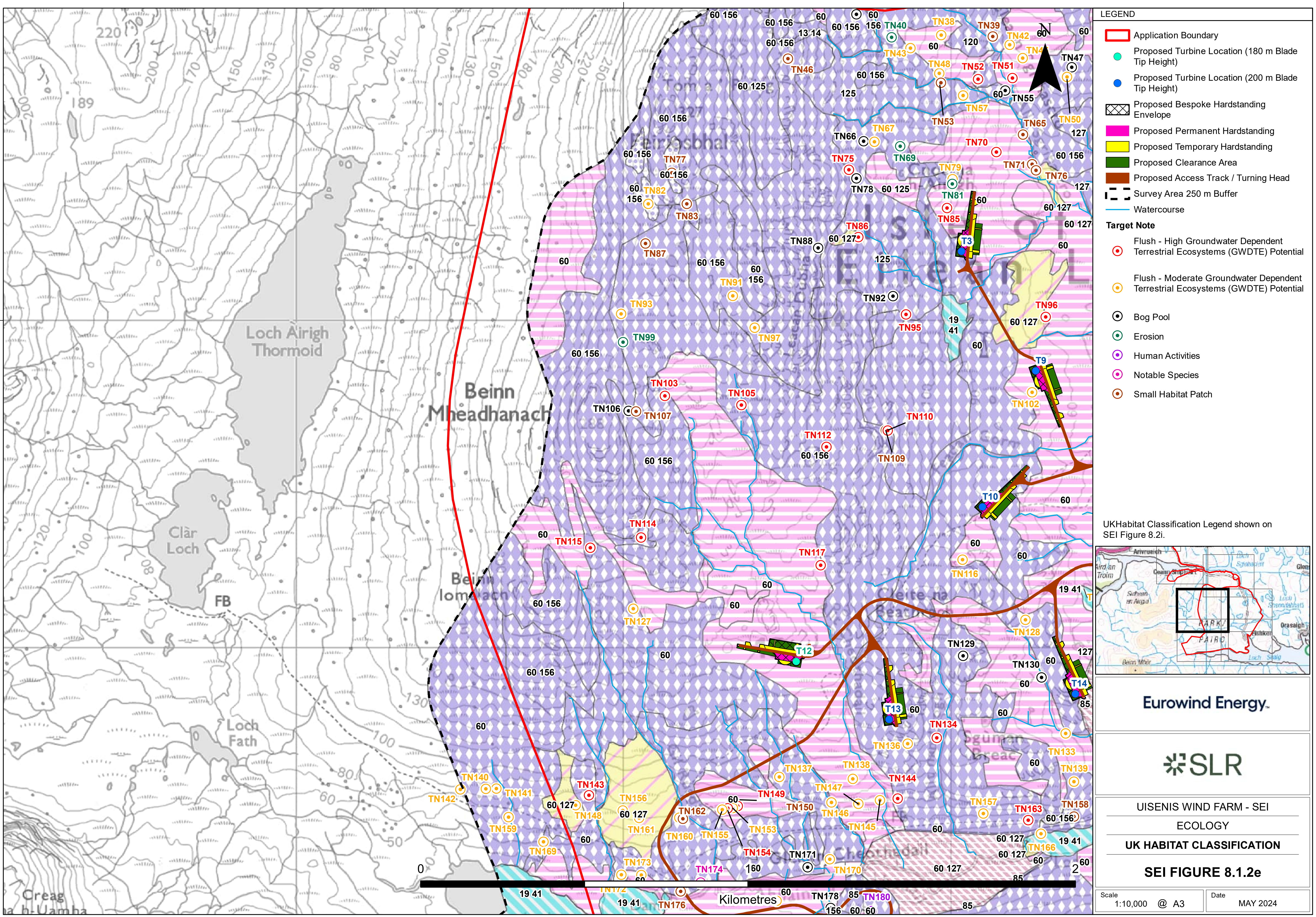
UISENIS WIND FARM - SEI

ECOLOGY

UK HABITAT CLASSIFICATION

SEI FIGURE 8.1.2d

Scale	Date
1:10,000 @ A3	MAY 2024



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UISENIS WIND FARM - SEI

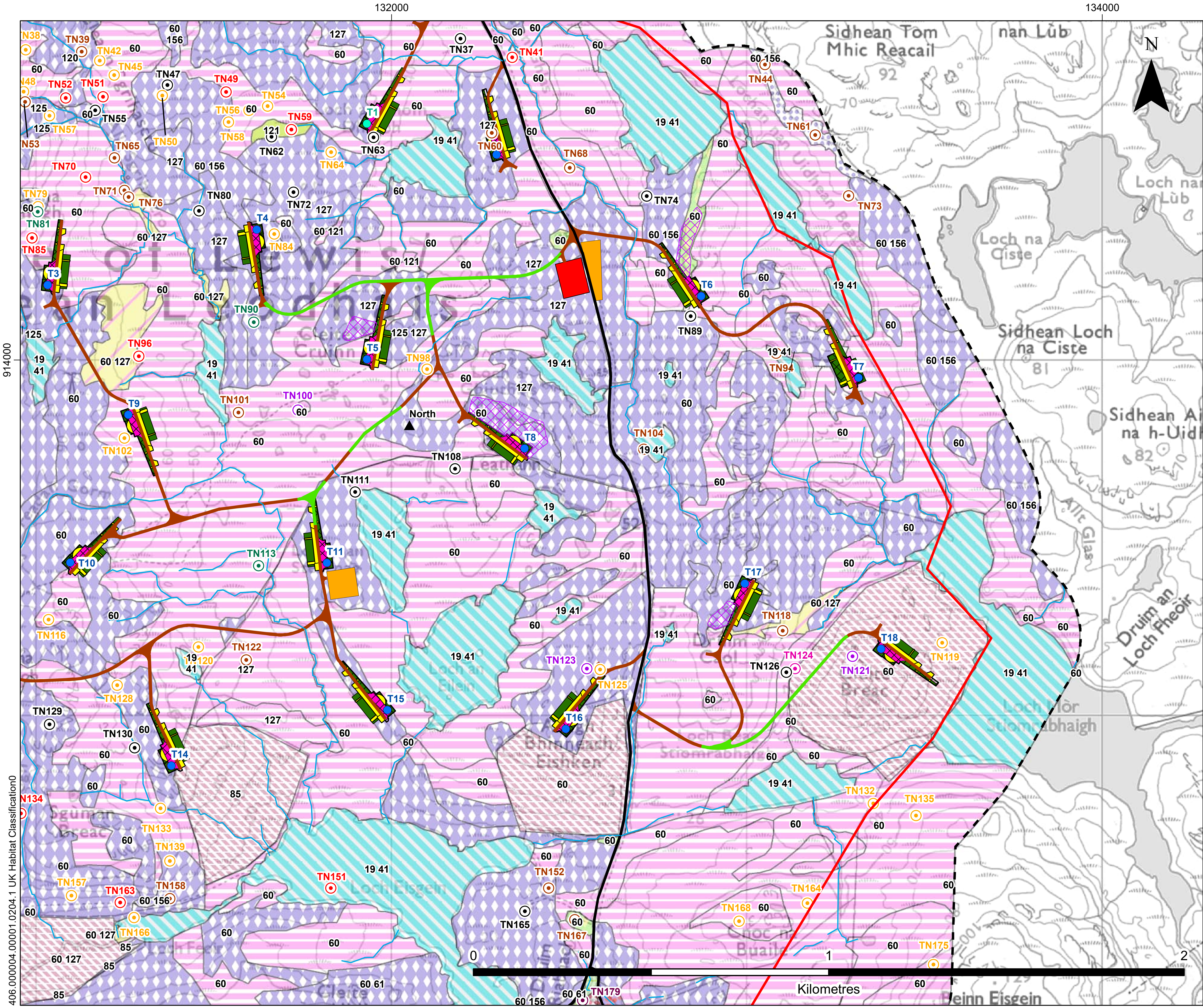
ECOLOGY

UK HABITAT CLASSIFICATION

SEI FIGURE 8.1.2e

Scale 1:10,000 @ A3

Date MAY 2024



LEGEND

- Application Boundary
- Proposed Turbine Location (180 m Blade Tip Height)
- Proposed Turbine Location (200 m Blade Tip Height)
- Proposed Permanent Met Mast
- Proposed Bespoke Hardstanding Envelope
- Proposed Permanent Substation
- Proposed Permanent Hardstanding
- Proposed Temporary Hardstanding
- Proposed Temporary Construction Compound
- Proposed Clearance Area
- Potential Borrow Pit
- Proposed Access Track / Turning Head
- Proposed Floating Access Track
- Existing Road (To Be Upgraded)
- Survey Area 250 m Buffer
- Watercourse

Target Note

- Flush - High Groundwater Dependent Terrestrial Ecosystems (GWDTE) Potential
- Flush - Moderate Groundwater Dependent Terrestrial Ecosystems (GWDTE) Potential
- Bog Pool
- Erosion
- Human Activities
- Invasive Species
- Notable Species
- Small Habitat Patch

UKHabitat Classification Legend shown on SEI Figure 8.2i.

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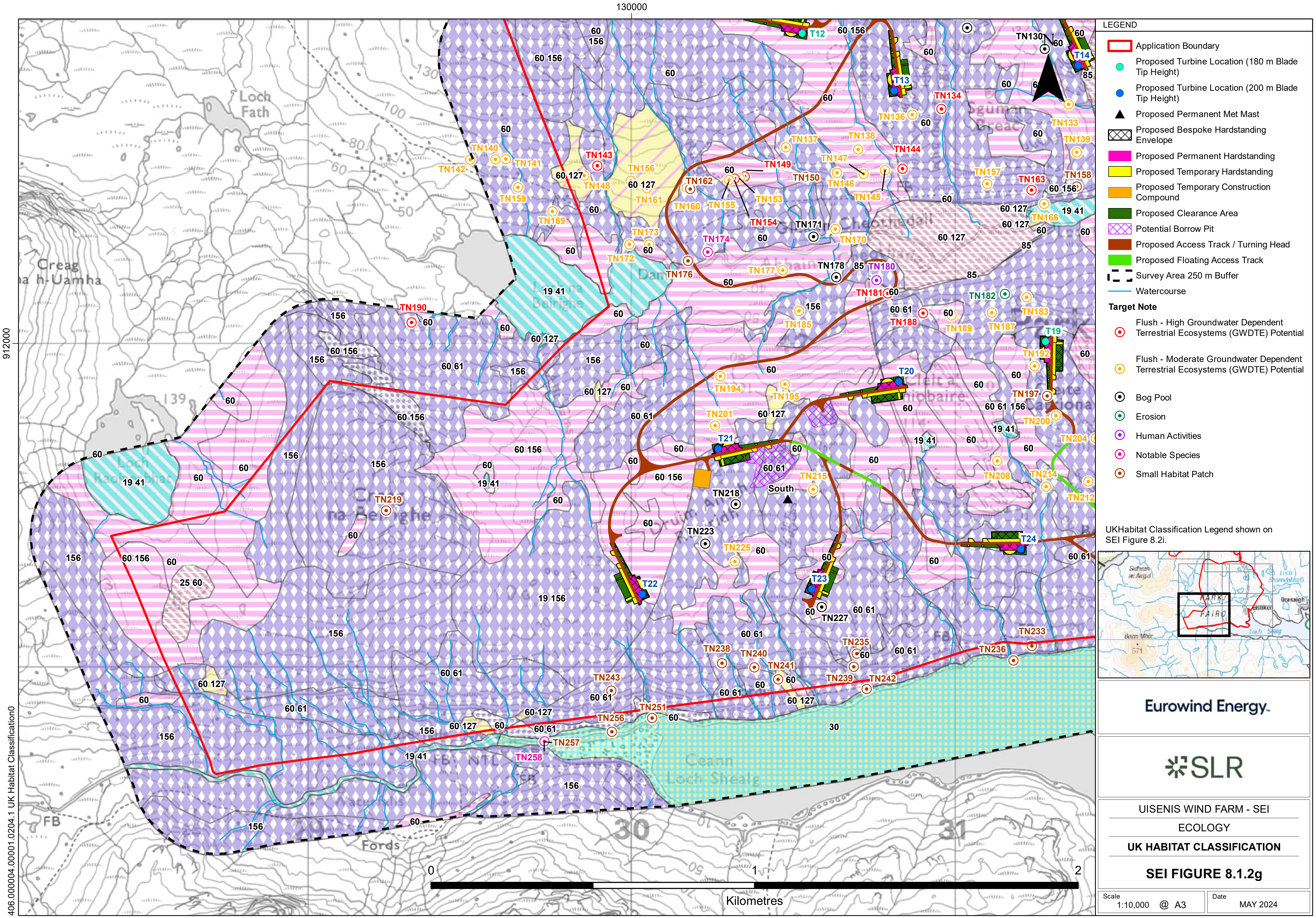
UISENIS WIND FARM - SEI

ECOLOGY

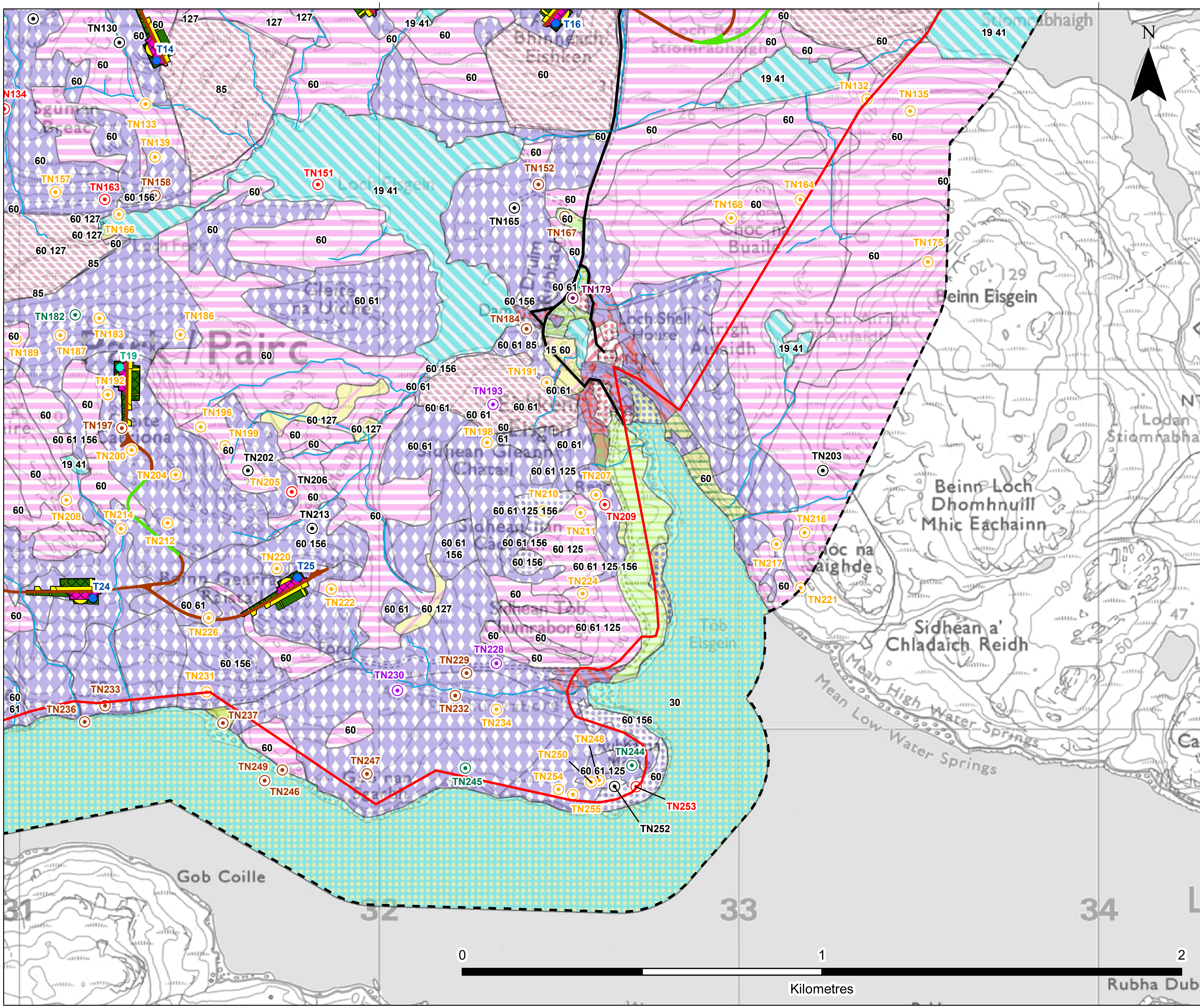
UK HABITAT CLASSIFICATION

SEI FIGURE 8.1.2f

Scale	Date
1:10,000 @ A3	MAY 2024



Contains Ordnance Survey data © Crown copyright and database rights (2024) 0100031673.



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UISENIS WIND FARM - SEI

ECOLOGY

UK HABITAT CLASSIFICATION

SEI FIGURE 8.1.2h

Scale 1:10,000 @ A3

Date MAY 2024

406.00004.00001.0204.1 UK Habitat Classification0

LEGEND

LEGEND

UK Habitat Classification

- f1a5 - Blanket Bog (H7130)
- f1a6 - Degraded Blanket Bog
- f2b - Purple Moor Grass and Rush Pastures
- f2c - Upland Flushes, Fens and Swamps
- g1b5 - Montane Acid Grasslands (H6150)
- g3c - Other Neutral Grassland
- h1b5 - Dry Heaths, Upland (H4030)
- h1b6 - Wet Heathland with Cross-Leaved Heath, Upland (H4010)
- h3e - Gorse Scrub
- h3g - Rhododendron Scrub
- h3h - Mixed Scrub
- r1c - Oligotrophic and Dystrophic Lakes
- r2b - Other Rivers and Streams
- t2h - Beach
- u1 - Built-Up Areas and Gardens
- u1b5 - Buildings
- u1e - Built Linear Features
- w1h5 - Other Woodland; Mixed; Mainly Broadleaved
- w2c - Other Coniferous Woodland

Secondary Habitats
13 - Scattered Dwarf Shrubs
14 - Scattered Rushes
19 - Ponds (Priority Habitat)
41 - Freshwater - Natural
60 - Sheep Grazed
63 - Burnt
85 - Cutover Peat
120 - Wet
121 - Waterlogged
125 - Soil Erosion
127 - Peat
156 - Rock Outcrop

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UISENIS WIND FARM - SEI

ECOLOGY

UK HABITAT CLASSIFICATION

SEI FIGURE 8.1.2i

Scale	Date
	MAY 2024

406.000004.00001.0205.0 UK Habitat Classification Legend

SEI Technical Appendix 8.5

Outline Habitat Management Plan

Uisenis Power Ltd.

58 Morrison Street, Edinburgh, Scotland, EH3 8BP

Prepared by:

SLR Consulting Limited

No. 50 Stirling Business Centre, Wellgreen, Stirling,
FK8 2DZ

SLR Project No.: 428.013221.00001

18 June 2024

Revision: 01

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
01	18 June 2024	KH	ST	AS

Basis of Report

This document has been prepared by SLR Consulting Limited (SLR) with reasonable skill, care and diligence, and taking account of the timescales and resources devoted to it by agreement with Uisenis Power Ltd. (the Client) as part or all of the services it has been appointed by the Client to carry out. It is subject to the terms and conditions of that appointment.

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Table of Contents

Tables in Text

Figures in Text

Annexes

1.0 Introduction

SLR Consulting Ltd (SLR) was commissioned by Uisenis Power Ltd ('the applicant') to produce an Outline Habitat Management Plan (OHMP) for the proposed Uisenis Wind Farm (proposed development), situated on the Isle of Lewis, Outer Hebrides, to accompany the Environmental Impact Assessment (EIA) Report for the proposed development. Following post submission requests from consultees (NatureScot, SEPA and RSPB) that additional peat habitat restoration be proposed, the OHMP submitted as part of the 2023 EIA Report has been updated. This Technical Appendix is the updated and consolidated OHMP, the Supplementary Environmental Information (SEI) OHMP.

1.1 Site Description

'The Site' refers to all land within the application boundary, **SEI Figure 8.5.1**. Habitat loss calculations referenced in this Technical Appendix include all infrastructure, including habitat lost when widening the existing public road.

The Site is situated approximately 20km south east of Stornoway and lies within the administrative boundary of Comhairle nan Eilean Siar (CnES), Western Isles Council. The Site is positioned in the north of the Park (Pairc) peninsula. The peninsula is defined by two long and narrow sea lochs, Loch Erisort (Eireasort) to the north, and Loch Seaforth (Shiophoirt) to the south, the latter forming part of the boundary between Lewis and Harris.

The topography of the Site is undulating, ranging from approximately 10 metres (m) Above Ordnance Datum (AOD) at the shore of Loch Sealg, to approximately 270m AOD in the north west. The Site is characterised primarily by blanket mire and heath habitat, with small stands of acid grassland and linear flush habitat also recorded throughout. Multiple lochs are scattered throughout the Site, connected by a series of watercourses. The largest connected loch is Loch Eisgein, connecting with Loch Feoir and Loch na Beirighe to the west of the Site via the Abhainn Cheothadail. Much of the Site is open and exposed, with the only recorded areas of woodland around Eishken Lodge.

1.2 Details of the Proposed Development

The proposed development consists of up to 25 wind turbines (comprising 22 turbines at 200m to blade tip; and three turbines at 180m to blade tip) and associated infrastructure with a total installed capacity of approximately 165MW. The proposed development represents a re-design of the consented 45 turbines of Muaitheabhal Wind Farm, including its south and east extensions (ECU references: E00005222, EC00005223, EC00002096).

1.3 Purpose and Scope of this Report

This OHMP outlines proposed habitat restoration and management measures in relation to the proposed development, which would remain in place for the lifetime of the scheme. It details the habitat management and monitoring that is proposed to compensate for the direct and indirect loss of sensitive natural/semi-natural habitats, notably blanket bog and wet heath, as a result of construction of the wind farm and to provide biodiversity enhancements, in accordance with planning policy requirements.

The OHMP is intended as a precursor to a more detailed Habitat Management Plan (HMP), which would be produced and agreed with CnES prior to the commencement of construction.

1.4 Evidence of Technical Competence and Experience

The OHMP has been written by Dr Kirstie Hazelwood, Senior Ecologist at SLR Consulting Ltd with support from Hannah Rowding, Senior Ecologist at SLR Consulting Ltd.

Kirstie Hazelwood, MSc, PhD, ACIEEM

Kirstie is a Senior Ecologist with nine years' experience in ecology, within consultancy, NGOs and research. She is an associate member of the Chartered Institute for Ecology and Environmental Management (CIEEM) and holds a PhD in tree community ecology. She has worked on over 30 upland and lowland sites in Scotland including numerous large development sites. She has trained in the recently developed UK Habitat Classification (UKHab) methods and has carried out extensive National Vegetation Classification (NVC) and habitat assessment work. She has a particular interest in plant communities, habitat quality monitoring and habitat restoration.

Hannah Rowding

Hannah is a Senior Ecologist with seven years' experience in ecological consultancy. She is an Associate member of CIEEM and holds a MSc in Environmental Protection and Management. As an experienced field surveyor, Hannah has worked on a range of upland sites throughout Scotland and maintains proficiency in habitat and vegetation surveys (including Phase 1 habitat survey, UKHab and NVC). Hannah is also adept in ecological data management and analysis and communicating key information through technical reporting.

2.0 Methodology

This OHMP has been prepared with reference to relevant HMP and peatland restoration guidance (NatureScot, 2016; Gilbert & Anderson, 1998) including the International standards for Habitat Restoration (Society for Ecological Restoration, 2019).

The aim of the OHMP is to establish the key objectives and principles by which parts of the Site would be restored and managed to the benefit of biodiversity, which would then form the basis for the more detailed HMP, post consent. It is not the intention for this document to provide full details of proposed management, many of which cannot be determined fully at this stage.

2.1 Hierarchy of Terms for Restoration Planning

The following terms (Society for Ecological Restoration, 2019), have been used to structure this OHMP:

- the **Scope** is the broad geographic or thematic focus of the project;
- the **Vision** is a general summary of the desired condition one is trying to achieve through the work of the project;
- the **Targets** identify the native ecosystems to be restored at the Site as informed by the reference model, along with any social outcomes or constraints expected of the project;
- **Goals** are formal statements of the medium to long-term desired ecological or social condition, including the level of recovery sought. Goals must be clearly linked to targets, measurable, time-limited, and specific; and
- **Objectives** are formal statements of the interim outcomes along the trajectory of recovery. Objectives must be clearly linked to targets and goals, and be measurable, time-limited, and specific.

2.2 Baseline Data Collection

This OHMP has been informed by baseline data collected for the Ecology desk-study and habitat and mammal surveys, carried out as part of the EIA. More detail on these is provided below and in the relevant Chapters and Technical Appendices to the EIA Report and SEI including:

- **Technical Appendix 8.1: UK Habitat Classification (UKHab) and National Vegetation Classification (NVC) Report**;
- **Technical Appendix 8.2: Otter Survey Report**;
- **Technical Appendix 8.3: Bat Survey Report**;
- **Technical Appendix 8.4: Fish Habitat Survey Report**;
- **Technical Appendix 8.6: Fish Population Assessment;**
- **Technical Appendix 8.7: Fresh Water Pearl Mussell Report;**
- **Chapter 8: Ecology**;
- **SEI Chapter 8: Ecology**;
- **Chapter 9: Ornithology**; and
- **SEI Chapter 9: Ornithology**.

2.2.1 Desk Study

Sources of desk study data included:

- Land Use Consultants (2004). *Muaitheabhal Wind Farm: Environmental Statement (ES)*;

- Land Use Consultants (2006). *Muaitheabhal Wind Farm: Supplementary Environmental Information (SEI)*;
- Land Use Consultants (2009). *Muaitheabhal Wind Farm: SEI*;
- Land Use Consultants (2011). *Muaitheabhal Wind Farm East Extension: ES;*
- Land Use Consultants (2011). *Muaitheabhal Wind Farm East Extension: SEI;*
- Land Use Consultants (2013). *Muaitheabhal Wind Farm South Extension: ES;*
- Protected and notable species records from the Outer Hebrides Biological Recording Group (OHBR);
- Multi-Agency Geographic Information for the Countryside (MAGIC): Information relating to statutory designated nature conservation; and
- Scotland's Carbon and Peatland Map (Scottish Government, 2016).

2.2.2 Field Surveys

Protected Mammal Surveys

Protected mammal surveys were undertaken for all areas within 250m of all proposed Site infrastructure. Surveys were carried out between June and November 2022. A bat transect survey was conducted in July 2022 and further surveys using static detectors were carried out in August 2022.

Surveys focused on habitats most likely to support protected mammals (specifically otter *Lutra lutra* and bat species), including riparian corridors, waterbodies, buildings and woodland or scrub areas. Surveys followed standard guidance as detailed in the **Technical Appendix 8.2: Otter Survey Report** and the **Technical Appendix 8.3: Bat Survey Report**. Incidental field signs relating to other protected or notable species were also recorded as target notes.

Fish Habitat Surveys

Fish habitat surveys were conducted from 31 October 2022 to 01 November 2022 by Gavia Environmental and the Outer Hebrides Fisheries Trust (OHFT). The study incorporated five survey locations on watercourses within the Site and one survey location just outside the Site boundary in the watercourse that flows into Loch Sealg. Methods developed by the Scottish Fisheries Coordination Centre (Scottish Fisheries Co-ordination Centre, 2007) were adopted. During the field survey each watercourse and surrounding habitats were characterised. For more detail, see **Technical Appendix 8.4: Fish Habitat Survey Report, Technical Appendix 8.6: Fish Population Assessment** and **SEI Technical Appendix 8.7: Freshwater Pearl Mussel Survey Report.**

Habitat and Vegetation Surveys

The vegetation and habitat survey area included all land within 250m of all proposed infrastructure, and the minor road running from the A859 to the Eishken Lodge (Eishken Road) was surveyed to a 100m buffer, in accordance with SEPA guidance on groundwater dependent terrestrial ecosystems (GWDTEs) (SEPA, 2017). Surveys were carried out between 20 and 23 June 2022, 04 and 08 July 2022, and 08 and 14 November 2022. The OHMP areas are within the Turbine Developable Area and the access track area is now shown in **SEI Figure 8.5.1**.

Surveys included UK Habitat Classification (UKHab) (Butcher, Carey, Edmonds, & Treweek, 2020) and National Vegetation Classification (NVC) survey (Rodwell, 2006). These were carried out in enough detail to allow the identification of European Nature Information System (EUNIS) habitat types, habitats listed on Annex 1 of the EC Habitats Directive, and potential GWDTEs. For full details, please refer to **Technical Appendix 8.1: UKHab and NVC Report**. Peat condition on Site was recorded and are shown in **SEI Figure 8.5.2**.

Ornithology Surveys

Ornithology surveys were carried out in 2021 and 2022. Full details of the surveys can be found in **Chapter 9: Ornithology** of the EIA Report and **SEI Chapter 9: Ornithology**. The assessment focuses on the Site and appropriate study areas, based on NatureScot survey and assessment guidance (SNH 2016a; 2017; SNH 2018a,b,c) (see **Technical Appendix 9.1** for further details). Surveys included: flight activity surveys, breeding divers and greenshank surveys and breeding bird surveys. A search was undertaken for ornithological designated sites within 20km of the Site and scarce breeding birds[1] (Schedule 1, Annex I raptor species, excluding eagles) within a 2km buffer around the Site.

3.0 Baseline Data Summary

The baseline data summarised in this section focuses on information of particular relevance to the design of the OHMP. Full details can be found in the EIA Report **Chapter 8: Ecology, SEI Chapter 8: Ecology, Chapter 9: Ornithology, and SEI Chapter 9: Ornithology**, and associated technical appendices, as referenced in Section 2.0 of this report.

3.1 Survey Data

3.1.1 Designated Sites

The closest statutory designated site is the Lewis Peatland RAMSAR and SPA, located approximately 954m to the northwest of the Site at its nearest point and approximately 7.2km north west of the proposed turbines (Turbine Developable Area). The RAMSAR/SPA has been designated for supporting blanket bog, oligotrophic and dystrophic lochs, lochans and pools, wet heath, and breeding black-throated diver *Gavia arctica*, dunlin *Calidris alpina schinzii*, golden eagle *Aquila chrysaetos*, golden plover *Pluvialis apricaria*, greenshank *Tringa nebularia*, merlin *Falco columbarius* and red-throated diver *Gavia stellata*.

The Inner Hebrides and Minches Special Area of Conservation (SAC) is approximately 5.5km to the southeast of the Site at its closest point and approximately 11.5km to the south east of Turbine Developable Area. This SAC is designated for harbour porpoise and is hydrologically connected to Loch Sealg, situated adjacent to the southern boundary of the Site.

Shiant Isles SPA (underpinned by the Shiant Islands SSSI) is approximately 10.1km to the south east of the Site at its nearest point and approximately 10.8km to the south east of the Turbine Developable Area. The SPA is designated for breeding fulmar *Fulmarus glacialis*, guillemot *Uria aalge*, kittiwake *Rissa tridactyla*, puffin *Fratercula arctica*, razorbill *Alca torda*, shag *Phalacrocorax aristotelis*, breeding seabird assemblage and non-breeding Greenland barnacle goose *Branta leucopsis*.

North Harris Mountains SPA is approximately 13km to the west of the Site at its nearest point and designated for golden eagle.

West Coast of the Outer Hebrides marine SPA (mSPA) is approximately 16km to the south west of the Site at its nearest point and designated for non-breeding black-throated diver, eider *Somateria*

[1] Scarce breeding birds are those listed on Annex 1 of the EU Birds Directive or Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) and in the case of the proposed development consists of any raptor, diver, wader or owl species listed on either Annex 1 or Schedule 1.

mollissima, great northern diver *Gavia immer*, long-tailed duck *Clangula hyemalis*, red-breasted merganser *Mergus serrator*, Slavonian grebe *Podiceps auritus* and breeding red-throated diver.

3.1.2 Protected Species

Otter field signs, in the form of spraints, were identified on the shores of the larger waterbodies within the Site, including Loch Eishkein, Loch Seaforth, Loch na Muilne and Loch ab Eilein Liatha. A confirmed otter holt and otter signs, in the form of spraints, were also recorded on the banks of Loch Sealg. Some waterbodies and watercourses across the Site were considered to be of high ecological value for supporting otter. For full details, please refer to **Technical Appendix 8.2: Otter Survey Report**.

Bat activity surveys carried out in August 2022 recorded bats in flight around Eishkein Lodge. Bat presence (common pipistrelle (*Pipistrellus pipistrellus*) was confirmed (see **Technical Appendix 8.3** for full details) and bats were observed foraging around the buildings and woodland. Other than the woodland habitat around Eishken Lodge, there is limited habitat for bat roosting or foraging features within the rest of the Site.

Static bat detector surveys recorded a total of 13 bat passes of common pipistrelle over a total of 15 nights of recording during August 2022. Due to the small number of recorded passes at locations closest to Eishken Lodge during this period, it is considered likely that bat activity further away from the suitable habitat of Eishken Lodge, in similarly low value habitats is likely to be even lower. Given that the habitat present is of low suitability for bats, and the fact that the project is of 'medium' size under the BCT guidelines (2021), the Site constitutes as 'low risk' bat habitat.

3.1.3 Fish

Fish habitat quality was assessed as moderate to high in all survey locations, with the highest habitat quality recorded on the watercourse between Loch Beirighe and Loch Eishken. Salmonoid spawning potential was assessed as optimal in one location near Loch Eishken and sub-optimal or not suitable in all other locations surveyed.

European eel (*Anguilla Anguilla)*, Atlantic Salmon (*Salmo salar*) and brown/sea trout (*Salmo trutta*) have been recorded utilising the site according to surveys that were conducted to support previous applications.

Atlantic salmon and brown trout were caught at most surveys locations and one European eel **(Technical Appendix 8.4: Fish Habitat Survey Report and Technical Appendix 8.6: Fish Population Assessment).**. No fresh water pearl mussel were recorded on Site (**SEI Technical Appendix 8.7: Freshwater Pearl Mussel Survey Report)**.

3.1.4 Habitat and Vegetation Surveys

The vegetation surveys illustrated that the majority of the Site consists of bog and wet heath, with some dry heath, grassland, flush and freshwater habitats. See **Table 3-1** for details.

Table 3-1 Summary of Habitats on Site

Broad Habitat Type	UKHab Classification	NVC Community	Annex I Habitat	SBL Priority Habitat	Western Isles BAP
Grassland	g1b6 Other upland acid grassland	U4 *Festuca ovina – Agrostis capillaris – Galium saxatile* grassland	N/A	N/A	N/A
		U6 Juncus squarrosus – Festuca ovina grassland	N/A	Acid Grassland	N/A
	g3c Other neutral grassland	N/A	N/A	N/A	N/A
Woodland	w1h5 Other Woodland, Mixed; Mainly broadleaved	N/A	N/A	N/A	N/A
	w2c Other Coniferous Woodland	N/A	N/A	N/A	N/A
Heathland and scrub	h1b5 Dry heaths; upland	H9 *Calluna vulgaris – Deschampsia flexuosa* heath	H4030	Upland heathland	Upland and moorland
		H10 Calluna vulgaris – *Erica cinerea* heath			
		H12 Calluna vulgaris – *Vaccinium myrtillus* heath			
		H21 Calluna vulgaris – *Vaccinium myrtillus – Sphagnum capillifolium* heath			
	h1b6 Wet heaths; upland	M15 *Trichophorum germanicum – Erica tetralix* wet heath	H4010	Upland heathland	Upland and moorland
	h3e Gorse scrub	W23 *Ulex europeaus -Rubus fruiticosus* scrub	N/A	N/A	N/A
	h3g Rhododendron scrub	N/A	N/A	N/A	Invasive non-native species

Broad Habitat Type	UKHab Classification	NVC Community	Annex I Habitat	SBL Priority Habitat	Western Isles BAP
	h3h Mixed scrub	N/A	N/A	N/A	N/A
Wetland	f1a5 Blanket bog	M1 *Sphagnum denticulatum* bog pool community	H7130	Blanket bog	Peatland and wetland
		M2 *Sphagnum cuspidatum/fallax* bog pool community			
		M3 *Eriophorum angustifolium* bog bool community			
		M17 *Trichophorum germanicum – Eriophorum vaginatum* blanket mire	H7130	Blanket bog	Peatland and wetland
		M19 *Calluna vulgaris – Eriophorum vaginatum* blanket mire			
	f1a6 Degraded blanket bog	M15* *Trichophorum germanicum* – Erica tetralix wet heath	N/A	N/A	Peatland and wetland
Fen, marsh and swamp	f2b Purple moor grass and rush pasture	M23 *Juncus effusus/ acutiflorus – Galium palustre* rush pasture	N/A	N/A	N/A
		M25 *Molinia caerulea – Potentilla erecta* mire	N/A	N/A	N/A
	f2c Upland flushes, fens and swamps	M6 *Carex echinata – Sphagnum fallax/ denticulatum* mire	N/A	N/A	N/A
		M10 *Carex dioica – Pinguicula vulgaris* mire			
		M29 *Hypericum elodes – Potamogeton polygonifolius* soakaway			
Urban	u1b5 Buildings	N/A	N/A	N/A	N/A
	u1e Built linear features	N/A	N/A	N/A	N/A
Rivers and lakes	r1c7 Acid peat-stained lakes and ponds		3160 Natural dystrophic	Freshwater: rivers, burns and lochs	Ponds

Broad Habitat Type	UKHab Classification	NVC Community	Annex I Habitat	SBL Priority Habitat	Western Isles BAP
			lakes and ponds		
	r2a Rivers	N/A	N/A	Freshwater: rivers, burns and lochs	Rivers

3.1.5 Ornithology Surveys

Important ornithological species recorded on Site were black-throated diver, golden eagle, white-tailed eagle, merlin, greenshank, golden plover and dunlin. Predicted impacts of construction activities due to the proposed development include displacement and disruption of breeding, foraging or roosting birds as a result of noise and general disturbance over a short-term period, and temporary and permanent loss of habitat. This has the potential to impact on breeding or foraging individuals.

Predicted impacts during the operational stage of the Wind Farm are: displacement of birds around operational turbines and other infrastructure, collisions with turbines and operational lighting of turbines.

4.0 HMP Working Group and Review

Should the proposed development receive consent, a group of key stakeholders would be invited to form a HMP working group, their role would be to provide input into and comment on the detailed HMP and subsequent revisions to the HMP during the lifetime of the wind farm.

We envisage that the working group would include the following stakeholders:

- The wind farm operator and their ecologist(s);
- The landowner;
- CnES;
- SEPA;
- RSPB; and
- NatureScot.

Further details, including terms of reference for the HMP working group, would be provided in the detailed HMP, post consent.

The HMP would be reviewed and amended appropriately after five years to enable assessment of progress toward achieving goals and objectives and to inform active management.

5.0 Outline Habitat Management Plan

5.1 Vision

To enhance the extent and condition of target habitats and species within the proposed Habitat Management Areas (HMAs).

5.2 Targets

This section details the species and habitats (features) that would be the targets of the HMP. The main focus is features for which compensation is required due to potential impacts from the proposed development (e.g., habitat loss). However, consideration is also given to habitat enhancement for features with particularly high conservation value that occur on Site, especially where declines may be anticipated in the absence of the HMP, if no habitat management is undertaken. Species for which monitoring is recommended in the EIA are also included to allow for adaptive management and mitigation.

Table 5-1 includes all the target habitats and species for management and monitoring detailed in the EIA to allow for understanding of any impacts and adaptive management and mitigation. Associated objectives, outlined in **Table 5-3**, are included for reference.

Table 5-1: HMP Targets

Feature	Rationale	Management Prescriptions	Relevant Objectives (Table 5-3)
Blanket Bog	Compensation required for direct and indirect loss of blanket bog due to wind farm construction. Enhancement is also appropriate as this is an Annex 1 protected habitat (Wildlife and Countryside Act 1981) and an SBL priority habitat.	Reinstatement of peat that is disturbed during construction, ditch and drain blocking, and reduction in grazing pressure.	1.2, 2.1 and 2.2
Wet Heath	Compensation required for direct and indirect loss of wet heath due to wind farm construction. Enhancement is also appropriate as this is an Annex 1 protected habitat (Wildlife and Countryside Act 1981) and an SBL priority habitat.	Restoration of borrow pits where wet heath is damaged in the creation, reduction in grazing pressure in wet heath areas in the winter.	1.1 and 2.2
Fish	Priority fish species have been recorded on Site, with good spawning habitat for Atlantic Salmon present and enhancement is therefore appropriate. Some disturbance/displacement of fish and fish habitat is possible during wind farm construction in association with installation of watercourse crossing points and compensation is required.	Reduction in grazing pressure and broadleaf tree planting in riparian habitat. Enhancement of riparian habitat through tree planting that will reduce erosion and improve spawning and parr habitat.	2.2 and 3.1
Otter	Otter is a priority species under Highland Nature 2021- 2026 and is present on Site and enhancement is therefore appropriate. Some disturbance/displacement of otter is possible during wind farm construction in association with installation of watercourse crossing points and compensation is required.	Reduction in grazing pressure and broadleaf tree planting in riparian habitat will improve habitat and foraging for otters using the watercourses on Site.	2.2 and 3.1

Feature	Rationale	Management Prescriptions	Relevant Objectives (Table 5-3)
Eagles	Golden and white-tailed eagles are protected under Schedule 1 of the Wildlife and Countryside Act and are known to be present on Site. Some disturbance/displacement of eagles is possible during wind farm construction and operation, plus a risk of collision with turbines during wind farm operation and mitigation is therefore proposed.	Removal of carcasses and gralloch from inside the turbine area will reduce collision risk for eagle species.	2.2, 4.1 and 4.2
Raptors	Raptor species protected under Schedule 1 of the Wildlife and Countryside Act are present on Site (see Chapter 9: Ornithology for details) and habitat enhancement is therefore appropriate.	Removal of carcasses and gralloch from inside the turbine area will reduce collision risk for eagle species. Reduction in grazing pressure will improve heath and bog habitat and will thereby improve foraging opportunities for upland breeding raptors, with the increase in breeding prey species utilising the area.	2.2
Upland Waders	Breeding upland waders protected under the Annex 1 of the Wildlife and Countryside Act and listed as Birds of Conservation Concern (BoCC) are present on Site and habitat enhancement is therefore appropriate.	Reinstatement of blanket bog that is disturbed during construction, ditch and drain blocking, and reduction in grazing pressure will enhance wet heath and blanket bog habitat improving breeding conditions for waders.	1.2, 2.1 and 2.2
Divers	Breeding divers protected under Schedule 1 of the Wildlife and Countryside Act and listed as BoCC are present on Site and habitat enhancement is therefore appropriate.	Provision of nesting rafts on lochs outside the turbine area will improve breeding conditions for divers.	4.3

Size of Area to be Restored

The estimated total loss of habitat as a result of the proposed development, including direct and indirect loss, would be 87.16ha, including loss of blanket bog and wet and dry heath Annex 1 habitats (see **Table 5-2**). Restoration areas recommended in this OHMP include 89ha of blanket bog through active bog restoration methods, 611ha of wet heath through managed grazing methods and approximately 5ha of riparian tree planting.

Table 5-2: Habitat Loss Areas

UKHab	Direct Loss (ha)	Indirect Loss (ha)	Total Loss (ha)
Blanket Bog (f1a5) – Annex 1 (H7130)	10.87	24.20	35.07
Degraded Blanket Bog (f1a6)	2.40	6.48	8.88

UKHab	Direct Loss (ha)	Indirect Loss (ha)	Total Loss (ha)
Purple moor grass and rush pasture (f2b)	0.34	1.09	1.43
Upland Acid Grassland (g1b6)	0.80	0.35	1.14
Upland Dry Heath (h1b5) – Annex 1 (H4030)	0.02	0.12	0.14
Upland Wet Heath (h1b6) – Annex 1 (H4010)	25.11	15.39	40.50
Mixed woodland, mainly broadleaved (w1h5)	0.00	<0.01	<0.01
All	**39.54**	**47.63**	**87.16**

Direct Habitat Loss

Where existing habitat would be replaced by proposed infrastructure, it would be permanently lost from the Site at least for the operational lifetime of the wind farm.

Indirect and Temporary Habitat Loss (e.g. drying)

Where bog is close to proposed infrastructure it is likely that changes in hydrological conditions, in particular drainage, will lead to permanent change to the existing habitat. A precautionary approach has been taken which assumes that habitat change of this type would effectively result in the loss of the affected peatland habitats. For the purposes of habitat loss calculations, we have considered the effect to extend 10m beyond infrastructure[2]. For other habitats an allowance for temporary loss of 5m is included to allow for possible temporary loss due to damage during construction.

For the purposes of assessment, a precautionary approach has been taken which assumes that direct habitat loss (all habitats) and indirect loss of bog habitats, e.g. blanket bog and wet modified bog, represents a permanent, irreversible negative effect, although in practice some areas indirectly affected may be able to be restored, e.g. during reinstatement following construction. Temporary loss of heath habitat caused during construction, for example by vehicles driving around the construction footprint and storage of materials, is anticipated to recover following reinstatement works within five years (Gilbert & Anderson, 1998).

5.3 Goals and Objectives

The management goals and objectives of the OHMP are summarised in **Table 5-3,** with further details provided thereafter. Monitoring goals and objectives are set out in **Table 5-4**.

[2] This figure is in line with similar assessments for other projects, and although arbitrary, is considered precautionary based on experience at other sites.

Table 5-3: OHMP Management Goals and Objectives

Goal	Goal Description	Objective	Objective Description	Targets	Location	Timescales	Indicators
1	Restore habitats disturbed during construction	1.1	Restore borrow pits	Wet Heath	Borrow pits	Implementation within two years of completion of wind farm	Habitat condition monitoring: Common Standards Monitoring (CSM), (JNCC, 2004))
		1.2	Reinstate any peat that is disturbed during construction in accordance with the Peat Management Plan (SLR Consulting, 2023)	Blanket bog, upland waders and raptors	Areas of blanket bog disturbed during construction	Implementation within two years of completion of wind farm construction	Habitat condition monitoring: CSM, hydrological monitoring of the water table within blanket bog habitat
2	Enhance upland habitat condition	2.1	Carry out artificial ditch blocking and reprofiling work to encourage rewetting and improve bog habitat condition from moderate to good	Blanket bog, upland waders and raptors	Bog restoration areas (see **SEI Figure 8.5.1**)	Implementation within two years of completion of wind farm construction	Habitat condition monitoring: CSM, hydrological monitoring, ditch blocking, reprofiling, breeding raptor monitoring, upland breeding wader monitoring
		2.2	Grazing management regime to exclude grazers from steep ground between October and March.	Wet heath, blanket bog upland waders, eagles and other raptors, fish and otter	Wet heath and blanket bog restoration areas (see **SEI Figure 8.5.1**)	Implementation within two years of completion of wind farm construction	Habitat condition monitoring: Common Standards Monitoring (CSM), grazing monitoring, breeding raptor monitoring, upland breeding wader monitoring
3	Enhance riparian habitat	3.1	Native tree planting in riparian areas	Otter and fish species	Upstream of spawning and juvenile fish habitats on shallow peat or	Implementation within two years of completion of	Woodland planting monitoring and management, otter monitoring, electro-fishing,

Goal	Goal Description	Objective	Objective Description	Targets	Location	Timescales	Indicators
					mineral soil only, where native tree planting is appropriate, further surveys to confirm locations (see **SEI Figure 8.5.1**)	wind farm construction	macro-invertebrate monitoring
4	Protect and enhance habitat for ornithological species	4.1	Remove carcasses and gralloch from the turbine area to discourage foraging in the turbine area and therefore reduce collision risk.	Eagles	Within 200m of each turbine(see **SEI Figure 8.5.1**)	Year round throughout the lifespan of the project	Eagle and other raptor monitoring
		4.2	Low intervention area - no disturbing activities within 1 km of eagle nests during the sensitive breeding season (February to August)	Eagles	Within 1 km of eagle nesting areas	During the breeding season throughout the lifespan of the project	Eagle monitoring
		4.3	Provide nesting platforms for divers on appropriate lochs	Divers	In appropriate lochs outside the turbine area.	Implementation within two years of completion of wind farm construction	Diver monitoring

5.4 Outline Habitat Creation/ Restoration Methods

All management tasks carried out under the HMP would be conducted by suitably experienced contractors, under the supervision (where required) of suitably qualified and experienced ecologists.

All management plans have been discussed and agreed the with landowners.

5.4.1 Post-Construction Habitat Restoration

5.4.1.1 Borrow Pits

Borrow pits created on Site during the construction of the wind farm would be restored to their original habitat post-construction. Potential borrow pit sites have been chosen in areas that avoid deep peat and sensitive habitats such as dry heath on rocky outcrops as far as possible. Borrow pits will directly and indirectly cause a loss of 5.3ha of wet heath, 0.6ha of blanket bog and 0.7ha of acid grassland, this loss is included in habitat loss calculations above (**Table 5-2**), however a proportion of this will be restored under borrow pit restoration management.

Restoration plans would be put in place before the creation of borrow pits, with plans to reinstate the original habitat in moderate condition. Methods would include the storage and reinstatement of peat turves (SLR Consulting, 2023), dressing steep slopes with a thin layer of peat, leaving rock exposed and allowing to regenerate as wet or dry heath. Reseeding from surrounding habitats, cutting heather and spreading the brash or translocating turves removed during construction would also be considered as an option for speeding up this process. For details on peat management during construction please see **SEI Technical Appendix 10.2: Peat Management Plan.**

Reinstatement of peat

Where peatland habitat is disturbed during construction, peat would be reinstated where possible. This retains the natural peat layers and prevents loss of valuable peat where possible. For full details please see **SEI Technical Appendix 10.2: Peat Management Plan**.

5.4.2 Enhance Upland Habitat

Blanket Bog Restoration

There are several areas of degraded blanket bog on Site that have drains dug through the peat. This type of drainage exposes the bare peat for drying and erosion and lowers the water table, thereby degrading the peatland (see **Photograph 5-1**). There are five areas outlined to be targeted for blanket bog restoration, covering 89ha in total, including several areas close to the north of Eishken Lodge, and an area along the waterway that connects Loch na Beirighe and Loch Eishken (see **SEI Figure 8.5.1 and 8.5.3**). Other blanket bog areas within the Site are in good condition with a high water table and good species diversity with presence of blanket bog indicator species, and are therefore not suitable for restoration (**SEI Figure 8.5.2**).

The vegetation remains intact between the drainage ditches in all five areas, therefore there is a good opportunity for restoration to a good quality blanket bog. Blanket bog restoration would improve the peatlands in this area, a natural carbon store, improve habitat for breeding birds and invertebrates, and reduce sedimentation in adjacent watercourses, with positive implications for fish and otters on Site.

Additional areas of peat cutting were recorded in the north west of the Site to the south east of Loch Shiphoirt. Peat cutting has taken place in narrow strips 2m to 3m wide, where generally strips have been cut with an uncut baulk (also 2m to 3m wide) left in between. There is also evidence of strip cutting within a grassland suggesting that this area was created through the removal of peat (**Photograph 5-2**). This area is heavily grazed by sheep, and the high grazing pressure extends to the surrounding areas of peatland habitat. Many of the faces have eroded to a moderate or gentle slope, however 50%+ may be suitable for re-profiling works. There are also two areas where parallel drains are present on blanket bog, with no strip cutting. This may be the precursor to peat cutting works.

Ditch blocking and re-profiling the faces of the strip cutting areas are likely to be the best management technique for restoring these areas, however given the extent of the drainage, the areas should be assessed in detail during preparation of the detailed HMP and other restoration techniques should also be considered, such as wave damming and ground smoothing. This assessment would be underpinned by assessments carried out previously on this Site in a previous HMP (Arcus Renewable Energy Consulting Ltd., 2012), however due to developments in peatland restoration methods in recent years, a full blanket bog restoration assessment would be undertaken across all five areas and the best techniques recommended.

Restoration works will be undertaken with reference the Peatland ACTION Technical Compendium (NatureScot Peatland ACTION n.d.) on good practice for peatland restoration techniques. Peatland restoration would be undertaken in line with NatureScot guidance on Peatland Restoration and Breeding Birds (NatureScot 2022) to avoid disturbance to Schedule 1 listed species and other sensitive breeding species highlighted in the guidance. Areas of peatland restorations within 500m of an active golden eagle or white-tailed eagle nest should take place outside the breeding season where possible.

Photograph 5-1
Blanket bog area with drainage ditches suitable for blanket bog restoration

Photograph 5-2
Peat cutting areas suitable for blanket bog restoration

5.4.2.1 Reduction of Grazing

Current grazing pressure on site has caused erosion of wet heath and blanket bog habitat, particularly on steeper slopes and on the higher parts of the Site where the soil is naturally thin. These areas show patches of exposed bare ground and hummocking (see **Photograph 5-3**). Erosion also causes entrainment of particulates in waterways, which degrades habitats that fish for spawning. Grazing on the Site is by domestic sheep and horses, and by wild deer using the Site.

A grazing plan on Site would target both domestic and wild grazers. Low level domestic grazing in the spring and summer is preferred, this should reduce the dominant *Molinia caerulea* cover and create a more varied vegetation structure, that benefits a variety of wildlife, including upland waders and raptors.

A detailed grazing plan would be agreed as part of the final HMP, and will include but not be limited to the following:

- Light or no grazing in the autumn and winter, as this is when habitats on steep slopes are vulnerable to erosion;
- Fencing around steep slope and higher ground areas would remove grazing livestock and any wild grazers (e.g. red deer) in the autumn and winter, but allow low level grazing (by livestock) in the spring and summer. Deer would be excluded from the grazing area year round. The fenced area would cover 611ha of wet heath and blanket bog mosaic, an indicative fence line is shown in **SEI Figure 8.5.1**, incorporating steep sloping ground and high ground where there rocky areas are vulnerable to erosion;
- Any fencing operations will be undertaken outwith the eagle breeding season (February to August inclusive) in order to avoid impacts to eagles;
- Micrositing of fencing will be considered to help to avoid bird collisions following the erection of the new fence line. This includes choosing low altitude areas or gullies when running the fence line along slopes. The need for fence markers should be evaluated where placing fencing in exposed areas is necessary; and
- Fencing design will be suitable for waders to move through the area so that breeding and foraging areas are not inhibited.

The wet heath and blanket bog restoration through grazing reduction extends to areas beyond the proposed infrastructure, and would therefore benefit waders and provide foraging for eagles and other raptors through improved habitat in areas where there are no turbines. Reduction in erosion damage on site would protect the wet heath and reduce erosion in waterways, improving fish habitat. Areas proposed for grazing management have been agreed with the landowner.

Photograph 5-3
Areas of erosion within wet heath areas suitable for habitat restoration

5.4.3 Enhance Riparian Habitat

There is habitat for spawning and juvenile fish and confirmed breeding otter on Site. Native woodland planting in riparian zones can benefit fish and otter species. Woodland planting stabilises soils, reducing erosion and sedimentation downstream of the planting, and improves invertebrate diversity in the planted area, providing increased food diversity for fish.

Indicative areas are shown in **SEI Figure 8.5.1**, where riparian zones are located in wet heath on shallow peat. The indicative areas cover approximately 5ha, this would need to be surveyed for suitability and an indicative planting plan would be drawn up. Areas to be planted would be carefully selected, avoiding blanket bog and the higher altitude thinner soils, and planting would aim to be upstream of spawning and juvenile habitats. A surveyor would assess suggested tree planting areas for their appropriateness for tree planting. Recommendations were made in a previous HMP for this site (Arcus Renewable Energy Consulting Ltd., 2012), planting recommendations and locations from this report would be considered in the detailed HMP, taking previous and proposed electrofishing data and current fish and habitat data into consideration. Planting should be undertaken outside of the breeding bird season in order to avoid disturbance to breeding birds in these areas.

Tree species used would be native to Scotland and from seed of regional providence. The tree planting would tie in with locally relevant tree conservation initiatives. Full details of the species mix to be planted would be provided in the detailed HMP. Protection of trees from browsing animals would be required, the nature of this would be agreed with the landowner and local stakeholders with details provided in the detailed HMP. During the establishment phase, weeding, watering and beating up may all be required, this would be informed by monitoring and would be carried out throughout the first ten years after planting when required.

5.4.4 Protect and Enhance Habitat for Important Bird Species

Carrion Removal

Availability of carrion is a key aspect influencing eagle flight activity in a particular area. It is recommended that fallen stock / deer removal within 200m of each turbine is carried out. All fallen stock / deer found on Site would be removed to dissuade eagles from foraging inside the area around the proposed turbines. The area within 200m of each turbine would be searched by a ranger or keeper regularly and any fallen stock / deer found on Site would be removed.

Additionally, any carrion or gralloch on Site, due to stalking activities, would be removed.

Fallen stock/deer, carrion and gralloch should be placed outside of the turbine are within the fenced in habitat improvement area, to persuade eagles to forage outside the turbine array and inside the habitat improvement area.

Low Intervention Area

There are currently two golden eagle pairs breeding close to the Site or within the redline boundary. There would be no activities that might cause disturbance to the breeding pairs within 1km of all possible breeding sites during the sensitive breeding season (February to August), this area can be refined once the breeding sites have been selected and breeding sites are confirmed. This includes any maintenance works on the wind farm or land management practices carried out by the client (e.g. peat restoration) or the land users (e.g. muirburn or shooting). Implementation of the low intervention areas would be based on ongoing ornithology monitoring, indicating where eagles are breeding within 1km of the Site and adapting low intervention areas accordingly.

Diver Nesting Platforms

Nesting divers have been recorded on a loch within the northeast of the Site. Divers benefit from the provision of man-made nesting platforms that cannot be accessed from the shore as this protects nests from predation from foxes and stoats and protects against fluctuations in water levels that can flood nests (Broad, 2018; P. Nummu, 2013). A diver platform would be targeted at the loch where divers have been recorded breeding (see EIA Report **Chapter 9: Ornithology** for details). Additional diver platforms would be sited on other suitable lochs on site outside the turbine envelope to reduce the risk of collision or displacement.

5.5 Monitoring

All monitoring would be conducted by suitably qualified and experienced ecologists.

Table 5-4 describes the monitoring methods that are referenced in **Table 5-3**, each in response to one or more objective. See **Table 5-4** for a timetable of monitoring activities.

Depending on the results of these surveys, additional monitoring approaches may be required to assess progress toward objectives and inform management. Any such measures would be agreed with the HMP Working Group as part of the HMP review process.

Vegetation surveys, grazing assessments and hydrological monitoring would commence one year prior to construction to provide an updated baseline.

5.5.1 Common Standards Monitoring Vegetation Condition Quadrats

Common Standards Monitoring (CSM) provides a detailed insight into the changes in vegetation and some abiotic factors that pick-up trends in vegetation changes that are valuable to understanding the progress of habitat restoration and management works and informing further management. CSM is designed to assess whether features (e.g. habitats) are in favourable or unfavourable condition and whether condition is being maintained, recovering or declining over time. The assessment is based on habitat-specific criteria involving key indicator species and vegetation structure. These surveys would provide data in relation to bog and wet heath habitats.

Control sites would be chosen outside the blanket bog restoration areas that are in good condition and indicative of blanket bog in the wider area, this area would be used as an indication of the progress of blanket bog recovery after restoration works have taken place. CSM would be undertaken in the bog restoration areas (see **SEI Figure 8.5.1**) and bog restoration control sites to assess the progress of restoration techniques implemented. CSM would also be undertaken in the grazing management areas (see **SEI Figure 8.5.1**), to monitor the change in habitat condition driven by the change in grazing regime.

Methods

CSM relies on a series of guidance documents, each relating to a broad habitat category e.g. JNCC 2009: 'Common Standards Monitoring Guidance for Upland Habitats' (JNCC, 2009). The thresholds in CSM that delineate habitats in favourable condition from those in unfavourable condition were designed to more or less equate to the minimum standard for SSSI site selection (JNCC, 2004). The objective of this HMP is to maintain or improve habitat condition compared to baseline condition, not the minimum standard for SSSI site selection. The threshold conditions would therefore be adjusted accordingly following the first round of CSM data collection. CSM targets will then be updated for this Site in the detailed HMP.

CSM transect lines would be set up in bog restoration areas to give coverage of each restoration area. A sample of transects would also be set up throughout the non-restored bog and wet heath habitats on Site to give an idea of the habitat variation across the Site. A grid reference would be recorded for the north west corner of each transect to allow re-location on return monitoring visits. Quadrat sampling would use 2m x 2m quadrats.

The criteria used to assess the data from each quadrat would depend on the vegetation community within the quadrat. CSM guidance provides a list of which NVC communities compose each of the broader habitat types that CSM relates to. Therefore, the surveyor would record the NVC community for each quadrat to make sure that it is assessed using the correct criteria.

5.5.2 Grazing Assessment

A grazing assessment would monitor the impacts of grazing within the steep areas and higher ground on the Site that are fenced off from grazing in the autumn and winter (see **SEI Figure 8.5.1**). The grazing assessment would follow methods outlined by SNH (Scottish Natural Heritage, 1998), and would be undertaken at the baseline pre-construction stage and post-construction to assess whether the change in grazing regime in the grazing management areas has improved the quality of the wet heath. The assessment would be undertaken at representative sample locations across the grazing management areas. A grazing assessment would be undertaken within each CSM quadrat, and within the area surrounding each CSM quadrat where the assessment calls for a larger sample area.

5.5.3 Hydrological monitoring

Hydrological monitoring is an important aspect of any blanket bog restoration plan. It is implemented through installation of a network of dipwells to monitor water table levels over time and informs the requirement for remedial measures. Dipwells would be installed within the bog restoration areas (see **SEI Figure 8.5.1**) during baseline monitoring before blanket bog restoration is undertaken, and then after restoration has taken place. Dipwell locations would provide representative coverage of the bog restoration area and control area, a minimum of ten monitoring locations is recommended per blanket bog restoration area. The locations of these monitoring sites would coincide with some of the CSM quadrat locations to improve the interpretability of the CSM data set. The grid reference for each monitoring location would be recorded to allow relocation. Full details of monitoring locations would be provided in the detailed HMP.

Unless the water table monitoring method selected allows for continuous data logging at set intervals, quarterly monitoring of dipwells would be undertaken in each monitoring year, to measure water levels and assess if they are high enough to promote bog vegetation growth.

Dipwells show the highest water level and lowest water level experienced since the last time the data was recorded. There are two foam balls which are moved by the water level, when a high level is recorded the top foam ball moves up and stays there unless the water level exceeds this measurement, similarly the other foam piece shows the lowest water level recorded. When taking water level data from a dipwell the difference between the distance from the top of the tubes to ground level and the distance from the top of the tubes to water level is calculated to determine the below ground water level.

Climatic data would be recorded alongside hydrological monitoring to evaluate local weather conditions against water table fluctuations. This will either be using a weather station on Site or using the nearest SEPA rainfall data gauge. This will provide additional information about general weather patterns that effect water levels in addition to the impacts of peatland management.

5.5.4 Ditch Blocking Checks

For the bog restoration to be successful the drainage dams installed during the restoration process need to remain effective. During drain blocking, all of the dam locations would be recorded. In the first two monitoring years, all of the dam locations would be checked for signs of effectiveness, damage and requirements for maintenance. In subsequent monitoring years, especially if dam performance has been good with little maintenance requirement, it may be appropriate to spot check only a proportion of dam locations.

5.5.5 Woodland Planting Monitoring

Areas of riparian woodland creation would be inspected at regular intervals following planting to assess tree condition and survival and any factors likely to limit success, such as grazing or excessive weeds in tree tubes. Further management actions would be decided following the visit, including potentially beating up, replacement of tree tubes and weeding of tree tubes.

5.5.6 Ornithology Surveys

Post-construction ornithology surveys are described in **Chapter 9: Ornithology**. Outline monitoring for ornithology is included here for completeness, however not all monitoring relates directly to habitat management outlined in this report.

Loch Diver Surveys

Lochs with artificial nest rafts will be surveyed on a yearly basis, to assess the efficacy of the rafts and the success of breeding divers in these lochs. Rafts will be inspected for damage outside the breeding season and repaired when necessary.

Lochs with suitability for breeding divers within 1km of the Site will be surveyed (as per the 2021 surveys) in order to confirm presence/absence of divers, and to determine the outcome of any breeding attempts. Survey methods will follow those outlined in Gilbert *et al.* (Gilbert G. G., 1998), as per current NS guidance (NatureScot, 2017).

Breeding Eagle Surveys

Annual golden eagle and white-tailed eagle monitoring would form part of the Eagle Conservation Programme (see **SEI Technical Appendix 9.5**). This would cover all eagle territories on the Pairc peninsula.

Breeding Wader Surveys

To allow for meaningful comparison of data, surveys methods should reflect those used in the baseline surveys for EIA including the survey area used for the 2022 surveys. Surveys would focus on areas of habitat management on the Site, including blanket bog and wet heath habitat across the Site (see **SEI Figure 8.5.1**).

Surveys would follow the current guidance (NatureScot, 2017) which includes recommendations set out in Calladine *et al.* (Calladine, 2009), requiring an adapted Brown & Shepherd (Brown, 1993) method with four survey visits at least seven days apart between mid-April and early July .

5.5.7 Monitoring Timetable

The monitoring timetable for the first ten years after construction is shown in **Table 5-4**. By year ten the HMP would be reviewed and an updated HMP would be written, recommending further monitoring and management as appropriate.

Table 5-4: OHMP Monitoring Timetable

Survey Type	Monitoring Year									
	Pre-works	1	2	3	4	5	6	7	8	9	10
Common Standards Monitoring (CSM)	X	X		X		X					X
Grazing assessment	X	X		X		X					X
Hydrological monitoring	X	X		X		X					X
Ditch blocking monitoring		X	X	X		X					X
Woodland planting monitoring		X	X	X	X	X					X
Carcass searches		X	X	X	X	X	X	X	X	X	X
Breeding eagle surveys		X	X	X	X	X	X	X	X	X	X
Upland breeding wader surveys		X	X	X		X					X
Loch diver surveys		X	X	X		X					X
Maintenance of diver rafts		X	X	X	X	X	X	X	X	X	X
HMP review and re-write											X

5.6 External Factors

It is important to note that external factors such as climate change can influence habitat restoration success. Over the lifetime of the wind farm it is possible that climate change will affect the habitats on Site and in the surrounding area. This should be taken into account during monitoring and reporting and is another reason why a control site in relation to bog restoration is important.

6.0 References

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Annex A Figures

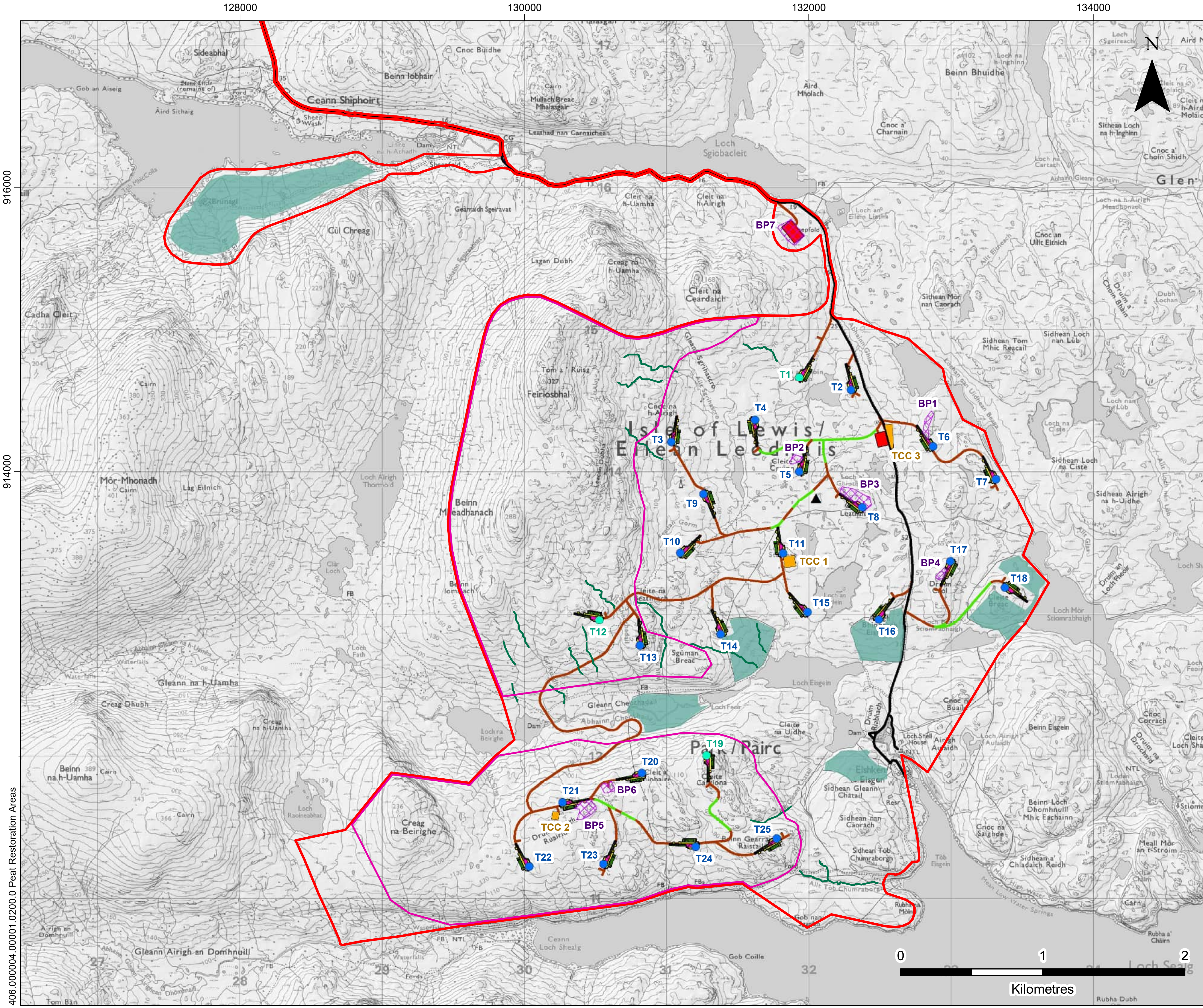
SEI SEI Technical Appendix 8.5

Outline Habitat Management Plan

Uisenis Power Ltd.

SLR Project No.: 428.013221.00001

18 June 2024



LEGEND

- Application Boundary
- Proposed Turbine Location (180 m Blade Tip Height)
- Proposed Turbine Location (200 m Blade Tip Height)
- Proposed Permanent Met Mast
- Proposed Bespoke Hardstanding Envelope
- Proposed Permanent Substation
- Proposed Permanent Hardstanding
- Proposed Temporary Hardstanding
- Proposed Temporary Bridge Alignment
- Proposed Temporary Construction Compound
- Proposed Clearance Area
- Potential Borrow Pit
- Proposed Floating Access Track
- Proposed Access Track / Turning Head
- Existing Road (To Be Upgraded)

Habitat Management Areas

- Riparian Planting Area
- Peat Restoration Area
- Wet Heath Restoration Area

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UISENIS WIND FARM - SEI

ECOLOGY

PEAT RESTORATION AREAS

SEI FIGURE 8.5.1

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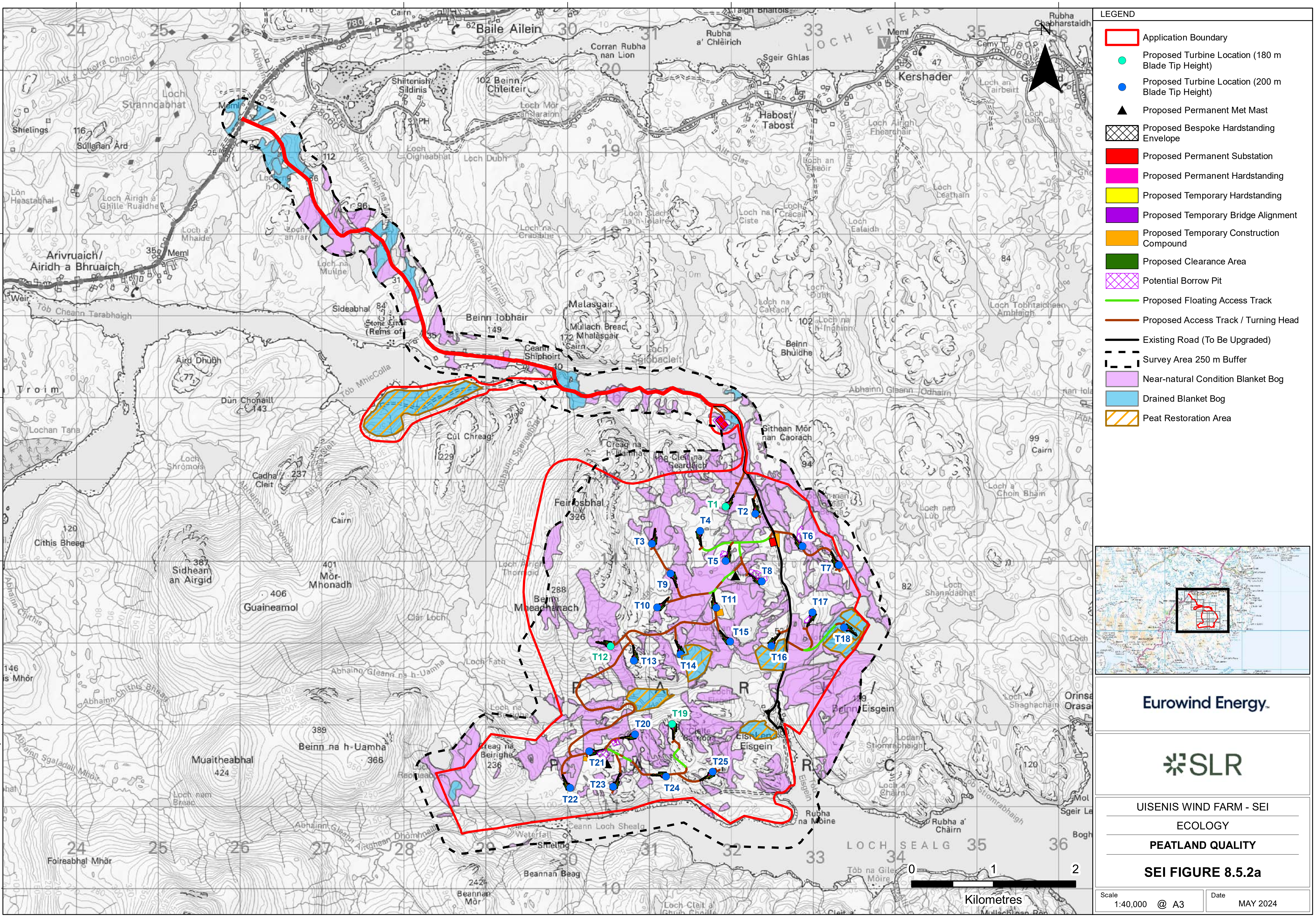
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Proposed Temporary Hardstanding
Proposed Temporary Bridge Alignment
Proposed Temporary Construction Compound
Proposed Clearance Area
Potential Borrow Pit
Proposed Floating Access Track
Proposed Access Track / Turning Head
Existing Road (To Be Upgraded)
Survey Area 250 m Buffer
Near-natural Condition Blanket Bog
Drained Blanket Bog
Peat Restoration Area
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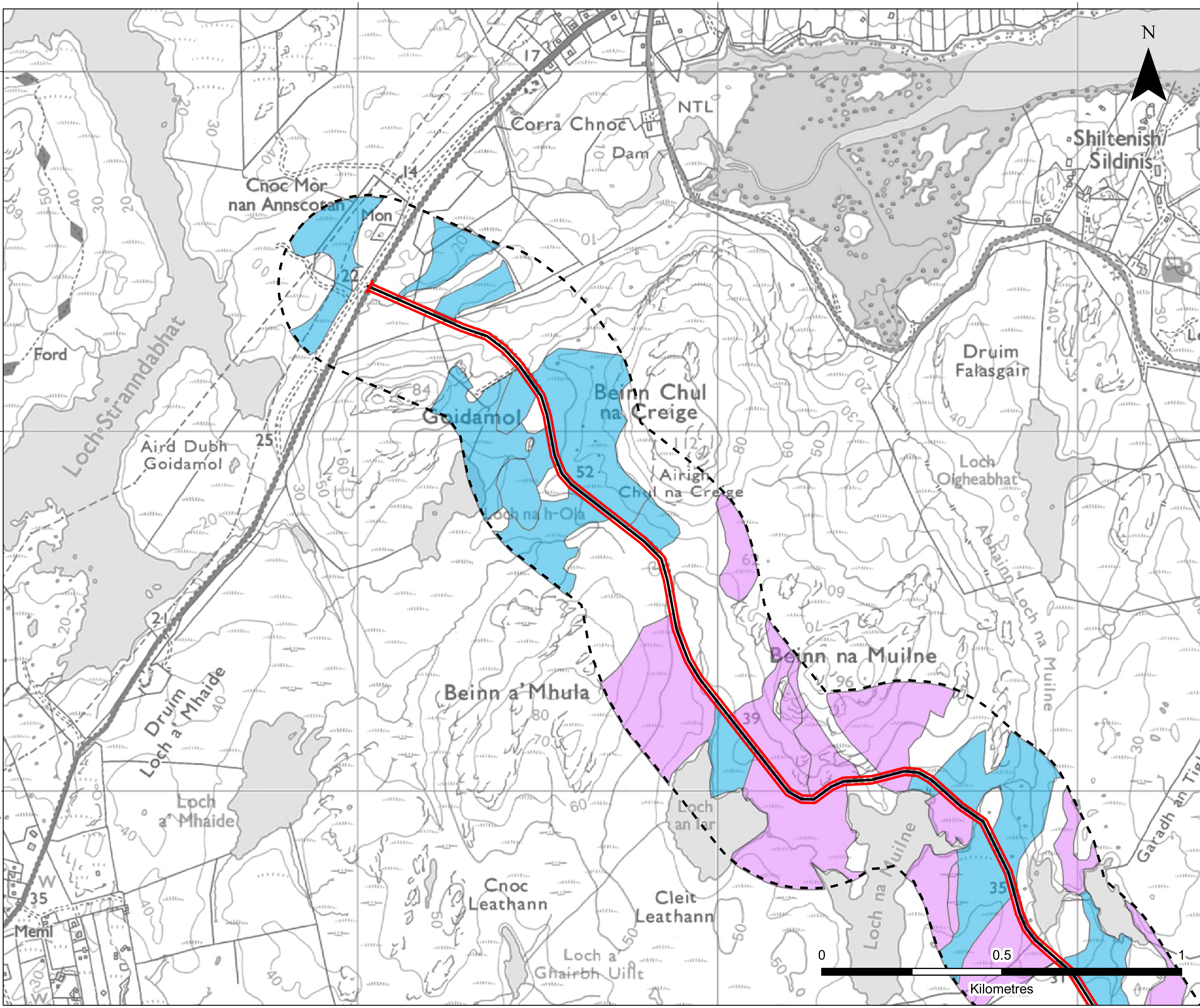
MAY 2024



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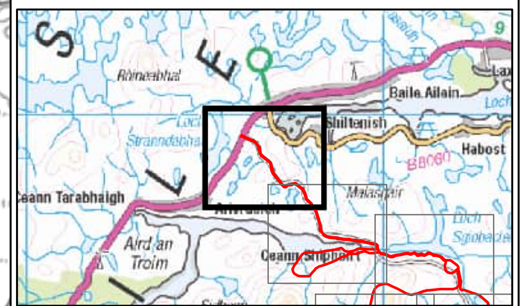
- Survey Area 250 m Buffer
- Near-natural Condition Blanket Bog
- Drained Blanket Bog



Eurowind Energy

SLR

UISENIS WIND FARM - SEI

ECOLOGY

PEATLAND QUALITY

SEI FIGURE 8.5.2b

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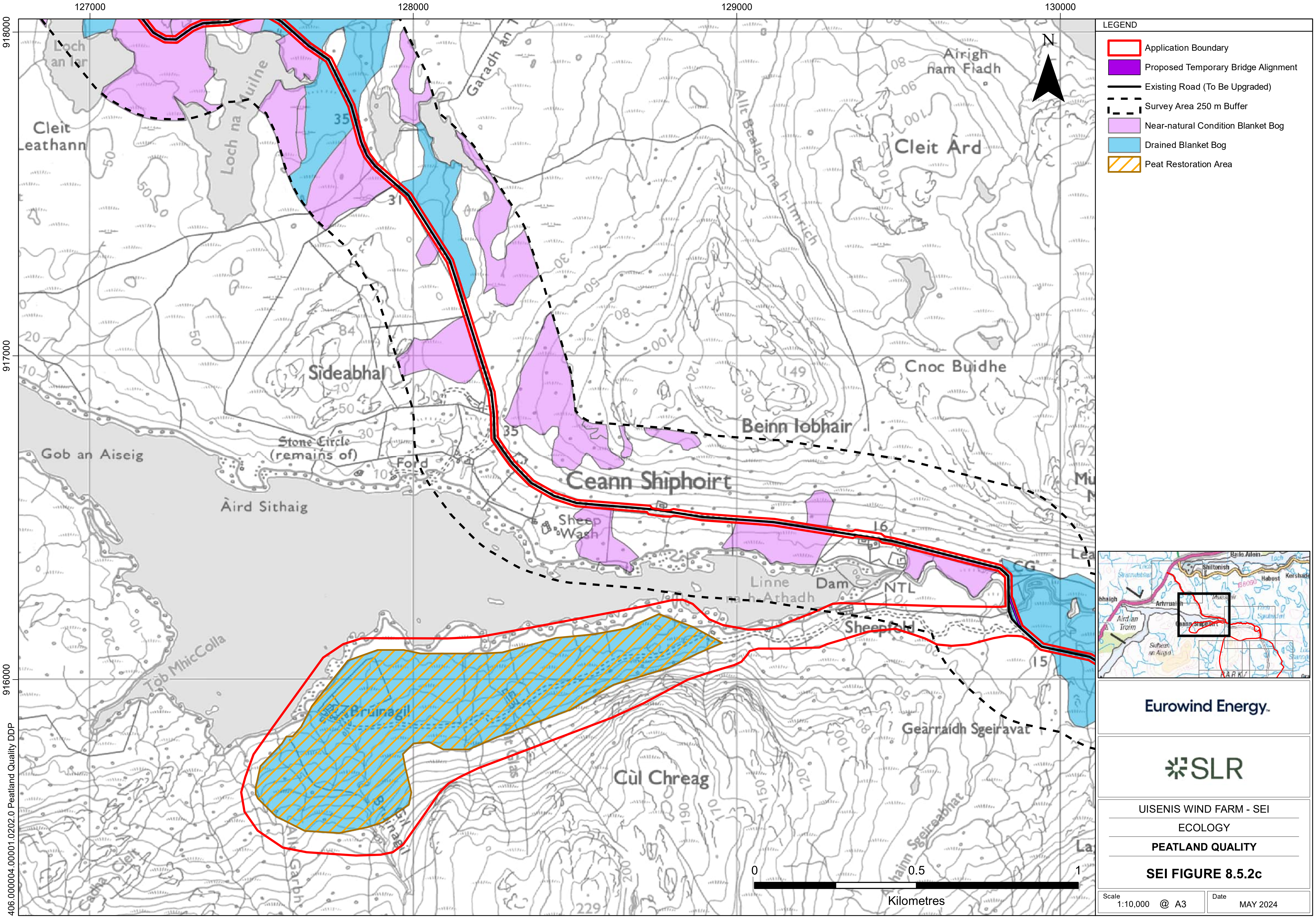

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Application Boundary
Proposed Temporary Bridge Alignment
Existing Road (To Be Upgraded)
Survey Area 250 m Buffer
Near-natural Condition Blanket Bog
Drained Blanket Bog
Peat Restoration Area
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Beinn Iobhair
Stone Circle (remains of)
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Ceann Shiphoirt
Àird Sìthaig
Sheep Wash
Linne nan Athadh
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Tob MhicColla
Bruinagil
Gearraidh Sgeiravat
Cùl Chreag
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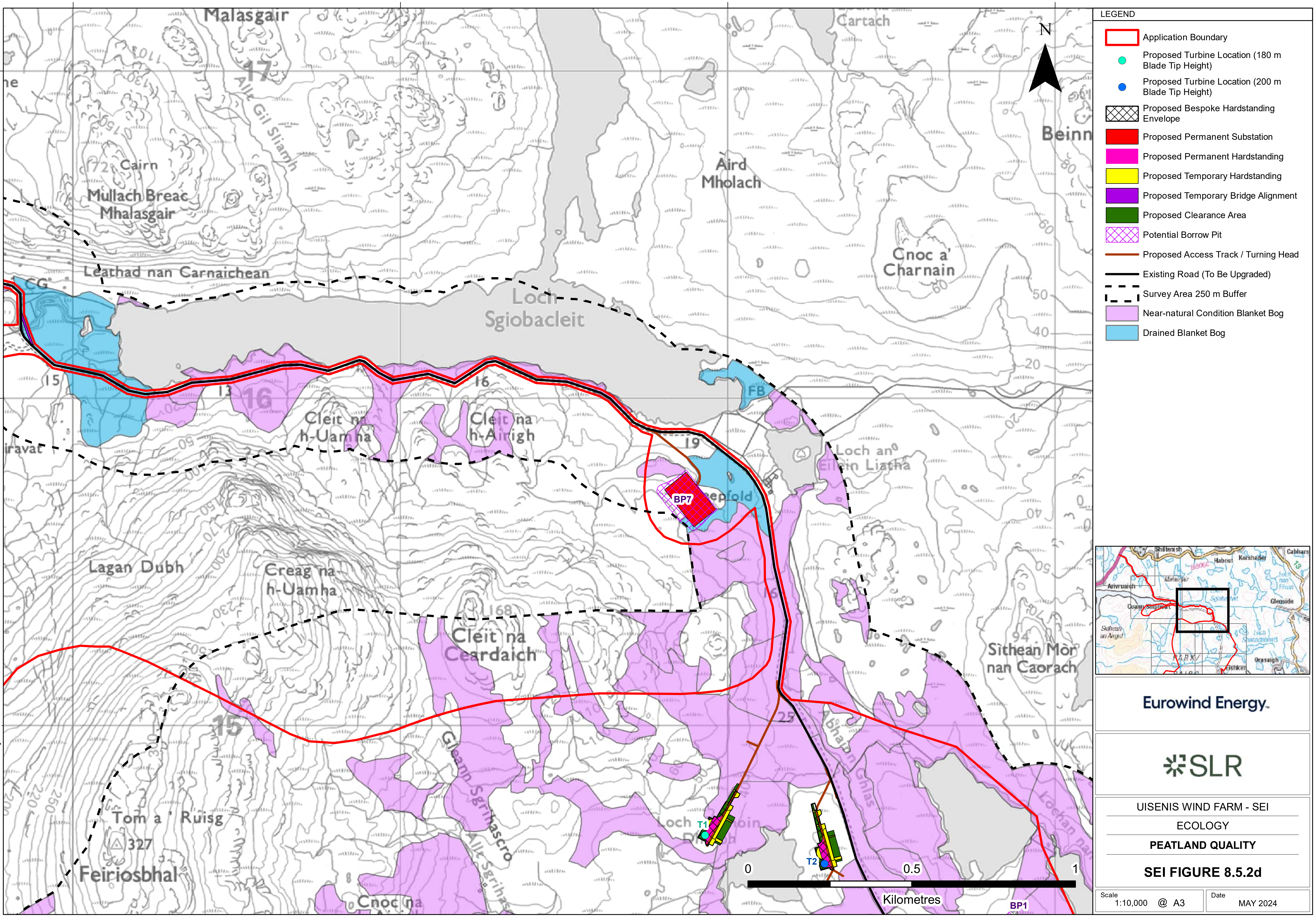

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Cleit na h-Airigh
Loch an Eilein Liatha
Lagan Dubh
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Potential Borrow Pit
Proposed Access Track / Turning Head
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Survey Area 250 m Buffer
Near-natural Condition Blanket Bog
Drained Blanket Bog
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UISENIS WIND FARM - SEI
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PEATLAND QUALITY
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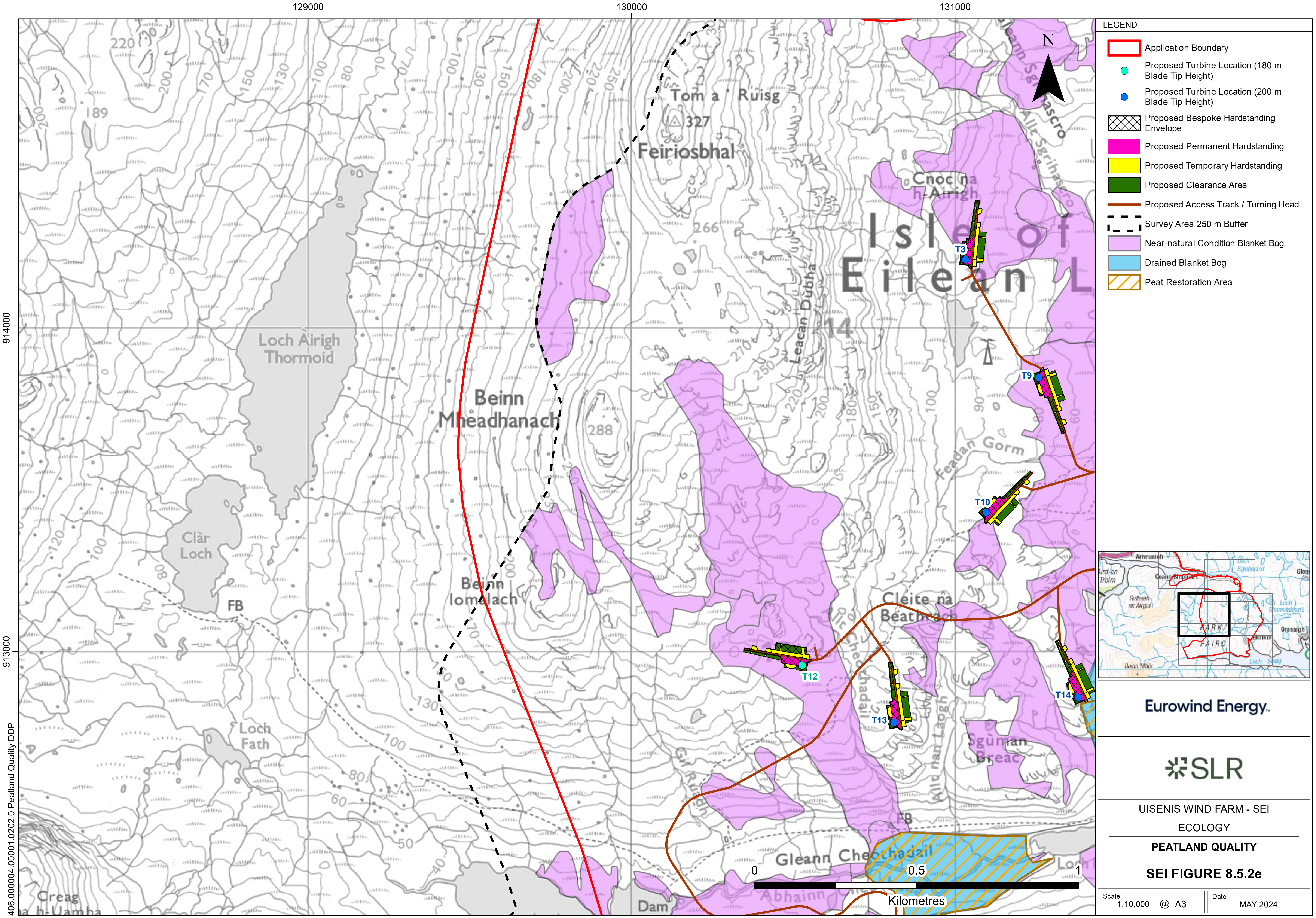
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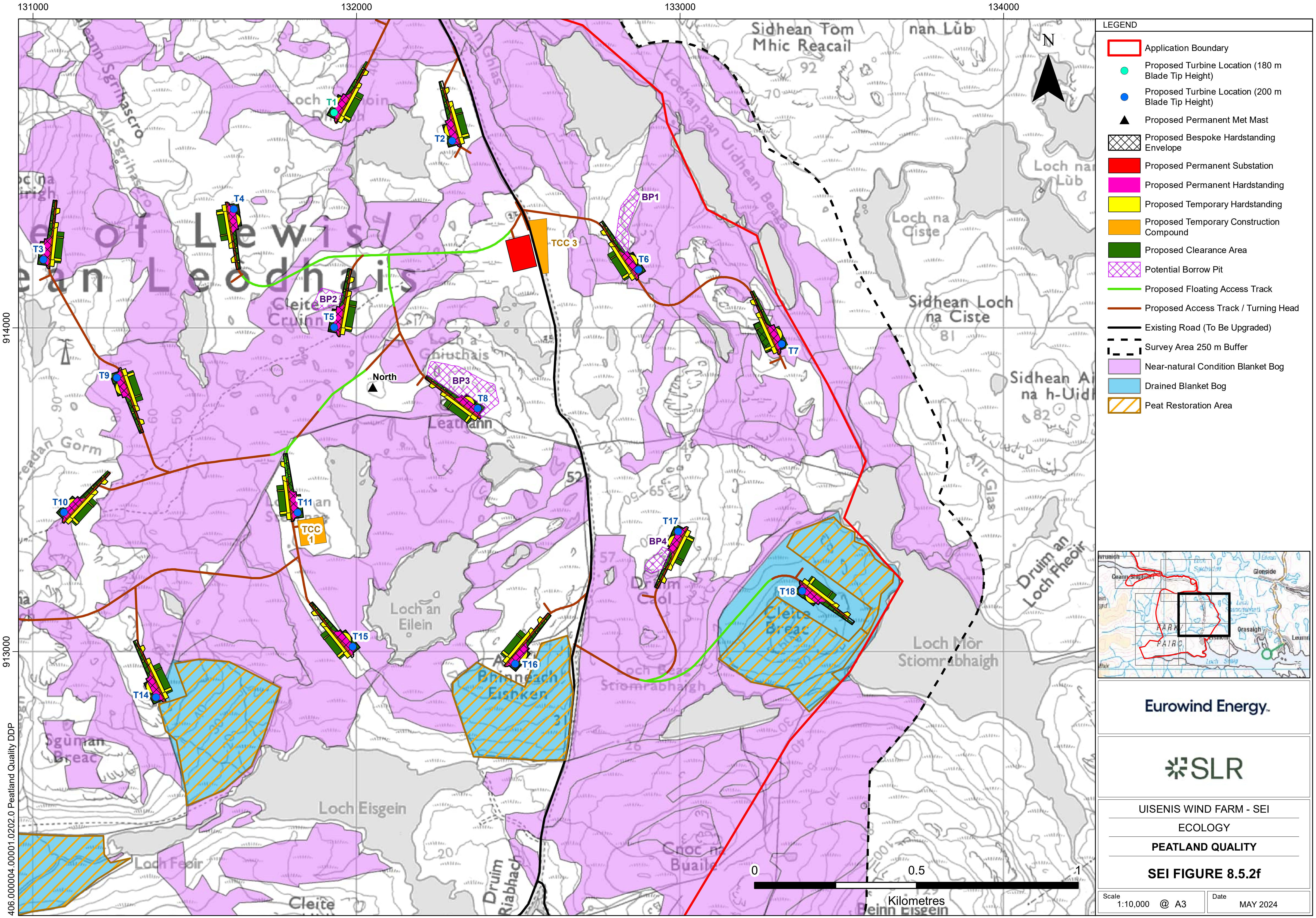

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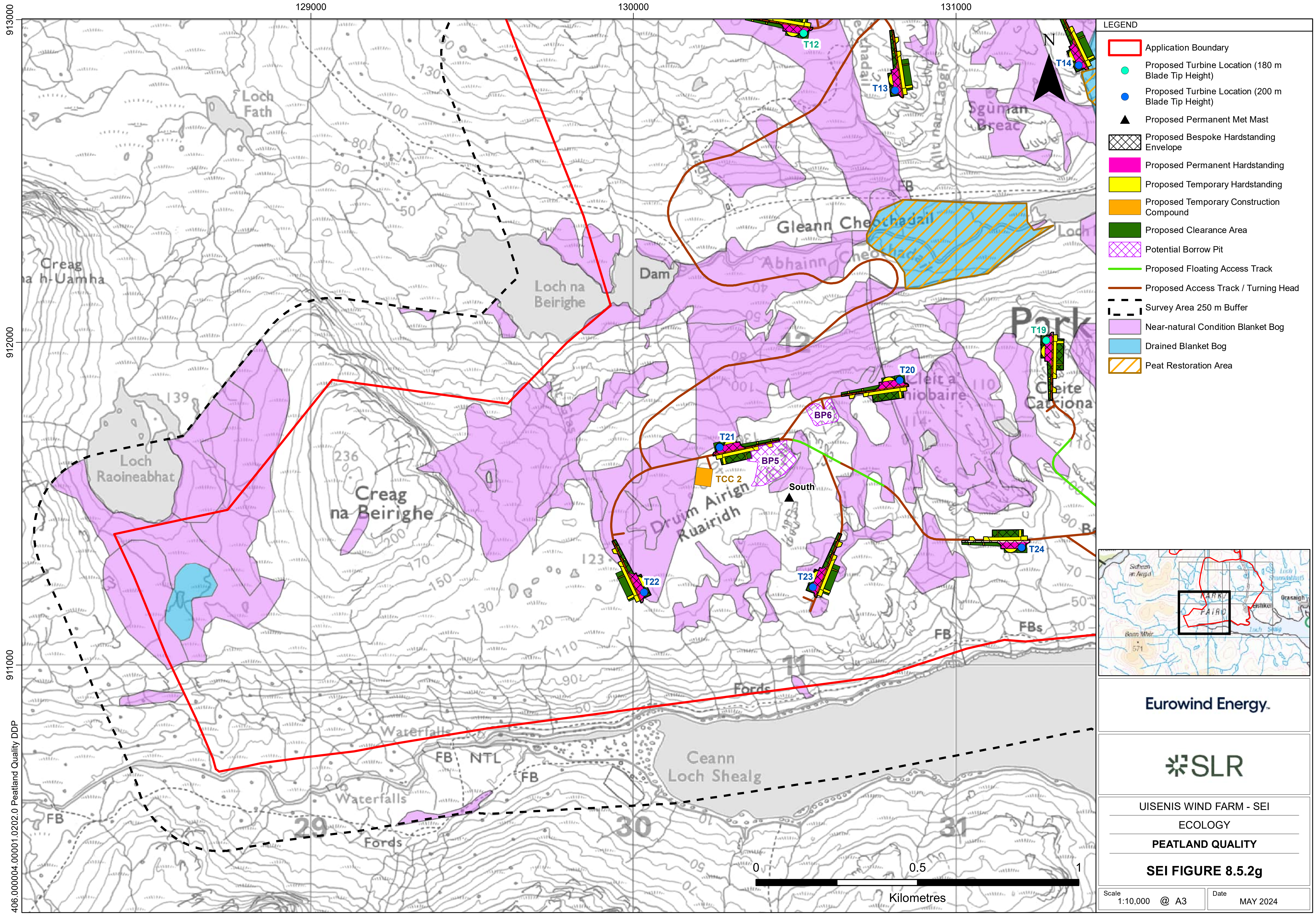

Eurowind Energy

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UISENIS WIND FARM - SEI

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PEATLAND QUALITY

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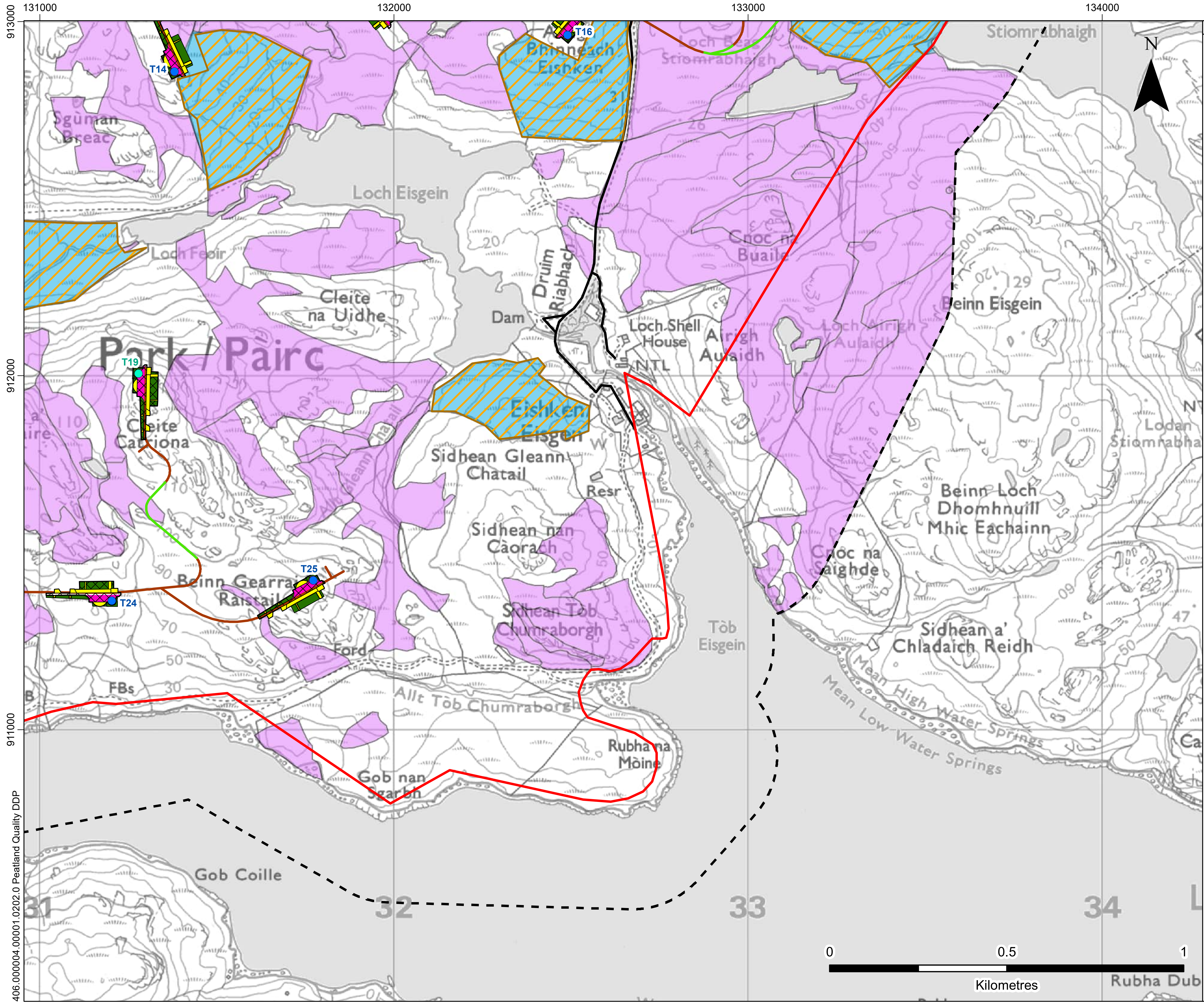

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- Survey Area 250 m Buffer
- Near-natural Condition Blanket Bog
- Drained Blanket Bog
- Peat Restoration Area

Eurowind Energy

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UISENIS WIND FARM - SEI

ECOLOGY

PEATLAND QUALITY

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Date MAY 2024

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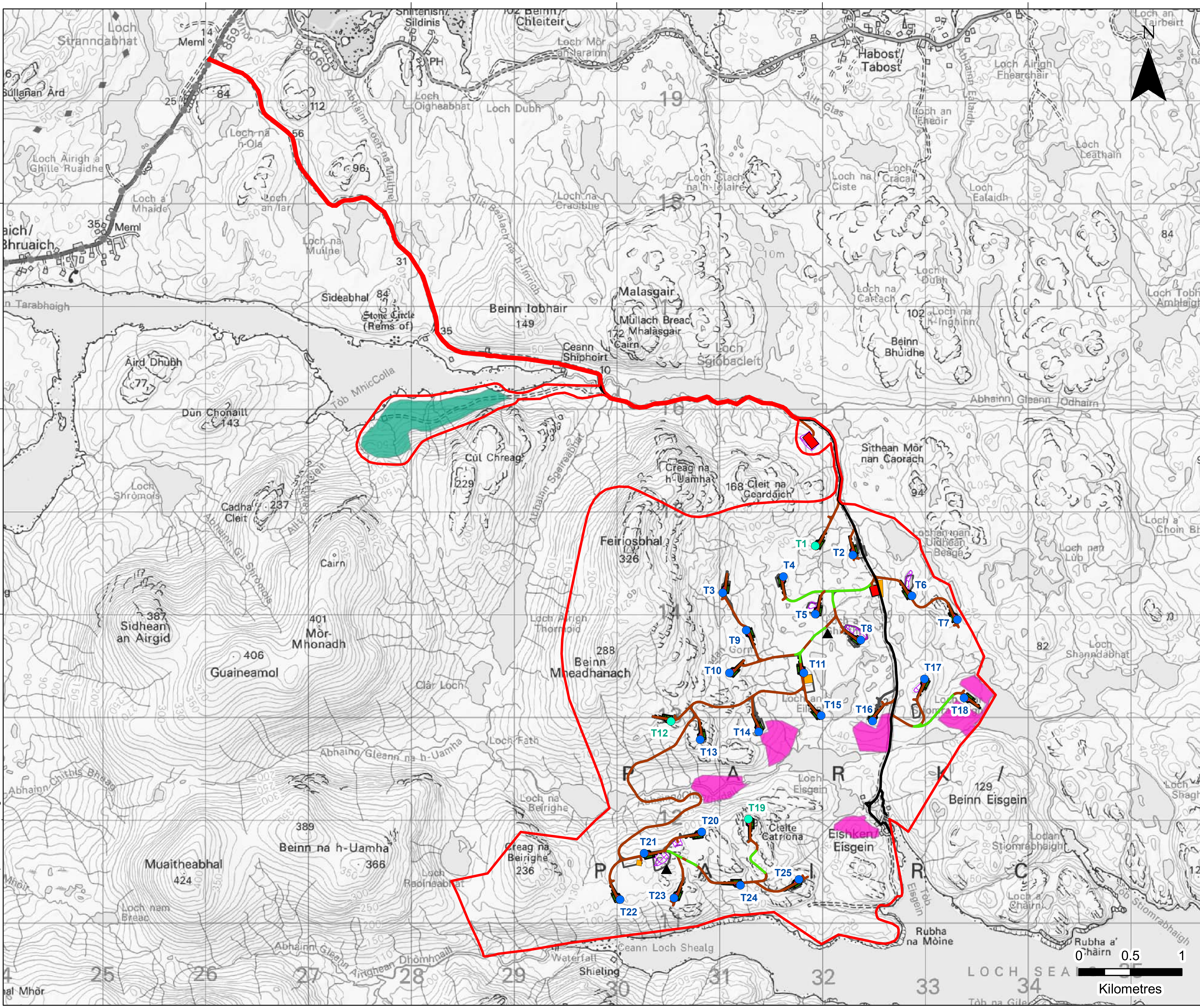

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- Proposed Turbine Location (200 m Blade Tip Height)
- Proposed Permanent Met Mast
- Proposed Bespoke Hardstanding Envelope
- Proposed Permanent Substation
- Proposed Permanent Hardstanding
- Proposed Temporary Hardstanding
- Proposed Temporary Bridge Alignment
- Proposed Temporary Construction Compound
- Proposed Clearance Area
- Potential Borrow Pit
- Proposed Access Track / Turning Head
- Proposed Floating Access Track
- Existing Road (To Be Upgraded)
- 2023 EIA Report Layout
- 2023 EIA Report Peat Restoration Area
- Additional Peat Restoration Area

Eurowind Energy.

SLR

UISENIS WIND FARM - SEI

ECOLOGY

PROPOSED PEAT BOG RESTORATION AREAS

SEI FIGURE 8.5.3

Scale	Date
1:35,000 @ A3	JUNE 2024

406.00004.00001.0203.1 Proposed Peat Bog Restoration Areas

Making Sustainability Happen

UISENIS WIND FARM FISH POPULATION ASSESSMENT

UISENIS WIND FARM

OUTER HEBRIDES FISHERIES TRUST

18/12/2023

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Project name	Uisenis Wind Farm
Project number	P23285
Prepared by	TD
Approved by	CB

Revision History

Revision	Date	Prepared By	Reviewed By	Approved By	Comments
V0.6	18/12/23	TD	DM	CB	

Quality Assurance

This report has been prepared according to Gavia Environmental Quality Management Process. Gavia Environmental employs consultant scientists who are members of appropriate professional institutions and adhere to professional codes of conduct.

Disclaimer

This report is presented to Outer Hebrides Fisheries Trust in respect of Uisenis Wind Farm Fish Population Assessment, and may not be used or relied on by any other person or by the client in relation to other matters not covered specifically by the scope of this report.

Notwithstanding anything to the contrary contained in the report, Gavia Environmental Ltd is obliged to exercise reasonable skill, care, and diligence in the performance of the services required by Outer Hebrides Fisheries Trust and shall not be liable except to the extent that it has failed to exercise reasonable skill care and diligence, and this report shall be read and construed accordingly.

The report has been prepared by Gavia Environmental Ltd. No individual is personally liable in connection with the preparation of this report. By receiving this report and acting on it, the client or any other person accepts that no individual is personally liable whether in contract, tort, for breach of statutory duty or otherwise.

GAVIA environmental

Contents

Executive Summary

Gavia Environmental (GEL) were commissioned to carry out a fully quantitative fish population assessment, following Scottish Fisheries Coordination Centre guidelines on undertaking and managing electrofishing operations (SFCC, 2007). The fully quantitative fish population assessment using electrofishing methodology was carried out, and data provided by, the Outer Hebrides Fisheries Trust (OHFT), for Uisenis Wind Farm ('the Proposed Development'). The Proposed Development is located at National Grid Reference (NGR) NB 30848 12877 (centre point of the Proposed Development) on the Eishken Estate, approximately 20 km southwest of Stornoway on the Isle of Lewis. Five Survey Locations (Uise_2, Uise_4, Uise_5, Uise_6, and Uise_7) were selected based on recommendations from a previous Fish Habitat Survey (Gavia 2022), at locations with habitat for sustaining juvenile salmonids. Electrofishing field data was collected by the OHFT and then issued to Gavia Environmental Ltd. (GEL), to construct a summative report on the density estimates of juvenile salmonids in the watercourses within the Proposed Development, and control site out-with the Proposed Development (unlikely to be impacted by any works). Watercourses surveyed included the Allt Sgrihascro (Uise_2), Abhainn Cheothadail (Uise_4, Uise_5), Abhainn Gleann Airighean Dhomhnaill (Uise_6), and Abhainn Gleann na h-Uamha (Uise_7). All Survey Locations were located within the Proposed Development boundary, except the Abhainn Gleann na h-Uamha (Uise_7) which was chosen as a control site and is unlikely to be impacted by the Proposed Development.

The densities of fish varied across survey locations. Atlantic salmon and brown trout species were caught at all survey locations, except the Abhainn Gleann Airighean Dhomhnaill (Uise_6), where no salmonids were caught at all. The Abhainn Gleann na h-Uamha (Uise_7) was selected as a control to record any effects that are catchment based and not directly attributable to the Proposed Development. The control will be able to assess whether changes in fish population structure is a wider catchment-based effect or one directly attributable to the Proposed Development.

For Atlantic salmon, in the Allt Sgrihascro (Uise_2), no parr were caught throughout the survey, and two fry were recorded at this Survey Location. This was similar in the Abhainn Gleann na h-Uamha (Uise_7, control site), where a larger number (9) of Atlantic salmon fry were recorded, than parr (1). At all other Survey Locations where fish were caught, no fry were caught, only parr.

For brown trout, only at Uise_4 Survey Location in the Abhainn Cheothadail, were there more trout fry (2) caught than parr (0). More parr than fry were recorded at Uise_2 in the Allt Sgrihascro (5 fry, 7 parr) and Uise_7 control site in the Abhainn Gleann na h-Uamha (0 fry, 3 parr). An equal number of fry (2) and parr (2) were recorded at the Uise_5 Survey Location in the Abhainn Cheothadail.

The SFCC developed a national river classification scheme for Scottish rivers and developed categories in quintile ranges for juvenile salmonids (per 100 m^2 of water) for different river width classes, which are based on one-run (1st pass) electrofishing method, and calculated on densities >0 over 50 Survey Locations in the Outer Hebrides Statistical Region (OHSR hereafter) (Godfrey, 2005). Uise_2 Atlantic salmon fry density estimate was 0.996 (SFCC Classification: Very Poor), and no Atlantic Salmon parr were caught during the survey (SFCC Classification: Absent). Minimum density estimates for brown trout per 100 m^2 were 4.914 for fry (SFCC Classification: Very Poor), and 6.88 for parr (SFCC Classification: Moderate).

Data collected from the Abhainn Cheothadail (Eishken, Lewis), (Uise_4), derived minimum density estimates per 100 m^2 of 1.916 Atlantic Salmon parr (SFCC Classification: Very Low). No Atlantic Salmon fry were caught during the survey (SFCC Classification: Absent). Regarding Brown Trout, minimum density estimates per 100 m^2 were 1.277 for fry (SFCC Classification: Moderate), and no parr were recorded (SFCC Classification: Absent).

Data collected from the Abhainn Cheothadail (Eishken, Lewis), (Uise_5), derived minimum density estimates for salmon fry per 100 m^2 were 4.909 (SFCC Classification: Good) and 1.636 (SFCC Classification: Very Poor) for salmon parr per 100 m^2. Minimum density estimates for trout fry and parr were 0.818 (SFCC Classification: Very Poor) and 1.636 (SFCC Classification: Moderate), respectively.

Airighean Dhomhnaill, (Uise_6), no Atlantic Salmon, or Brown Trout were recorded at the Survey Location (SFCC Classification: Absent).

The Abhainn Gleann na h-Uamha, (Uise_7), derived minimum density estimates per 100 m^2 of 2.806 (SFCC Classification: Moderate) for salmon fry, and 0.935 for salmon parr (SFCC Classification: Very Poor). No trout fry were caught at this Survey Location (SFCC Classification: Absent). Minimum density estimates per 100 m^2 for brown trout parr were 2.876 (SFCC Classification: Moderate).

1 Introduction

Gavia Environmental (GEL) were commissioned to carry out a fully quantitative fish population assessment, following SFCC guidelines on undertaking and managing electrofishing operations (SFCC, 2007), with field data provided by the Outer Hebrides Fisheries Trust (OHFT), for Uisenis Wind Farm ('the Proposed Development'). The Proposed Development is located at NGR NB 30848 12877 (centre point of the Proposed Development) on the Eishken Estate, approximately 20 km southwest of Stornoway on the Isle of Lewis. The fully quantitative fish population assessment using electrofishing methodology was carried out by the Outer Hebrides Fisheries Trust (OHFT), and data was then issued to Gavia Environmental Ltd. (GEL) to construct a summative report on the density estimates of juvenile salmonids in the watercourses within the Proposed Development, and control site out-with the Proposed Development (unlikely to be impacted by any works). Watercourses surveyed included the Allt Sgrihascro, Abhainn Cheothadail, Abhainn Gleann Airighean Dhomhnaill, and Abhainn Gleann na h-Uamha. All Survey Locations were located within the Proposed Development boundary, except the Abhainn Gleann na h-Uamha (Uise_7) which was chosen as a control site and is unlikely to be impacted by the Proposed Development.

The Development encompasses 26 turbines up to a maximum of 215 metres in height with an installed capacity of 189 MW (Eurowind Energy, 2022). In 2022 Eurowind Energy submitted a Scoping Report to the Scottish Government outlining environmental surveys and assessments required. From this, a Fish Habitat Survey (FHS) was recommended and carried out at six Survey Locations (Uise_1, Uise_2, Uise_3, Uise_4, Uise_5, and Uise_6) by GEL, with further recommendations from this to gain knowledge on the present (baseline, pre-construction) juvenile salmonid population densities within the watercourses with the potential to be impacted by the Proposed Development. In the FHS, observations were made in the context of SFCC definitions and those outlined by Louhi *et al*. (2008). Field data was then analysed and graded as having High, Good, Moderate, Poor or Low fish habitat quality.

From the FHS, it was found that Survey Locations, Uise_4 and Uise_5 contained High fish habitat potential, Uise_2 and Uise_6 contained Good fish habitat potential, and Uise_1, and Uise_3 contained only Moderate fish habitat potential. It was therefore recommended that Survey Locations Uise 2, Uise 4, Uise 5, and Uise 6, and a control Survey Location out-with the Proposed Development, should be subject to a fish population assessment, as these Survey Locations had the most likelihood of sustaining juvenile salmonids. Following recommendations from the FHS for control Survey Locations, Uise_7 was selected as a control as it is situated of an area of the Abhainn Gleann na h-Uamha, just upstream of the Proposed Development boundary. The objective of the "control site" is to record any effects that are catchment based and not directly attributable to the Proposed Development. These controls will be able to assess whether changes in fish population structure is a wider catchment-based effect or one directly attributable to the Proposed Development.

This report therefore aims to:

- Provide baseline fish population data on watercourses potentially affected by the Proposed Development from which future monitoring can be compared with (during and post construction); and
- Place salmonid fish densities on watercourses potentially affected by the Proposed Development in a regional context.

2 Methodology

Juvenile salmonid surveys were conducted using an Electracatch 250V backpack electrofishing unit with hand-held anode and trailing cathode. A smooth DC current was used with a voltage output of around 200-240 volts and Scottish Fisheries Coordination Centre (SFCC) protocols for juvenile salmonid surveying and habitat surveying were followed. Instream conductivity was measured prior to electrofishing so that an appropriate voltage output could be set. This is essential to prevent permanent damage to fish. A stop net/natural break was used at the top of each Survey Location and captured fish were anesthetized using (buffered) ms-222 before processing. Processed fish were subsequently allowed to recover in buckets of fresh river water prior to being released back into the section of burn from where they were removed. Fully-quantitative multi-run electrofishing surveys were used as this is the survey type that provides the most accurate population estimates.

Post survey the electrofishing and habitat data was entered into the SFCC database where minimum density estimates per 100 m^2 were calculated.

2.1 Fully Quantitative Electrofishing Survey

Assessment of the species composition, abundance and age class structure of fish population was conducted in reasonable accordance with Scottish Fisheries Coordination Centre guidelines on undertaking and managing electrofishing operations (SFCC, 2007) and British Standards (i.e., BS 14011 - Sampling of fish with electricity & BS 14962 Guidance on the scope and selection of fish sampling methods). The survey team comprised of three experienced surveyors. The survey lead was qualified to SVQ Level III (leading electrofishing operations and undertaking fish habitat surveys), both assistants were qualified to SVQ Level II (introduction to electrofishing).

A fully quantitative (3-run) electrofishing survey was carried out at each Survey Location, as per SFCC protocol, to obtain quantitative estimates of the population present and confidence intervals. A quantitative electrofishing survey is the enumeration of a stock component within a given Survey Location. The estimate of the total population was calculated from the number of fish caught in a sample. In order to calculate the population estimate, a depletion sampling method was followed (where fish are removed from a Survey Location in a series of successive electrofishing runs). Depletion methods are considered as self-calibrating as the catch data is used to derive the probability of capture (Wyatt and Lacey, 1994). The population estimate is based on the rate at which the number of individuals caught for each catch on successive runs drop off. For the estimation to be valid, the removal method must significantly reduce the population size with each successive sampling run. Each survey was conducted within an approximate 100 m^2 section.

2.1.1 Limitations of electrofishing

The SFCC electrofishing method was primarily designed for assessing juvenile salmonid populations in relatively slow-moving water. Although non-Salmonid fish species might be captured during surveys, accurately determining their populations using this electrofishing method can be challenging.

It is important to note that electrofishing is unlikely to capture all of the fish at a survey location. Therefore, the densities reported in this document are estimations – either a minimum estimate or, where possible, calculated using methods like Zippin or Carle and Strub estimates – to represent the population of juvenile salmonids within the survey location. An absence of fish cannot be definitively confirmed through electrofishing techniques, so a density of zero does not always indicate fish are entirely absent from that particular section of watercourse.

While electrofishing can assess low fish densities, accurately gauging the actual population density of the watercourse or the survey location becomes more challenging. If fish are sparsely distributed with a low population density, drawing definitive conclusions from the data may become more difficult.

2.2 Fish Processing

Caught individuals were carefully placed in an aerated freshwater container with a small hand net. Four individuals at the time were place in an anaesthetic (ms-222, buffered) container. The fork length was recorded, and the individuals were placed into a recovery container (i.e., aerated freshwater). At the end of the processing, all individuals were carefully released at the upstream limit of the survey section.

2.3 Analysis and Statistics

2.3.1 Fish Population Assessment: Analysis

2.3.1.1 Age Class

The electrofishing survey focused on evaluating the condition of young salmonid species, specifically Atlantic salmon (*Salmo salar*) and Brown trout (*Salmo trutta*). In most instances, determining the age of fish can be accomplished by assessing their length. However, as fish get older, identifying their age becomes more challenging. In these situations, a few scales can be extracted from fish, alongside length assessments, to confirm the ages of fish whose age cannot be definitively determined solely from their length. In this survey, salmonids were classified into two age groups: fry (0+) and parr (1+ and over).

2.3.1.2 Analyses

Fish densities were calculated separately for fry (young of the year) and parr in salmon and trout populations. Minimum density estimates were calculated by dividing the number of captured fish by the surveyed area. Corrections using Zippin, Carle and Strub methodologies were applied where appropriate, using the Removal Sampling II software (Pisces conservation). Zippin's maximum likelihood estimation (MLE) procedure is one of the most accurate methods used to estimate total populations from removal trapping (Sanots and Olivia, 1991). However, it has been shown that a comparatively large proportion of the population must be caught to obtain reasonably precise estimates (Zippin, 1956; Zippin, 1958). The weighted maximum likelihood estimator of Carle and Strub is a development of the Zippin method and was developed for use with catch data that is poor and fails to provide valid estimates using the Zippin maximum likelihood method (Carle and Strub, 1978). It has the advantage of being able to produce population estimates and confidence intervals under situations where Zippin fails (i.e., when the probability of catch varies from run to run, or when the population size is small which was the case in the study). However, despite being more robust than the Zippin method, it is still susceptible to the same violations mentioned above as the Zippin method is, and the confidence limits of the data should be considered when the data are interpreted.

2.3.1.3 SFCC Classification Scheme

The SFCC classification scheme for the Outer Hebrides Statistical Region (OHSR hereafter) (Godfrey, 2005), was used to categorise fish densities, providing an indication of the relative abundance of salmonid fish sampled during the survey.

The Godfrey’s classification scheme operates on an area-based model, utilising a single-run approach. Consequently, classification in this survey is based solely on the initial pass of the multi-run approach. Grades of abundance ranging from Very Poor to Good were assigned within each quintile range, with an 'absent' classification indicating no fish caught during the survey.

The SFCC developed a national river classification scheme for Scottish rivers. The following classification is quintile ranges for juvenile salmonids (per 100 m^2 of water) in different river width classes, based on one-run electrofishing method, calculated on densities >0 over 50 Survey Locations in the OHSR. Hence, its relevance to this fish population assessment area.

Table 1. OHSR SFCC Classification Scheme for Juvenile Salmonids– N individuals / 100 m^2 in a stream <4 m, 4-6 m, and >6 m width

Species & Age	<4 m	4 -6 m	>6 m		Species & Age	<4 m	4 -6 m	>6 m
Salmon 0+					**Trout 0+**			
0th percentile	1.2	0.5	0.9		0th percentile	0.6	1.1	0.2
20th percentile	4.1	1.9	1.5		20th percentile	2.1	1.9	0.3
40th percentile	7.4	2.7	2.8		40th percentile	3.5	2.2	0.5
60th percentile	12.4	5.3	3.6		60th percentile	6.8	4.8	0.9
80th percentile	18.7	8.2	7.2		80th percentile	13.1	9.0	2.5
100th percentile	167.3	15.8	10.9		100th percentile	56.3	11.8	8.5
Salmon 1++					**Trout 1++**			
0th percentile	1.0	0.7	1.0		0th percentile	0.7	0.4	0.2
20th percentile	3.1	3.9	1.7		20th percentile	1.6	0.6	0.2
40th percentile	6.8	5.0	2.0		40th percentile	2.8	0.7	0.3
60th percentile	10.1	7.2	3.7		60th percentile	4.9	1.9	0.5
80th percentile	17.2	10.2	7.5		80th percentile	8.4	3.7	1.3
100th percentile	40.4	13.5	3.2		100th percentile	38.1	5.7	2.1

Table 2: SFCC Classification Scheme – N individuals / 100 m^2 in a stream <4 m, 4-6 m, and >6 m width.

Density In Regional Classification	Description
No fish caught	***Absent***
Min to 20th percentile	***Very poor***
20th to 40th percentile	***Poor***
40th to 60th percentile	***Moderate***
60th to 80th percentile	***Good***
80th to 100th percentile	***Excellent***

3 Results

A fully quantitative, 3-run survey technique was used. Densities were low throughout the survey and in some cases, too low for reliable statistical analyses using Carle & Strub and/or Zippin methods. The Carle & Strub method can produce results with relatively low numbers but only when a depletion (fish caught reduces each run) occurs.

3.1 Allt Sgrihascro (Uise_2)

The Survey Location was approximately 100 m downstream of where ATV'S ford the burn, below Loch Sgrihascro Mhor.

Minimum density estimates per 100 m^2 for all runs were 0.983 for Atlantic salmon fry, 0.00 for Atlantic salmon parr, and 4.914 for Brown trout fry, and 6.88 for Brown trout parr.

Minimum density estimates per 100 m^2 for one-run were 0.00 for Atlantic salmon fry and parr, as no fish were caught in the first electrofishing run. Minimum density estimates per 100 m^2 for one-run Brown trout populations were 4.914 fry, and 6.88 for parr.

SFCC Classifications are based on 1^{st} pass (one-run) electrofishing runs, and percentile ranges differ dependent on river width (Table 1). Uise_2 watercourse average width was 2.85 m, meaning it was categorised into <4 m river in Table 1 above. Data collected from the Allt Sgrihascro (Uise_2) derived minimum density estimates per 100 m^2 of 0.983 Atlantic Salmon fry (SFCC Classification as Very Poor). No Atlantic Salmon parr were caught during the survey (SFCC Classification: Absent). In regard to Brown Trout, minimum density estimates per 100 m^2 were 0.983 for 1-run brown trout fry (SFCC Classification: Very Poor), and 6.88 for parr (SFCC Classification: Good).

Instream vegetation was recorded as 70% at this Survey Location with a substrate predominantly comprising of cobble then pebble, with some areas of gravel and fewer boulders. Draped vegetation saw 60% on the right bank, and 40% on the left bank. Along the survey section the flow was noted as being mostly (60%) deep glide, and run (25%), riffle (10%), and deep pool (5%).

Two European eel (*Anguilla anguilla*) were also caught at this Survey Location. For an overview of fish fauna, SFCC classification, and density estimates, please see Table 3 in section 2.6 below. For full habitat field notes see Appendix D.

3.2 Abhainn Cheothadail (Uise_4)

Minimum density estimates per 100 m^2 for all runs were 0.00 for Atlantic salmon fry, 2.555 for Atlantic salmon parr, and 1.277 for Brown trout fry, and 0.00 for Brown trout parr.

Minimum density estimates per 100 m^2 for one-run were 0.00 for Atlantic salmon fry, and 1.916 for parr. Minimum density estimates per 100 m^2 for one-run Brown trout populations were 1.277 for fry, and 0.00 for parr.

SFCC Classifications are based on 1^{st} pass electrofishing runs, and percentile ranges differ dependent on river width (Table 1). Uise_4 watercourse average width was 8.24 m, meaning it was categorised into >6 m river in Table 1 above. Data collected from the Abhainn Cheothadail (Eishken, Lewis), (Uise_4), derived minimum density estimates per 100 m^2 of 1.916 Atlantic Salmon parr (SFCC Classification: Poor). No Atlantic Salmon fry were caught during the survey (SFCC Classification: Absent). Regarding Brown Trout, minimum density estimates per 100 m^2 were 1.277 for fry (SFCC Classification: Good), and no parr were recorded (SFCC Classification: Absent).

Instream vegetation was recorded as 0% at this Survey Location with a substrate predominantly comprising of boulder (45%) then cobble (30%), with areas of gravel (10%) and pebble (10%), and few bedrock sections (5%). Draped vegetation saw 50% on the left bank, and 0% on the right bank. A large section of the left bank was undercut (70%). Along the survey section the flow was noted as being mostly (60%) riffle, then deep glide (20%), and shallow glide (10%), with some areas of run (5%) and torrent (5%).

Three European eel (*Anguilla Anguilla*) were also caught at this Survey Location. For an overview of fish fauna, SFCC classification, and density estimates, please see Table 3 in section 2.6 below. For full habitat field notes see Appendix D.

3.3 Abhainn Cheothadail (Uise_5)

The Survey Location was upstream of Loch Feoir. The downstream end of the Survey Location was located where the tributary (Allt nan Laogh) enters the main river.

A depletion in numbers each run meant that further statistical analyses of Zippin and Carle and Strub methods were possible for Atlantic salmon 0+ and 2+ individuals, and brown trout 0+ individuals.

Minimum density estimates per 100 m^2 for all runs were 7.364 for Atlantic salmon fry, 8.182 for Atlantic salmon parr, and 1.636 for Brown trout fry and parr.

Minimum density estimates per 100 m^2 for one-run were 4.909 for Atlantic salmon fry, and 1.636 for parr. Minimum density estimates per 100 m^2 for one-run Brown trout populations were 0.818 for fry, and 1.636 for parr.

Density estimates per 100 m^2 for Atlantic salmon 0+ individuals using the Zippin method was 7.809, with lower, upper, 95% confidence levels of 5.918, 9.7, and 1.891, respectively. Probability was 0.615. For Atlantic salmon 2+ individuals using the Zippin method, density estimates per 100 m^2 were 6.841, with lower, upper, 95% confidence levels of -9.096, 22.778, and 15.937, respectively. Probability was 0.262.

Density estimates per 100 m^2 for Atlantic salmon 0+ individuals using the Carle & Strub method was 7.364, with lower, and upper confidence levels of 7.364. Probability was 0.692. For Atlantic salmon 2+ individuals using the Carle & Strub method, density estimates per 100 m^2 were 4.091, with lower and upper confidence levels of 4.091. Probability was 0.556.

Density estimates per 100 m^2 for brown trout 0+ individuals using the Zippin method was 1.783, with lower, upper, 95% confidence levels of 0.568, 2.998, and 1.215, respectively. Probability was 0.565. Density estimates per 100 m^2 for Brown Trout 0+ individuals using the Carle & Strub method was 1.636, with lower, and upper confidence levels of 1.636. Probability was 0.667.

SFCC Classifications are based on 1st pass electrofishing runs, and percentile ranges differ dependent on river width (Table 1). Uise_5 watercourse average width was 5.82 m, meaning it was categorised into 4-6 m river in Table 1 above. Data collected from the Abhainn Cheothadail (Eishken, Lewis), (Uise_5), derived minimum density estimates for salmon fry per 100 m^2 were 4.909 (SFCC Classification: Moderate) and 1.636 (SFCC Classification: Very Poor) for salmon parr per 100 m^2. Minimum density estimates for trout fry and parr were 0.818 (SFCC Classification: Very Poor) and 1.636 (SFCC Classification: Moderate), respectively.

Instream vegetation was recorded as 0% at this Survey Location with a substrate predominantly comprising of equal amounts of cobble (40%) and pebble (40%), with areas of gravel (15%), and few boulders (5%). Draped vegetation saw 50% on the left bank, and 30% on the right bank, and both banks had 95% undercut. Along the survey section the flow was noted as being mostly run (70%), and equal flows of deep glide (10%), shallow glide (10%), and riffle (10%).

Three European eel (*Anguilla Anguilla*) were also caught at this Survey Location. For an overview of fish fauna, SFCC classification, and density estimates, please see Table 3 in section 2.6 below. For full habitat field notes see Appendix D.

3.4 Abhainn Gleann Airighean Dhomhnaill (Uise_6)

The Survey Location was located at the Abhainn Gleann Airighean Dhomhnaill (Eishken, Lewis), (Uise_6). No Atlantic Salmon, or Brown Trout were recorded at this Survey Location (SFCC Classification: Absent).

Instream vegetation was recorded as 0% at this Survey Location with a substrate predominantly comprising of equal amounts of boulder (55%) and cobble (25%), and bedrock (15%), with few areas of gravel (5%). There was no draped vegetation or undercut on either bank. Along the Survey Location section the flow was noted as being mostly run (50%), riffle (45%), and torrent (5%).

One European eel (*Anguilla Anguilla*) was caught at this Survey Location. For an overview of fish fauna, SFCC classification, and density estimates, please see Table 3 in section 2.6 below. For full habitat field notes see Appendix D.

3.5 Abhainn Gleann na h-Uamha (Uise_7)

The upstream end of the Survey Location was located at a steep waterfall.

A depletion in numbers each run meant that further statistical analyses of Zippin and Carle and Strub methods were possible.

Minimum density estimates per 100 m^2 for all runs were 8.418 for Atlantic salmon fry, 0.935 for Atlantic salmon parr, and 0.00 for Brown trout fry, and 2.806 for Brown trout parr.

Minimum density estimates per 100 m^2 for one-run were 2.806 for Atlantic salmon fry, and 0.935 for parr. Minimum density estimates per 100 m^2 for one-run Brown trout populations were 0.00 for fry, and 1.871 for parr.

Density estimates per 100 m^2 using the Zippin method was 2.876, with lower, upper, 95% confidence levels of 2.206, 3.546, and 0.67, respectively. Probability was 0.288 using the Zippin method. Density estimates per 100 m^2 using the Carle and Strub method was 2.806, with lower, and upper confidence levels of 2.806. Probability was 0.474 using the Carle and Strub method.

SFCC Classifications are based on 1st pass electrofishing runs, and percentile ranges differ dependent on river width (Table 1). Uise_7 watercourse average width was 4.86 m, meaning it was categorised into 4-6 m river in Table 1 above. Data collected from the Abhainn Gleann na h-Uamha, (Uise_7), derived minimum density estimates per 100 m^2 of 2.806 (SFCC Classification: Moderate) for salmon fry, and 0.935 for salmon parr (SFCC Classification: Very Poor) (Table 12). No trout fry were caught at this Survey Location (SFCC Classification: Absent). Minimum density estimates per 100 m^2 for trout parr were 2.876 (SFCC Classification: Moderate).

Instream vegetation was recorded as 0% at this Survey Location with a substrate predominantly comprising of equal amounts of cobble (40%) and pebble (40%), with areas of gravel (15%), and few boulders (5%). Draped vegetation saw 50% on the left bank, and 30% on the right bank, and both banks had 95% undercut. Along the survey section the flow was noted as being mostly run (70%), and equal flows of deep glide (10%), shallow glide (10%), and riffle (10%).

For an overview of fish fauna, SFCC classification, and density estimates, please see Table 3 in section 2.6 below. For full habitat field notes see Appendix D.

3.6 Fish Fauna Results & Classifications

Table 3 presents fish fauna data for Uisenis Wind Farm collected in September 2023, minimum density classification per the SFCC classification scheme, and populations estimates (all runs) using Carle & Strub (C&S) and Zippin where possible (where a depletion in fish numbers occurred each run). NGRs and average lengths are also included as a summary. A Map with SFCC Regional Classifications for Atlantic salmon fry, and parr, and brown trout fry, and parr, for each Electrofishing Survey Location can be viewed in Appendix C (Figures 2.1, 2.2, 2.3, and 2.4 respectively).

Table 3: Fish Fauna Results, Classifications, and Estimates per 100 m^2.

Survey Location	NGR	Fish Density & Species	Average Length (mm)	SFCC Classification	Population Estimate (1st run)	Population Estimate (all runs)	Population Estimate (Zippin)	Population Estimate (Carle & Strub)
Uise_2	NB 31571 13678	Salmon Fry: 1	66	***Very Poor***		0.983		
		Salmon Parr: 0		***Absent***				
		Trout Fry: 5	61	***Very Poor***	0.983	4.914		
		Trout Parr: 7	76	***Good***	6.88	6.88		
Uise_4	NB 30281 12279	Salmon Fry: 0		***Absent***				
		Salmon Parr: 4	95	***Poor***	1.916	2.555	1.964	1.916
		Trout Fry: 2	57	***Good***	1.277	1.277		1.277
		Trout Parr: 0		***Absent***				
Uise_5	NB 31055 12312	Salmon Fry: 9	57	***Moderate***	4.909	7.364	7.809	7.364
		Salmon Parr: 10	90	***Very Poor***	1.636	8.182	6.841	4.091
		Trout Fry: 2	51	***Very Poor***	0.818	1.636	1.783	1.636
		Trout Parr: 2	138	***Moderate***	1.636	1.636		
Uise_6	NB 29425 10748	Salmon Fry: 0		***Absent***				
		Salmon Parr: 0		***Absent***				
		Trout Fry: 0		***Absent***				
		Trout Parr: 0		***Absent***				
Uise_7	NB 29244 12301	Salmon Fry: 9	56	***Moderate***	2.806	8.418	13.172	9.353
		Salmon Parr: 1	70	***Very Poor***	0.935	0.935		
		Trout Fry: 0		***Absent***				
		Trout Parr: 3	107	***Moderate***	1.871	2.806	2.876	2.806

4 Discussion

The densities of salmonids varied across the five survey locations. Atlantic salmon and brown trout species were caught at all Survey Locations, except the Abhainn Gleann Airighean Dhomhnaill (Uise_6), where no juvenile salmonids were caught at all. However, one European eel (*Anguilla Anguilla*) was caught at this Survey Location. The Abhainn Gleann na h-Uamha (Uise_7) was selected as a control site to record any effects that are catchment based and not directly attributable to the Proposed Development. The control will be able to assess whether changes in fish population structure is a wider catchment based effect, or one directly attributable to the Proposed Development.

For the purposes of SFCC regional classification, fish were categorised into fry (0+) and parr (anything 1+ and over). One larger fish was recorded (4++, 244 mm length) that may have been a mature trout, however this was still recorded as parr in this report. SFCC Classification ranged from Very Poor, to Good across the five Survey Locations.

For Atlantic salmon, in the Allt Sgrihascro (Uise_2), no parr were caught throughout the survey, and two fry were recorded at this survey location. Recruitment may have improved from the previous year, given there were more fry caught than parr. This was similar in the Abhainn Gleann na h-Uamha (Uise_7, control site), where a larger number (9) of Atlantic salmon fry were recorded, than parr (1).

At all other Survey Locations where fish were caught, no fry were caught, only parr. This may mean that this year's recruitment of Atlantic salmon was less of that of the previous years in the Abhainn Cheothadail (Uise_4, and Uise_5).

For brown trout, only at Uise_4 Survey Location in the Abhainn Cheothadail, were there more trout fry (2) caught than parr (0). More parr than fry were recorded at Uise_2 in the Allt Sgrihascro (5 fry, 7 parr) and Uise_7 control site in the Abhainn Gleann na h-Uamha (0 fry, 3 parr). An equal number of fry (2) and parr (2) were recorded at the Uise_5 Survey Location in the Abhainn Cheothadail. This could mean that recruitment of trout fry from previous years has only improved in the Uise_4 watercourse, and has deteriorated in all other watercourses surveyed, with the exception of Uise_6 where no fish were recorded. An overview of fry and parr caught at each Survey Location can be viewed in Figure 1 below.

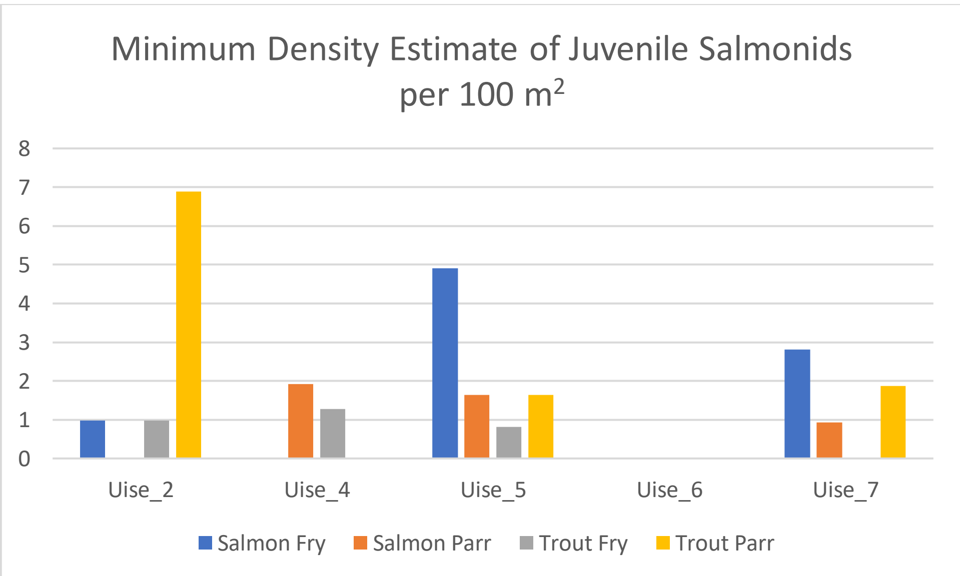

Figure 1: Minimum density of Atlantic salmon, and brown trout, fry and parr per 100 m^2 at each Survey Location (based on 1^{st} pass electrofishing data).

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Appendices

Appendix A Survey Locations

Uise_2

Plate 1: Uise_2 looking upstream.

Plate 2: Uise_2 looking downstream.

Plate 3: Uise_2, Salmon and Trout caught at this Survey Location.

Plate 4: Uise_2, Large Trout caught at this Survey Location.

Uise_4

Plate 5: Uise_4 looking upstream.

Plate 6: Uise_4 looking downstream.

Plate 7: Uise_4, Salmon and Trout caught at this Survey Location.

Uise_5

Plate 8: Uise_5 looking upstream.

Plate 9: Uise_5 looking downstream.

Uise_6

Plate 10: Uise_6 looking upstream.

Plate 11: Uise_6 looking downstream.

Uise_7

Plate 12: Uise_7 looking upstream.

Plate 12: Uise_7 looking upstream.

Appendix B Uisenis Wind Farm Boundary Map

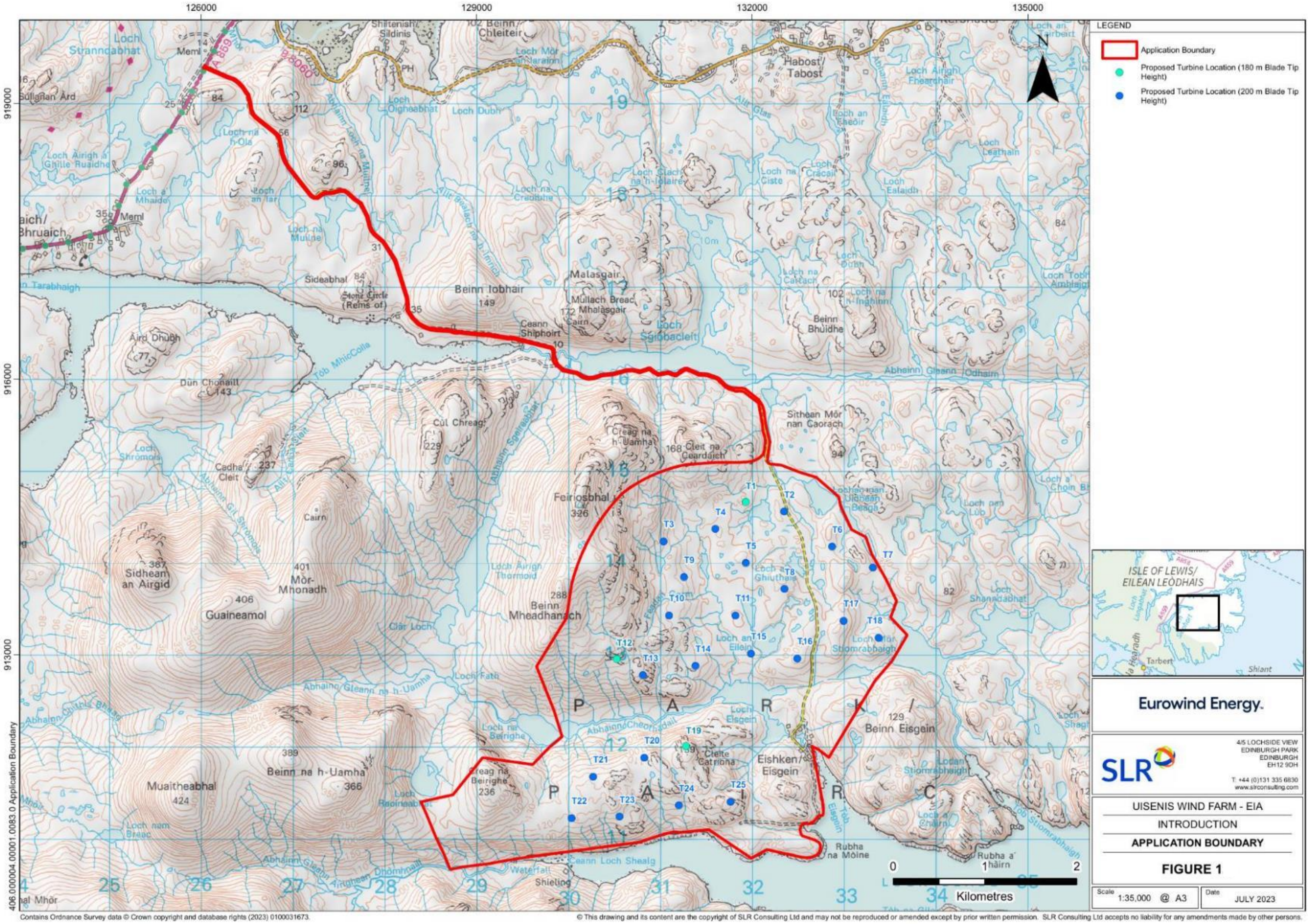


Figure 1: Development Boundary and access track route (Map provided by SLR).

Appendix C Electrofishing Survey Locations: SFCC Regional Classifications

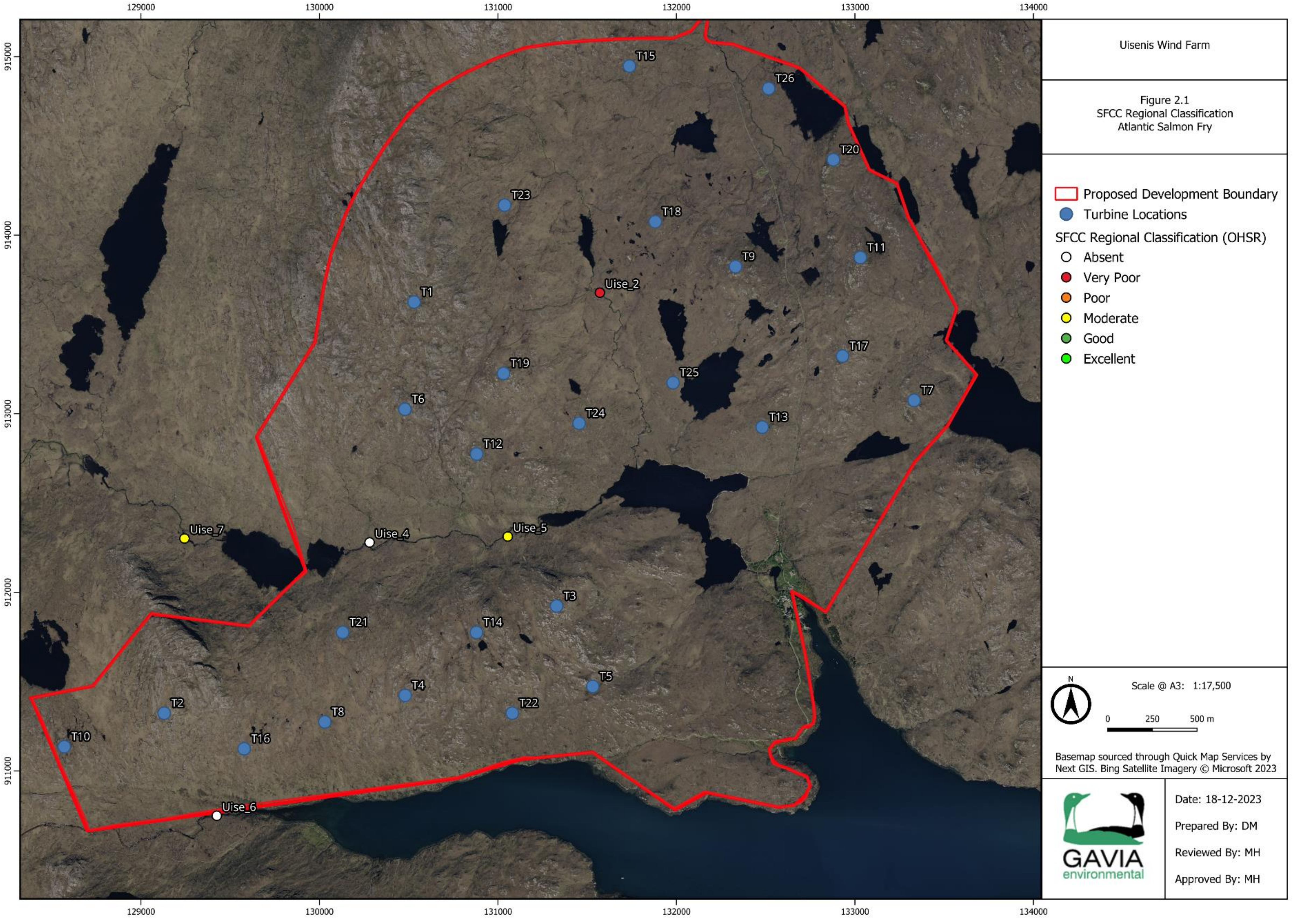


Figure 2.1: Atlantic Salmon Fry SFCC Regional Classification

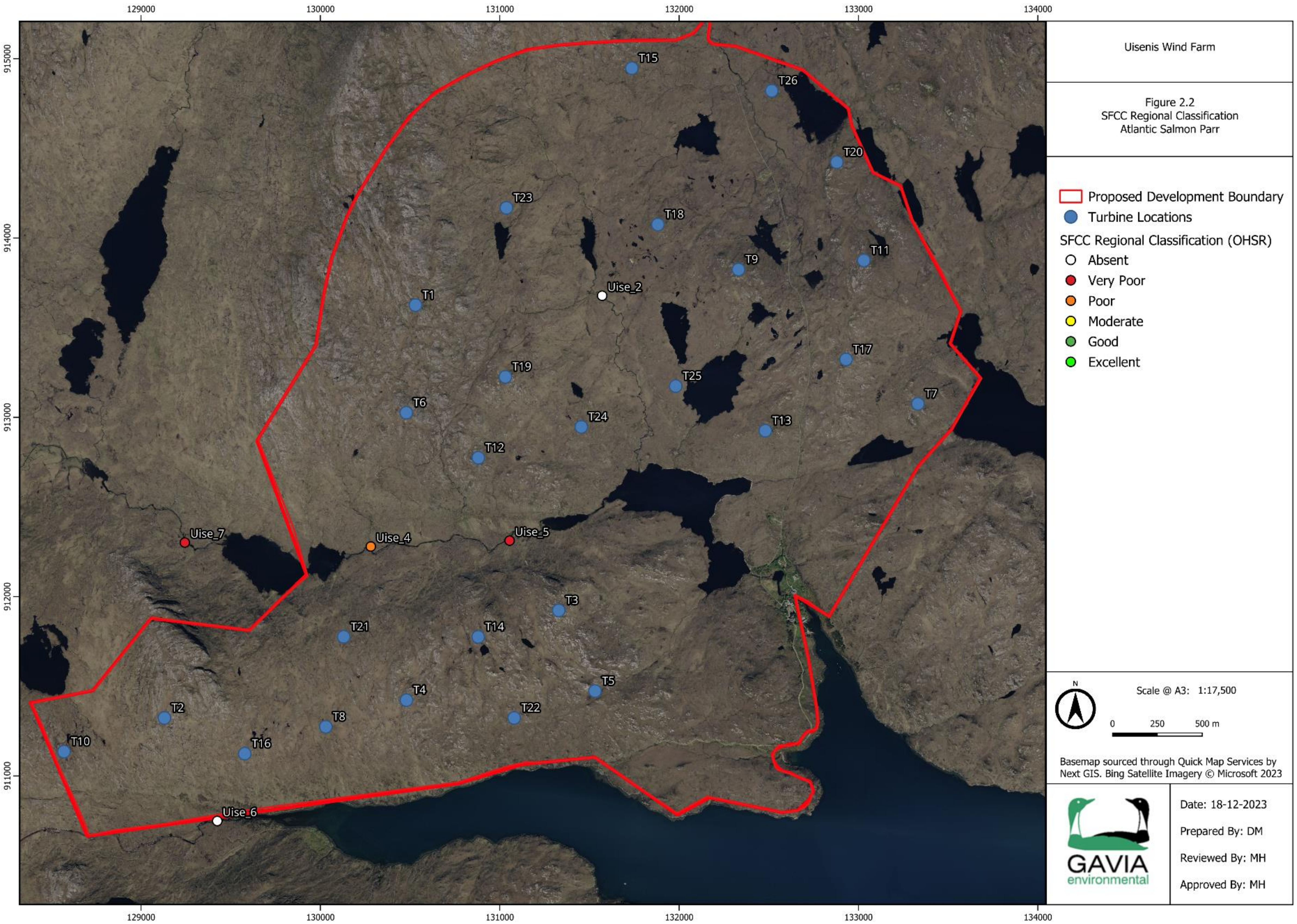


Figure 2.2: Atlantic Salmon Parr SFCC Regional Classification

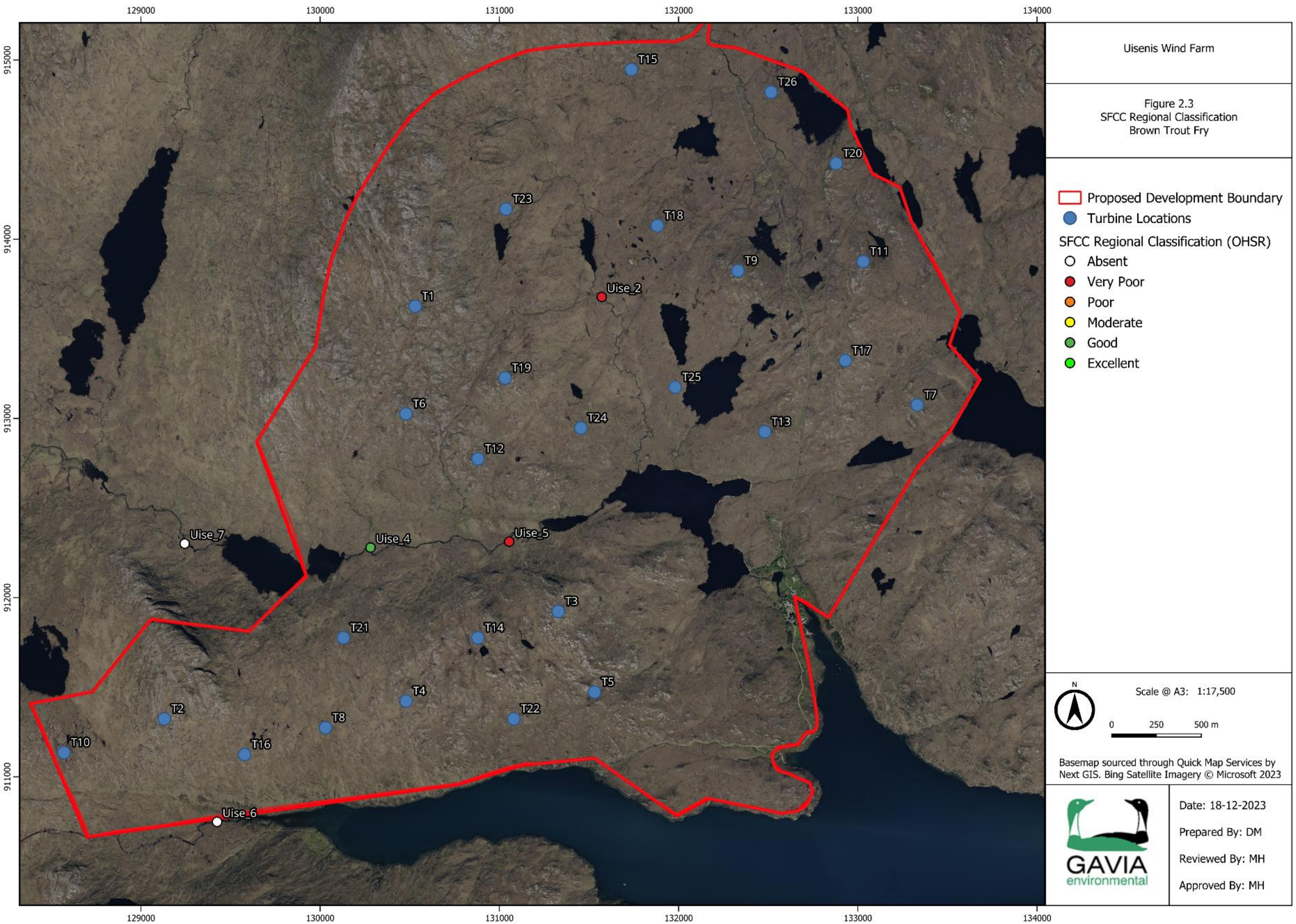


Figure 2.3: Brown Trout Fry SFCC Regional Classification

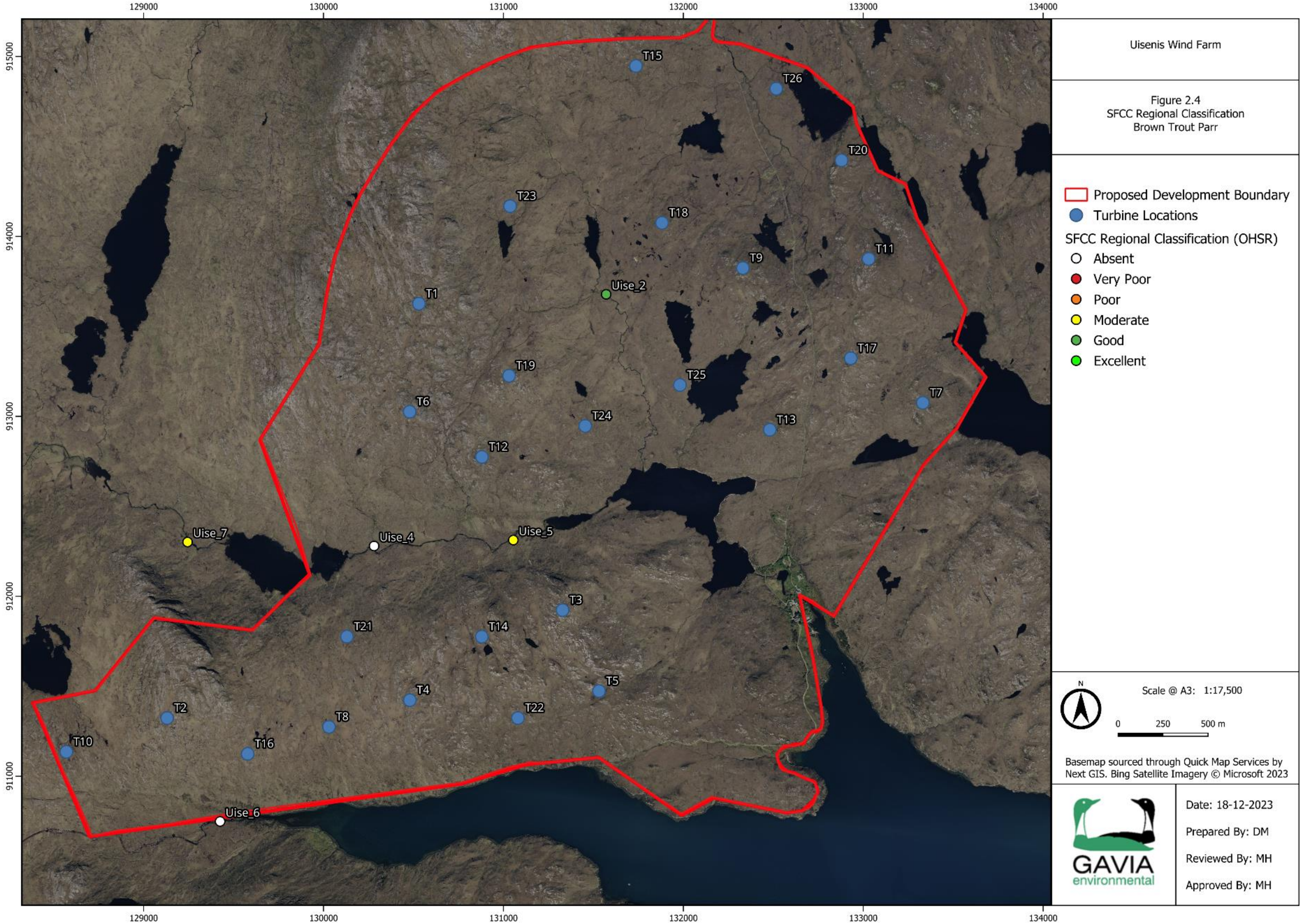


Figure 2.4: Brown Trout Parr SFCC Regional Classification

Appendix D Electrofishing Field Survey Notes

SFCC Electrofishing Event Report

Easting: 131571	Northing: 913678	Site code: Uise_2	Altitude: 46
River: Allt Sgrihascro			
Site situation: Approx. 100m D/S of where ATV'S ford the burn. Below Loch Sgrihascro Mhor.			
Access/permission: Chris Macrae (Headkeeper) Eishken Estate			Date: 26/09/23

Type of fishing: Quantitative (1mm)	Number of Fishing Runs: 3
Instream Cover: Good	Target Species: Atlantic Salmon (Salmo salar)

Dimensions

Wet Width Area (m^2): 101.8	Site Length (m): 55.0
Bed Width Area (m^2): 101.8	
Bank Width Area (m^2): 154.9	

Point No.	Measured At (m)	Wet Width (m)	Bed Width (m)	Bank Width (m)
A-Upst	0.0	2.3	2.3	3.0
B	11.0	1.9	1.9	2.4
C	22.0	1.7	1.7	2.7
D	33.0	1.9	1.9	2.9
E	44.0	1.6	1.6	3.3
F-Downst	55.0	1.7	1.7	2.6

Depth

< 10	11-20	21-30	31-40	41-50	> 50
0	0	0	20	70	10

Instream

Instream Vegetation (%): 70	Silted: No
Stable: Stable	Compacted: Partly
Notes:	

High Organic HO	Silt SI	Sand SA	Gravel GR	Pebble PE	Cobble CO	Boulder BO	Bedrock BE	Obscured OB	Substrate Total
20	0	0	10	25	40	5	0	0	100

Flow

Flow Speed (m/s):
Notes:

Still Marginal SM	Deep Pool DP	Shallow Pool SP	Deep Glide DG	Shallow Glide SG	Run RU	Riffle RI	Torrent TO	Flow Total
0	5	0	60	0	25	10	0	100

Bank

	Left Bank	Right Bank
Total Fish Cover (%)	100	0
Bankface Veg.	Simple	Simple
Banktop Veg.	Simple	Simple
Overhang Bough (%)	0	0
Canopy Cover (%)	0	
Notes		

Undercut UC		Draped DR		Bare BA		Marginal MA		Roots RT		Rocks RK		Other OTH		Bank Total	
LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB

100	100	40	60	0	0	0	0	0	0	0	0	0	0	140	160

Other

Team Leader:	Paul Hopper
Number of Staff:	2
Survey Purpose:	Contract (Other than SAC or WFD)
Purpose Notes:	Eisgen (Uisenis Windfarm)
Equipment Type:	Backpack
Volts:	250
Amps:	0.6
Smooth / Pulsed:	Smooth
Manufacturer:	Electracatch
Model:	
No. of Anodes:	1
Ring Diameter:	240.00
Stop Net:	Both Boundaries
Capture Net:	Hand/Dip
Effective Fishing:	Yes
Conductivity:	55

Temperature:	12.70
Time:	14:30
Water Level:	Medium
Water Clarity:	Clear
Survey Notes:	PH: 5.9
Salmon Access:	Regularly
Trout Access:	Yes
Pollution:	
Access Notes:	
Pollution Notes:	
Stocking:	No
Salmon Stocked:	No
Trout Stocked:	No
Stocking Notes:	
Photos and IDs:	✓

Other Fish Species Count

Species	Count
European Eel (Anguilla anguilla)	2

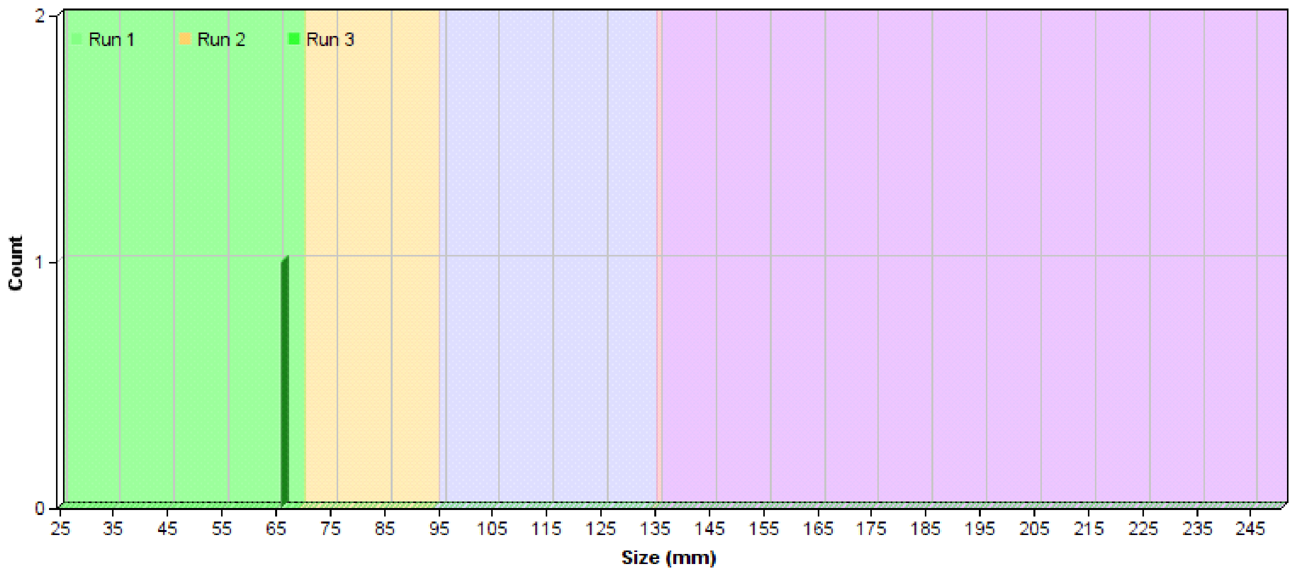
Atlantic Salmon Density Report

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m^2)		Minimum Estimate (per 100m^2)		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	0	0	1	0	0	1			0.000	0.983	66		
1+	0	0	0	0	0	0			0.000	0.000			
2+	0	0	0	0	0	0			0.000	0.000			
3+	0	0	0	0	0	0			0.000	0.000			
4++	0	0	0	0	0	0			0.000	0.000			
Total	0	0	1	0	0	1							
					Salmon Missed	(NaN)							

Zippin					
Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%	
0+					
1+					
2+					
3+					
4++					

Carle & Strub					
Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%	
0+					
1+					
2+					
3+					
4++					



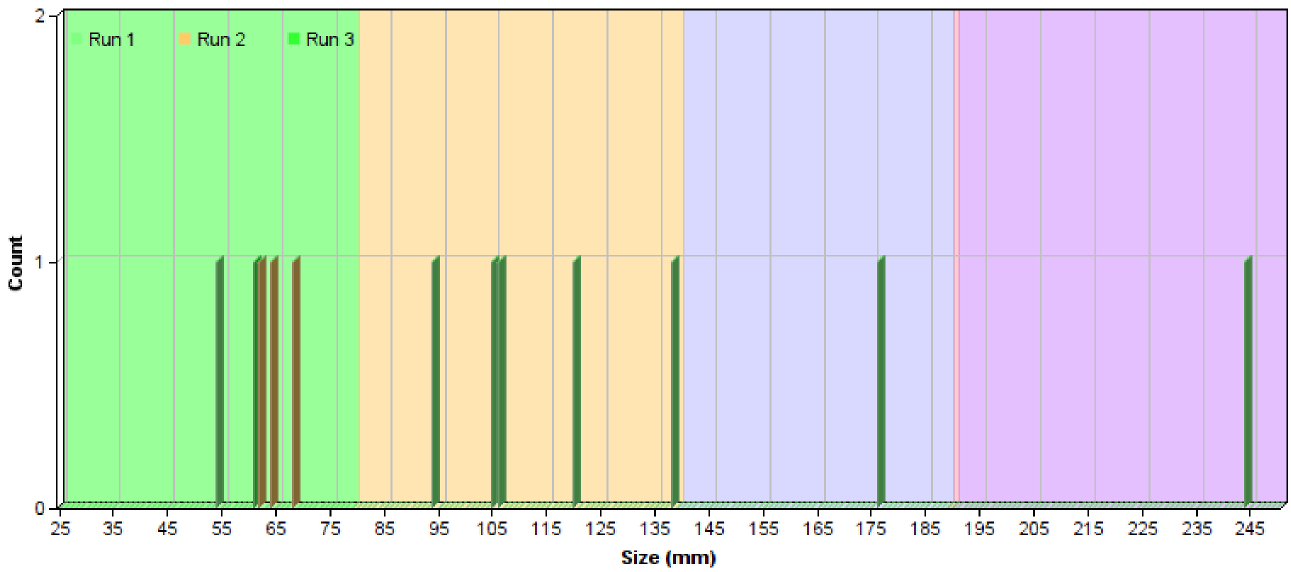
Brown Trout (Sea Trout) Density Report

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m^2)		Minimum Estimate (per 100m^2)		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	1	3	1	0	0	5			0.983	4.914	61	5.119	
1+	5	0	0	0	0	5			4.914	4.914	112	16.935	
2+	1	0	0	0	0	1			0.983	0.983	176		
3+	0	0	0	0	0	0			0.000	0.000			
4++	1	0	0	0	0	1			0.983	0.983	244		
Total	8	3	1	0	0	12							
Trout Missed						(NaN)							

Zippin					
Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%	
0+					
1+					
2+					
3+					
4++					

Carle & Strub					
Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%	
0+					
1+					
2+					
3+					
4++					



Run 1
Run 2
Run 3
Count
2
1
0
25
35
45
55
65
75
85
95
105
115
125
135
145
155
165
175
185
195
205
215
225
235
245
Size (mm)

SFCC Electrofishing Event Report

Easting: 130281	Northing: 912279	Site code: Uise_4	Altitude: 35
River: Abhainn Cheothadail (Eishken, Lewis)			
Site situation: U/S end of site is where tributary (Gil Ruadh) enters main river.			
Access/permission: Chris Macrae (Headkeeper) Eishken Estate			Date: 27/09/23

Type of fishing: Quantitative (1mm)	Number of Fishing Runs: 3
Instream Cover: Good	Target Species: Atlantic Salmon (Salmo salar)

Dimensions

Wet Width Area (m^2): 156.6	Site Length (m): 19.0
Bed Width Area (m^2): 164.9	
Bank Width Area (m^2): 189.2	

Point No.	Measured At (m)	Wet Width (m)	Bed Width (m)	Bank Width (m)
A-Upst	0.0	6.5	8.7	9.8
B	4.8	7.9	7.9	9.2
C	9.5	9.6	9.6	11.2
D	14.3	9.9	9.9	11.2
E-Downst	19.0	7.3	7.3	8.4

Depth

< 10	11-20	21-30	31-40	41-50	> 50
5	0	20	50	5	20

Instream

Instream Vegetation (%): 0	Silted: No
Stable: Stable	Compacted: Uncompacted
Notes:	

High Organic HO	Silt SI	Sand SA	Gravel GR	Pebble PE	Cobble CO	Boulder BO	Bedrock BE	Obscured OB	Substrate Total
0	0	0	10	10	30	45	5	0	100

Flow

Flow Speed (m/s):
Notes:

Still Marginal SM	Deep Pool DP	Shallow Pool SP	Deep Glide DG	Shallow Glide SG	Run RU	Riffle RI	Torrent TO	Flow Total
0	0	0	20	10	5	60	5	100

Bank

	Left Bank	Right Bank
Total Fish Cover (%)	100	100
Bankface Veg.	Simple	Simple
Banktop Veg.	Simple	Simple
Overhang Bough (%)	0	0
Canopy Cover (%)	0	
Notes		

Undercut UC		Draped DR		Bare BA		Marginal MA		Roots RT		Rocks RK		Other OTH		Bank Total	
LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB
70	0	50	0	0	0	0	90	0	0	10	10	0	0	130	100

Other

Team Leader:	Donnie Maciver
Number of Staff:	3
Survey Purpose:	Contract (Other than SAC or WFD)
Purpose Notes:	Eisgen (Uisenis) Windfarm
Equipment Type:	Backpack
Volts:	250
Amps:	0.3
Smooth / Pulsed:	Smooth
Manufacturer:	Electracatch
Model:	
No. of Anodes:	1
Ring Diameter:	240.00
Stop Net:	Both Boundaries
Capture Net:	Hand/Dip
Effective Fishing:	Yes
Conductivity:	51

Temperature:	12.30
Time:	13:20
Water Level:	Medium
Water Clarity:	Clear
Survey Notes:	PH: 6.0
Salmon Access:	Regularly
Trout Access:	Yes
Pollution:	No
Access Notes:	
Pollution Notes:	
Stocking:	No
Salmon Stocked:	No
Trout Stocked:	No
Stocking Notes:	
Photos and IDs:	✓

Other Fish Species Count

Species	Count
European Eel (Anguilla anguilla)	2
European Eel (Anguilla anguilla)	1

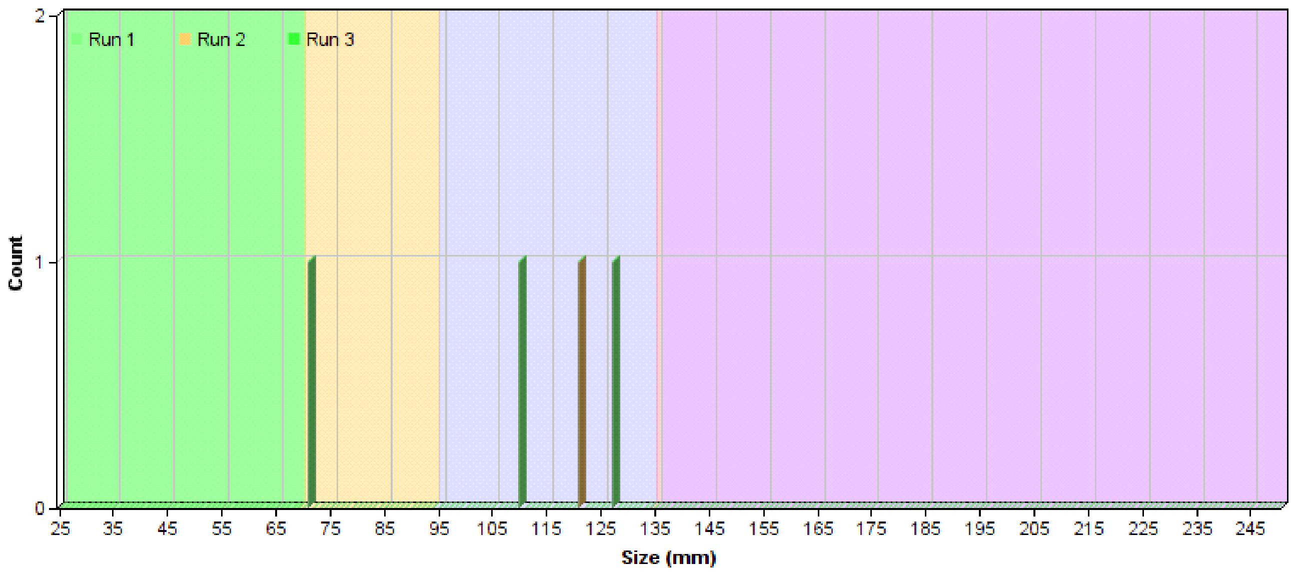
Atlantic Salmon Density Report

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m^2)		Minimum Estimate (per 100m^2)		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	0	0	0	0	0	0			0.000	0.000			
1+	1	0	0	0	0	1			0.639	0.639	71		
2+	2	1	0	0	0	3	1.964	1.916	1.277	1.916	119	8.622	
3+	0	0	0	0	0	0			0.000	0.000			
4++	0	0	0	0	0	0			0.000	0.000			
Total	3	1	0	0	0	4							
					Salmon Missed	(NaN)							

Zippin					
Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%	
0+					
1+					
2+	1.964	1.506	2.422	0.458	0.71
3+					
4++					

Carle & Strub					
Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%	
0+					
1+					
2+	1.916	1.916	1.916	.	0.75
3+					
4++					



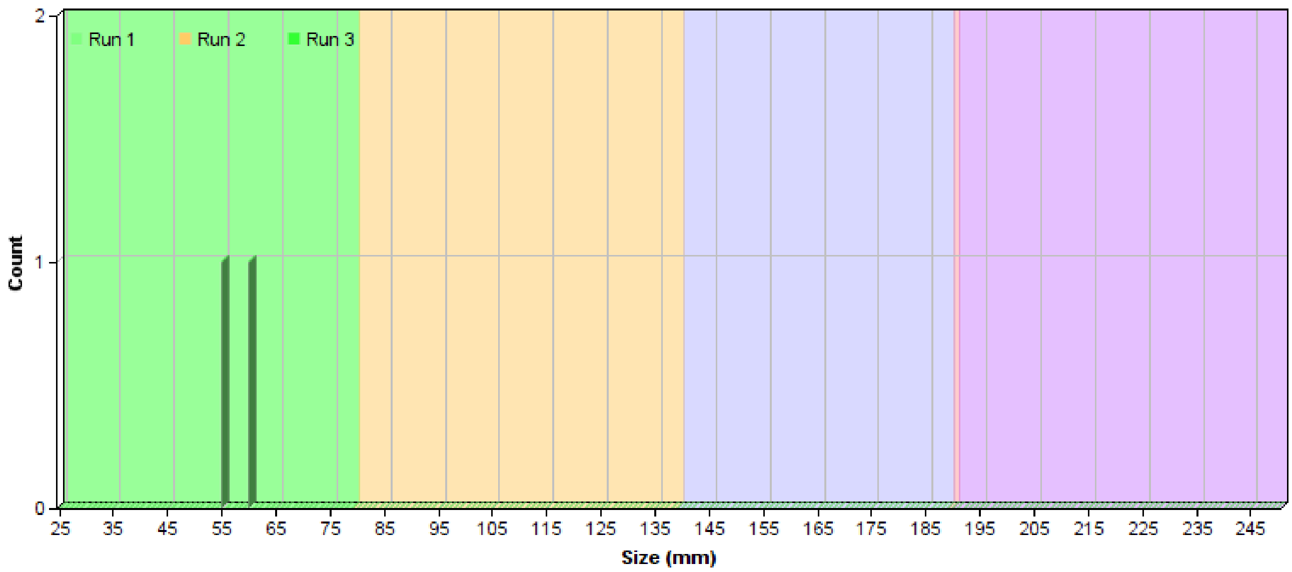
Brown Trout (Sea Trout) Density Report

- The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m^2)		Minimum Estimate (per 100m^2)		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	2	0	0	0	0	2			1.277	1.277	57	3.536	
1+	0	0	0	0	0	0			0.000	0.000			
2+	0	0	0	0	0	0			0.000	0.000			
3+	0	0	0	0	0	0			0.000	0.000			
4++	0	0	0	0	0	0			0.000	0.000			
Total	2	0	0	0	0	2							
					Trout Missed	(NaN)							

Zippin					
Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%	
0+					
1+					
2+					
3+					
4++					

Carle & Strub					
Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%	
0+					
1+					
2+					
3+					
4++					



Run 1
Run 2
Run 3
Count
Size (mm)
2
1
0
25
35
45
55
65
75
85
95
105
115
125
135
145
155
165
175
185
195
205
215
225
235
245

SFCC Electrofishing Event Report

Easting: 131055	Northing: 912312	Site code: Uise_5	Altitude: 17
River: Abhainn Cheothadail (Eishken, Lewis)			
Site situation: U/S of Loch Feoir. D/S end of site is where tributary (Allt nan Laogh) enters main river.			
Access/permission: Chris Macrae (Headkeeper) Eishken Estate.			Date: 27/09/23

Type of fishing: Quantitative (1mm)	Number of Fishing Runs: 3
Instream Cover: Good	Target Species: Atlantic Salmon (Salmo salar)

Dimensions

Wet Width Area (m²): 122.2	Site Length (m): 21.0
Bed Width Area (m²): 122.2	
Bank Width Area (m²): 145.3	

Point No.	Measured At (m)	Wet Width (m)	Bed Width (m)	Bank Width (m)
A-Upst	0.0	5.7	5.7	7.1
B	5.0	6.0	6.0	6.9
C	10.0	6.4	6.4	7.3
D	15.0	5.8	5.8	7.0
E-Downst	21.0	5.2	5.2	6.3

Depth

< 10	11-20	21-30	31-40	41-50	> 50
0	0	30	40	20	10

Instream

Instream Vegetation (%): 0	Silted: No
Stable: Stable	Compacted: Uncompacted
Notes:	

High Organic HO	Silt SI	Sand SA	Gravel GR	Pebble PE	Cobble CO	Boulder BO	Bedrock BE	Obscured OB	Substrate Total
0	0	0	15	40	40	5	0	0	100

Flow

Flow Speed (m/s):
Notes:

Still Marginal SM	Deep Pool DP	Shallow Pool SP	Deep Glide DG	Shallow Glide SG	Run RU	Riffle RI	Torrent TO	Flow Total
0	0	0	10	10	70	10	0	100

Bank

	Left Bank	Right Bank
Total Fish Cover (%)	100	100
Bankface Veg.	Simple	Simple
Banktop Veg.	Simple	Simple
Overhang Bough (%)	0	0
Canopy Cover (%)	0	
Notes		

Undercut UC		Draped DR		Bare BA		Marginal MA		Roots RT		Rocks RK		Other OTH		Bank Total	
LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB
95	95	50	30	0	0	5	0	0	0	0	5	0	0	150	130

Other

Team Leader:	Donnie Maciver
Number of Staff:	3
Survey Purpose:	Contract (Other than SAC or WFD)
Purpose Notes:	Eisgen (Uisinis) Windfarm.
Equipment Type:	Backpack
Volts:	250
Amps:	0.3
Smooth / Pulsed:	Smooth
Manufacturer:	Electracatch
Model:	
No. of Anodes:	1
Ring Diameter:	240.00
Stop Net:	Both Boundaries
Capture Net:	Hand/Dip
Effective Fishing:	Yes
Conductivity:	50

Temperature:	12.50
Time:	14:45
Water Level:	Medium
Water Clarity:	Clear
Survey Notes:	
Salmon Access:	Regularly
Trout Access:	Yes
Pollution:	No
Access Notes:	
Pollution Notes:	
Stocking:	No
Salmon Stocked:	No
Trout Stocked:	No
Stocking Notes:	
Photos and IDs:	✓

Other Fish Species Count

Species	Count
European Eel (Anguilla anguilla)	1
European Eel (Anguilla anguilla)	2

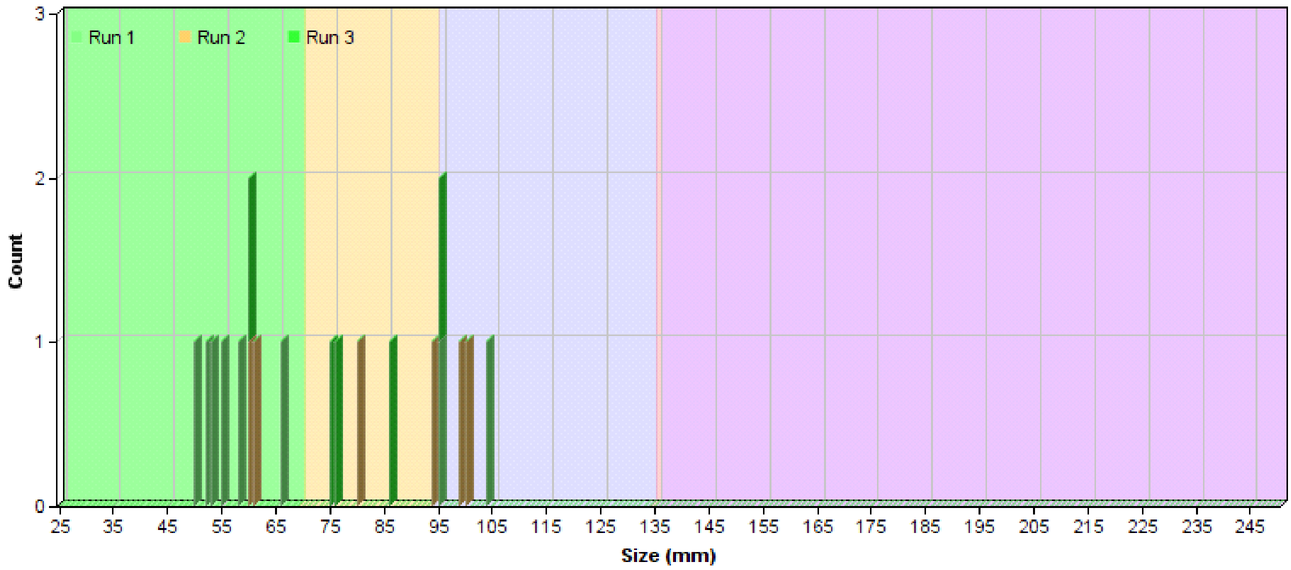
Atlantic Salmon Density Report

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m^2)		Minimum Estimate (per 100m^2)		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	6	2	1	0	0	9	7.809	7.364	4.909	7.364	57	5.118	
1+	0	2	3	0	0	5			0.000	4.091	82	7.887	
2+	2	2	1	0	0	5	6.841	4.091	1.636	4.091	98	3.782	
3+	0	0	0	0	0	0			0.000	0.000			
4++	0	0	0	0	0	0			0.000	0.000			
Total	8	6	5	0	0	19							
Salmon Missed						(NaN)							

Zippin					
Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%	
0+	7.809	5.918	9.7	1.891	0.615
1+					
2+	6.841	-9.096	22.778	15.937	0.262
3+					
4++					

Carle & Strub					
Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%	
0+	7.364	7.364	7.364	.	0.692
1+					
2+	4.091	4.091	4.091	.	0.556
3+					
4++					



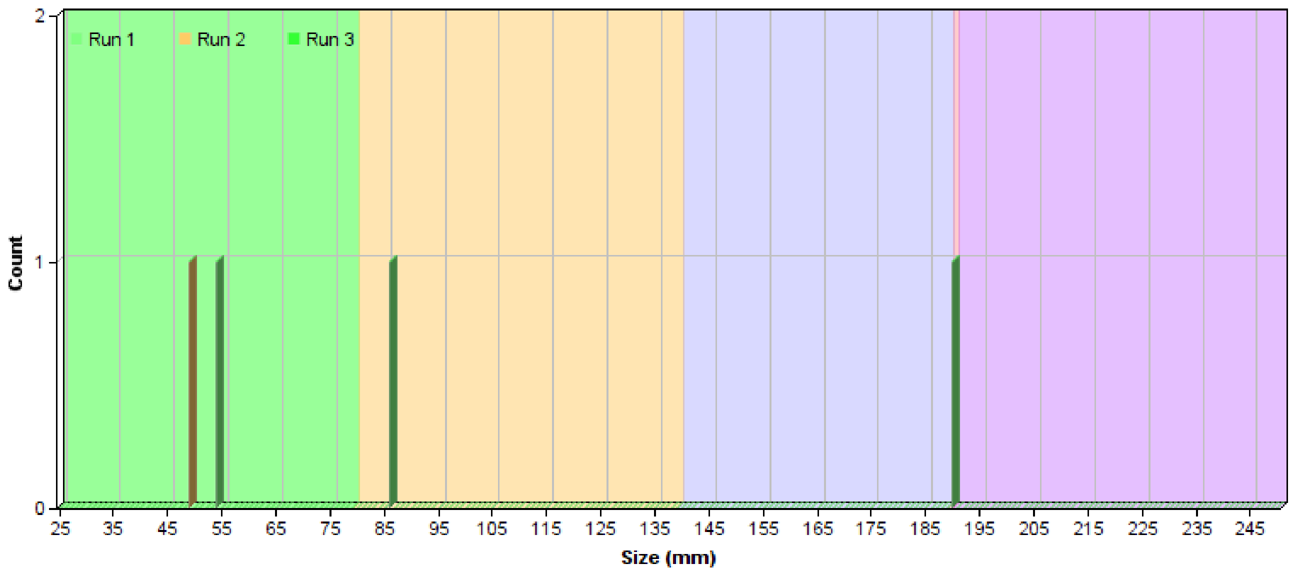
Brown Trout (Sea Trout) Density Report

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m^2)		Minimum Estimate (per 100m^2)		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	1	1	0	0	0	2	1.783	1.636	0.818	1.636	51	3.536	
1+	1	0	0	0	0	1			0.818	0.818	86		
2+	0	0	0	0	0	0			0.000	0.000			
3+	1	0	0	0	0	1			0.818	0.818	190		
4++	0	0	0	0	0	0			0.000	0.000			
Total	3	1	0	0	0	4							
					Trout Missed	(NaN)							

Zippin					
Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%	
0+	1.783	.568	2.998	1.215	0.565
1+					
2+					
3+					
4++					

Carle & Strub					
Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%	
0+	1.636	1.636	1.636	.	0.667
1+					
2+					
3+					
4++					



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Run 2
Run 3
Count
Size (mm)
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2
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35
45
55
65
75
85
95
105
115
125
135
145
155
165
175
185
195
205
215
225
235
245

SFCC Electrofishing Event Report

Easting: 129425	Northing: 910748	Site code: Uise_6	Altitude: 14
River: Abhainn Gleann Airighean Dhomhnaill (Eishken, Lewis)			
Site situation: U/S end of site is at Steep waterfall.			
Access/permission: Chris Macrae (Headkeeper) Eishken Estate			Date: 26/09/23

Type of fishing: Quantitative (1mm)	Number of Fishing Runs: 1
Instream Cover: Poor	Target Species: Atlantic Salmon (Salmo salar)

Dimensions

Wet Width Area (m²): 109.9	Site Length (m): 11.5
Bed Width Area (m²): 109.9	
Bank Width Area (m²): 142.1	

Point No.	Measured At (m)	Wet Width (m)	Bed Width (m)	Bank Width (m)
A-Upst	0.0	9.5	9.5	12.4
B	3.0	9.8	9.8	12.7
C	6.0	10.9	10.9	12.2
D	9.0	11.1	11.1	14.2
E-Downst	11.5	6.5	6.5	10.3

Depth

< 10	11-20	21-30	31-40	41-50	> 50
0	10	20	60	10	0

Instream

Instream Vegetation (%): 0	Silted: No
Stable: Stable	Compacted: Uncompacted
Notes:	

High Organic HO	Silt SI	Sand SA	Gravel GR	Pebble PE	Cobble CO	Boulder BO	Bedrock BE	Obscured OB	Substrate Total
0	0	0	5	0	25	55	15	0	100

Flow

Flow Speed (m/s):
Notes:

Still Marginal SM	Deep Pool DP	Shallow Pool SP	Deep Glide DG	Shallow Glide SG	Run RU	Riffle RI	Torrent TO	Flow Total
0	0	0	0	0	50	45	5	100

Bank

	Left Bank	Right Bank
Total Fish Cover (%)	60	30
Bankface Veg.	Simple	Simple
Banktop Veg.	Simple	Simple
Overhang Bough (%)	0	0
Canopy Cover (%)	0	
Notes		

Undercut UC		Draped DR		Bare BA		Marginal MA		Roots RT		Rocks RK		Other OTH		Bank Total	
LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB
0	0	0	0	40	70	0	20	0	0	60	10	0	0	100	100

Other

Team Leader:	Paul Hopper
Number of Staff:	2
Survey Purpose:	Contract (Other than SAC or WFD)
Purpose Notes:	Eisgen (Usinis) Windfarm
Equipment Type:	Backpack
Volts:	250
Amps:	0.2
Smooth / Pulsed:	Smooth
Manufacturer:	Electracatch
Model:	
No. of Anodes:	1
Ring Diameter:	240.00
Stop Net:	Both Boundaries
Capture Net:	Hand/Dip
Effective Fishing:	Yes
Conductivity:	53

Temperature:	12.40
Time:	00:10
Water Level:	Medium
Water Clarity:	Clear
Survey Notes:	P.H: 6.7 Length of site restricted by waterfall and plunge pool below bridge.
Salmon Access:	No
Trout Access:	Don
Pollution:	No
Access Notes:	
Pollution Notes:	
Stocking:	No
Salmon Stocked:	No
Trout Stocked:	No
Stocking Notes:	
Photos and IDs:	✓

Other Fish Species Count

Species	Count
European Eel (Anguilla anguilla)	1

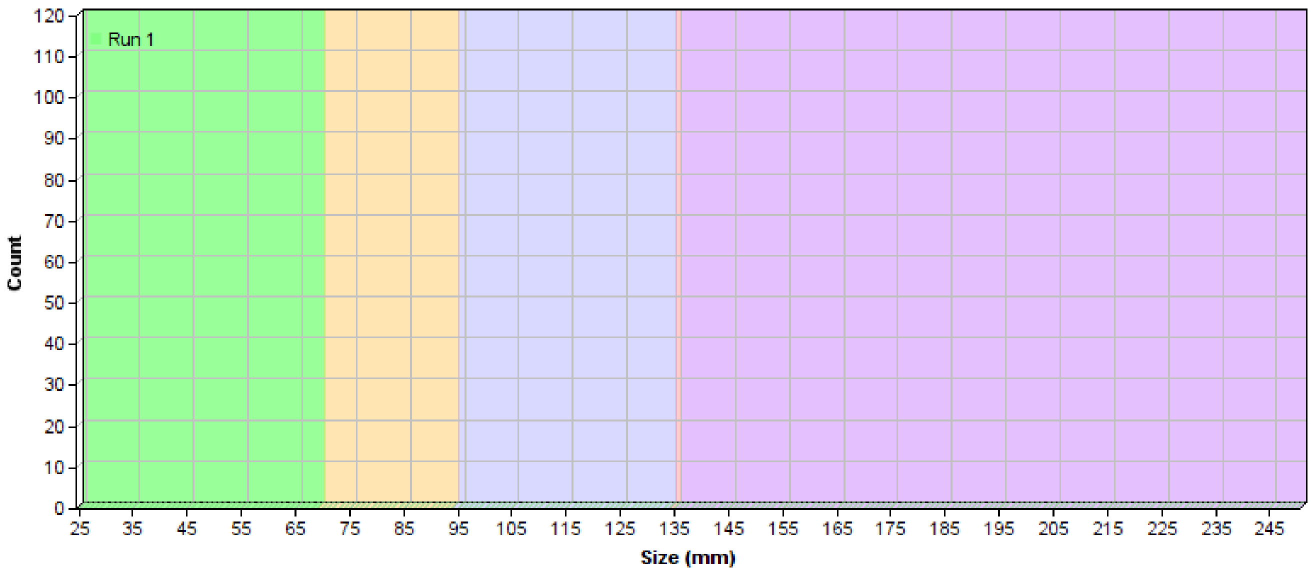
Atlantic Salmon Density Report

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m^2)		Minimum Estimate (per 100m^2)		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	0	0	0	0	0	0			0.000	0.000			
1+	0	0	0	0	0	0			0.000	0.000			
2+	0	0	0	0	0	0			0.000	0.000			
3+	0	0	0	0	0	0			0.000	0.000			
4++	0	0	0	0	0	0			0.000	0.000			
Total	0	0	0	0	0	0							
					Salmon Missed	(NaN)							

Zippin					
Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%	
0+					
1+					
2+					
3+					
4++					

Carle & Strub					
Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%	
0+					
1+					
2+					
3+					
4++					



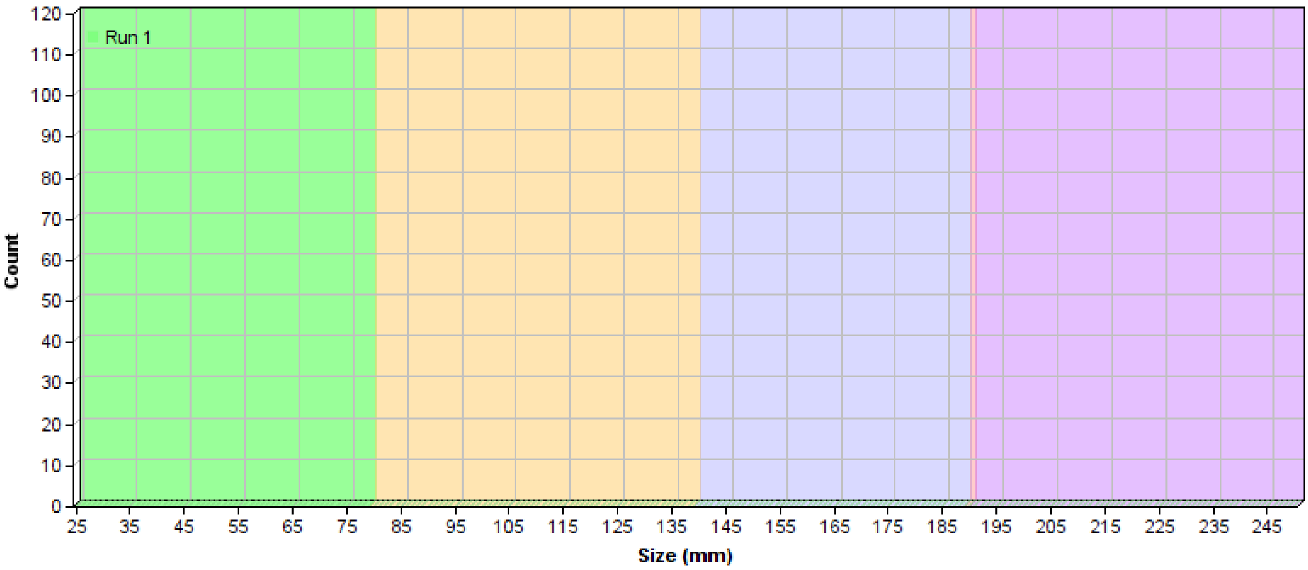
Brown Trout (Sea Trout) Density Report

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m^2)		Minimum Estimate (per 100m^2)		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	0	0	0	0	0	0			0.000	0.000			
1+	0	0	0	0	0	0			0.000	0.000			
2+	0	0	0	0	0	0			0.000	0.000			
3+	0	0	0	0	0	0			0.000	0.000			
4++	0	0	0	0	0	0			0.000	0.000			
Total	0	0	0	0	0	0							
					Trout Missed	(NaN)							

Zippin					
Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%	
0+					
1+					
2+					
3+					
4++					

Carle & Strub					
Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%	
0+					
1+					
2+					
3+					
4++					



Run 1
Count
120
110
100
90
80
70
60
50
40
30
20
10
0
25
35
45
55
65
75
85
95
105
115
125
135
145
155
165
175
185
195
205
215
225
235
245
Size (mm)

SFCC Electrofishing Event Report

Easting: 129244	Northing: 912301	Site code: Uise_7	Altitude: 54
River: Abhainn Gleann na h-Uamha			
Site situation: U/S end of site is on gravel bar approx. 50m U/S of deep pool.			
Access/permission: Chris Macrae (Headkeeper) Eishken Estate			Date: 27/09/23

Type of fishing: Quantitative (1mm)	Number of Fishing Runs: 3
Instream Cover: Good	Target Species: Atlantic Salmon (Salmo salar)

Dimensions

Wet Width Area (m^2): 106.9	Site Length (m): 22.0
Bed Width Area (m^2): 117.5	
Bank Width Area (m^2): 122.8	

Point No.	Measured At (m)	Wet Width (m)	Bed Width (m)	Bank Width (m)
A-Upst	0.0	4.9	4.9	5.1
B	5.5	6.9	6.9	7.2
C	11.0	5.0	7.4	7.6
D	16.5	3.5	3.5	3.8
E-Downst	22.0	4.0	4.0	4.2

Depth

< 10	11-20	21-30	31-40	41-50	> 50
0	15	20	5	25	35

Instream

Instream Vegetation (%): 30	Silted: No
Stable: Stable	Compacted: Uncompacted
Notes:	

High Organic HO	Silt SI	Sand SA	Gravel GR	Pebble PE	Cobble CO	Boulder BO	Bedrock BE	Obscured OB	Substrate Total
40	0	0	5	10	30	15	0	0	100

Flow

Flow Speed (m/s):
Notes:

Still Marginal SM	Deep Pool DP	Shallow Pool SP	Deep Glide DG	Shallow Glide SG	Run RU	Riffle RI	Torrent TO	Flow Total
0	0	0	40	10	30	20	0	100

Bank

	Left Bank	Right Bank
Total Fish Cover (%)	100	100
Bankface Veg.	Uniform	Uniform
Banktop Veg.	Simple	Simple
Overhang Bough (%)	0	0
Canopy Cover (%)	0	
Notes		

Undercut UC		Draped DR		Bare BA		Marginal MA		Roots RT		Rocks RK		Other OTH		Bank Total	
LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB
75	80	30	25	10	10	0	0	0	0	0	10	0	0	115	125

Other

Team Leader:	Donnie Maciver
Number of Staff:	3
Survey Purpose:	Contract (Other than SAC or WFD)
Purpose Notes:	Eisgen (Usinis) Windfarm
Equipment Type:	Backpack
Volts:	240
Amps:	0.3
Smooth / Pulsed:	Smooth
Manufacturer:	Electracatch
Model:	
No. of Anodes:	1
Ring Diameter:	240.00
Stop Net:	Both Boundaries
Capture Net:	Hand/Dip
Effective Fishing:	Yes
Conductivity:	43

Temperature:	10.70
Time:	10:30
Water Level:	Medium
Water Clarity:	Clear
Survey Notes:	P.H: 6.44
Salmon Access:	Regularly
Trout Access:	Yes
Pollution:	No
Access Notes:	
Pollution Notes:	
Stocking:	No
Salmon Stocked:	No
Trout Stocked:	No
Stocking Notes:	
Photos and IDs:	✓

Other Fish Species Count

Species	Count

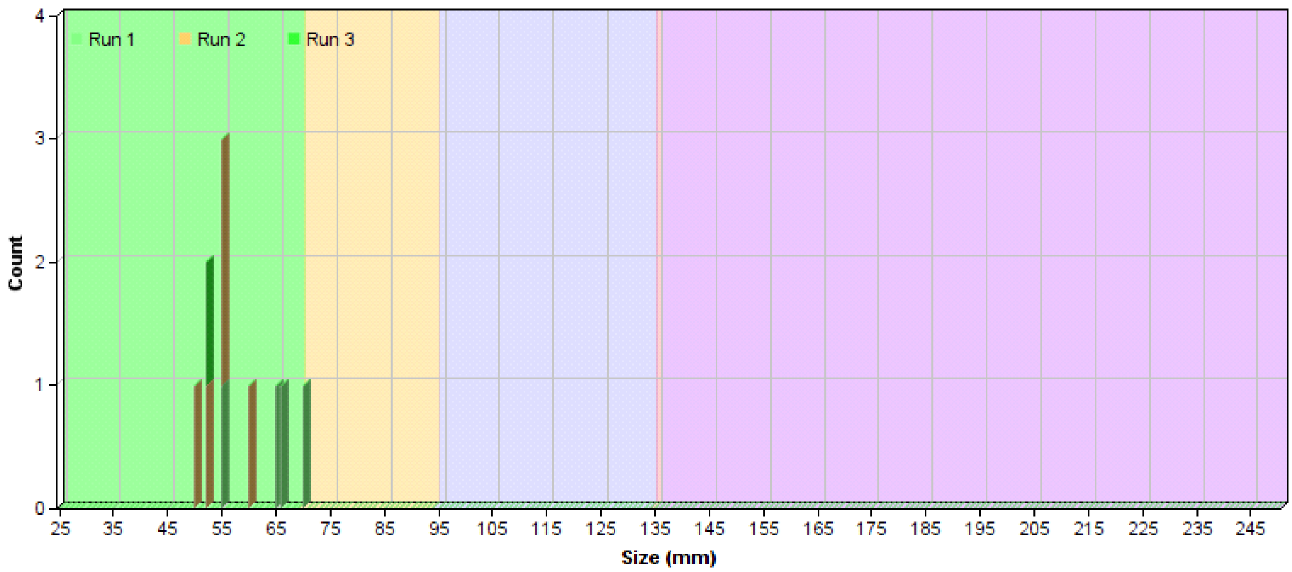
Atlantic Salmon Density Report

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m^2)		Minimum Estimate (per 100m^2)		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	3	5	1	0	0	9	13.172	9.353	2.806	8.418	56	5.745	
1+	1	0	0	0	0	1			0.935	0.935	70		
2+	0	0	0	0	0	0			0.000	0.000			
3+	0	0	0	0	0	0			0.000	0.000			
4++	0	0	0	0	0	0			0.000	0.000			
Total	4	5	1	0	0	10							
Salmon Missed						(NaN)							

Zippin					
Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%	
0+	13.172	-6.306	32.65	19.478	0.288
1+					
2+					
3+					
4++					

Carle & Strub					
Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%	
0+	9.353	6.635	12.071	2.718	0.474
1+					
2+					
3+					
4++					



Brown Trout (Sea Trout) Density Report

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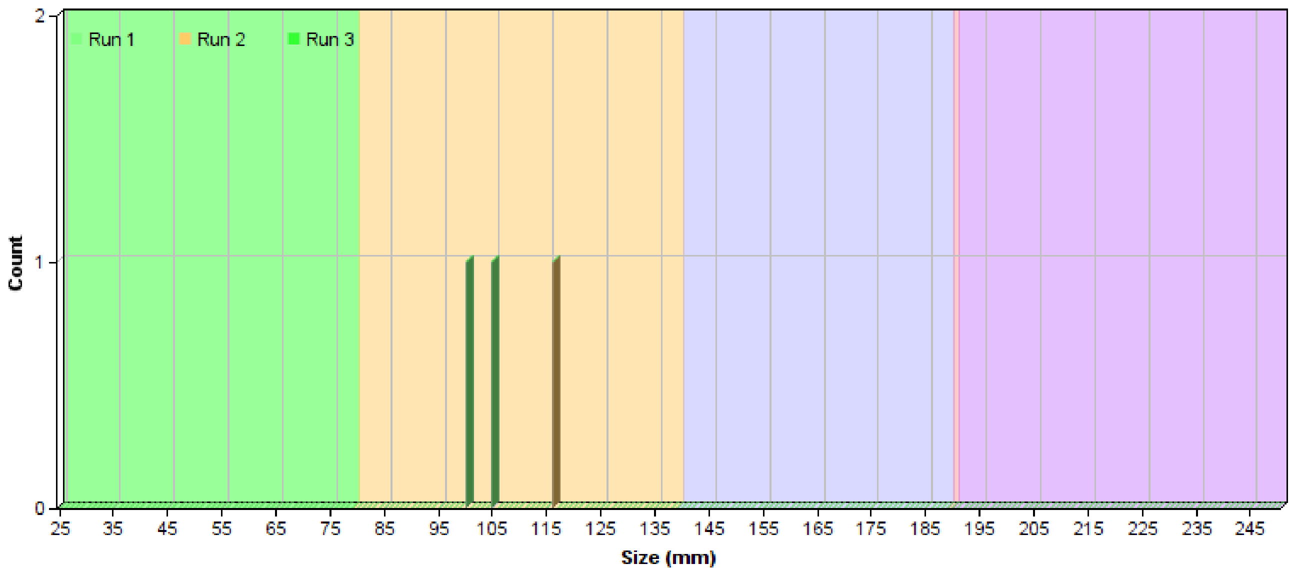
Age	Counts						Density Estimate (per 100m^2)		Minimum Estimate (per 100m^2)		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	0	0	0	0	0	0			0.000	0.000			
1+	2	1	0	0	0	3	2.876	2.806	1.871	2.806	107	8.185	
2+	0	0	0	0	0	0			0.000	0.000			
3+	0	0	0	0	0	0			0.000	0.000			
4++	0	0	0	0	0	0			0.000	0.000			
Total	2	1	0	0	0	3							
Trout Missed						(NaN)							

Zippin					
Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%	
0+					
1+	2.876	2.206	3.546	0.67	0.71
2+					
3+					
4++					

Carle & Strub					
Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%	
0+					
1+	2.806	2.806	2.806	.	0.75
2+					
3+					
4++					



Run 1
Run 2
Run 3
Count
2
1
0
25
35
45
55
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115
125
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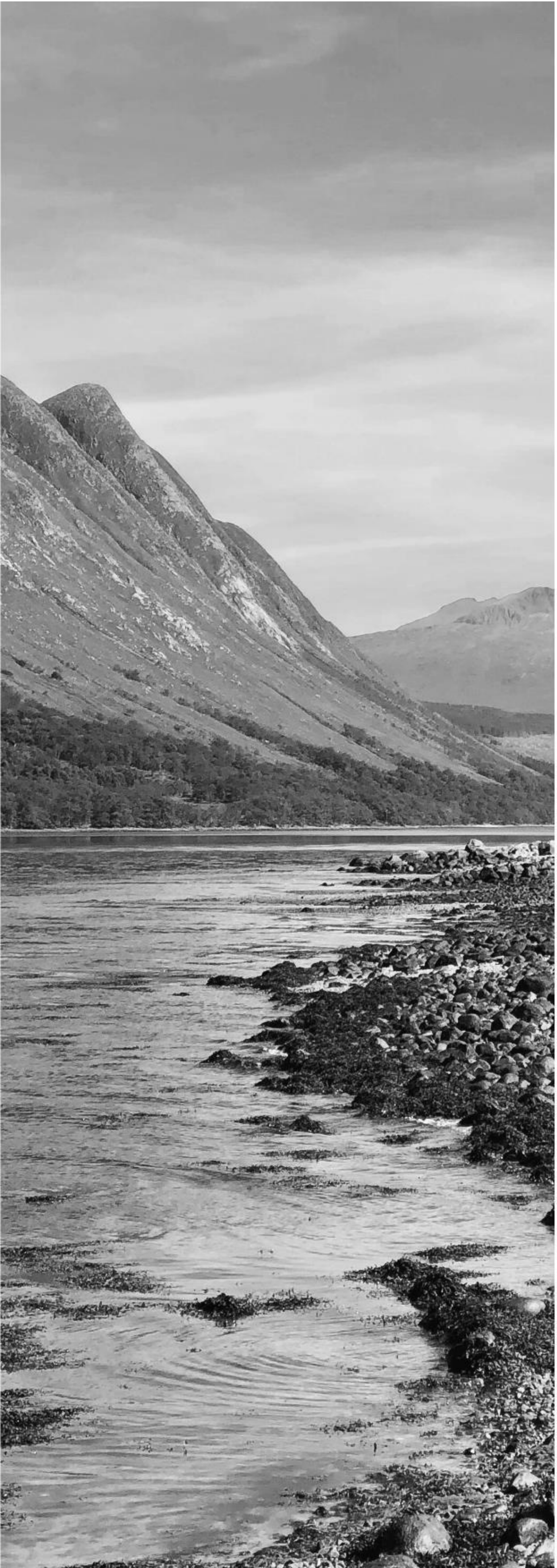
225
235
245
Size (mm)



UISENIS WIND FARM FRESHWATER PEARL MUSSEL SURVEY

UISENIS WIND FARM – FRESHWATER PEARL MUSSEL SURVEY REPORT

OUTER HEBRIDES FISHERIES TRUST

21/12/2023

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Perth

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G3 7QL

0141 401 0699

Basepoint

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Evesham

WR11 1GP

01386 764 797

Report prepared for	Outer Hebrides Fisheries Trust The Sawmill, Marybank, Stornoway HS2 0DD
Project name	Uisenis Wind Farm – Freshwater Pearl Mussel Survey Report
Project number	P23285
Prepared by	TD
Approved by	CB

Revision History

Revision	Date	Prepared By	Reviewed By	Approved By	Comments
V1.0	21/12/23	TD	DM	CB	

Quality Assurance

This report has been prepared according to Gavia Environmental Quality Management Process. Gavia Environmental employs consultant scientists who are members of appropriate professional institutions and adhere to professional codes of conduct.

Disclaimer

This report is presented to Outer Hebrides Fisheries Trust in respect of Uisenis Wind Farm Freshwater Pearl Mussel Survey, and may not be used or relied on by any other person or by the client in relation to other matters not covered specifically by the scope of this report.

Notwithstanding anything to the contrary contained in the report, Gavia Environmental Ltd is obliged to exercise reasonable skill, care, and diligence in the performance of the services required by Outer Hebrides Fisheries Trust and shall not be liable except to the extent that it has failed to exercise reasonable skill care and diligence, and this report shall be read and construed accordingly.

The report has been prepared by Gavia Environmental Ltd. No individual is personally liable in connection with the preparation of this report. By receiving this report and acting on it, the client or any other person accepts that no individual is personally liable whether in contract, tort, for breach of statutory duty or otherwise.

Contents

Executive Summary

Gavia Environmental Ltd. ('GEL') was commissioned by the Outer Hebrides Fisheries Trust ('the Client') to undertake freshwater pearl mussel (FWPM) surveys within the proposed Uisenis Wind Farm (the Proposed Development) development boundary, on watercourses around the Eishken Estate, on the Isle of Lewis.

Surveys were undertaken within an approximate 1.6 km stretch of the Abhainn Cheothadail between Loch na Beirghe and Loch Eishken (SL1 – SL13), six unnamed minor watercourses (Survey Locations SL_14 – SL_19) which flow into Loch Eishken, and one adjacent to the proposed access track (SL_24). Watercourses crossed by, or adjacent to, proposed access tracks were also surveyed, Seaforth River (SL_27 – SL_30), River Eishken (SL_20 – SL_23), and Abhainn Ghlas (SL_25), as these areas may have the potential to be impacted by construction related run off.

All Survey Locations were located within or immediately adjacent to the Proposed Development boundary. In total, 2.7 km was surveyed.

The objectives of this report were to:

- Collect FWPM habitat information on watercourses potentially affected by the Proposed Development, assigning an overall rating of *Optimal*, *Sub-Optimal*, or *Unsuitable* to each Survey Location based on its potential to support FWPM populations;
- Conduct physical searches for FWPM under licence, following a shallow water survey methodology (NatureScot, 2018) in wadable depths to identify and quantify FWPM populations on watercourses potentially affected by the Proposed Development; and
- Collect in-situ water quality data on watercourses potentially affected by the Proposed Development to determine the potential for each watercourse to support FWPM populations.

Habitat information was collected at 30 Survey Locations SL1-SL30 and an overall rating of *Optimal*, *Sub-Optimal*, or *Unsuitable* was assigned to each Survey Location based on best available literature on FWPM habitat requirements. Physical searches for FWPM were conducted in accordance with the approved NatureScot (2018) shallow water survey methodology. Water quality was also recorded at 12 of the Survey Locations across the Proposed Development.

No FWPM were identified in any of the sections searched during the survey. No evidence of any shells or existence of FWPM was found throughout the search. Some *Optimal* habitats were recognised and documented in the Abhainn Cheothadail and Seaforth River catchments. Water quality requirements for FWPM were within established optimal thresholds in all locations for conductivity, temperature, and dissolved oxygen. The pH was lower than the described optimal threshold at 8 of the 12 Survey Locations sampled for water quality.

In conclusion, some watercourses did present with suitable habitat for FWPM colonisation, but no individuals were found in the accessible survey areas. Water quality parameters dictated suitability for FWPM establishment, other than pH at the 8 aforementioned Survey Locations.

Survey Locations with areas of deep water (>2.0 m) made up approximately 13% of the total area covered and therefore these could not be checked for FWPM as were out with safe wadable depths. It was not possible to prove a presence / absence of FWPM in these areas.

1 Introduction

1.1 Background

Gavia Environmental Ltd. ('GEL') was commissioned by the Outer Hebrides Fisheries Trust ('the Client') to undertake freshwater pearl mussel surveys within the proposed Uisenis Wind Farm (the Proposed Development) development boundary, on watercourses around the Eishken Estate, on the Isle of Lewis. The Proposed Development red line boundary is shown in Appendix A, Figure 1. The survey was carried out over a 4-day period from 26th September 2023, until 29th September 2023.

Surveys took place on watercourses potentially affected by the Proposed Development, including an approximate 1.6 km stretch of the Abhainn Cheothadail between Loch na Beirghe and Loch Eishken (SL1 – SL13), six unnamed minor watercourses (Survey Locations SL_14 – SL_19) which flow into Loch Eishken, and one adjacent to the proposed access track (SL_24). Watercourses crossed by, or adjacent to, proposed access tracks were also surveyed, Seaforth River (SL_27 – SL_30), River Eishken (SL_20 – SL_23), and Abhainn Ghlas (SL_25), as these areas may have the potential to be impacted by construction related run off. In total, 2.7 km of river was surveyed.

Freshwater pearl mussels (FWPM), *Margaritifera margaritifera,* are fully protected under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended). It is illegal to disturb, injure, take, or kill a FWPM (NatureScot, 2023). All surveyors must therefore be licensed by the relevant statutory conservation agency (NatureScot) before undertaking any survey work that involves handling the species. All surveys were carried out, or supervised, by an experienced license holder (License No. 171403), and all license conditions were complied with.

1.2 Study Objectives

The objectives of this report were to:

- Collect FWPM habitat information on watercourses potentially affected by the Proposed Development, assigning an overall rating of *Optimal*, *Sub-Optimal*, or *Unsuitable* to each Survey Location based on its potential to support FWPM populations;
- Conduct physical searches for FWPM under licence, following a shallow water survey methodology (NatureScot, 2018) in wadable depths to identify and quantify FWPM populations on watercourses potentially affected by the Proposed Development; and
- Collect in-situ water quality data on watercourses potentially affected by the Proposed Development to determine the potential for each watercourse to support FWPM populations.

An overview of each Survey Location and its assigned habitat suitability category, is provided in Appendix E, Figures 2.1 – 2.6.

1.3 Project Personnel

Table 1 lists the project personnel.

Table 1. Project Personnel

Personnel	Role
Chris Baker (CEnv, MCIEEM)	Director, Licence Holder
Toni Dwyer (BSc, MSc)	Project Manager, Environmental Consultant
Grant Hill	Environmental Consultant

2 Methodology

2.1 Desk Study

A desk study was carried out at the start of the commission and ahead of field surveys. Information sources used for this study are described below:

- **Bing Maps** (2022) – to obtain aerial imagery to inform field surveys; and
- **Scottish Environment Protection Agency** (SEPA) (2022) – to review information on the SEPA Water Classification Hub regarding the classification status of watercourses potentially affected by the Proposed Development.

2.2 Freshwater Pearl Mussel Habitat Assessment

FWPM habitat was graded taking the criteria in Table 2 below into consideration. For example, *Optimal* habitat will include many of the optimal characteristics shown below with little obvious scope for detrimental effects such as eutrophication (nutrient enrichment) or acidification. *Unsuitable* habitat will display few of the habitat requirements categorised and/or show potential/actual signs of harmful influences. *Sub-Optimal* habitat will contain some of the required criteria but may also show potential for negative impacts (Skinner et. al., 2003). Each Survey Location was assigned an overall rating of *Optimal*, *Sub-Optimal*, or *Unsuitable* based on its potential to support FWPM populations. Where smaller pockets of *Optimal* habitat too small to map were encountered within Survey Locations rated as *Sub-Optimal* / *Unsuitable* overall, these were recorded as Target Notes (Table 6). Notes of habitat type, substrate type, bankside vegetation, and National Grid Reference numbers were recorded on a standard survey form. Images of the Survey Locations and underwater images of the substrate were also taken where possible.

Table 2: Freshwater Pearl Mussel Habitat and Water Quality Requirements, and Limitations

Habitat & Water Quality Requirements for FWPM	Limitations
• Water quality - oligotrophic conditions (poor in nutrients), pH 6.5 – 8.5 • Low (<100 µS/cm) overall conductivity.[3,4] • Water depth - 0.1 – 2 m (optimal 0.3 – 0.4 m). • Water velocity - 0.1 – 2 ms^{-1} (optimal 0.25 - 0.75ms^{-1}), moderate flow preferably with areas of riffle, and pools for refuge from high flows.[2] • Substrate - small sand patches stabilised amongst large stones or boulders.[1] • Bankside cover - shade created by herbaceous vegetation and trees with little or no bank erosion.[2] • Stable channels - little bed transport except in floods is important. Channel structure should not be altered in any way that will impede water flow, increase flooding, or alter the distribution of substrates.[2] • Water Temperatures between 5 °C to 15 °C.[2,5] • Dissolved oxygen (DO) must continuously be above 9 mg L^{-1} for FWPM survival.[5] • Total Dissolved Solids (TDS) below 750 mg/L (75 µg/L)[6,7]	• River engineering - For hydro-electric schemes, flood protection or fisheries reasons may cause local extinctions. Activities such as dredging and weir construction cause alteration or loss of suitable riverbed substrata. • Sedimentation - Can adversely affect juvenile pearl mussels filter feeding and respiration. • Eutrophication - Filamentous algal mats, high phytoplankton production and detritus formed by their decay indicate eutrophication conditions that are deleterious to freshwater pearl mussel populations. • Inorganic pollutants - Pyrethroid sheep dip is known be highly toxic but the direct effect on freshwater pearl mussels is not known. Indirect effects could occur through a reduction in salmonid numbers. • Acidification - Acidification is known to have deleterious effects on juvenile trout and salmon and could therefore have an indirect effect on freshwater pearl mussels. Acidification may also alter juvenile habitat.

[1]Degerman, 2009; [2]Skinner et al., 2003; [3]Osterling et al., 2010; [4]Janaki Ram, K., 1997; [5]Skinner et al., 2005; [6] Scannell and Jacobs (2001); [7]Scannell, P.W., and Jacobs, L.L., (2001)

2.3 Freshwater Pearl Mussel Population Survey

The following methodology (NatureScot, 2018) describes the protocols followed if FWPM are identified at a site.

Prior to conducting the survey, a general assessment was made of the river and the substrate types within the Survey Location, by assessing the substrate types present from the riverbank and/or by wading. This allowed the identification of specific areas most likely to harbour FWPM applying information on their known habitat preferences from previous studies and experience and accounted for potential changes in substrate composition.

When the Survey Location was identified the river was entered at the nearest point and a search was conducted, concentrating on the most favourable substrates so as to optimise search efficiency. To ensure compatibility with other surveys, searches were made:

- Using a glass-bottomed viewing bucket (bathyscope);
- Conducted under favourable conditions i.e., bright light, clear water, low flow regime;
- In water sufficiently shallow for safe wading;
- In an upstream direction, checking favourable sites e.g., in the shelter of cobbles, boulders or overhanging banks; and
- By moving loose debris and trailing weed gently aside with no disturbance of the riverbed required.

Negative results: If no FWPM were found in a specific search area, the search was moved to other suitable areas within the Survey Location. If FWPM were not found in a given Survey Location, information was recorded on a standard recording form.

Positive results: If a live FWPM or dead shell is found then a systematic search is made.

Within areas where significant numbers of FWPM were found, one transect 50 m long by 1 m was searched and laid out so as to traverse the main area of suitable habitat. If an initial search of the whole transect indicated that there were likely to be fewer than 250 FWPM, all FWPM were counted. If there are too many FWPM in the transect to count accurately (i.e., >250), 1 m x 1 m quadrats were laid at 10, 20,30, 40, and 50 m intervals. Counts and measurements of the FWPM in these five quadrats were used to provide an extrapolated estimate for the whole 50 m transect.

2.3.1 Favourable Condition Assessment

A FWPM population is considered to be in favourable condition if:

- There are more than or equal to 10 FWPM per m^2 within the quadrats in the 50 m transect; and
- If at least 20% are <65 mm long (less than 20 years old) and at least some are <30 mm long (less than 10 years old).

2.4 Survey Limitations

Certain areas of the Abhainn Cheothadail, River Eishken, and Seaforth River, were not accessible by wading due to the unsafe conditions they posed to surveyors (deep, and/or fast flowing water), and therefore this is recorded as a limitation to the FWPM population assessment part of the study. Clear water and bright survey conditions however allowed for assessment of the instream habitat to be made from the bankside with polarised glasses.

Areas noted as high flow/torrents (>2 ms^{-1}) and unsafe to enter for surveyors however predominantly featured unsuitable habitat for FWPM. Areas of high flows would be subject to high bed transport and unstable substrate. Stable substrate is a requirement to sustain FWPM populations. Some of these areas also featured predominantly bedrock with no finer substrates and therefore were also unsuitable for FWPM colonisation.

Some areas were too deep to enter for surveyors. Survey Locations with areas of deep water (>2.0 m) made up approximately 13% of the total area covered and therefore these could not be checked for FWPM as were out with safe wadable depths. The shallow water survey methodology states that searches should be conducted in water sufficiently shallow for safe wading. It was not possible to confirm the presence/absence of FWPM in areas too deep to access by wading. FWPM colonies are most often found within 0.2 – 2 m depths but have been known to colonise depths of 2 m and above.

2.5 Data Management and Reporting

Data was provided in a spreadsheet form that is compatible with existing spreadsheets containing FWPM data. In circumstances where FWPM are found at a Survey Location the following data is collated: FWPM length; and British Grid Reference. Where a transect is conducted the following information would be collated: FWPM numbers in each 50 m transect (survey location code, date, grid reference, no. live FWPM in each quadrat and total transect, no. dead shells, % of juvenile FWPM (≤65 mm) in each 50 m transect, number of FWPM ≤30mm in each 50m transect etc.); and measurements of FWPM shell dimensions (sampling point code, date, measurements etc.). If a FWPM cannot be safely retrieved, an estimation of length is given by comparing FWPM to a scaled metrestick in the water.

In this circumstance where FWPM are not found, notes on the watercourse habitat, substrate, surrounding riparian vegetation, and a number of water quality measurements are recorded on a standard recording form, to make a decision on the suitability of the habitat and substrate for FWPM colonisation.

2.6 Water Quality

Water quality parameters were taken at 12 of the Survey Locations throughout the survey. Values were obtained using the hand-held Aquaread AP-2000 Water Quality Monitoring Device. The following parameters were recorded:

- Temperature
- Oxygen Reduction Potential (ORP)
- pH
- Dissolved Oxygen (DO)
- Electrical Conductivity (EC)
- Total Dissolved Solids (TDS)

3 Results

3.1 Desk Study

3.1.1 Watercourse Classification

One watercourse was identified within the SEPA (2023) Water Classification Hub:

- **Abhainn Cheothadail** (ID:20761) – This waterbody is in the Lewis and Harris Coastal catchment of the Scotland river basin district, and is considered to be in High overall status. All water body parameters are considered to be in High status. The main stem is approximately 7.8 kilometres in length.

3.1.2 Protected Areas

The Proposed Development is not within any designated areas, according to the NatureScot SiteLink Map.

3.2 Freshwater Pearl Mussel Habitat Assessment

Survey Locations SL_2, SL_3, and SL_27 were rated as *Optimal* habitat for FWPM, with substrate, environmental conditions, and water quality all within optimal ranges. Survey Locations SL_1, SL_11, SL_13, SL_25, SL_26, SL_29, and SL_30 were rated as *Sub-Optimal* habitat for FWPM, with substrate, environmental conditions, and/or water quality being just out-with optimal ranges – but still within liveable requirements for FWPM colonisation. Survey Locations SL_4, SL_5, SL_6, SL_7, SL_8, SL_9, SL_10, SL_12, and SL_13 were rated as *Unsuitable* habitat for FWPM. Most of these locations were subject to fast flowing water (bed transport too high for colonisation), lack of gravel/sand or boulders (required for stabilisation and shelter), or poor water quality (pH out with optimal ranges, algal growth indicating potential eutrophication) conditions. A full report of each survey location and conditions, can be viewed in Appendix B, Table 3. Some small pockets of *Optimal* habitat was recorded across Survey Locations rated as *Sub-Optimal Unsuitable* and these were too small to map but were recorded as Target Notes (Table 6). Figures for FWPM habitat suitability are included in Appendix E, Figures 2.1 - 2.6.

3.3 Freshwater Pearl Mussel Population Survey

No FWPM were identified within any of the Survey Locations. *Optimal* habitat with the potential to support FWPM populations was found within some Survey Locations (SL_2, SL_3, and SL_27), but no mussels were identified within these areas or indeed any of the Survey Locations searched, where access allowed safe wading. Pockets of *Optimal / Sub-Optimal* habitat were also searched within areas given an overall rating of *Unsuitable*.

3.4 Water Quality

Temperature was relatively stable at each of the 12 Survey Locations tested with variation staying within 1°C (11.85 °C ± 0.45 °C). These temperatures are well within the optimal water temperatures described for Freshwater Pearl Mussels (Skinner et al., 2003). The lowest temperature was recorded as 11.4 °C at Survey Location SL_2, and the highest temperature (12.3 °C) was recorded at Survey Location SL_28.

Oxygen Reduction Potential (ORP) ranged from 123.2 mV, to 2002.8mV across the 12 Survey Locations.

The pH ranged from 5.63 (at Survey Location SL_25), to 7.47 (at Survey Location SL_9). The known pH range for FWPM in Scotland is 6.5 – 8.5. Eight of the 12 Survey Location pH results were below the threshold that is considered optimal for FWPM habitat. These Survey Locations consisted of: SL_1, SL_20, SL_21, SL_23, SL_25, SL_26, SL_29, and SL_28.

Dissolved oxygen (DO) ranged from 100%, to 104.2%; and 10.71 mgL^{-1} to 11.19 mgL^{-1} across the 12 Survey Locations.

Conductivity ranged from 40 μScm^{-1} to 70 μScm^{-1} across the Survey Locations sampled.

TDS ranged from 27 μgL^{-1} to 45 μgL^{-1} across the Survey Locations sampled.

Exact locations (NGRs) and water quality parameter results for all Survey Locations tested, can be viewed in Appendix C, Table 4, and Table 5 respectively.

4 Discussion

4.1 Freshwater Pearl Mussel Habitat Assessment

Watercourses that may be impacted by the Proposed Development, and in close proximity to the intended access tracks for the Proposed Development, were surveyed where flow was substantial enough to sustain FWPM populations, based on the habitat requirements, described in Table 2.

Any pockets of *Optimal* habitat within an overall *Unsuitable* assigned FWPM habitat suitability, was recorded as a Target Note. Other factors such as bedrock sections, and areas of high algal growth were also recorded as Target Notes, which can be viewed in Appendix D and Appendix E, Figures 2.1 and 2.4. A full report of habitat suitability for each Survey Location can be viewed in Appendix B, Table 3, but a short summary of Survey Locations rated as *Optimal*, *Sub-Optimal*, and *Unsuitable* are discussed below. Limitations were present during the survey where surveyors deemed it unsafe to enter (discussed in 2.4 Survey Limitations) – these limitations are also noted in Table 3.

Optimal Habitat

Survey Locations SL_2, SL_3, and SL_27 had *Optimal* habitat for FWPM, with substrate, environmental conditions, and water quality all within Optimal ranges. Each of these locations had Optimal substrate, flow conditions, and water quality parameters within, or just slightly below, FWPM requirements. Survey Location SL_27 pH was slightly below optimal ranges for FWPM but surrounding peat banks and high recent rainfall increasing runoff, could explain a lower pH at this location. All other habitat requirements for FWPM at SL_27 were within Optimal requirements, hence it was categorised as *Optimal* overall.

Sub-Optimal Habitat

Survey Locations SL_1, SL_11, SL_13, SL_25, SL_26, SL_29, and SL_30 were rated as *Sub-Optimal* habitat, with substrate, environmental conditions, and/or water quality being just out-with optimal ranges – but still within liveable requirements for FWPM colonisation (Table 2).

These Survey Locations displayed a mix of optimal and sub-optimal characteristics i.e., optimal substrate, but some areas of high flow with high bed transport present. pH was slightly below optimal ranges for FWPM at these Survey Locations, and this was taken into consideration during FWPM habitat suitability rating of *Sub-Optimal*.

Unsuitable Habitat

All other Survey Locations were deemed *Unsuitable* for FWPM habitat suitability. This was mainly due to very fast flowing water, where bed transport would have been high. The substrate lacked gravel and/or boulders in some Survey Locations – which are required by FWPM to stabilise themselves, and provide shelter, respectively.

All unnamed watercourses entering Loch Eishken (SL_14 – SL_19), excluding SL_17, lacked enough flow to sustain FWPM populations, with some watercourses below the minimum water level requirements outlined in Table 2.

The pH was below the required parameters for FWPM at these Survey Locations, making the water more acidic. FWPM are very sensitive to acidic conditions, and higher acidity can affect shell growth and mineralisation. The general land use and surrounding vegetation across these Survey Locations was peatland blanket bog which is more acidic. Recent high rainfall could increase runoff and thus lower pH, making these watercourses more acidic.

There was both *Unsuitable* and *Sub-Optimal* FWPM habitat at SL_30, with the right channel mainly Unsuitable due to high flow. The left channel was mainly *Sub-Optimal* with a small section of torrent and high flow. This is shown in Appendix E, Figure 2.6.

4.2 Water Quality

All temperatures recorded at each of the 12 water quality Survey Locations were all within the optimal requirements stated by Skinner et al., 2003, and Skinner et al., 2005.

Water quality was taken at three points along the main stretch of the Abhainn Cheothadail (SL_2, SL_9, and SL_13). pH displayed a variation of 6.68 – 7.47. These pH results were within the cited range of pH (6.5 – 8.5) for FWPM (Osterling et al., 2010; Janaki Ram, K., 1997). At only one other Survey Location pH was within the optimal range for FWPM (SL_1), which was the waterbody between Loch Eishken and Loch Feoir, another substantial body of water, and had a pH of 6.68. The pH at all other Survey Locations (SL_17, SL_23 SL_21, SL_20, SL_25, SL_26, SL_29, and SL_28) were below the optimal range for pH, ranging between 5.63 and 6.24. These watercourses are all very small inlets to Loch Eishken with high peat banks, or roadside watercourses that may be subject to more runoff than the substantially larger Abhainn Cheothadail. These factors may affect the pH, with run-off from peat making watercourses more acidic.

Conductivity remained within the 100 µS/cm, and 70 µS/cm, optimal habitat requirement limit outlined by Oliver (2000) and Bauer (1988) respectively, and thus would be suitable scope to sustain FWPM.

Dissolved oxygen ranged from 100% – 104.2% saturation, and 10.87mgL^{-1} – 11.19 mgL^{-1} exceeded the established Optimal habitat requirement of 90-110% by Oliver (2000), and the 9 mgL^{-1} by Skinner et al., (2003).

FWPM requirements are currently not available for other measured water quality parameters.

5 Conclusions

No FWPM were identified within the Proposed Development.

Whilst some *Optimal* and *Sub-Optimal* habitat was found for supporting FWPM, at almost all Survey Locations, substrate and flow were not appropriate to sustain FWPM populations. High flow rates and torrents were present throughout most of the Abhainn Cheothadail, River Eishken, Abhainn Ghlas, and Seaforth River. In contrast, all but one (SL_17) of the unnamed watercourses entering Loch Eishken displayed insufficient water flow to provide suitable habitat for FWPM.

Water quality parameters were optimal throughout the Abhainn Cheothadail (SL_2 – SL_13), and the waterbody between Loch Eishken and Loch Feoir (SL_1). At all other (eight) Survey Locations, pH was not within the optimal range for FWPM.

Although indicative, water quality results are only relevant on the days of sampling, offering a snapshot. A more regular sampling protocol would determine baseline water quality values over a longer period of time.

Some sections of the Survey Locations were inaccessible due to high flows or deep water. Little bed transport except in floods is important for FWPM and, as stated in Table 2 above, FWPM are unlikely to inhabit areas of flows with a velocity greater than > 2 ms^{-1} -. The bed substrate must not be altered greatly, and channel structure should not be regularly changeable. It is therefore unlikely that FWPM would inhabit these areas that were not wadable.

Survey Locations with areas of deep water (>2.0 m) made up approximately 13% of the total area covered and therefore these could not be checked for FWPM as were out with safe wadable depths. FWPM colonies are most often found within 0.2 – 2 m depths but have been known to colonise depths of 2 m and above. It was not possible to prove a presence / absence of FWPM in these areas.

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Appendices

Appendix A Proposed Development Boundary

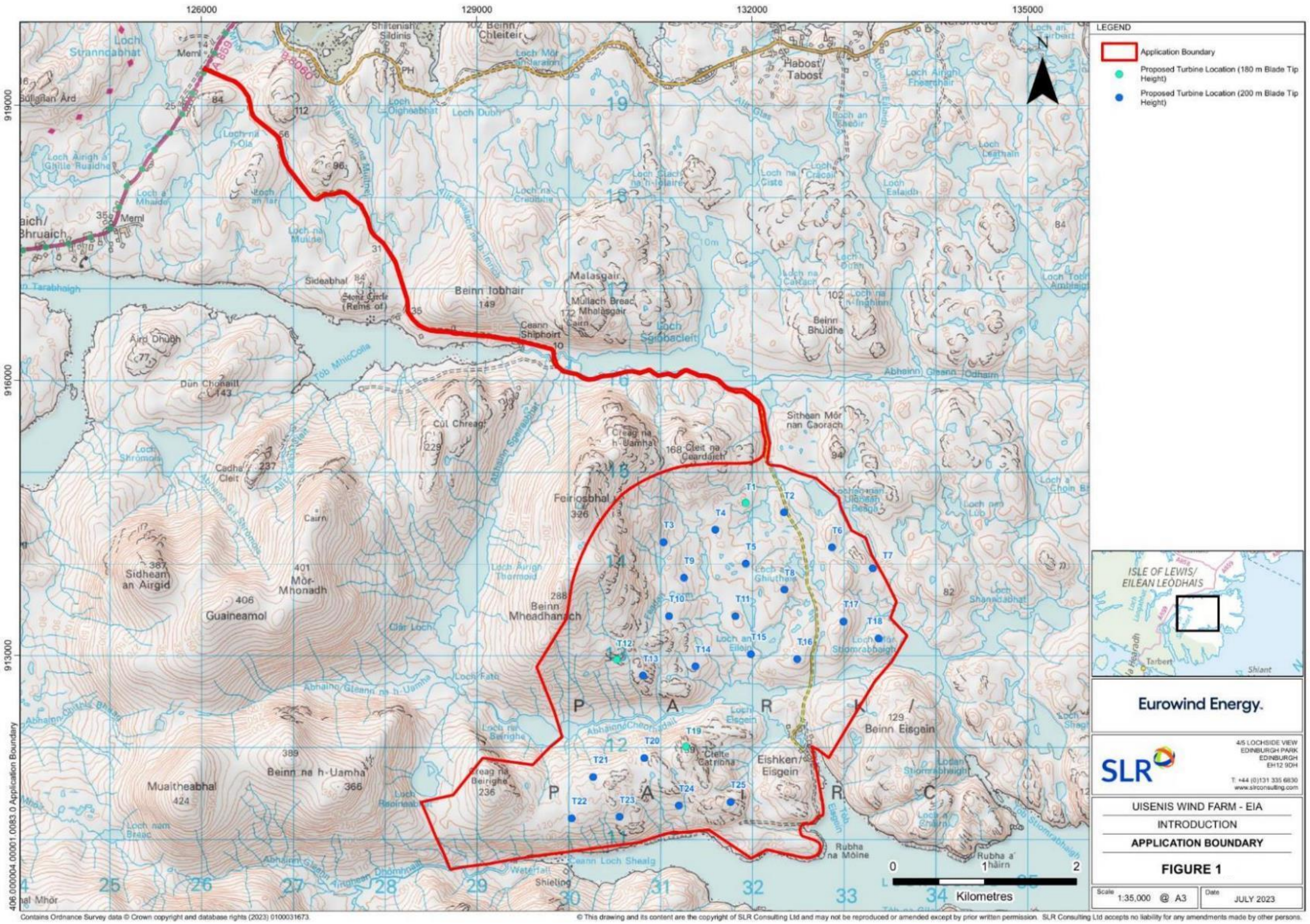
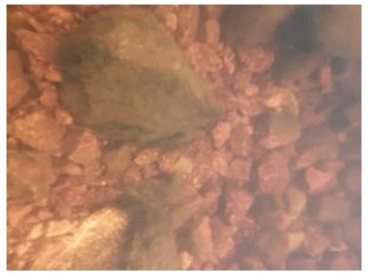
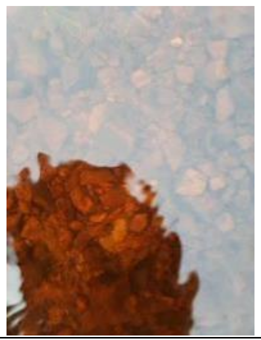


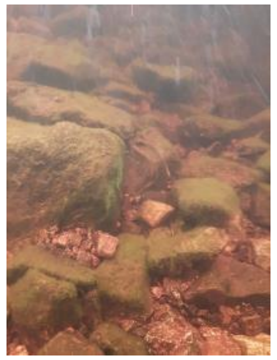
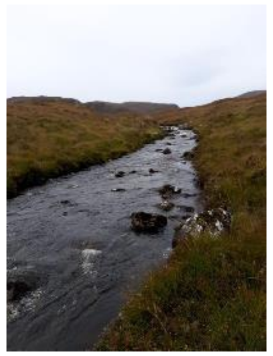
Figure 1: The Proposed Development Boundary (map supplied by SLR).

Appendix B Survey Location Summary

Table 3. Survey Location Summary and Habitat Report

Survey Location	Photograph of Survey Location and/or Substrate	Description
SL_1		A 60 m stretch of the Abhainn Cheothadail of Sub-Optimal FWPM habitat with FWPM requirements being out-with Optimal range – but still within liveable requirements for substrate, environmental conditions, and water quality. This is a section between 2 lochs in the lower reaches of the Abhainn Cheothadail. The average wet width was 9 m and average depth was 1 m. Instream vegetation on substrate approximately 10% coverage. The survey location was too deep to wade in places. Substrate consisted of 20% gravel, 30% pebble, 40% cobble, 10% boulder. Bankside vegetation was mainly grass and peat banks, and adjacent land use was natural peatland blanket bog. Water quality parameters were also taken at this Survey Location. Two juvenile salmonid fish were identified at the Survey Location.
SL_2		A 20 m stretch of the Abhainn Cheothadail with Optimal habitat. All substrate, environmental, and water quality conditions were within Optimal requirements for FWPM colonisation. Substrate consisted of 10% gravel, 30% pebble, 30% cobble, 20% boulder, and 10% mud/clay. Bankside vegetation was mainly grasses and peat banks, which offered bankside cover and adjacent land use was natural peatland blanket bog. River widths were taken at multiple points along the stretch, with an average wet width of 10 m. Average depth was <0.5 m.
SL_3		A 22.5 m stretch of the Abhainn Cheothadail with Optimal habitat. All substrate, environmental, and water quality conditions were within Optimal requirements for FWPM colonisation. Substrate consisted of 20% gravel, 30% pebble, 30% cobble and 20% boulder. The substrate was slightly more compacted in places and rigid underfoot – but the majority was similar to SL_2. Bankside vegetation and land use was the same at SL_2. Average wet width was 4 m, and average depth was 0.45 m. A salmonid parr was noted at this location.
SL_4	  	An 85 m stretch of the Abhainn Cheothadail with Unsuitable habitat due to lack of boulders in the substrate for shelter and stabilisation (10% gravel, 60% pebble and 30% cobble). Substrate changes to hard compacted cobbles and pebbles with soft mud/clay and areas of vegetation (20%) at the edges. A small, shallow (<0.25 m) watercourse enters on the left bank with mud/clay substrate (100%) which is also unsuitable for FWPM. Bankside vegetation and land use was the same as previous Survey Locations. There are two target notes (Appendix C) within this Survey Location. An area of algal blanket which covers more than 80% of the riverbed, which is highlighted as a eutrophication limitation for FWPM, in Table 2. Target notes available to view in Appendix D.

Survey Location	Photograph of Survey Location and/or Substrate	Description
SL_5	 	An 87 m stretch of the Abhainn Cheothadail that is Unsuitable habitat for FWPM due to limited fines / no gravel present in the substrate, which is required for FWPM stabilisation. Substrate consisted of 50% pebble, 40% cobble, 10% boulder. Average depth is 0.7 m. Average wet width is 3.5 m, with one wider section (15 m wet width, 20 m length, 0.25 m depth) present within the section. The wide section has similar substrate but with only 5% boulders. The collapsed left peat banks described in previous section, continue in this section. Bankside vegetation and land use is the same as previous Survey Locations. Photographs show an upstream view of the Survey Location, and a particularly wide section of the river.
SL_6		A 42 m stretch of the Abhainn Cheothadail. Substrate consisted of 10% gravel, 20% pebble, 60% cobble, 10% boulder. Depth of 0.35 m average, large sections of bedrock, and faster flowing water (riffle, run and torrent) rendered this area Unsuitable FWPM habitat due to bed transport being high under these conditions. Areas of high torrent and high flows are subject to higher bed transport which is unsuitable for FWPM. Average wet width was 8 m. Bankside vegetation and land use was the same as previous Survey Locations. Limited bankside cover was provided.
SL_7	 	An Unsuitable 60 m section of the Abhainn Cheothadail due to bedrock and shallow, fast flowing water. Substrate consisted of 10% gravel, 20% pebble, 40% cobble, 10% boulder, 20% bedrock. Areas of fast flow made entry to this section inaccessible for surveyors in places. Areas of torrents and high flows are subject to higher bed transport which is unsuitable for FWPM. It was reasoned if it was unsafe for entry, then flows would be unsuitable for FWPM. Average wet width was 11 m, average depth was 0.25 m. Bankside vegetation and land use was the same as previous Survey Locations.
SL_8	 	A 150 m (total including river split) stretch of the Abhainn Cheothadail of Unsuitable habitat due to unsuitable substrate (bedrock with lack of boulders), and algal growth. The river splits into 2 channels in this section. The left channel consists of initially bedrock for 10 m and progresses to 20% gravel, 30% pebble, 40% cobble, and 10% boulder. Flow rate was lower than the previous section and water was shallower (0.2 m average depth) in the left channel. The right channel had some sub-optimal habitat but a distinct lack of boulders with cobbles too small to provide suitable cover (20% gravel, 30% pebble and 50% cobble). Average wet width of the right channel was 2 m and average depth was 0.6 m, flow was similar to the left channel.

Survey Location	Photograph of Survey Location and/or Substrate	Description
SL_9	 	A 270 m stretch of the Abhainn Cheothadail of Unsuitable habitat due to high flow run, riffle and torrents. Limitations to survey were present with some areas unsafe to enter for surveyors due to fast flows. It was reasoned if it was unsafe for entry, then flows would be unsuitable for FWPM with bed transport at these areas high. Pockets of suitable habitat and bedrock were noted as target notes (Appendix C). Water Quality was also taken at the end of the section. Substrate consisted of 10% gravel, 10% pebble, 60% cobble, 20% boulder. Average wet width 12 m, average depth was shallow at 0.3 m. Bankside vegetation and land use was the same as previous Survey Locations.
SL_10	 	A 32 m stretch of the Abhainn Cheothadail of Unsuitable FWPM habitat, with sheets of bedrock lining the banksides and substrate in some areas, and areas of high torrent flows. Limitations to survey were present where it was unsafe to enter to some areas due to fast flows. It was reasoned if it was unsafe for entry, then flows would be unsuitable for FWPM and bed transport at these areas would be too high. Narrows from 12 m in previous section, to 3.5 m in this section. Pockets of higher vegetation/algal blanket, and soft peat base also present within this survey location. Substrate consisted of 10% gravel, 30% pebble, 50% cobble, 10% boulder. Some Sub-Optimal pockets of substrate were present but no FWPM were present. Bankside vegetation and land use was the same as previous Survey Locations.
SL_11	  	A 154 m stretch of the Abhainn Cheothadail of Sub-Optimal habitat. Substrate consisted of 10% gravel, 20% pebble, 40% cobble, 25% boulder, 5% bedrock. The river here had an average depth of 0.35 m but fast flows with riffle, run and torrent areas throughout. Limitations to survey were present as it was unsafe to enter the water at some points throughout this Survey Location due to fast flows. It was reasoned if it was unsafe for entry, then flows would be unsuitable for FWPM and bed transport at these areas would be too high. Average wet width increases to 9 m here. Bankside vegetation and land use was the same as previous Survey Locations.
SL_12	 	An 85 m stretch of the Abhainn Cheothadail of Unsuitable FWPM habitat. The river here had an average depth of 0.6 m, and fast flowing with bedrock, and torrent and riffle/run sections throughout. Limitations to survey were present as it was unsafe for surveyors to enter due to fast flows. It was reasoned if it was unsafe for entry, then flows would be unsuitable for FWPM and bed transport at these areas would be too high. Average wet width was 6 m. Substrate consisted of 10% pebble, 20% cobble, 30% boulders, and 40% bedrock. Bankside vegetation and land use was the same as previous Survey Locations.

Survey Location	Photograph of Survey Location and/or Substrate	Description
SL_13	 	A 365 m stretch of the Abhainn Cheothadail of Unsuitable FWPM habitat due to Unsuitable substrate and high flows. Multiple deep pockets where torrents and boulder dams are throughout meant that the average depth was 0.8 m. Some of these locations were unsafe to enter due to fast flows. It was reasoned if it was unsafe for entry, then flows would be unsuitable for FWPM and bed transport at these areas would be too high to sustain FWPM populations. Average wet width was 4.5 m. Substrate consisted of 10% pebble, 20% cobble, 30% boulders, and 40% bedrock. Bankside vegetation and land use was the same as previous Survey Locations.
SL_14	 	A small watercourse entering Loch Eishken. Unsuitable FWPM habitat with insufficient flow and depth to sustain FWPM populations. The watercourse narrows further upstream. Depth was <0.1 m and wet width 1m average. Overhanging bankside vegetation makes the watercourse mostly overgrown.
SL_15		A small watercourse entering Loch Eishken. Unsuitable FWPM habitat with insufficient flow and depth to sustain FWPM populations. The watercourse narrows further upstream. Depth was max ~0.2 m and wet width <0.5 m average. Overhanging bankside vegetation makes the watercourse mostly overgrown.
SL_16		A small watercourse entering Loch Eishken. Unsuitable FWPM habitat with insufficient flow and depth to sustain FWPM populations. Wet width was <0.5 m and depth was max ~0.2 m.

Survey Location	Photograph of Survey Location and/or Substrate	Description
SL_17	  	An unnamed watercourse entering Loch Eishken with Sub-Optimal FWPM habitat, with FWPM requirements being out-with Optimal range – but still within liveable requirements for substrate, environmental conditions, and water quality. Substrate consisted of 10% gravel, 20% pebble, 40% cobble, 25% boulder and 5% bedrock. There was approximately 5% instream vegetation on substrate. The wet width was 2.5 m average and depth was 0.7 m average. Watercourse banksides consisted of peat banks. Water quality was taken at this Survey Location.
SL_18		A small watercourse entering Loch Eishken. Unsuitable FWPM habitat due to insufficient flow and shallow water levels out-with FWPM requirements (Table 2). Wider (~1.2 m) than previous watercourses flowing into Loch Eishken but shallow (<0.1 m). Narrows in wet width upstream to <0.5 m. Insufficient flow to sustain FWPM populations.
SL_19	 	An unnamed watercourse entering Loch Eishken. Unsuitable FWPM habitat due to insufficient flow and shallow water levels out-with FWPM requirements (Table 2). Narrow in wet width (<0.5 m) and shallow in depth (<0.2 m). Insufficient flow to sustain FWPM.
SL_20	 	River Eishken swell/Eishken Lodge Pond margins surveyed for suitable habitat further downstream at dam. Limitations to survey were present as it was unsafe to enter and survey at some points throughout this Survey Location due to depth being >2 m. Substrate consisted of 20% silt/sand, 10% pebble, 10% cobble, 20% boulder, and 40% mud, with high (>80%) instream vegetation / algae covering the substrate. Sub-Optimal FWPM habitat, as per Table 2 requirements. The algal blanket was recorded as a target note for an area of potential eutrophication. Target notes can be viewed in Appendix D.

Survey Location	Photograph of Survey Location and/or Substrate	Description
SL_21	 	River Eishken swell into Eishken Lodge Pond featuring Sub-Optimal habitat for FWPM. Shallow at the edges, and then too deep (>2 m) to enter. Substrate was within Optimal requirements (10% gravel, 40% pebble, 40% cobble, 10% boulder), but high vegetation/algal presence on the substrate (>80%). The algal blanket was recorded as a target note for an area of potential eutrophication. Target notes can be viewed in Appendix D.
SL_22	  	Downstream of Loch Eishken to Loch Sealg watercourse downstream of bridge. Unsuitable habitat, an island in the middle splits the river in two. Substrate overall 10% gravel, 10% pebble, 30% cobble, 50% boulder. But unsuitable due to high flows and high bed transport. Right channel narrower (<2 m wide), with lower flow (depth 0.3 m average), and areas of high vegetation (~80%). Some terrestrial vegetation was submerged due to high flows. The left channel had some instream vegetation (~20%) but significantly faster flows and deeper water (depth 0.9 m average). This resulted in areas that could not be entered due to safety issues – again limitations to this Survey Location. Where safe, substrate was checked and approximately 60% of the area was accessible to be surveyed. Water Quality was taken here.
SL_23	  	Watercourse between Loch Eishken and Loch Sealg, passing through Eishken Estate spillway. Unsuitable FWPM habitat. This Survey Location was too dangerous to enter with very high flows and torrents until the river splits downstream. Limitations present as it was unsafe for surveyors to enter. It was reasoned if it was unsafe for entry, then flows would be unsuitable for FWPM and bed transport at these areas would be too high. Substrate could not be viewed at this Survey Location due to the velocity of water and turbidity. The top of the Survey Location consists of a concrete weir.
SL_24	 	Unsuitable FWPM habitat due to insufficient flow and depth (<0.2 m) in most areas. Average wet width was 0.7 m. 50 m above road bridge, and 50 m below bridge was surveyed.

Survey Location	Photograph of Survey Location and/or Substrate	Description
SL_25	 	A 62 m section of Abhainn Ghlas with Sub-Optimal habitat with FWPM requirements being out-with Optimal range – but still within liveable requirements for substrate, and environmental conditions. Water quality was below FWPM range for pH – but this could be due to high rainfall and run off in days immediately before sampling, hence the rating of Sub-Optimal. Average wet width was 1 m and average depth was 0.4 m. Substrate consisted of 20% gravel, 30% pebble, 30% cobble and 10% boulder. Flow rate was optimal and undercut bank provided cover at this Survey Location.
SL_26	  	A 50 m stretch of a Seaforth River Tributary surveyed above and below the road bridge crossing. Upstream of the bridge featured unsuitable habitat for FWPM due to bedrock and torrent areas. Limitations to survey were present as it was unsafe for surveyors to enter due to fast flows. It was reasoned if it was unsafe for entry, then flows would be unsuitable for FWPM and bed transport at these areas would be too high. Downstream of the road bridge featured Sub-Optimal habitat for FWPM due to a change in flow and substrate however there was still a lack of larger stones and boulders which are required for stabilisation of substrate and shelter for FWPM. Average wet width was 1.8 m, average depth 0.4 m. Substrate downstream consisted of 20% gravel, 40% pebble, 35% cobble, 5% boulder. Water quality taken downstream.
SL_27	  	A 40 m stretch of the Seaforth River where Optimal FWPM habitat was found where the river widened Average wet width was 9 m and average depth was 0.4 m. Substrate consisted of 20% gravel, 30% pebble, 30% cobble, 20% boulder, with Optimal pockets of FWPM habitat seen throughout. Below this 40 m stretch was extremely fast flowing water, with torrents and rapids making it too unsafe to enter and survey any further downstream.
SL_28	 	A 220 m section of the Seaforth River with torrents and rapids throughout. Many sections were also very deep (>2 m). Limitations to survey were present as it was unsafe to enter and survey at some points throughout this Survey Location due to depth being >2 m, and very fast flowing water. It was reasoned if it was unsafe for entry due to high flows, then this would be unsuitable for FWPM as flow conditions would result in high bed transport and unstable substrate. A stable substrate to adhere themselves to, is a requirement for FWPM colonisation. More information on FWPM requirements can be viewed in Table 2.

Survey Location	Photograph of Survey Location and/or Substrate	Description
SL_29	 	A short 20 m section of the Seaforth River categorised as Sub-Optimal FWPM habitat. This watercourse was deep (>2 m) and fast flowing in several places. The substrate at this Survey Location consisted of 10% gravel, 20% pebble, 40% cobble and 30% boulder. Instream vegetation covered 50% of the substrate. The right channel average wet width was 3.5 m, and average depth was 1.5 m. Along the left bank was very deep and unsafe to enter, thus the right bank edges where accessible were surveyed. Water quality was taken here. Limitations to survey were present as it was unsafe to enter and survey at some points throughout this Survey Location due to depth being >2 m and flow conditions too fast to enter safely. It was reasoned if it was unsafe for entry due to high flows, then this would be unsuitable for FWPM as flow conditions would result in high bed transport and unstable substrate. A stable substrate to adhere themselves to, is a requirement for FWPM colonisation. More information on FWPM requirements can be viewed in Table 2.
SL_30	 	SL_30 consisted of a large section of the Seaforth River where the river splits into two channels. There was a mixture of Unsuitable and Sub-Optimal FWPM habitat in these sections, with the right channel mainly Unsuitable due to high flows. The left channel was mainly Sub-Optimal with a small section of torrents and high flows. The substrate at this Survey Location consisted of 10% gravel, 20% pebble, 40% cobble and 30% boulder. Instream vegetation coverage was 50%. Average wet width was 12 m, and average depth was 1.5 m. The left bank depth was >2 m and inaccessible. At the top of the Survey Location, torrents and fast flowing water made access unsafe with deep pools below. Limitations to survey were present as it was unsafe to enter and survey at some points throughout this Survey Location due to fast flows and depth being >2 m. It was reasoned if it was unsafe for entry due to high flows, then this would be unsuitable for FWPM as flow conditions would result in high bed transport and unstable substrate. More information on FWPM requirements can be viewed in Table 2.

Appendix C Water Quality Monitoring Survey Locations

Table 4. Water Quality Monitoring Survey Locations

Survey Location Code	Watercourse	Easting	Northing
SL_1	Loch Eishken/Loch Feoir	131546	912475
SL_2	Abhainn Cheothadail	131229	912358
SL_9	Abhainn Cheothadail	130938	912297
SL_13	Abhainn Cheothadail	130422	912289
SL_17	Loch Eishken Tributary	131778	912707
SL_20	Eishken Pond at the Estate	132570	911989
SL_21	Eishken Pond at the Estate	132527	912121
SL_23	River Eishken	132481	912086
SL_25	Abhainn Ghlas	132190	915303
SL_26	Seaforth River Tributary	129965	916118
SL_28	Seaforth River	129754	916254
SL_29	Seaforth River	129908	916249

Table 5. Water Quality Results

Parameter	Site Name											
	SL_1	SL_2	SL_9	SL_13	SL_17	SL_20	SL_21	SL_23	SL_25	SL_26	SL_28	SL_29
Temperature (oC)	12	11.4	11.7	11.9	11.6	11.85	12.1	11.8	12.1	12.1	12.3	11.9
ORP (mV)	167.7	123.2	140.5	190.2	169.2	197.3	202.8	200.2	197.2	180.2	195.3	182.9
pH	6.65	7.32	7.47	6.68	6.12	6.08	6.27	6.24	5.63	5.87	6.04	5.93
Dissolved Oxygen (%)	104.2	103.5	104.1	100	103.8	103.7	103.7	103.9	102.6	104	103	102.3
Dissolved Oxygen (mgL^{-1})	11.18	11.2	11.19	10.71	11.17	11.03	10.97	11.06	10.88	11.02	10.91	10.87
Conductivity (μScm^{-1})	44	43	40	41	48	42	46	48	65	51	70	70
Total Dissolved Solids (μgL^{-1})	28	27	28	29	31	29	29	31	40	33	42	45

Appendix D Target Notes

Table 6: Target notes recorded throughout the survey, the Survey Locations they were recorded in, and watercourses.

Target Note	Description	Survey Location	Watercourse	Easting	Northing
TN1	Algal blanket (indicating eutrophication)	SL_4	Abhainn Cheothadail	131144	912363
TN2	Unsuitable substrate (peat)	SL_4	Abhainn Cheothadail	131108	912347
TN3	Algal blanket (indicating eutrophication)	SL_8	Abhainn Cheothadail	130942	912258
TN4	Pocket of optimal habitat	SL_9	Abhainn Cheothadail	130748	912345
TN5	Pocket of optimal habitat	SL_9	Abhainn Cheothadail	130715	912312
TN6	Unsuitable substrate (bedrock)	SL_9	Abhainn Cheothadail	130259	912278
TN7	Unsuitable substrate (bedrock)	SL_9	Abhainn Cheothadail	131108	912347
TN8	Pocket of optimal habitat	SL_9	Abhainn Cheothadail	130942	912258
TN9	Pocket of optimal habitat	SL_13	Abhainn Cheothadail	130848	912321
TN10	Pocket of optimal habitat	SL_13	Abhainn Cheothadail	130249	912270
TN11	Pocket of optimal habitat	SL_13	Abhainn Cheothadail	130234	912249
TN12	Pocket of optimal habitat	SL_13	Abhainn Cheothadail	130203	912238
TN13	Algal blanket (indicating eutrophication)	SL_20	River Eishken	132555	912015
TN14	Algal blanket (indicating eutrophication)	SL_21	River Eishken	132548	912073
TN15	Algal blanket (indicating eutrophication)	SL_22	River Eishken	132475	912100

Appendix E FWPM Habitat Suitability

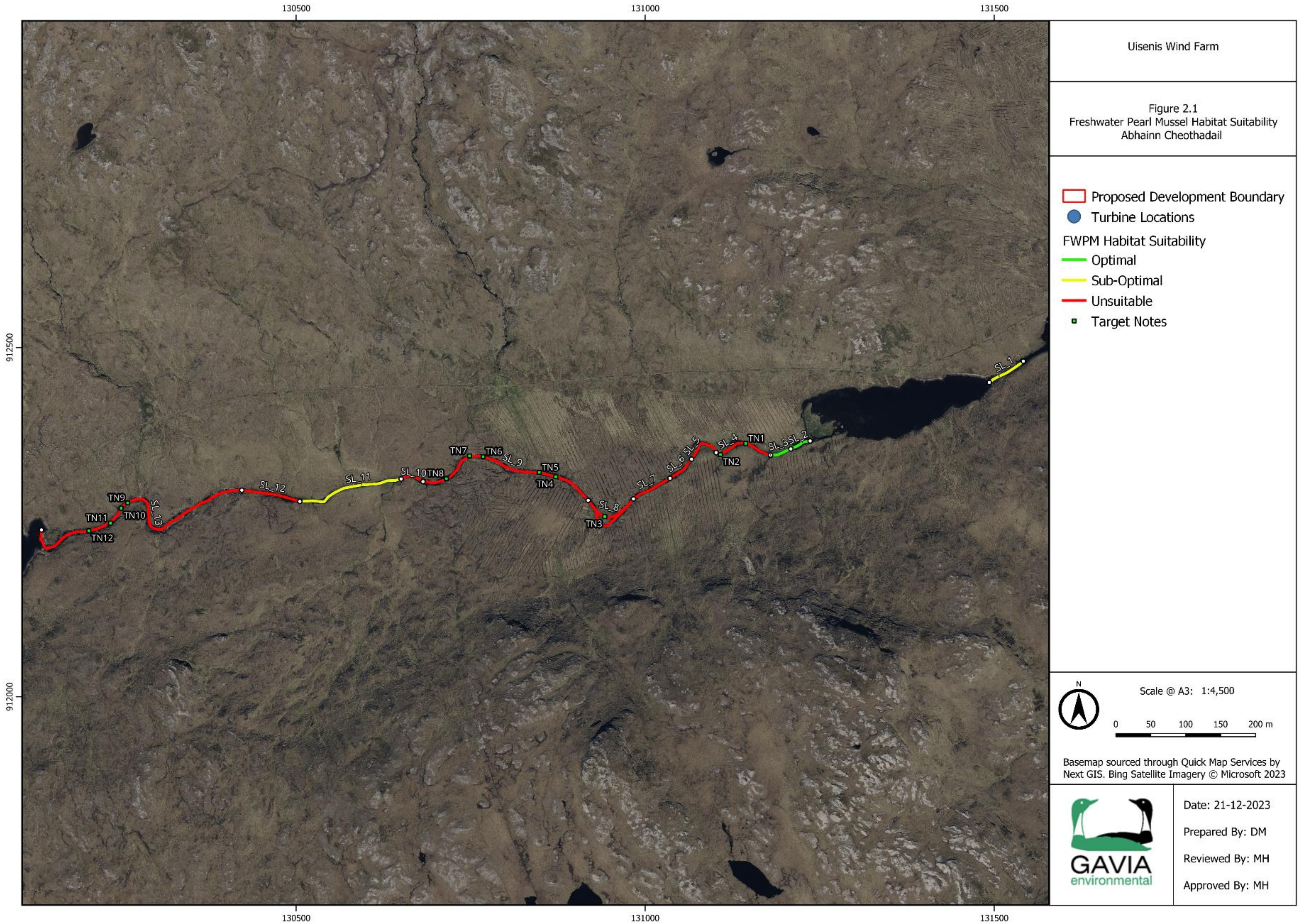


Figure 2.1: FWPM suitability on the Abhainn Cheothadail (SL_1 – SL_13).

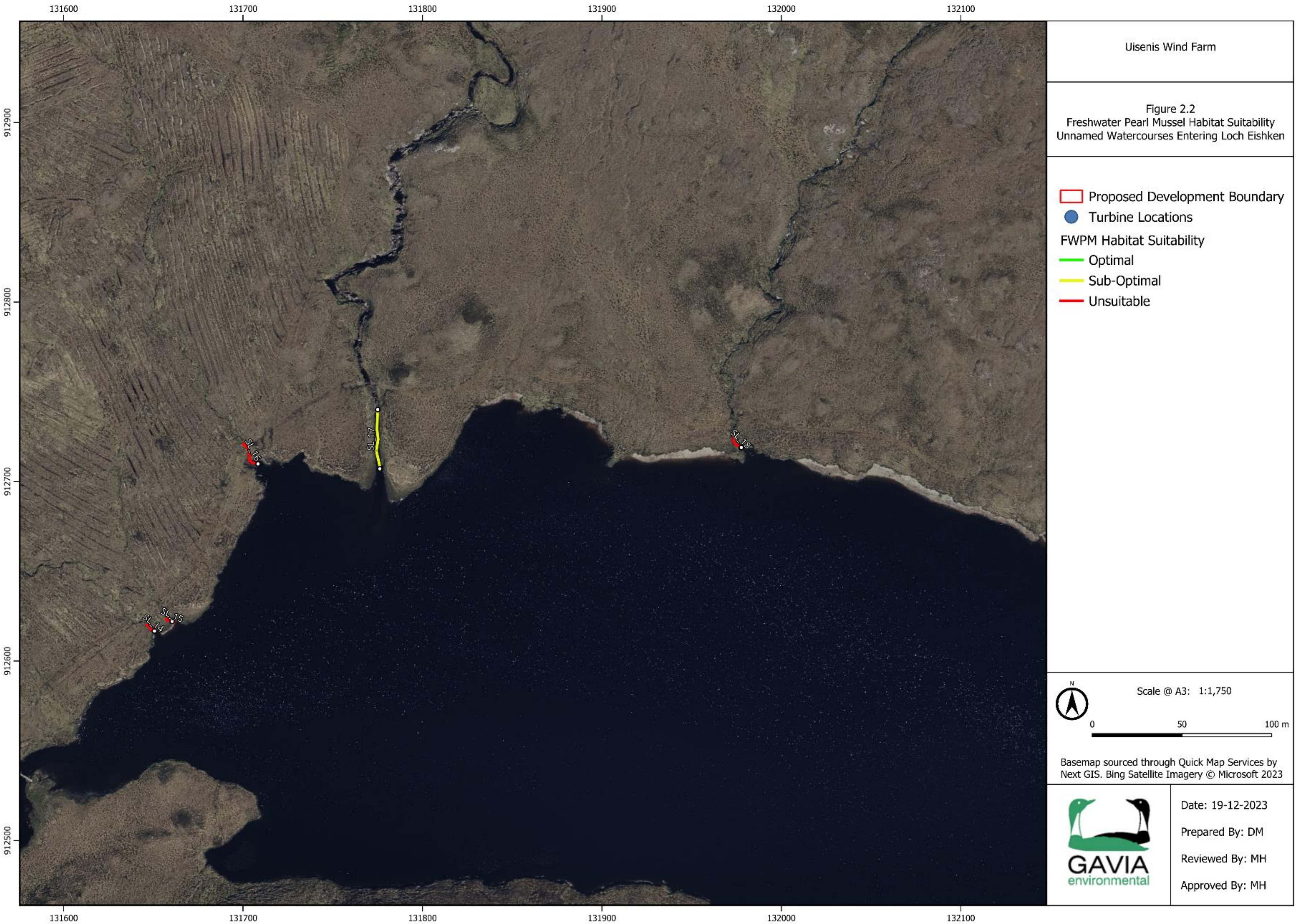


Figure 2.2: Unnamed watercourses entering Loch Eishken SL_14 – SL_18.

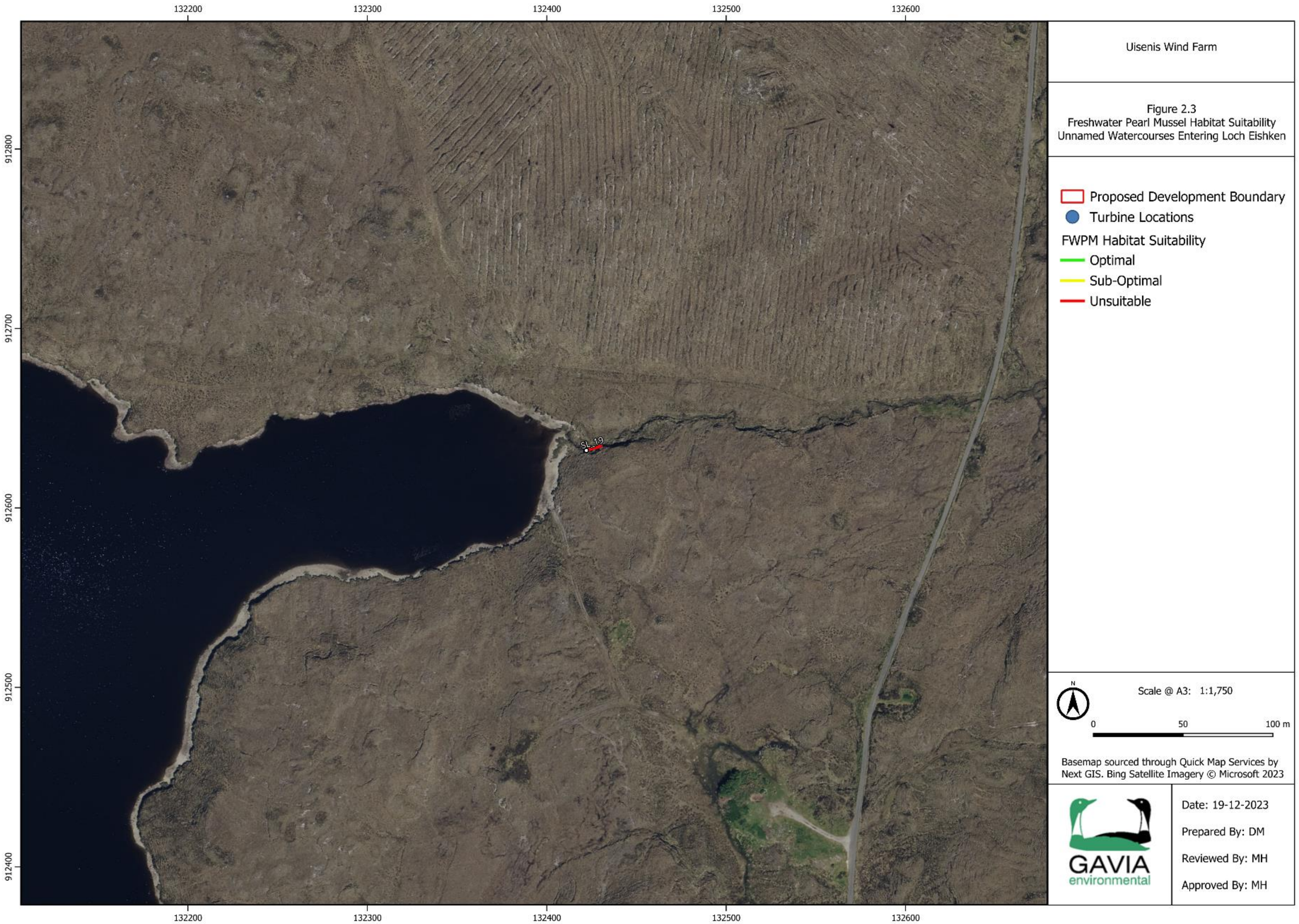


Figure 2.3: Unnamed watercourses entering Loch Eishken SL_19.

Figure 2.4: River Eishken SL_20 – SL_23.

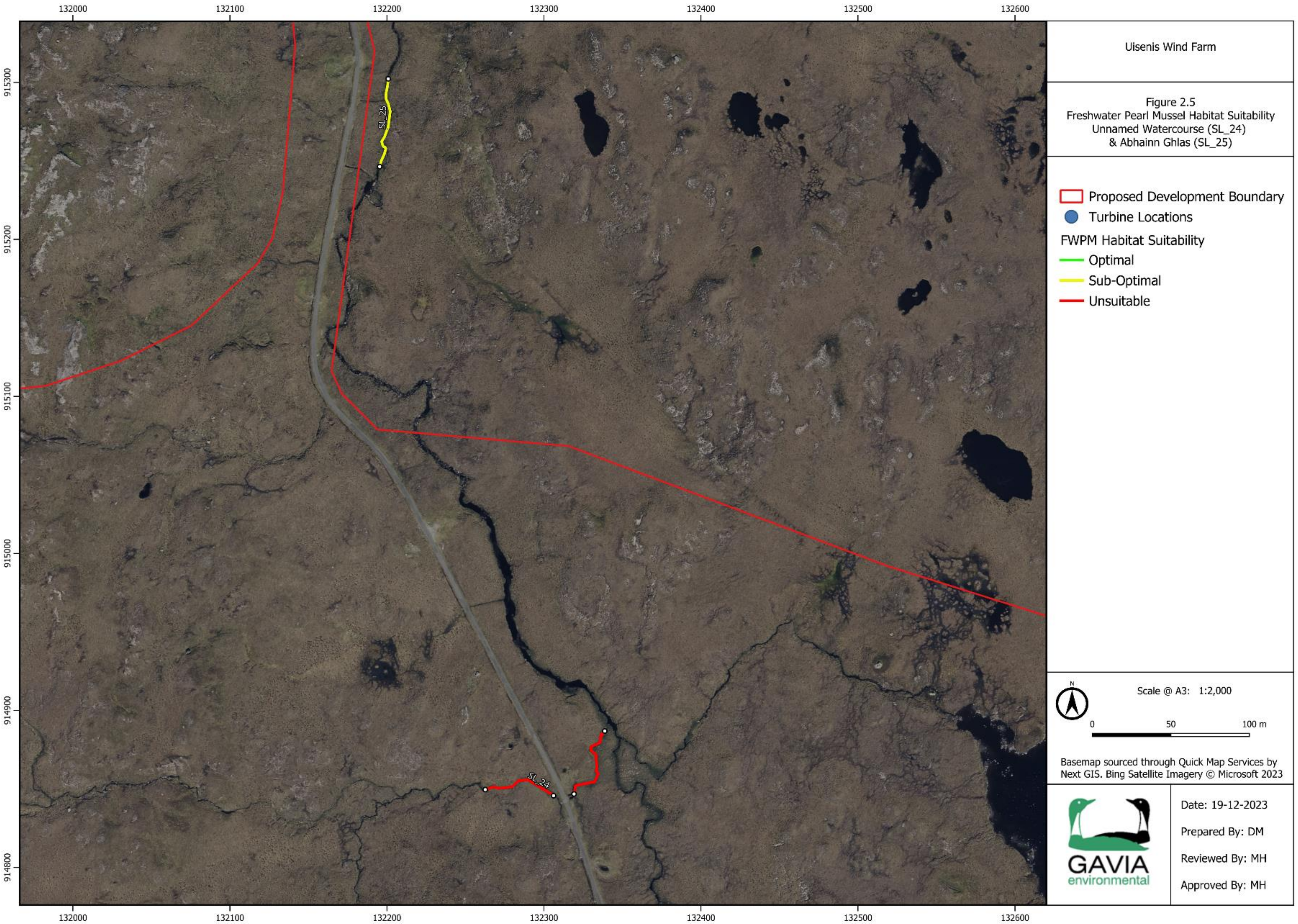


Figure 2.5: Unnamed watercourses adjacent to Proposed Development access track (SL_24).

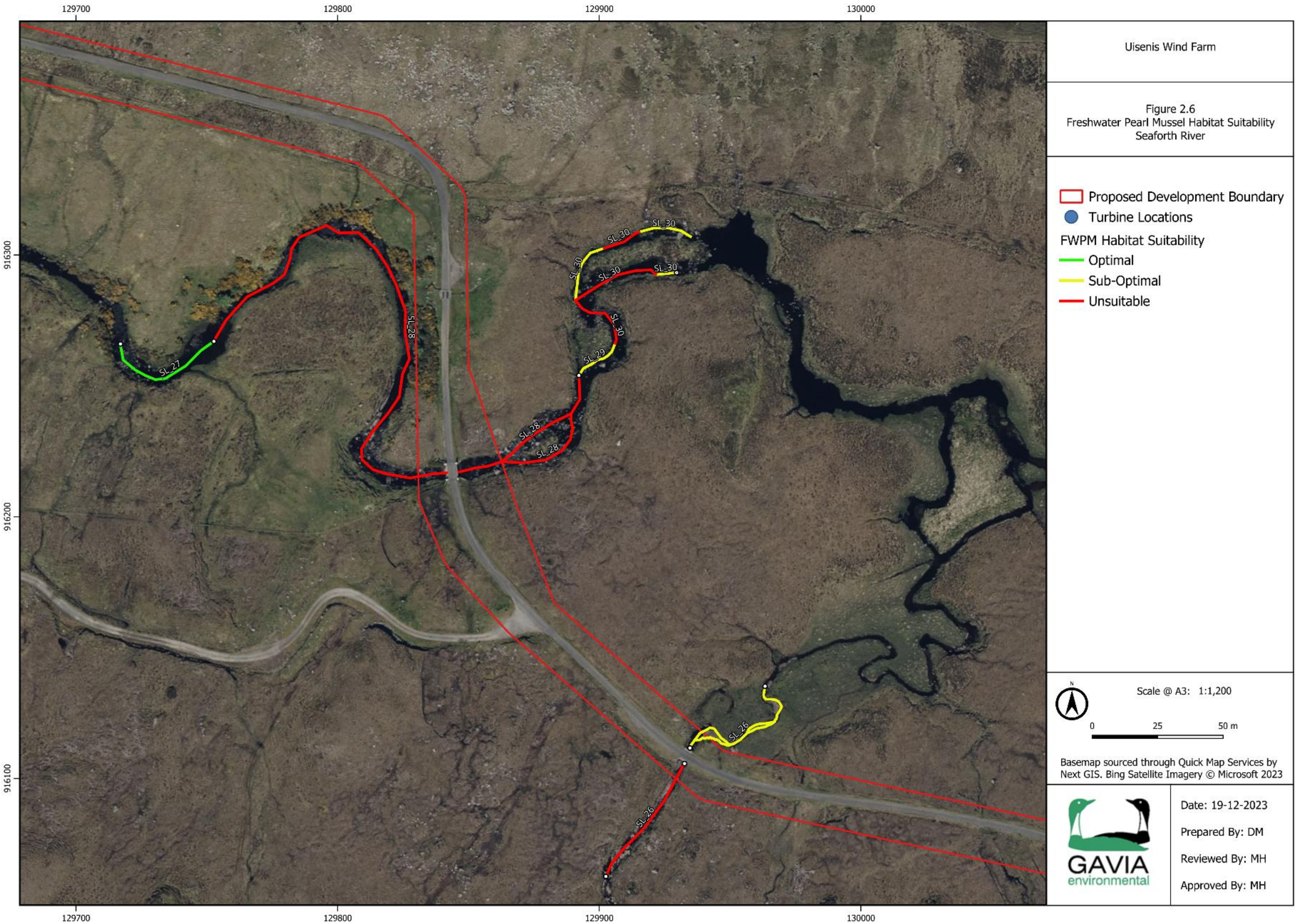


Figure 2.6: Seaforth River Watercourse SL_27 – SL_30.

SEI Technical Appendix 10.3: Borrow Pit Appraisal

Uisenis Wind Farm

Uisenis Power Ltd

Prepared by:

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SLR Project No.: 405.V64341.00001

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Revision: 0

Making Sustainability Happen

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
0	28 May 2024	R. Watson	A. Huntridge	A. Huntridge

Basis of Report

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Annexes

1.0 Introduction

1.1 General

SLR Consulting Ltd (SLR) was commissioned by Uisenis Power Ltd (the applicant) to undertake a Borrow Pit Appraisal (BPA) at the proposed Uisenis Wind Farm ('the proposed development').

The proposed development is located approximately 20km south west of Stornoway, on land within the Eisgen (Eishken) Estate on the Isle of Lewis.

It is anticipated that the development would comprise of 25 wind turbines with associated infrastructure including new and upgraded access tracks, crane hardstandings, borrow pits, substation and temporary construction compounds. The Site layout is detailed on **SEI Figure 10.3.1a.**

This report provides details of the proposed seven borrow pits, which would be necessary to provide the aggregates required to construct the proposed development.

The work has been undertaken by a team of Geotechnical Engineers and Geologists, with over 10 years' experience in undertaking peat assessments. The team was led by a Chartered Hydrogeologist with 30 years' consultancy experience and specialising in the assessment of soils, geology and water for renewable power projects in Scotland.

1.2 Scope and Objectives of the Report

Following comments from SEPA and NatureScot in response to the Environmental Impact Assessment (EIA) Report[1], **Technical Appendix 10.3 Borrow Pit Appraisal** has been updated to reflect the changes to the Borrow Pit Layouts from what was proposed in the EIA Report.

This SEI Technical Appendix supplements Chapter 10 of the SEI Report. The methodology employed in this SEI Technical Appendix is as set out in Chapter 10 of the EIA Report.

There has been substantial works undertaken to date in order to inform the size and location of proposed borrow pits, including site reconnaissance visits and several phases of peat probing which are detailed within **SEI Technical Appendix 10.1: Peat Landslide and Hazard Risk Assessment (PLHRA).**

The principal objective of this report is to provide an updated assessment of the aggregate requirements following the design changes to the proposed development and identify potential borrow pits suitable for providing the required aggregate.

There are seven proposed borrow pit search areas reviewed within this report. Selected because of their morphology, accessibility from proposed tracks, orientation and the expected proximity to suitable rock close to the surface. The proposed borrow pits are in areas where peat coverage is anticipated to be minimal and where bedrock may outcrop and potential aggregate reserves are expected to occur near the surface.

1 Uisenis Wind Farm. Environmental Impact Assessment. EIA Report Volume 2 - Chapter 10: Hydrology, Hydrogeology, Geology and Soils Chapter 10. Technical Appendix 10.2. Peat management Plan. July 2023.

2.0 Geological Setting

2.1 Soils

The principal soil type underlying the proposed development are peaty gleys, with mineral podzols and peat also present. The peaty gleys and podzols are drifts derived from Lewisian gneisses. The soils map of the proposed development is detailed within the **SEI Figure 10.2.**

2.2 Peat

The carbon and peatland map 2016 provides information regarding peat and soil coverage within the proposed development and is provided in **SEI Figure 10.3.**

Peat is present throughout the majority of the proposed development comprising of peaty soils and localised areas of deep peat. Published priority peatland mapping by NatureScot indicates that most of the proposed development is located within Class 1 and Class 2 peatland which is considered to be of high conservation value. Based on observations from site visits blanket bog was present with peat identified as being pseudo fibrous and noted to become amorphous at depth in the flatter areas of the proposed development with more fibrous to pseudo fibrous peat recorded on the slopes.

2.3 Superficial Geology

The British Geological Survey (BGS) indicates the presence of limited superficial cover with a small localised area of Glacial Till mapped within the south western corner of the proposed development and a small area of peat mapped in the western area of the proposed development. In areas of higher elevation and steeper gradients, the BGS mapping indicates no superficial deposits being present and shallow bedrock at surface throughout the proposed development.

The superficial geology of the proposed development is detailed in **SEI Figure 10.4**.

2.4 Bedrock Geology

The BGS indicates that the proposed develpment is predominantly underlain by the Outer Hebrides Thrust Zone Mylonites Complex. This formation is comprised of Precambrian (4000 to 541Ma) metamorphic fault rocks including mylonites, protocataclasite, cataclasite and pseudotachylite. Fault rocks consist of compressed fragments of rock material produced by the grinding and brittle deformation forces associated with fault activity.

A small area within the north of the Site is underlain by Precambrian Amphibolite which is a coarse-grained metamorphic rock belonging to the Lewisian Complex. Some of the access tracks and turbines, such as T5 and T7, are proposed for construction in this area.

There are several inferred faults present within the Site boundary. There is a major thrust fault in the west of the Site trending north to south east. There is another major fault in the south of the Site trending east to west through Loch Eisgein and the river valley where Abhainn Cheothadail is present. In addition, there are two thrust faults present in the east and south of the Site, trending north east – south west that appear to be offset by the major fault in the south.

Based on recent Site observations from August 2022, November 2022, January 2023 and February 2024, the bedrock encountered on Site is predominantly coarse, granular and strong.

The bedrock geology of the Site is shown on **SEI Figure 10.5**. Details of the geological units present on-site and immediately adjacent to the Site are detailed in **Table A**.

Table A: Bedrock Geology Summary

Age		Stratigraphic Group	Unit	Description
Precambrian	Archaean (4000 to 2500Ma) to Proterozoic (2500 to 541Ma)	Outer Hebrides Thrust Zone Mylonites Complex	Protocataclasite	Fault-related granular metamorphic rock that maintained primary cohesion during deformation, with matrix comprising 10-50% of total rock mass
		Outer Hebrides Thrust Zone Mylonites Complex	Mylonite	Fine-grained metamorphic fault rock with reduced grain size due to dynamic recrystallisation of the constituent minerals.
		Outer Hebrides Thrust Zone Mylonites Complex	Cataclasite	Fault-related metamorphic rock that maintained primary cohesion during deformation, with matrix comprising greater than 10% of total rock mass
		Outer Hebrides Thrust Zone Mylonites Complex	Pseudotachylite	Very fine-grained, glassy fault rock
		Lewisian Complex	Amphibolite	Coarse-grained metamorphic rock containing amphibole.

2.5 Structural Geology

A review of the BGS Geoindex onshore highlighted one major fault present trending north east to south west and divides the Mindork and Shinnel formations. The second faults trends north to south.

2.6 Mining and Quarrying

Following review of publicly available records, there is no history of large scale commercial mineral extraction within the proposed development and immediate area. Review of the BGS Geoindex indicates that there are road pits present alongside the existing road within the proposed development indicating small scale extraction for road construction.

2.7 Hydrology

Freshwater drainage across the Site is characterised by a network of streams, rivers and lochs. The large majority of drainage channels were located in the centre, north and south of the Site. The drainage in the northern area of the Site drains to the south into the Abhainn Cheothadail.

There are frequent minor lochs and lochans situated throughout the area, predominantly in the centre, north and east of the Site within the flatter expanses of the Site. These lochs typically drain to the south and south east into Loch Eisgein.

The minor lochans in the southern area of the proposed development in the area around T20 and T24 drain to the south into Loch Sealg.

The largest river within the proposed development boundary is Abhainn Cheothadail located in the south of the Site, which is fed by Loch na Beirighe and multiple streams located on the northern and southern flanks of the river valley. This river flows east, discharging into Loch Feoir, Loch Eishken and ultimately Loch Sealg.

The central section of the proposed access track also drains to the Loch Seaford whilst the northern extent of the access track is located within the catchment of the Abhainn Mhor, which drains to the Loch Erisort approximately 1km north west of the proposed access point.

The hydrology of the Site is detailed within the **SEI Figure 10.1.**

2.8 Hydrogeology

The solid geology underlying the Site is classified as fault zone rocks and a low productivity aquifer, where mylonitic rock and fault breccias yield small amounts of groundwater resulting in flow occurring predominantly through fractures and discontinuities. Small amounts of groundwater may be present within near surface fractures and weathered rock and from springs locally.

2.9 Aerial Photography

Review of the aerial photography indicate the borrow pit locations are largely covered by vegetation with exposed bedrock also visible at surface.

3.0 Borrow Pit Assessment

This section of the report provides an assessment of the potential borrow pit locations with an evaluation of their potential to meet the proposed development's aggregate requirements.

The assessment has been completed through a desk-based review of geological maps and memoirs and is supported by several site visits from SLR geologists and a geotechnical engineer. Potential borrow pit locations were inspected visually with a view to assess ground conditions and help determine the borrow pit's suitability for use during construction of the proposed development.

In exploring the seven potential borrow pit locations, as defined on **SEI Figure 10.3.1a**, consideration has been given to the practical aspects of each borrow pit. The main aspects to consider are as follows:

- ease of access;
- rock type;
- overburden thickness;
- topography;
- current and historical uses;
- proximity to construction activities;
- visual impact; and
- impact on environmentally sensitive areas.

Steeper topography is preferable for quarrying, where peat and soils coverage will be limited. Careful consideration was given to landscape and visual impacts, and other considerations included proximity to watercourses and places of archaeological interest. The proposed borrow pits are in areas where the peat cover is typically thinner or vacant and aggregate reserves are expected to occur near the surface.

No intrusive site investigation works have been undertaken into the quality of rock that might be recovered at the time of preparing this BPA. However, it is anticipated that a full ground investigation will take place in advance of construction of the proposed development. The investigation will include the testing of material from within the proposed borrow pit areas to assess its suitability for re-use.

3.1 Aggregate Requirements

The proposed turbine locations and their subsequent maintenance would require the construction of a purpose-built network of access tracks. These tracks would be single track with occasional passing places, un-metalled and would be constructed to the turbine suppliers' specifications conforming to the Specification for Highway Works (SHW)[2].

As indicated above, a site investigation would be required to investigate each borrow pit location to confirm the material suitability and re-use potential of the bedrock with bedrock samples recovered from the borrow pits and subjected to detailed geotechnical testing.

The indicative volumes of aggregate required for site infrastructure are summarised in **Table B** and based on the materials calculator provided in **Annex A**.

2 Highways Agency, Manual of Contract Documents for Highway Works Volume 1 Specification for Highway Works, Series 600 Earthworks, Published February 2017.

Table B: Aggregate Requirement Summary

Infrastructure Element	Volume of Aggregate Required (m^3)
New Excavated Access Track	52,066
Existing / Upgraded Access Track	19,123
New Floating Access Track	15,623
Turbine Bases - formation only	8,831
Fill above Turbine Bases	15,325
Permanent Hardstandings	44,925
Temporary Hardstandings	91,925
Substation North	12,326
Substation South	7,500
Temporary Construction Compound 1	6,301
Temporary Construction Compound 2	2,750
Temporary Construction Compound 3	6,400
Total	**283,095**

It has been estimated that approximately 283,095m^3 of suitable quality rock would be required to construct the proposed development. This includes SHW[2] classes 6F2, 6N/ 6P and concrete aggregate. If rock quality is not suitable for each of these engineered materials then there may be a requirement for imported materials.

No account has been taken in the calculations for the fortuitous 'winning' of rock during the construction phase for example during infrastructure excavations. If such rock was available, the amount extracted from the borrow pits would be reduced.

3.2 Borrow Pit Appraisal

This section of the report provides an assessment of the seven borrow pit search areas shown on **SEI Figure 10.3.1a** together with an evaluation of their potential to meet the proposed development's aggregate requirements.

Each location is reviewed in the sections below. Potential search areas have been highlighted with indicative excavation areas identified at each borrow pit location.

All borrow pits could be extended or reduced in size depending on review of aggregate requirements and/or ground investigation data.

These rock types have been assumed for the borrow pits where there were no rock exposures at the surface. The geology encountered within the Site is supported by BGS geological maps for the Site. Dimensions of the borrow pits, volume of superficial material to be removed and volumes of Site won rock for each borrow pit have been estimated based on cross-sections developed through a digital terrain model. These are required to be confirmed by future intrusive ground investigation works.

3.2.1 Borrow Pit 1

Borrow Pit 1 (BP1) is proposed in the north east of the Site at approximately NGR NB 32831 14332 shown on **SEI Figure 10.3.4** with further details in **Table C**.

Photo 1: View looking east from NGR NB 32772 14351 showing BP1

Table C: Borrow Pit 1

Borrow Pit Details	
Excavation Area	Approximately 6,592m^2
Height of Excavation	Approximately 7.2m
Gradient	Slope increasing gently towards the north
Details of Likely Extraction	Combination of digging, drilling and blasting
Likely Overburden Type and Depth	No detailed GI undertaken to date. No mapped superficial deposits. Average peat depth thickness 0.19m.
Extent of Aggregate Extraction	Approximately 36,817m^3
Aggregate Composition	Outer Hebrides Thrust Zone Mylonites Complex - Pseudotachylite

3.2.2 Borrow Pit 2

Borrow Pit 2 (BP2) is proposed in the north east of the Site at approximately NGR NB 31917 14097 shown on **SEI Figure 10.3.5** with further details in **Table D**.

Photo 2: View looking north-west from NGR NB 31954 14083 showing BP2

Table D: Borrow Pit 2

Borrow Pit Details	
Excavation Area	Approximately 4,008m^2
Height of Excavation	Approximately 10m
Gradient	Slope increasing gently towards the west
Details of Likely Extraction	Combination of digging, drilling and blasting
Likely Overburden Type and Depth	No detailed GI undertaken to date. No mapped superficial deposits. Average peat depth thickness 0.38m.
Extent of Aggregate Extraction	Approximately 16,721m^3
Aggregate Composition	Lewisian Complex - Amphibolite

3.2.3 Borrow Pit 3

Borrow Pit 3 (BP3) is proposed in the north east of the Site at approximately NGR NB 32338 13808 shown on **SEI Figure 10.3.6** with further details in **Table E**.

Photo 3: View looking northwest from NGR NB 32327 13846 showing BP3

Table E: Borrow Pit 3

Borrow Pit Details	
Excavation Area	Approximately 16,172m^2
Height of Excavation	Approximately 13.6m
Gradient	Slope increasing gently towards the north
Details of Likely Extraction	Combination of digging, drilling and blasting
Likely Overburden Type and Depth	No detailed GI undertaken to date. No mapped superficial deposits. Average peat depth thickness 0.29m.
Extent of Aggregate Extraction	Approximately 84,836m^3
Aggregate Composition	Outer Hebrides Thrust Zone Mylonites Complex - Pseudotachylite Lewisian Complex - Amphibolite

3.2.4 Borrow Pit 4

Borrow Pit 4 (BP4) is proposed in the north east of the Site at approximately NGR NB 32949 13288 shown on **SEI Figure 10.3.7** with further details in **Table F**.

Photo 4: View looking west from NGR NB 32968 13308 showing BP4

Table F: Borrow Pit 4

Borrow Pit Details	
Excavation Area	Approximately 3,348m^2
Height of Excavation	Approximately 6.2m
Gradient	Slope increasing gently towards the north-west
Details of Likely Extraction	Combination of digging, drilling and blasting
Likely Overburden Type and Depth	No detailed GI undertaken to date. No mapped superficial deposits. Average peat depth thickness 0.20m.
Extent of Aggregate Extraction	Approximately 9,655m^3
Aggregate Composition	Outer Hebrides Thrust Zone Mylonites Complex - Pseudotachylite

3.2.5 Borrow Pit 5

Borrow Pit 5 (BP5) is proposed in the south of the Site at approximately NGR NB 30437 11622 shown on **SEI Figure 10.3.8** with further details in **Table G**.

Photo 5: View looking west from NGR NB 30424 11614 showing BP5

Table G: Borrow Pit 5

Borrow Pit Details	
Excavation Area	Approximately 12,810m^2
Height of Excavation	Approximately 16.4m
Gradient	Slope increasing gently towards the south
Details of Likely Extraction	Combination of digging, drilling and blasting
Likely Overburden Type and Depth	No detailed GI undertaken to date. No mapped superficial deposits. Average peat depth thickness 0.20m.
Extent of Aggregate Extraction	Approximately 116,519m^3
Aggregate Composition	Outer Hebrides Thrust Zone Mylonites Complex - Pseudotachylite

3.2.6 Borrow Pit 6

Borrow Pit 6 (BP6) is proposed in the south of the Site at approximately NGR NB 30586 11787 shown on **SEI Figure 10.3.9** with further details in **Table H**.

Photo 6: View looking southwest from NGR NB 30630 11836 showing BP6

Table G: Borrow Pit 6

Borrow Pit Details	
Excavation Area	Approximately 5,200m^2
Height of Excavation	Approximately 10.3m
Gradient	Slope increasing gently towards the north
Details of Likely Extraction	Combination of digging, drilling and blasting
Likely Overburden Type and Depth	No detailed GI undertaken to date. No mapped superficial deposits. Average peat depth thickness 0.35m.
Extent of Aggregate Extraction	Approximately 32,007m^3
Aggregate Composition	Outer Hebrides Thrust Zone Mylonites Complex - Pseudotachylite

3.2.7 Borrow Pit 7

Borrow Pit 7 (BP7) is proposed in the north of the Site at approximately NGR 132831, 914332, shown on **SEI Figure 10.3.10** with further details in **Table I**.

Photo 7: View looking south from NGR NB 31881 15747 showing BP7

Table H: Borrow Pit 7

Borrow Pit Details	
Excavation Area	Approximately 15,824m^2
Height of Excavation	Approximately 12m
Gradient	Slope increasing gently towards the north
Details of Likely Extraction	Combination of digging, drilling and blasting
Likely Overburden Type and Depth	No detailed GI undertaken to date. No mapped superficial deposits. Average peat depth thickness 0.59m.
Extent of Aggregate Extraction	Approximately 107,982m^3
Aggregate Composition	Outer Hebrides Thrust Zone Mylonites Complex - Pseudotachylite

4.0 Proposed Borrow Pit Design

The indicative borrow pit volumes are presented in **Table C** to **Table I**. The design of the borrow pits anticipates extracting a net stone volume suitable for the requirements of the proposed development, excluding top surface dressing which would require importing. This target capacity has been determined based on the estimated requirements for construction materials together with additional allowances for overburden material. It is envisaged that overburden/soils together with processed materials would be carefully stored adjacent to the excavation void for eventual use in the restoration process.

4.1 Marking Out and Overburden Stripping

The permitted extents of the borrow pit would be marked out with pegs, and overburden, including topsoil, subsoil and weathered rock horizons, would be stripped from within this delineated area.

The overburden and weathered rock horizons would be stripped using a combination of crawler tractor dozers and backtrackers with the material loaded by loading shovels. The overburden (including surface vegetation turves) would be carefully stripped and stored as a series of separate turves, topsoil, subsoil and weathered rock storage mounds to be used for reinstatement purposes.

4.2 Excavations within Rock

Once overburden and weathered rock horizons have been stripped, and stored, a suitably qualified geotechnical engineer/blasting engineer would assess the nature of the underlying solid rock strata. The engineer would provide advice on suitable extraction techniques including; extraction method, bench and cut face design parameters, and blasting design (if required).

If blasting is required, blasting would be undertaken in accordance with the Quarries Regulations 1999[3] and Annex D PAN 50[4].

A combination of digging, ripping and blasting would be utilised to excavate rock (subject to the nature of the material encountered, depth of weathering and level of fracturing) which would be processed using a mobile crushing and screening plant, which would be sited within the base of the working borrow pit.

4.3 Stockpiling of Materials

The initial overburden strip would be stored within temporary screening mounds around the perimeter of the borrow pit. The screening mounds would be at least 1.5m in height.

The remaining unsuitable materials (weathered/unsuitable rock horizons) would be stockpiled within the base of the working borrow pit. The stockpiles would have a maximum height of 5m, with maximum side-slope gradients of 1(Vertical (V)) in 2.5(Horizontal (H)) and be in full compliance with the Quarries Regulations 1999[3] and Quarries National Joint Advisory Committee (QNJAC) Guidelines[5]. This material would be used as part of the restoration profiling on the cut faces.

3 Health and Safety Executive (2014), Health and Safety at Quarries, Quarries Regulations 1999, Approved Code of Practice and Guidance (Second Edition).

4 Scottish Government (2000), PAN 50 Annex D: Controlling the Environmental Effects of Surface Mineral Works.

5 Quarries National Joint Advisory Committee (2020), Available at: http://qnjac.co.uk/what-is-qnjac/. Last accessed April 2020.

4.4 Access Tracks/Haulage Routes

The proposed access to the borrow pit(s) would involve constructing access tracks from the main wind farm access track. The access tracks would include suitable roadside drainage ditches, with soakaways located, where appropriate.

The tracks (haulage routes) within the borrow pit would have a gradient of no steeper than 1(V) in 10(H).

4.5 Water Management/Drainage

The borrow pit(s) would feature a perimeter surface drain, which would aim to prevent water in-flow into the borrow pit. The water collected within the surface drains would be discharged either into the surrounding vegetation, or into suitably located settlement lagoons.

Where necessary, surface settlement lagoons would be constructed within the borrow pit. These would be constructed with the aim of containing any surface water collection within the excavation voids, and from collection of water from the perimeter surface drains. The lagoons would be contained within a bunded area at the base of the borrow pit, with suitable pumping systems installed allowing water to be pumped to soakaways as required.

4.6 Restoration

Upon completion of extraction at the borrow pit(s), surface profile restoration would be undertaken using the stockpiled overburden materials and other suitable materials excavated on-site (including peat) subject to review by the Environmental Clerk of Works (EnvCoW).

General fill material would be sourced from the stockpiles located within the borrow pit void. These would comprise of materials with unsuitable engineering properties for the proposed development construction such as weathered rock and unsuitable/poor quality rock horizons, and unsuitable materials arising from the crusher/blasting operations. This material would be utilised to provide the basis of the restoration profile.

The fill materials would be used as general fill to soften the benched profile of the excavations and provide a gentler sloping gradient than near vertical working face slope designs. The fill materials would also be used to provide a suitable gradient on the borrow pit floor to prevent ponding.

The stripped soils, and subsoil horizons which would be stored within perimeter screening mounds would be utilised as the surface dressing layer in which to provide a suitable medium for seeding and planting as appropriate.

The restoration of the borrow pit sites would not involve importing any material onto the proposed development. Only materials arising from the excavations would be utilised as part of the restoration scheme and Peat Management Plan. The base of the borrow pit would re-use existing stockpiled materials/soils generated from the site excavations to create a habitat on the floor of the borrow pit, which would be a maximum of 2m thick across the floor area and if suitable, some of these soils could be used to ‘dress’ shallower side slopes but not on the steeper faces.

An ECoW would be in place, to monitor the restoration and aftercare of the borrow pits.

4.7 Best Practice Guidance Documents

A number of general pollution prevention measures would be employed to minimise the risks to ground and surface waters during the creation and use of the borrow pits. Extraction operations would be carried out in accordance with relevant SEPA Guidance for Pollution

Prevention[6] and other codes of best practice, to ensure that both ground and surface waters are not contaminated. These would include relevant codes of best practice relevant to the Site, including:

- European Commission (EC) Water Framework Directive (2000/60/EC);
- Planning Advice Note (PAN) 50, Controlling the Environmental Effects of Surface Mineral Workings Scottish Government (2000) ;
- Good Practice on Controlling the Effects of Surface Mineral Working on the Water Environment, Department of the Communities and Local Government and Mineral Industry Research Organisation (2008);
- The Water Environment (Controlled Activities) (Scotland) Regulations 2011;
- Guidance for Pollution Prevention (GPPs) (various dates and references), SEPA; and
- Environmental Good Practice on Site C692, CIRIA (2010).

6 SEPA (2019), Guidance for Pollution Prevention (GPPs). Available at https://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/

5.0 Conclusion

In summary, seven borrow pits have been assessed as being capable of supplying all the aggregate required for the proposed development, excluding the concrete for the turbine bases and a surface road dressing. The locations and methods of working would be managed to cause minimal impact to the ground conditions and water environment. The borrow pit design and recommended methods of operation are in line with the Quarries Regulations, Approved Code of Practice, 1999 (as amended)[7] to provide a safe working environment and minimise risk of instability.

An approximate volume of excavated materials has been calculated for each of the proposed borrow pit locations, these volumes are based on initial calculations based on assumptions for the proposed development. These calculations would be verified by detailed intrusive investigation at the proposed locations, post-consent. Calculations do not take into consideration the 'winning' of materials along the route. Each of the proposed borrow pits selected could be increased or decreased in size, depending on the aggregate requirements or following an assessment of the suitability of aggregate materials following detailed ground investigation.

The quality of rock anticipated on-site is inferred from a visual assessment of rock outcrops and published information. An intrusive ground investigation, sampling and material laboratory testing will be required to confirm ground condition and suitability.

Prior to the construction of the proposed development, design and best practices, and any required mitigation measures, would be set out in full within a Construction Environmental Management Plan (CEMP) and would be secured by an appropriately worded predevelopment condition of consent.

7 Health and Safety Executive (2014), Health and Safety at Quarries, Quarries Regulations 1999, Approved Code of Practice and Guidance (Second Edition).

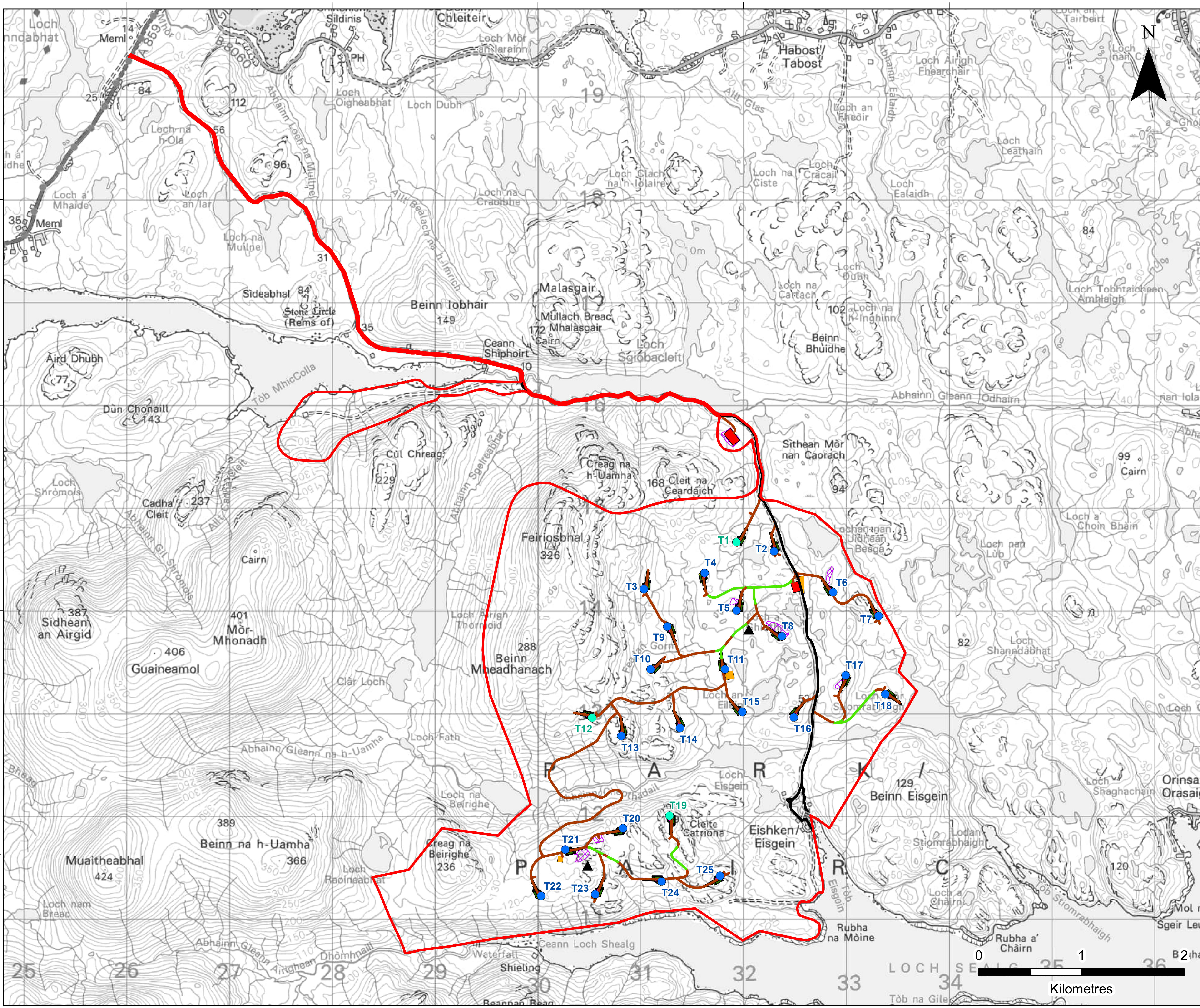
Figures

SEI Technical Appendix 10.3: Borrow Pit Appraisal

Uisenis Wind Farm

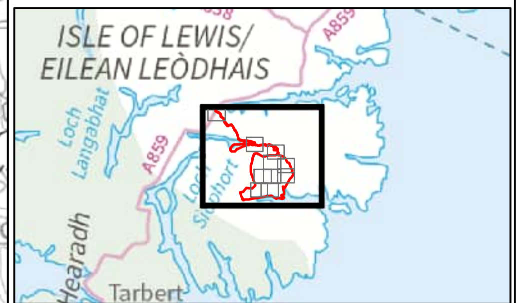
Uisenis Power Ltd

SLR Project No.: 405.V64341.00001



LEGEND

- Application Boundary
- Proposed Turbine Location (180 m Blade Tip Height)
- Proposed Turbine Location (200 m Blade Tip Height)
- Proposed Permanent Met Mast
- Proposed Bespoke Hardstanding Envelope
- Proposed Permanent Substation
- Proposed Permanent Hardstanding
- Proposed Temporary Hardstanding
- Proposed Temporary Bridge Alignment
- Proposed Temporary Construction Compound
- Proposed Clearance Area
- Potential Borrow Pit
- Proposed Floating Access Track
- Proposed Access Track / Turning Head
- Existing Road (To Be Upgraded)



Eurowind Energy

SLR

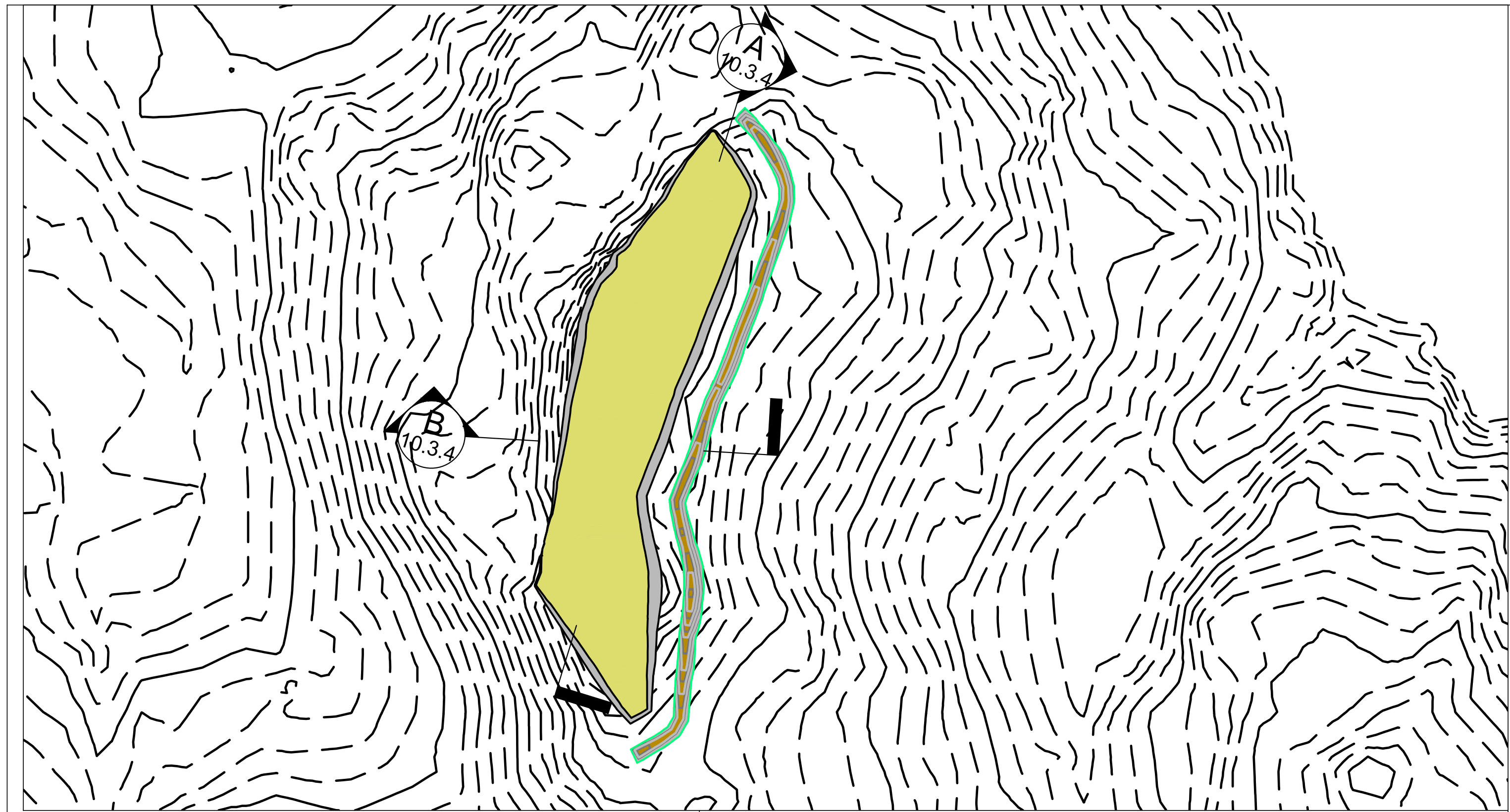
UISENIS WIND FARM - SEI

BPA

SITE LAYOUT

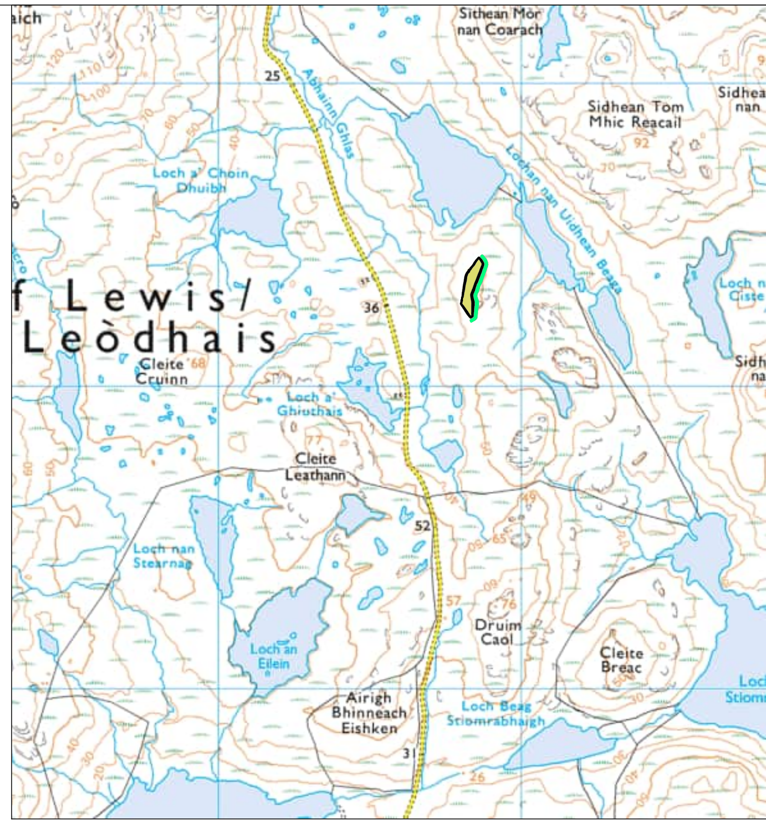
SEI FIGURE 10.3.1a

Scale	Date
1:35,000 @ A3	MAY 2024



01 | PLAN OF BORROW PIT
SCALE: 1:2500

0 50 100 150 200 250m
Scale 1:2,500



02 | LOCATION PLAN
SCALE: 1:25000

0 50 100 150 200 250m
Scale 1:2,500

N

Notes:

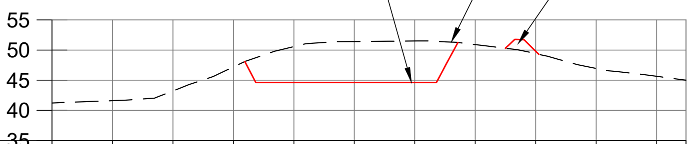
1. Overburden assumed to be circa 0.5m in thickness comprising soils and weathered rock.
2. Initial stripped overburden to be placed in peripheral bund, with subsequent overburden and waste materials to be stockpiled within flat basal area of borrow pit prior to being used in restoration.
3. Design parameters are indicative and should be refined based upon findings of ground investigations and or initial excavations, taking into account ground conditions and hydrological issues.
4. Assumes insitu conversion factor of 2 tonnes per m³.

Legend:

- Bench/base of excavation
- Excavation batter
- Peripheral bund

Chainage	00.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00	170.00	180.00	190.00	200.00	207.48
Existing Ground Levels	44.242	46.203	47.991	49.294	50.645	51.869	52.971	53.565	54.056	53.594	52.400	51.555	51.468	50.997	50.384	50.834	53.932	54.094	51.194	48.344	45.769	44.000
Proposed Levels		46.943	44.619	44.619	44.619	44.619	44.619	44.619	44.619	44.619	44.619	44.619	44.619	44.619	44.619 44.619	44.619	44.619	44.619	44.619	**48.764**		

SECTION A
Scale: H 1:1250,V 1:1250. Datum: 40.000



Chainage	00.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	104.85
Existing Ground Levels	41.211	41.609	43.225	47.201	50.584	51.426	51.504	50.917	49.405	46.958	45.651	45.000
Proposed Levels				48.092	44.619	44.619	44.619	51.266				

SECTION B
Scale: H 1:1250,V 1:1250. Datum: 35.000

TOTAL EXCAVATION VOLUME	40,293m³
OVERBURDEN VOLUME	3,476m³
NET STONE VOLUME	36,817m³
PERIPHERAL BUND FILL	1,530m³
NET STONE TONNAGE	73,634T
EXCAVATION AREA	6,592m²
EXCAVATION METHOD REQUIRED	DIGGING, DRILLING AND BLASTING
INFERRED DESIGN PARAMETERS	63 DEGREE FACES THROUGH COMPETENT ROCK MAXIMUM FACE HEIGHT OF 7.2m FINAL BENCH WIDTH OF 7.5m 1.5m HIGH PERIPHERAL BUND
CO-ORDINATES FOR CENTRE OF BORROW PIT	E: 132831 N: 914332

0 25 50 75 100 125m
Scale 1:1,250

Rev	Amendments	Date	By	Chk	Auth
0		05/24	IG	RW	RW

SLR
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Client
Eurowind Energy

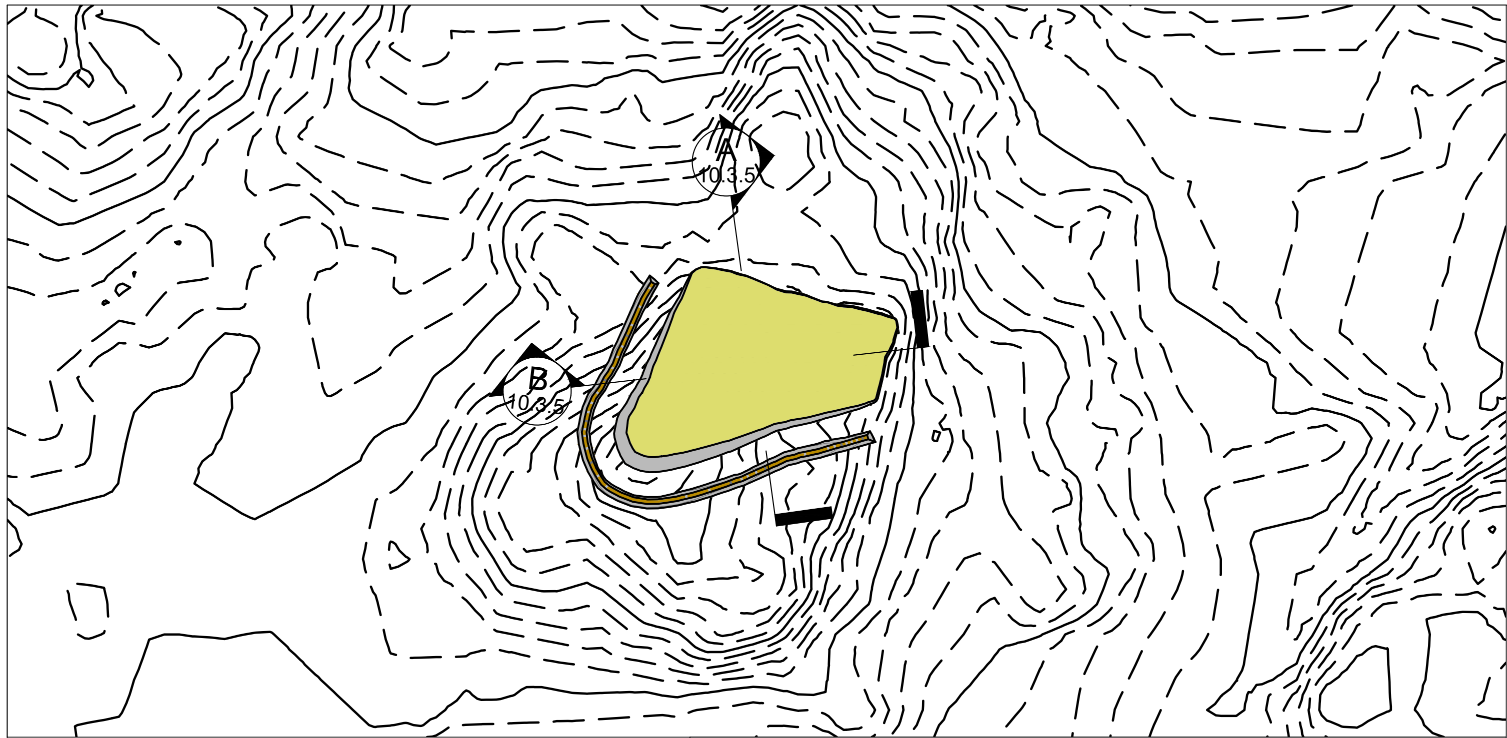
Project
TA 10.3 Borrow pit appraisal

Figure Title
Borrow Pit 1

Scale		SLR Project No.	
As shown @ A3		405.V64341.00001	
Designed	Drawn	Checked	Authorised
	IG	RW	RW
Date	Date	Date	Date
	05/24	05/24	05/24

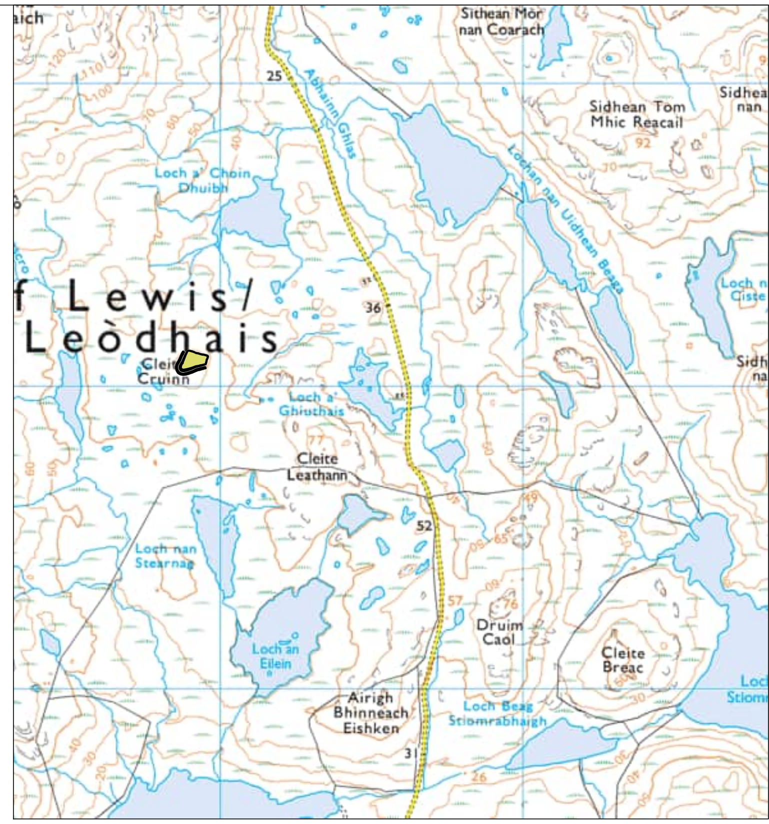
Figure Number: **SEI Figure 10.3.4** | Rev.: **0**

\\Ecafs\EDFS-E\Projects\120850 Eurowind Energy Ltd\405.V64341.00001 - Uisenis Wind Farm EIA\Tech\LO\Dwgs\Wking\Figure 10.3.4 - Borrow Pit 1.dwg Iain Green 23/05/2024



01 PLAN OF BORROW PIT
SCALE: 1:2500

0 50 100 150 200 250m
Scale 1:2,500



02 LOCATION PLAN
SCALE: 1:25000

0 50 100 150 200 250m
Scale 1:2,500

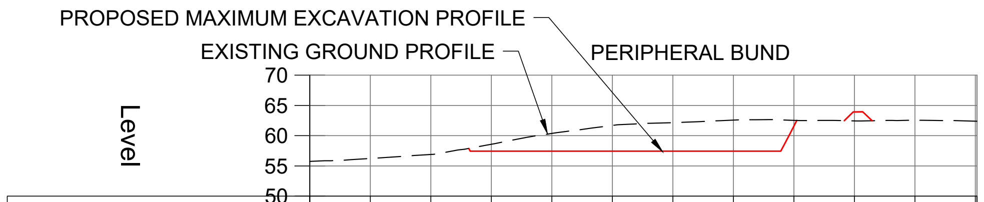
N

Notes:

1. Overburden assumed to be circa 0.5m in thickness comprising soils and weathered rock.
2. Initial stripped overburden to be placed in peripheral bund, with subsequent overburden and waste materials to be stockpiled within flat basal area of borrow pit prior to being used in restoration.
3. Design parameters are indicative and should be refined based upon findings of ground investigations and or initial excavations, taking into account ground conditions and hydrological issues.
4. Assumes insitu conversion factor of 2 tonnes per m³.

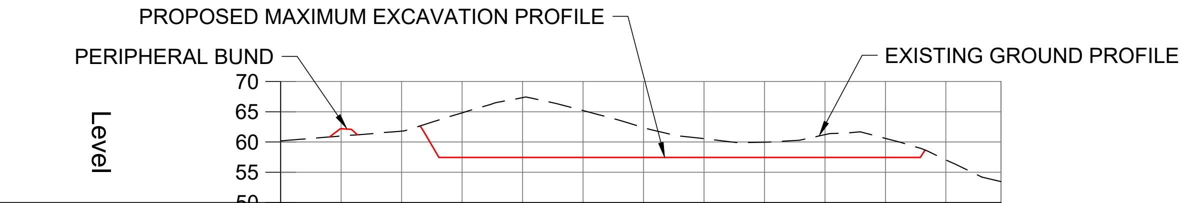
Legend:

- Bench/base of excavation
- Excavation batter
- Peripheral bund



Chainage	00.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.26
Existing Ground Levels	52.763	54.538	55.375	56.265	57.937	60.537	63.993	66.807	67.226	66.568	66.087	65.264
Proposed Levels		56.342	59.962	58.434	57.802	58.643	59.483	60.324	61.165	61.872	62.310	62.731

SECTION A
Scale: H 1:1250,V 1:1250. Datum: 50.000



Chainage	00.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	119.11
Existing Ground Levels	56.891	59.097	61.156	62.102	62.854	64.239	66.135	67.280	67.377	66.294	64.726	62.887	61.535
Proposed Levels	60.002	58.767	58.882	58.980	59.061	59.142	59.222	59.208	59.065	58.721	58.585 58.056 58.072		

SECTION B
Scale: H 1:1250,V 1:1250. Datum: 50.000

TOTAL EXCAVATION VOLUME	18,725m³
OVERBURDEN VOLUME	2,004m³
NET STONE VOLUME	16,721m³
PERIPHERAL BUND FILL	582m³
NET STONE TONNAGE	33,442T
EXCAVATION AREA	4,008m²
EXCAVATION METHOD REQUIRED	DIGGING, DRILLING AND BLASTING
INFERRED DESIGN PARAMETERS	63 DEGREE FACES THROUGH COMPETENT ROCK MAXIMUM FACE HEIGHT OF 10m FINAL BENCH WIDTH OF 7.5m 1.5m HIGH PERIPHERAL BUND
CO-ORDINATES FOR CENTRE OF BORROW PIT	E: 131909 N: 914090

0 25 50 75 100 125m
Scale 1:1,250

Rev	Amendments	Date	By	Chk	Auth
0		05/24	IG	RW	RW

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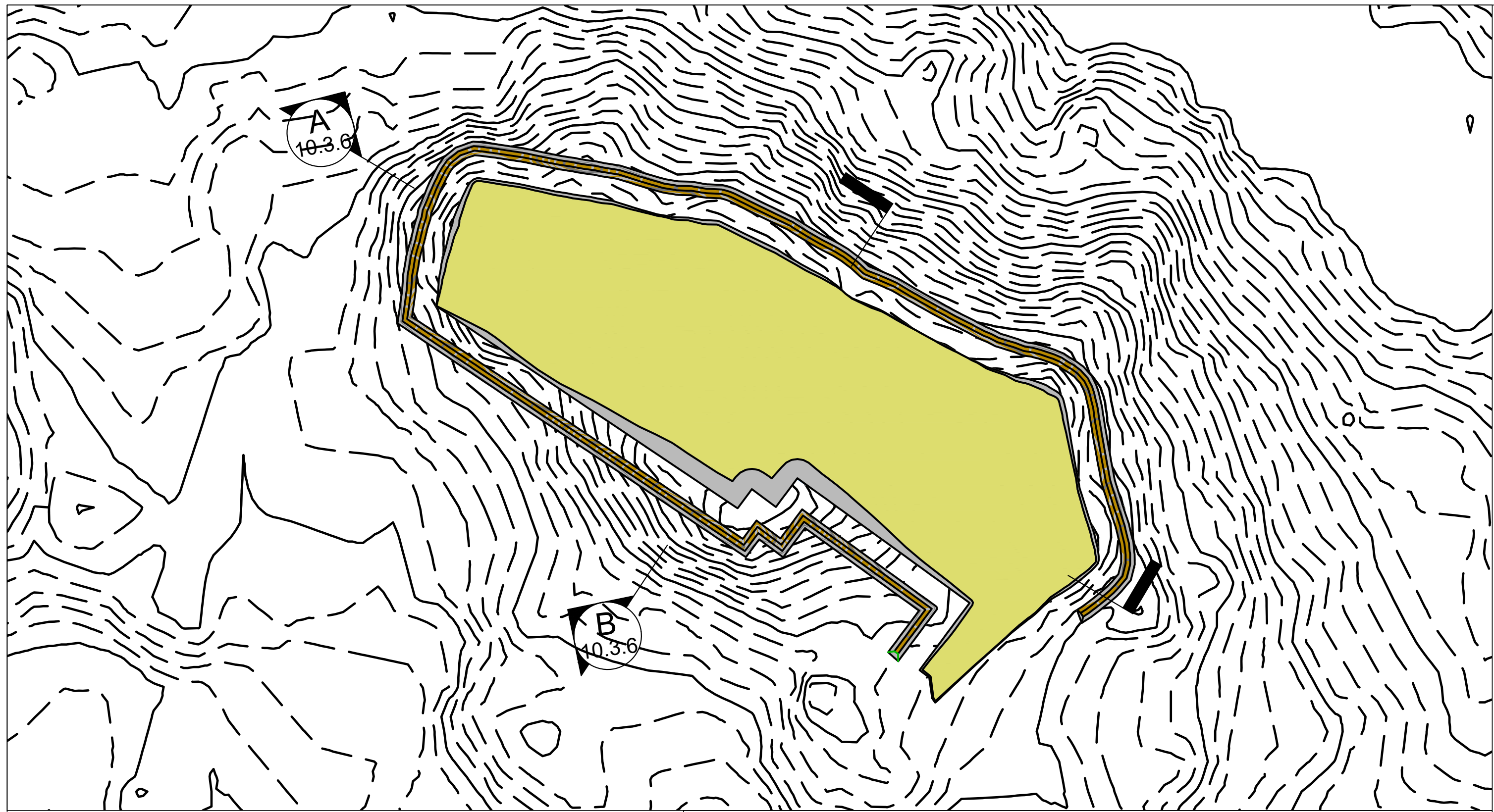
Client
Eurowind Energy

Project
TA 10.3 Borrow pit appraisal

Figure Title
Borrow Pit 2

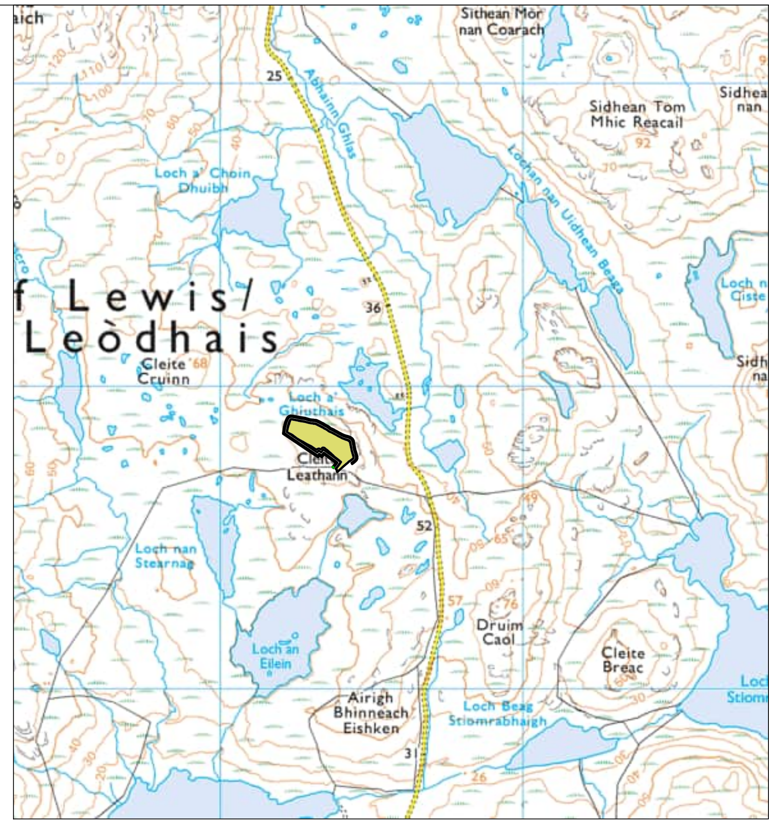
Scale: As shown @ A3		SLR Project No.: 405.V64341.00001	
Designed	Drawn: IG	Checked: RW	Authorised: RW
Date	Date: 05/24	Date: 05/24	Date: 05/24
Figure Number: SEI Figure 10.3.5			Rev.: 0

Iain Green 23/05/2024
\\Euafs\EDIFS-E\Projects\120850 Eurowind Energy Ltd\405.V64341.00001 - Uisenis Wind Farm EIA\Tech\LO\Dwgs\Wiking\Figure 10.3.5 - Borrow Pit 2.dwg



01 PLAN OF BORROW PIT
SCALE: 1:2500

0 50 100 150 200 250m
Scale 1:2,500



02 LOCATION PLAN
SCALE: 1:25000

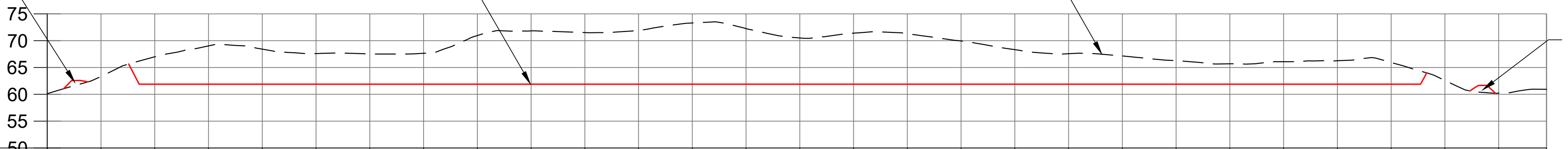
0 50 100 150 200 250m
Scale 1:2,500

Notes:

1. Overburden assumed to be circa 0.5m in thickness comprising soils and weathered rock.
2. Initial stripped overburden to be placed in peripheral bund, with subsequent overburden and waste materials to be stockpiled within flat basal area of borrow pit prior to being used in restoration.
3. Design parameters are indicative and should be refined based upon findings of ground investigations and or initial excavations, taking into account ground conditions and hydrological issues.
4. Assumes insitu conversion factor of 2 tonnes per m³.

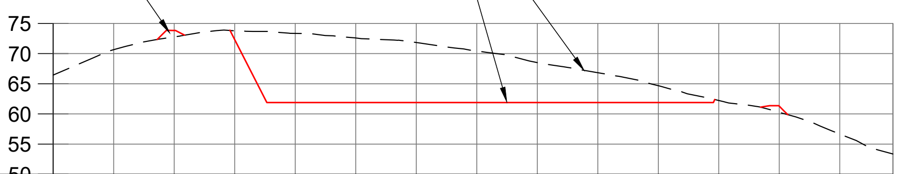
Legend:

- Bench/base of excavation
- Excavation batter
- Peripheral bund



Chainage	00.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00	170.00	180.00	190.00	200.00	210.00	220.00	230.00	240.00	250.00	260.00	270.00	278.89
Existing Ground Levels	60.109	63.342	66.997	69.028	68.428	67.591	67.532	67.657	70.958	71.819	71.511	71.883	73.307	72.244	70.507	71.403	71.314	69.939	68.319	67.576	67.149	66.277	65.680	66.089	66.256	65.929	62.584	60.220	60.932
Proposed Levels			65.649 61.890	61.890	61.890	61.890	61.890	61.890	61.890	61.890	61.890	61.890	61.890	61.890	61.890	61.890	61.890	61.890	61.890	61.890	61.890	61.890	61.890	61.890 61.890	61.890	61.890	63.995		

SECTION A
Scale: H 1:1250,V 1:1250. Datum: 50.000



Chainage	00.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	138.76
Existing Ground Levels	66.455	70.660	72.774	73.789	73.354	72.593	71.845	70.437	68.516	66.833	64.683	62.230	60.265	56.649	53.357
Proposed Levels				73.887 72.925	61.890	61.890	61.890	61.890	61.890	61.890	61.890	62.388			

SECTION B
Scale: H 1:1250,V 1:1250. Datum: 50.000

TOTAL EXCAVATION VOLUME	92,922m³
OVERBURDEN VOLUME	8,806m³
NET STONE VOLUME	84,836m³
PERIPHERAL BUND FILL	1,764m³
NET STONE TONNAGE	169,672T
EXCAVATION AREA	16,172m²
EXCAVATION METHOD REQUIRED	DIGGING, DRILLING AND BLASTING
INFERRED DESIGN PARAMETERS	63 DEGREE FACES THROUGH COMPETENT ROCK MAXIMUM FACE HEIGHT OF 13.6m FINAL BENCH WIDTH OF 7.5m 1.5m HIGH PERIPHERAL BUND
CO-ORDINATES FOR CENTRE OF BORROW PIT	E: 132329 N: 913823

0 25 50 75 100 125m
Scale 1:1,250

Rev	Amendments	Date	By	Chk	Auth
0		05/24	IG	RW	RW

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Client
Eurowind Energy

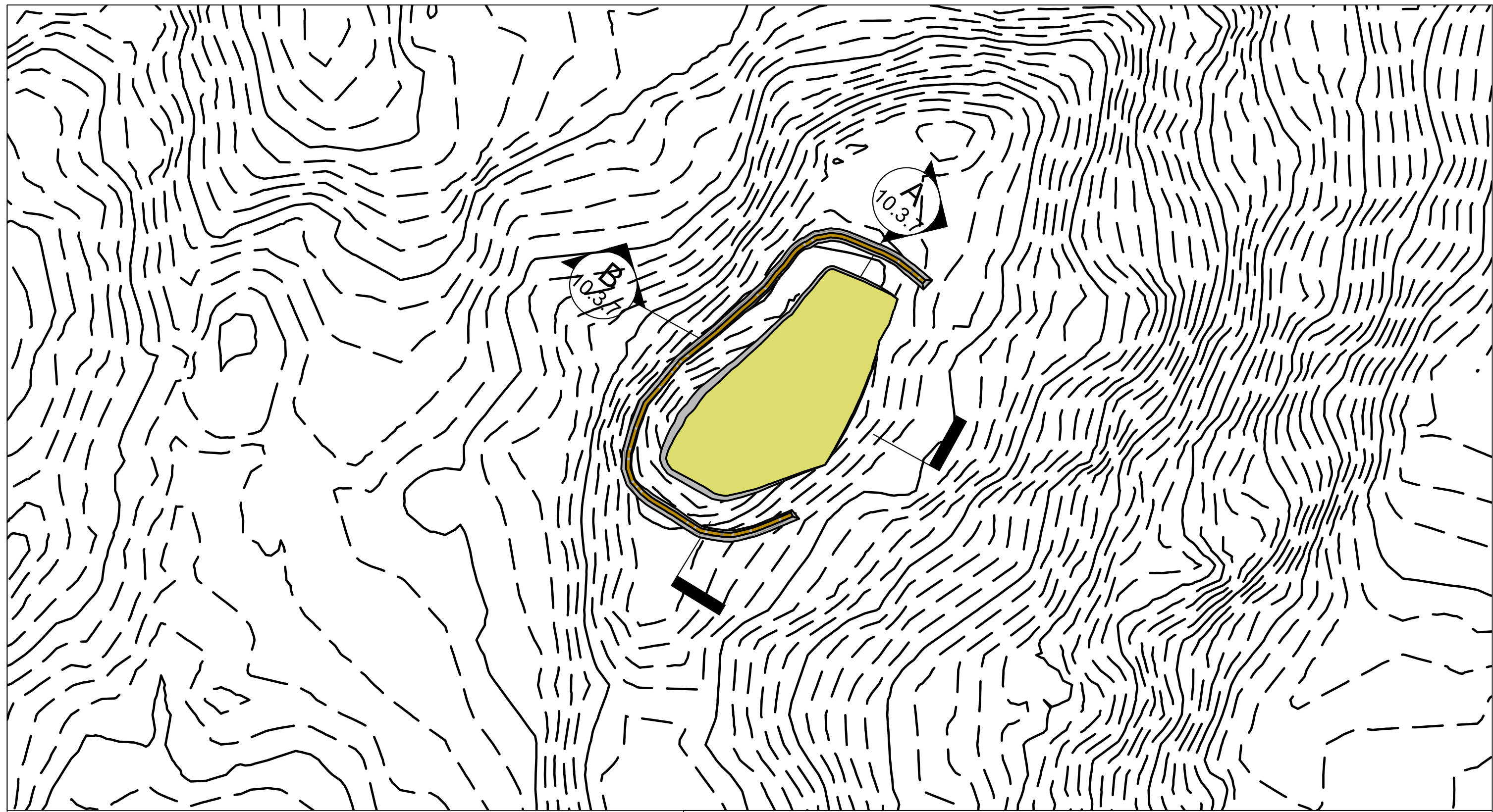
Project
TA 10.3 Borrow pit appraisal

Figure Title
Borrow Pit 3

Scale		SLR Project No.	
As shown @ A3		405.V64341.00001	
Designed	Drawn	Checked	Authorised
	IG	RW	RW
Date	Date	Date	Date
	05/24	05/24	05/24

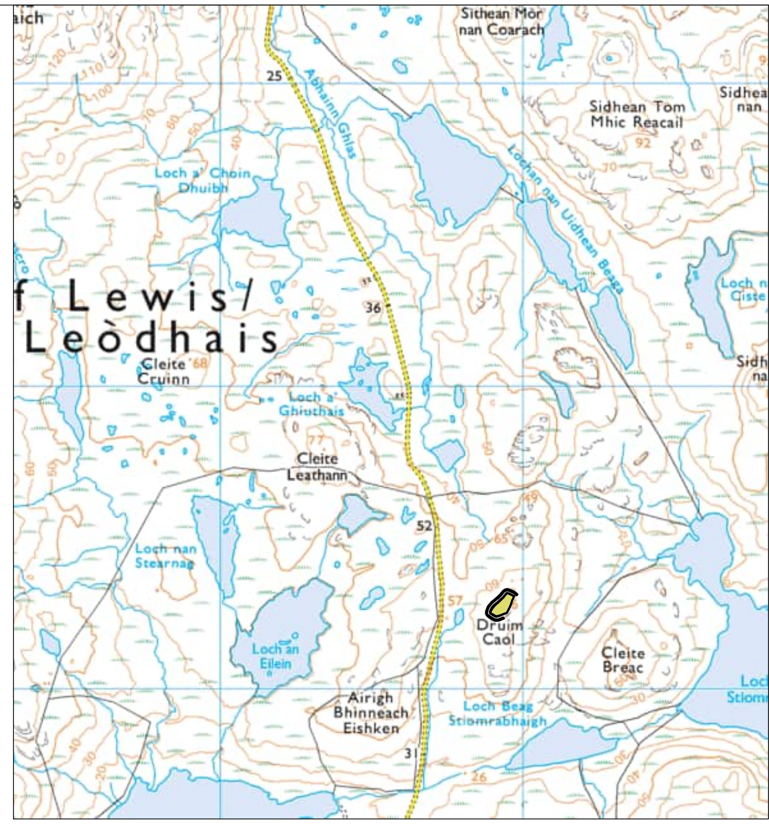
Figure Number
SEI Figure 10.3.6
Rev.
0

\\Euafs\EDIFS-E\Projects\120850 Eurowind Energy Ltd\405.V64341.00001 - Uisenis Wind Farm EIA\Tech\LO\Dwgs\Wiking\Figure 10.3.6 - Borrow Pit 3.dwg Iain Green 23/05/2024



01 PLAN OF BORROW PIT
SCALE: 1:2500

0 50 100 150 200 250m
Scale 1:2,500



02 LOCATION PLAN
SCALE: 1:25000

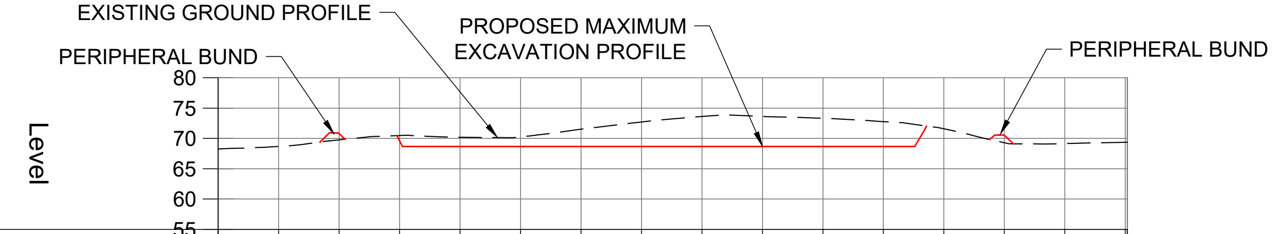
0 50 100 150 200 250m
Scale 1:2,500

Notes:

1. Overburden assumed to be circa 0.5m in thickness comprising soils and weathered rock.
2. Initial stripped overburden to be placed in peripheral bund, with subsequent overburden and waste materials to be stockpiled within flat basal area of borrow pit prior to being used in restoration.
3. Design parameters are indicative and should be refined based upon findings of ground investigations and or initial excavations, taking into account ground conditions and hydrological issues.
4. Assumes insitu conversion factor of 2 tonnes per m³.

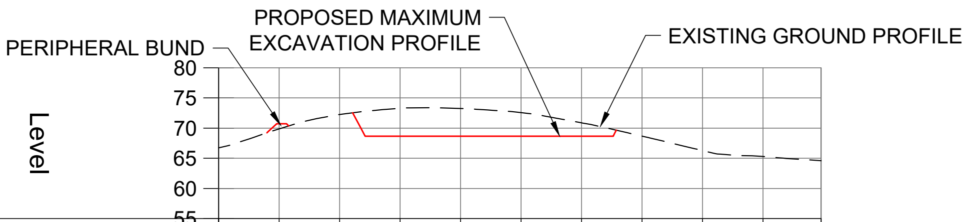
Legend:

- Bench/base of excavation
- Excavation batter
- Peripheral bund



Chainage	00.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00 / 150.03
Existing Ground Levels	66.763	66.788	66.769	66.312	65.540	65.776	66.136	65.406	64.441	63.761	63.099	63.454	64.014	64.960	64.775	63.505 / 63.466
Proposed Levels																

SECTION A
Scale: H 1:1250,V 1:1250. Datum: 55.000



Chainage	00.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	99.63
Existing Ground Levels	53.719	54.343	55.038	57.427	60.109	62.356	62.963	63.399	63.763	63.646	63.306
Proposed Levels											

SECTION B
Scale: H 1:1250,V 1:1250. Datum: 55.000

TOTAL EXCAVATION VOLUME	11,329m³
OVERBURDEN VOLUME	1,674m³
NET STONE VOLUME	9,655m³
PERIPHERAL BUND FILL	548m³
NET STONE TONNAGE	19,310T
EXCAVATION AREA	3,348m²
EXCAVATION METHOD REQUIRED	DIGGING, DRILLING AND BLASTING
INFERRED DESIGN PARAMETERS	63 DEGREE FACES THROUGH COMPETENT ROCK MAXIMUM FACE HEIGHT OF 6.2m FINAL BENCH WIDTH OF 7.5m 1.5m HIGH PERIPHERAL BUND
CO-ORDINATES FOR CENTRE OF BORROW PIT	E: 132934 N: 913280

0 25 50 75 100 125m
Scale 1:1,250

Rev	Amendments	Date	By	Chk	Auth
0		05/24	IG	RW	RW

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Client
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Project
TA 10.3 Borrow pit appraisal

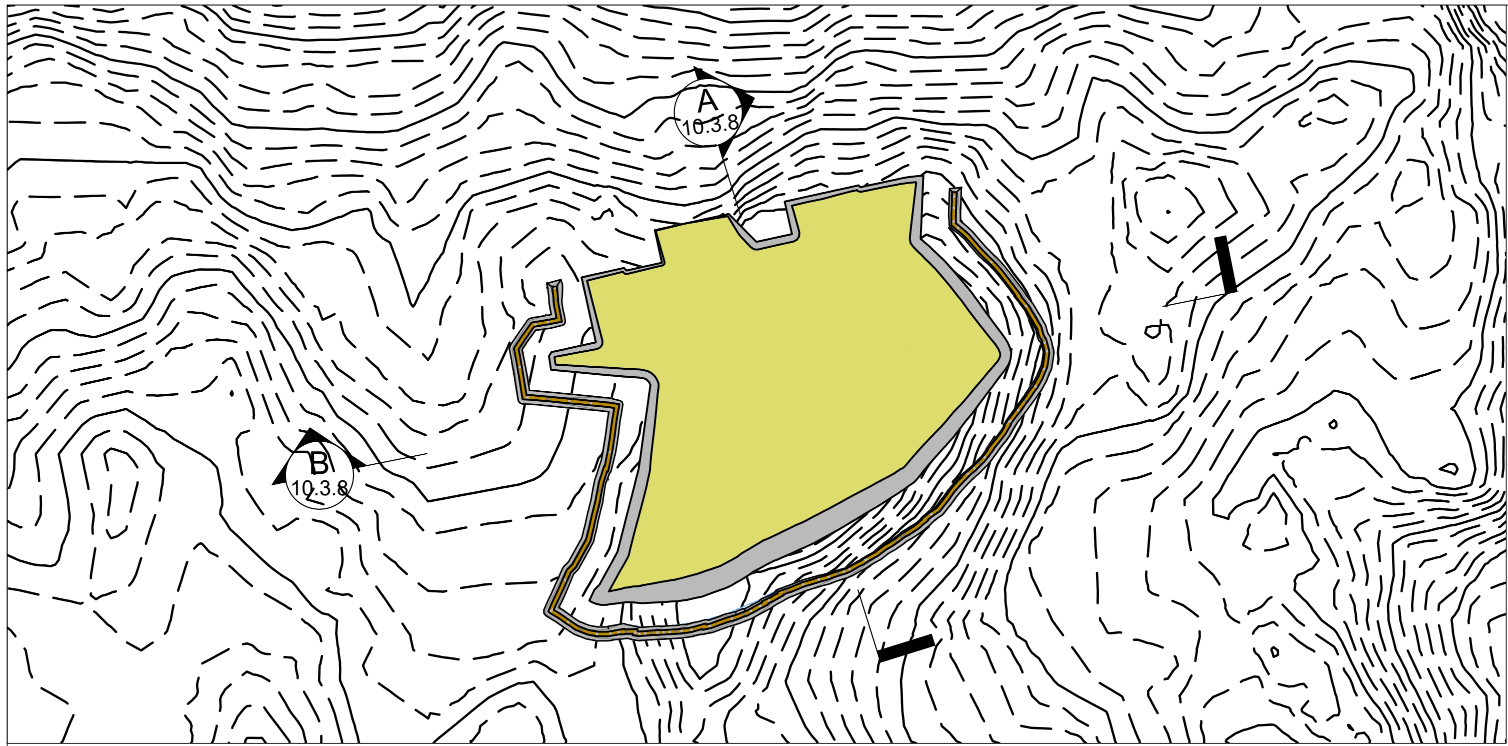
Figure Title
Borrow Pit 4

Scale: As shown @ A3	SLR Project No. 405.V64341.00001

Designed	Drawn	Checked	Authorised
	IG	RW	RW
Date	Date 05/24	Date 05/24	Date 05/24

Figure Number: SEI Figure 10.3.7
Rev.: 0

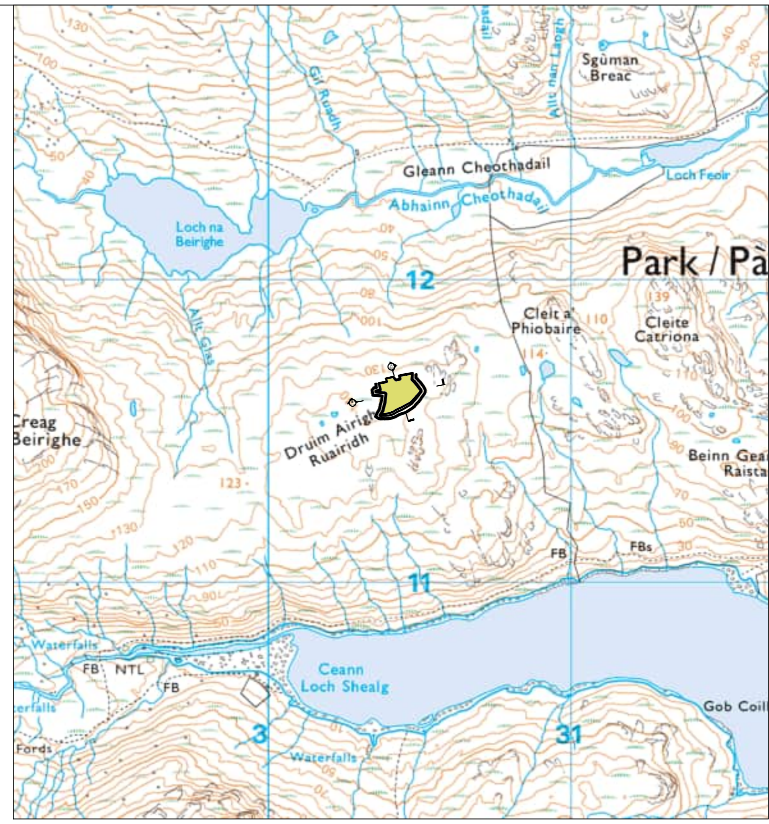
\\Euafs\EDIFS-E\Projects\120850 Eurowind Energy Ltd\405.V64341.00001 - Uisenis Wind Farm EIA\Tech\LQ\Dwgs\Wking\Figure 10.3.7 - Borrow Pit 4.dwg Iain Green 23/05/2024



01 PLAN OF BORROW PIT
SCALE: 1:2500

0 50 100 150 200 250m

Scale 1:2,500

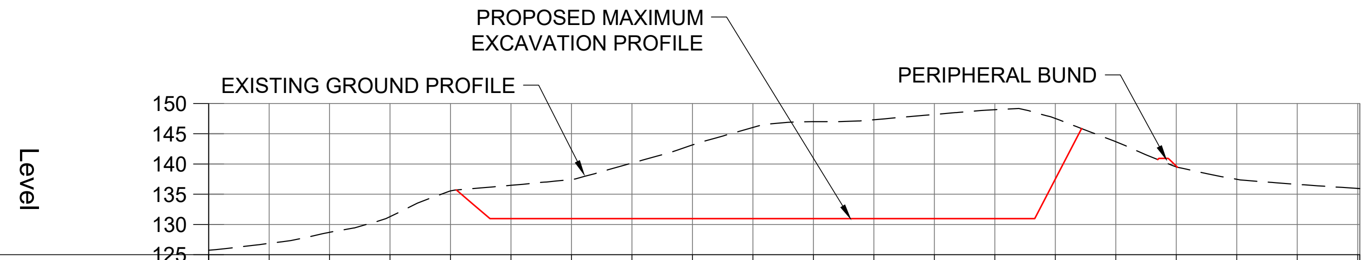


02 LOCATION PLAN
SCALE: 1:25000

0 50 100 150 200 250m

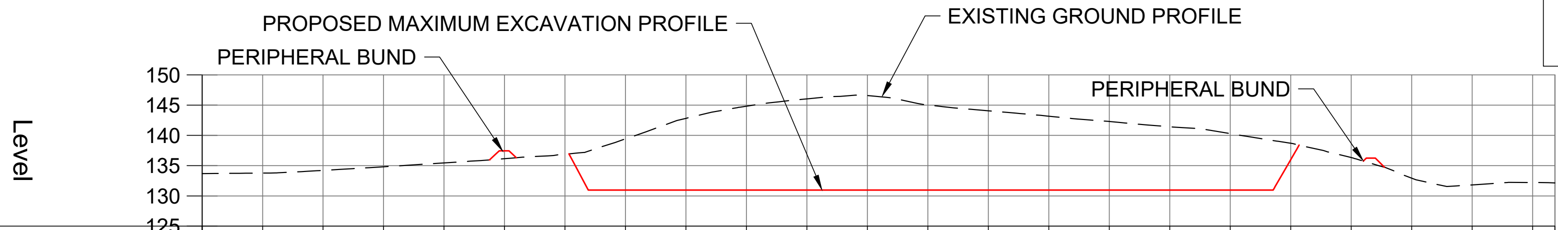
Scale 1:2,500

TOTAL EXCAVATION VOLUME	122,924m³
OVERBURDEN VOLUME	6,405m³
NET STONE VOLUME	116,519m³
PERIPHERAL BUND FILL	1,335m³
NET STONE TONNAGE	233,038T
EXCAVATION AREA	12,810m²
EXCAVATION METHOD REQUIRED	DIGGING, DRILLING AND BLASTING
INFERRED DESIGN PARAMETERS	63 DEGREE FACES THROUGH COMPETENT ROCK MAXIMUM FACE HEIGHT OF 16.4m FINAL BENCH WIDTH OF 7.5m 1.5m HIGH PERIPHERAL BUND
CO-ORDINATES FOR CENTRE OF BORROW PIT	E: 130432 N: 911628



Chainage	Existing Ground Levels	Proposed Levels
00.00	125.734	
10.00	126.879	
20.00	128.724	
30.00	131.311	
40.00	135.554	135.704
50.00	136.486	130.964
60.00	137.429	130.964
70.00	140.162	130.964
80.00	143.164	130.964
90.00	146.049	130.964
100.00	147.005	130.964
110.00	147.323	130.964
120.00	148.198	130.964
130.00	148.983	130.964
140.00	147.523	137.508 145.870
150.00	143.690	
160.00	139.526	
170.00	137.486	
180.00	136.642	
[illegible]	[illegible]	

SECTION A
Scale: H 1:1250,V 1:1250. Datum: 125.000



Chainage	Existing Ground Levels	Proposed Levels
00.00	133.685	
10.00	133.774	
20.00	134.216	
30.00	134.815	
40.00	135.450	
50.00	136.150	
60.00	136.896	136.951
70.00	139.424	130.964
80.00	142.819	130.964
90.00	144.825	130.964
100.00	146.044	130.964
110.00	146.593	130.964
120.00	145.027	130.964
130.00	144.069	130.964
140.00	143.174	130.964
150.00	142.298	130.964
160.00	141.426	130.964
170.00	140.285	130.964
180.00	138.694	135.975 138.393
190.00	136.334	
200.00	132.925	
210.00	131.812	
220.00	132.203	
223.67	132.137	

SECTION B
Scale: H 1:1250,V 1:1250. Datum: 125.000

0 25 50 75 100 125m

Scale 1:1,250

N

Notes:

1. Overburden assumed to be circa 0.5m in thickness comprising soils and weathered rock.
2. Initial stripped overburden to be placed in peripheral bund, with subsequent overburden and waste materials to be stockpiled within flat basal area of borrow pit prior to being used in restoration.
3. Design parameters are indicative and should be refined based upon findings of ground investigations and or initial excavations, taking into account ground conditions and hydrological issues.
4. Assumes insitu conversion factor of 2 tonnes per m³.

Legend:

- Bench/base of excavation
- Excavation batter
- Peripheral bund

Rev	Amendments	Date	By	Chk	Auth
0		05/24	IG	RW	RW

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Client
Eurowind Energy

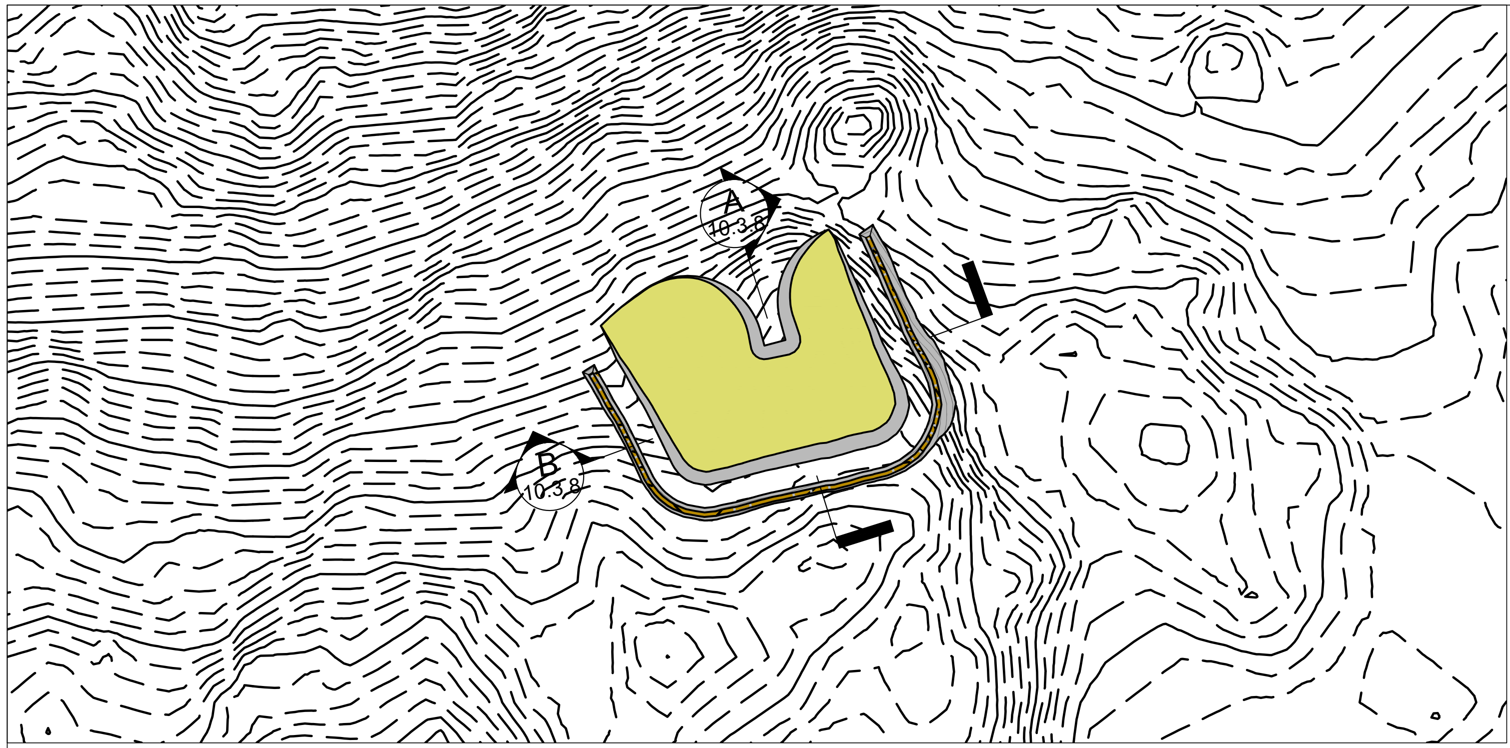
Project
TA 10.3 Borrow pit appraisal

Figure Title
Borrow Pit 5

Scale: As shown @ A3		SLR Project No.: 405.V64341.00001	
Designed	Drawn: IG	Checked: RW	Authorised: RW
Date	Date: 05/24	Date: 05/24	Date: 05/24
Figure Number: SEI Figure 10.3.8			Rev.: 0

Iain Green 23/05/2024

\\Eualfs\EDIFS-E\Projects\120850 Eurowind Energy Ltd\405.V64341.00001 - Uisenis Wind Farm EIA\Tech\LO\Dwgs\Wkng\Figure 10.3.8 - Borrow Pit 5.dwg

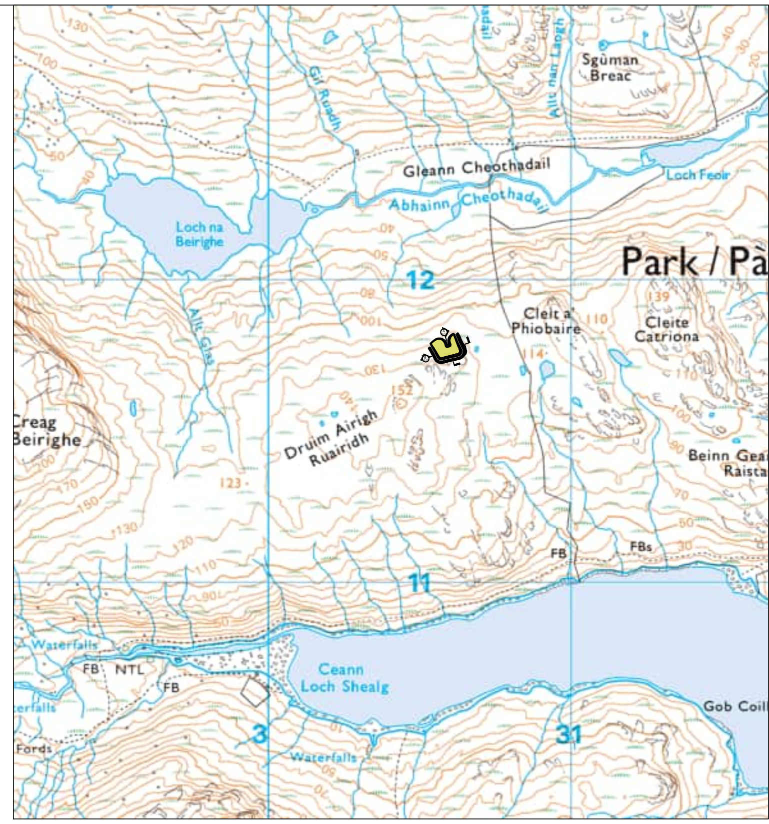


01 | PLAN OF BORROW PIT

SCALE: 1:2500

0 50 100 150 200 250m

Scale 1:2,500

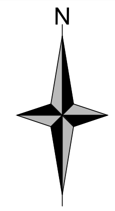


02 | LOCATION PLAN

SCALE: 1:25000

0 50 100 150 200 250m

Scale 1:2,500

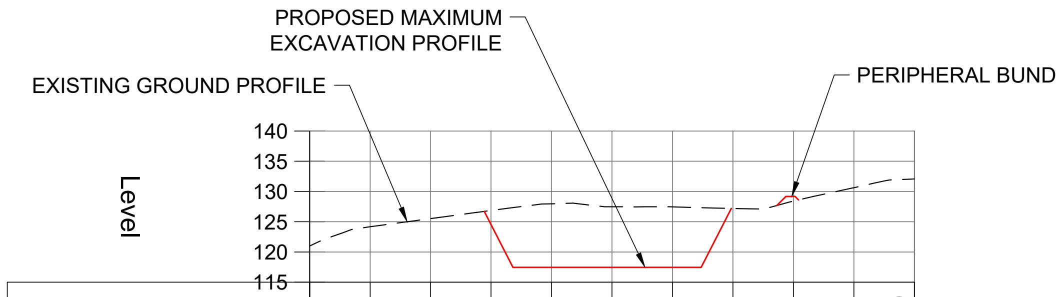


Notes:

1. Overburden assumed to be circa 0.5m in thickness comprising soils and weathered rock.
2. Initial stripped overburden to be placed in peripheral bund, with subsequent overburden and waste materials to be stockpiled within flat basal area of borrow pit prior to being used in restoration.
3. Design parameters are indicative and should be refined based upon findings of ground investigations and or initial excavations, taking into account ground conditions and hydrological issues.
4. Assumes insitu conversion factor of 2 tonnes per m³.

Legend:

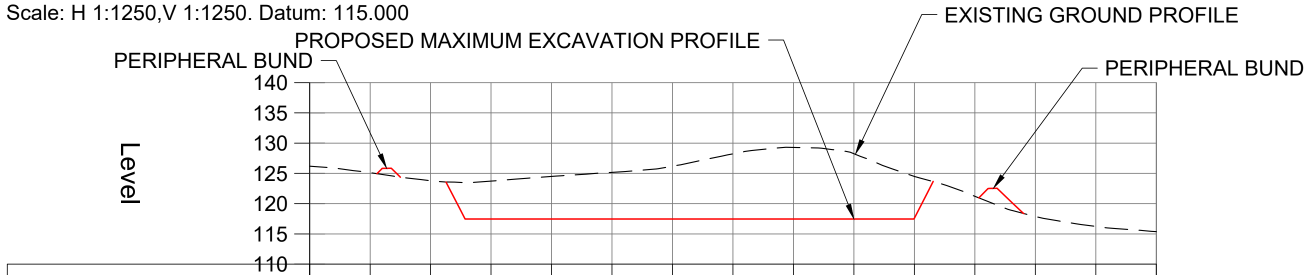
- Bench/base of excavation
- Excavation batter
- Peripheral bund



Chainage	00.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00
Existing Ground Levels	121.003	124.175	125.522	126.868	127.969	127.490	127.466	127.204	128.419	130.634	132.075
Proposed Levels				126.717 124.518	117.465	117.465	117.465	127.211			

SECTION A

Scale: H 1:1250,V 1:1250. Datum: 115.000



Chainage	00.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00
Existing Ground Levels	126.188	125.127	123.776	123.726	124.496	125.172	126.193	128.238	129.295	128.257	124.488	121.218	117.870	116.239	115.363
Proposed Levels			123.567	117.465	117.465	117.465	117.465	117.465	117.465	117.465	117.593 123.674				

SECTION B

Scale: H 1:1250,V 1:1250. Datum: 110.000

TOTAL EXCAVATION VOLUME	34,607m³
OVERBURDEN VOLUME	2,600m³
NET STONE VOLUME	32,007m³
PERIPHERAL BUND FILL	1,187m³
NET STONE TONNAGE	64,014T
EXCAVATION AREA	5,200m²
EXCAVATION METHOD REQUIRED	DIGGING, DRILLING AND BLASTING
INFERRED DESIGN PARAMETERS	63 DEGREE FACES THROUGH COMPETENT ROCK MAXIMUM FACE HEIGHT OF 10.3m FINAL BENCH WIDTH OF 7.5m 1.5m HIGH PERIPHERAL BUND
CO-ORDINATES FOR CENTRE OF BORROW PIT	E: 130592 N: 911771

0 25 50 75 100 125m

Scale 1:1,250

Rev	Amendments	Date	By	Chk	Auth
0		05/24	IG	RW	RW

SLR

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Client: Eurowind Energy

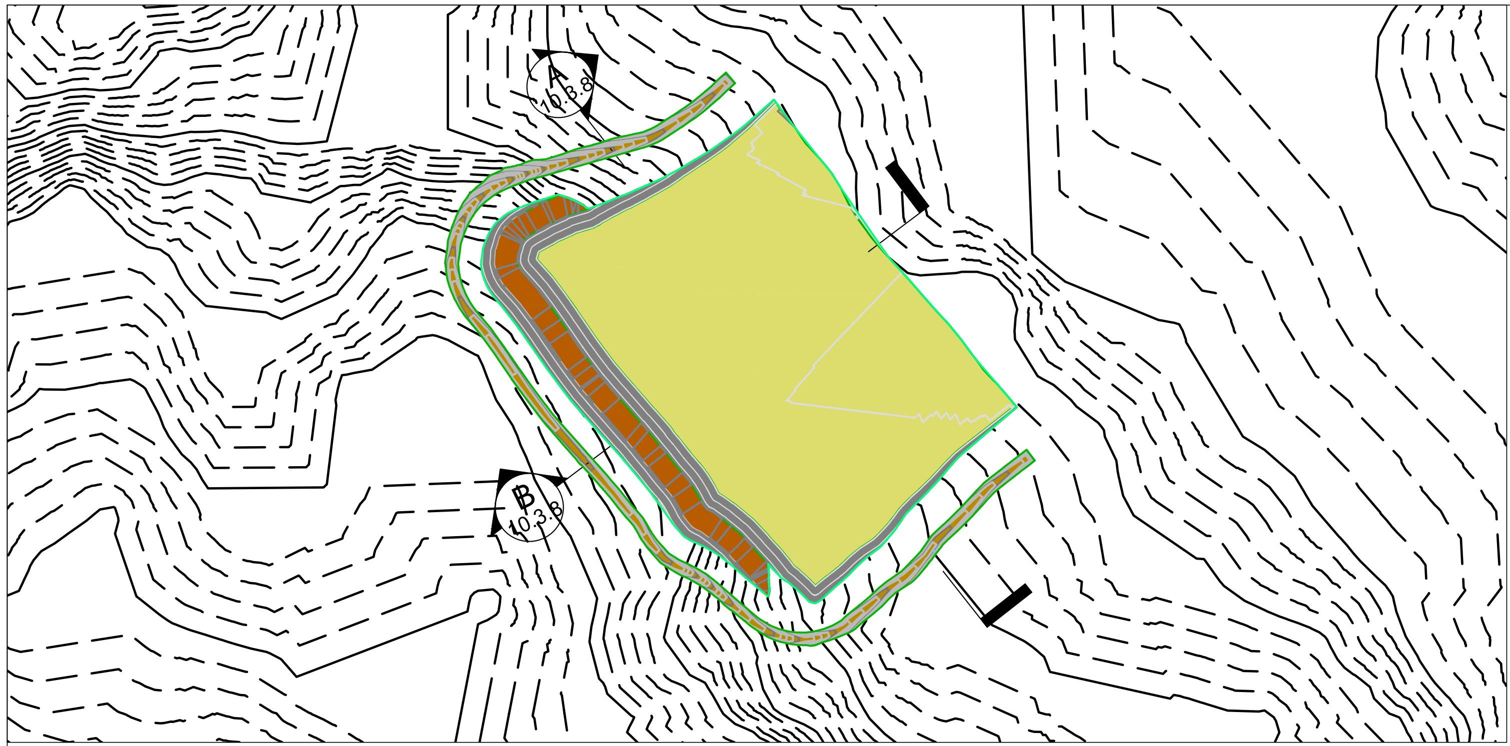
Project: TA 10.3 Borrow pit appraisal

Figure Title: Borrow Pit 6

Scale	SLR Project No.		
As shown @ A3	405.V64341.00001		
Designed	Drawn: IG	Checked: RW	Authorised: RW
Date	Date: 05/24	Date: 05/24	Date: 05/24

Figure Number: SEI Figure 10.3.9 Rev. 0

\\Euafs\EDIFS-E\Projects\120850 Eurowind Energy Ltd\405.V64341.00001 - Uisenis Wind Farm EIA\Tech\LO\Dwgs\Wiking\Figure 10.3.8 - Borrow Pit 6.dwg Iain Green 24/05/2024

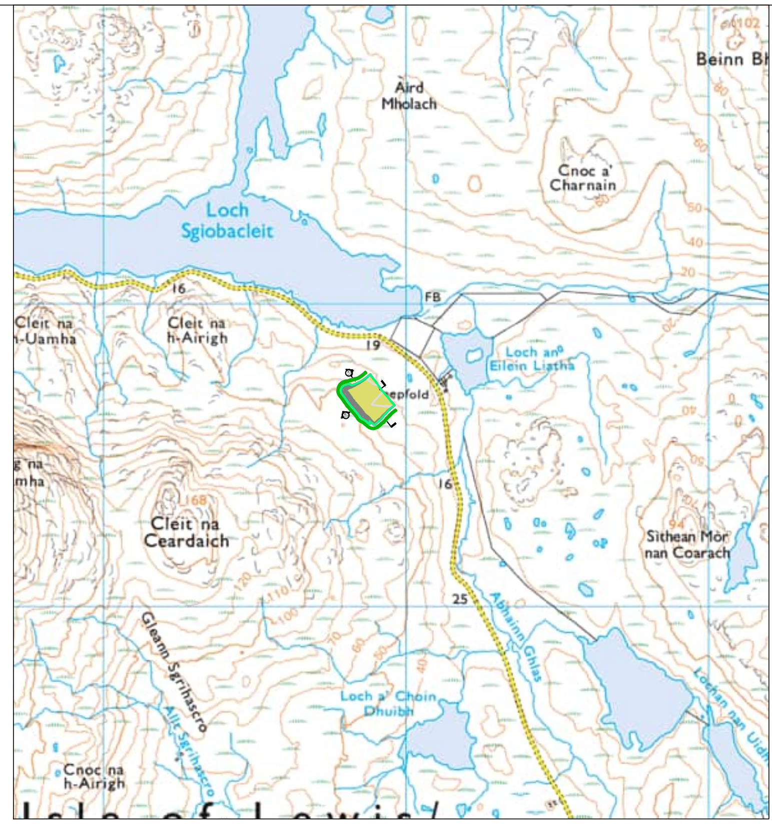


01 PLAN OF BORROW PIT

SCALE: 1:2500

0 50 100 150 200 250m

Scale 1:2,500



02 LOCATION PLAN

SCALE: 1:25000

0 50 100 150 200 250m

Scale 1:2,500

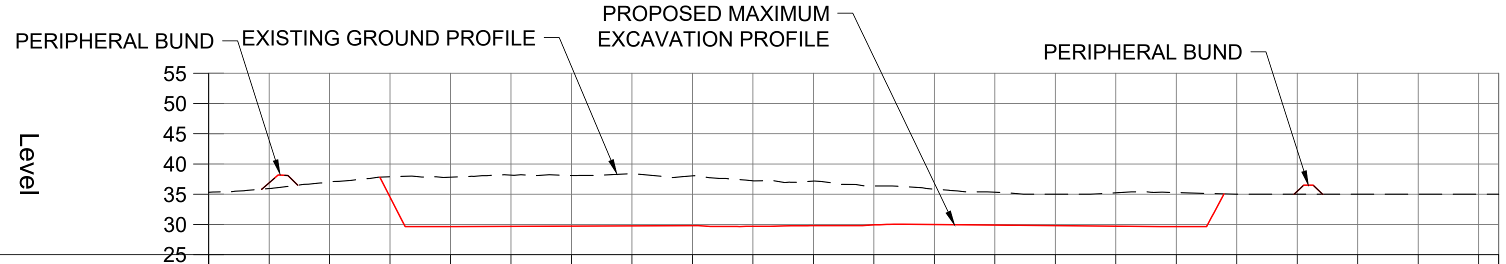
N

Notes:

1. Overburden assumed to be circa 0.5m in thickness comprising soils and weathered rock.
2. Initial stripped overburden to be placed in peripheral bund, with subsequent overburden and waste materials to be stockpiled within flat basal area of borrow pit prior to being used in restoration.
3. Design parameters are indicative and should be refined based upon findings of ground investigations and or initial excavations, taking into account ground conditions and hydrological issues.
4. Assumes insitu conversion factor of 2 tonnes per m³.

Legend:

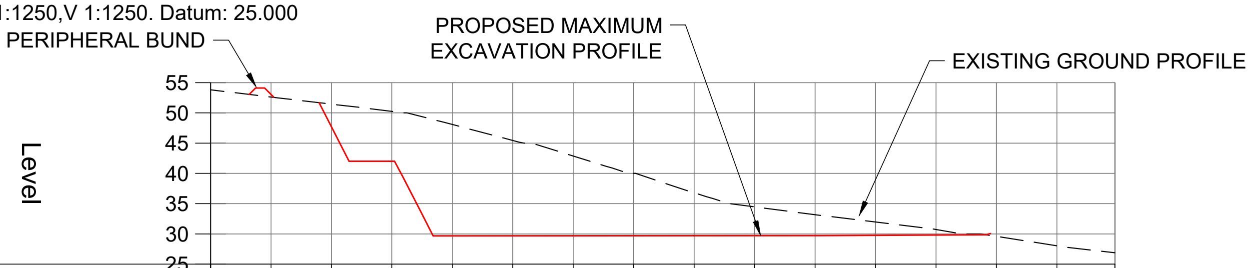
- Bench/base of excavation
- Excavation batter
- Peripheral bund
- Bench



Chainage	00.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00	170.00	180.00	190.00	200.00	210.00 213.32
Existing Ground Levels																						
Proposed Levels																						

SECTION A

Scale: H 1:1250,V 1:1250. Datum: 25.000



Chainage	00.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	149.59
Existing Ground Levels																
Proposed Levels																

SECTION B

Scale: H 1:1250,V 1:1250. Datum: 25.000

TOTAL EXCAVATION VOLUME	115,894m³
OVERBURDEN VOLUME	7,912m³
NET STONE VOLUME	107,982m³
PERIPHERAL BUND FILL	1,778m³
NET STONE TONNAGE	215,964T
EXCAVATION AREA	15,824m²
EXCAVATION METHOD REQUIRED	DIGGING, DRILLING AND BLASTING
INFERRED DESIGN PARAMETERS	63 DEGREE FACES THROUGH COMPETENT ROCK MAXIMUM FACE HEIGHT OF 12.0m FINAL BENCH WIDTH OF 7.5m 1.5m HIGH PERIPHERAL BUND
CO-ORDINATES FOR CENTRE OF BORROW PIT	E: 130592 N: 911771

0 25 50 75 100 125m

Scale 1:1,250

Rev	Amendments	Date	By	Chk	Auth
0		05/24	IG	RW	RW

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Project: TA 10.3 Borrow pit appraisal

Figure Title: Borrow Pit 7

Scale: As shown @ A3		SLR Project No.: 405.V64341.00001	
Designed	Drawn: IG	Checked: RW	Authorised: RW
Date	Date: 05/24	Date: 05/24	Date: 05/24

Figure Number: **SEI Figure 10.3.10** Rev.: 0

\\Eu...\EDIFS-E\Projects\120850 Eurowind Energy Ltd\405.V64341.00001 - Uisenis Wind Farm EIA\Tech\LO\Dwgs\Wking\Figure 10.3.10 - Borrow Pit 7.dwg Iain Green 24/05/2024

Annex A Aggregate Assessment

SEI Technical Appendix 10.3: Borrow Pit Appraisal

Uisenis Wind Farm

Uisenis Power Ltd

SLR Project No.: 405.V64341.00001

Infrastructure	Length m	As built surface width m	As built area m2	Thickness m	Number	Volume m3	Final Volume m3	Notes:
New Excavated Access Track	17355	6	104132	0.5	1	52066	52066	
Existing / Upgraded Access Track	12749	3	38247	0.5	1	19123	19123	
New Floating Access Track	2604	6	15623	1	1	15623	15623	
Turbine Bases - formation only			707	0.5	25	8831	8831	
Fill above Turbine Bases			707	2	25	35325	15325	Less volume of bases 25*800m3 = 20,000m3
Permanent Hardstandings			1797	1	25	44925	44925	
Temporary Hardstandings			3677	1	25	91925	91925	
Substation North			12326	1	1	12326	12326	
Substation South			7500	1	1	7500	7500	
Temporary Construction Compound 1			6301	1	1	6301	6301	
Temporary Construction Compound 2			2750	1	1	2750	2750	
Temporary Construction Compound 3			6400	1	1	6400	6400	
TOTAL REQUIREMENT						303095	283095	All volume measurements in m^3

Potential Volume of Rock to be sourced on site	
BP1	36,817
BP2	16,721
BP3	84,836
BP4	9,655
BP5	116,519
BP6	32,007
BP7	107,982
Total Volume from Site	404,537
Import requirements (shortfall)	-121442
Total import	-121442
plus 10% contingency	-133586

Making Sustainability Happen

SEI Technical Appendix 10.2: Peat Management Plan

Uisenis Wind Farm

Uisenis Power Ltd

Prepared by:

SLR Consulting Limited

No. 50 Stirling Business Centre, Wellgreen, Stirling, FK8 2DZ

SLR Project No.: 405.V64341.00001

18 June 2024

Revision: 00

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
00	18 June 2024	R. Watson	A. Huntridge	A.Smith

Basis of Report

This document has been prepared by SLR Consulting Limited (SLR) with reasonable skill, care and diligence, and taking account of the timescales and resources devoted to it by agreement with Uisenis Power Ltd (the Client) as part or all of the services it has been appointed by the Client to carry out. It is subject to the terms and conditions of that appointment.

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Photos in Text

Figures

Annexes

1.0 Introduction

1.1 General

SLR Consulting Ltd (SLR) was commissioned by Uisenis Power Ltd (the applicant) to undertake a Stage 1 Outline Peat Management Plan (PMP) at the proposed Uisenis Wind Farm (the ‘proposed development’).

The proposed development is located approximately 20km south west of Stornoway, on land within the Eisgen (Eishken) Estate on the Isle of Lewis (‘the Site’) and the location is detailed on **SEI Figure 10.2.1: Site Location**.

This report presents the findings of data obtained from peat depth probing and peat surveys conducted by SLR Consulting in August 2022, November 2022, January 2023 and February 2024.

The work has been undertaken by a team of Geotechnical Engineers and Geologists, with over 17 years’ experience in undertaking peat assessments. The team was led by a Chartered Hydrogeologist with 30 years’ consultancy experience and specialising in the assessment of soils, geology and water for renewable power projects in Scotland.

1.2 Proposed Development

The proposed development is comprised of 25 wind turbines, and associated infrastructure including:

- associated turbine formations and transformers;
- hardstanding areas for erecting cranes at each turbine location;
- upgrading of existing road and tracks;
- series of on-site access tracks connecting each turbine;
- underground cables linking the turbines to the grid connection;
- on-site substations;
- temporary construction compound(s);
- turning heads; and
- borrow pit(s).

The layout of the proposed development is detailed on **SEI Figure 10.2.2: Site Layout.**

1.3 Objectives

The previously submitted **Technical Appendix 10.2: Peat Management Plan** has been updated to address the responses from SEPA and NatureScot as detailed in Supplementary Environmental Information (SEI) **Chapter 10: Hydrology, Hydrogeology, and Geology**.

This **SEI Technical Appendix 10.2: Peat Management Plan** supplements and should be read in conjunction with SEI Chapter 10, and supersedes the **Technical Appendix 10.2** that was submitted alongside the EIA Report. The methodology employed in this SEI Technical Appendix is as set out in Chapter 10 of the EIA Report and Chapter 10 of the SEI Report.

The PMP outlines the overall approach of minimising disruption to peatland, and it aims to ensure that all further opportunities to minimise peat disturbance and peat excavation would be taken during detailed design and construction of the proposed development.

The PMP has been developed to demonstrate that peat has been afforded what would be significant consideration during the construction phase of the proposed development, should consent be granted. It aims to propose mitigation measures that would minimise any impacts and support the long-term habitat restoration and management plans.

The PMP seeks to identify that appropriate proposals for re-use, re-instatement and restoration of excavated peat can be accommodated within the proposed development and associated **SEI Technical Appendix 8.5 Outline Habitat Management Plan (OHMP)**, without significant environmental or health and safety implications, to minimise risk in terms of carbon release and human health.

The purpose of this report is to ensure that there has been systematic consideration of peat management and to provide an initial quantitative assessment to guide the development process. Specifically, the report is intended to:

- Describe how, through site investigation and iterative design, the proposed development has been structured and designed to minimise, so far as reasonably practicable, the quantity of peat which will be excavated;
- Demonstrate that volumes of peat anticipated to be excavated by the proposed development have been considered; and
- Explain how excavated peat will be managed.

1.4 Role of the Peat Management Plan

The PMP is intended to be a working document to be used throughout the key stages of the design, construction, operation, decommissioning and re-instatement phases of the proposed development as part of an overall Construction Environmental Management Plan (CEMP). These stages are outlined below.

1.4.1 Stage 1: Environmental Impact Assessment (EIA)

The Outline Peat Management Plan submitted as part of the EIA (including SEI). From this initial report the PMP will be developed further into a Stage 2 Pre-Construction PMP.

1.4.2 Stage 2: Post Consent / Pre-Construction

As part of the EIA (SEI) it will have been demonstrated that, based on the investigation and data collected, it is likely that the excavated materials for the proposed development can be managed in an appropriate manner. The peat mass balance calculations may be further developed, and prior to the relevant works commencing, because of any further or more detailed ground investigation or survey works required to inform detailed design, or that may be required under planning consent conditions.

1.4.3 Stage 3: Construction Stage

Actual peat volumes excavated during construction will be recorded against the overall predicted volumes. Within micrositing allowances, the alignment and design of tracks, hardstanding orientation and construction methods will be reviewed to avoid/minimise peat disturbance as much as possible considering the more detailed information available once construction commences. A regular review and update of the peat mass balance table will be undertaken by the appointed Contractor and monitored by the Ecological Clerk of Works (ECoW) on site and made available to regulators as required.

1.5 Legislation and Guidance

The PMP has been compiled in accordance with the following legislation and best practice guidance:

- National Planning Framework for Scotland 4 (NPF4) (Scottish Government, February 2023);
- SEPA Regulatory Position Statement - Developments on Peat (Scottish Environment Protection Agency, 2010);
- Good Practice during Windfarm Construction, 4th Edition (Scottish Renewables, Scottish Natural Heritage (now NatureScot), Scottish Environment Protection Agency, Forestry Commission Scotland, Historic Environment Scotland, Marine Scotland Science and AEECoW, 2019);
- Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste (Scottish Renewables and SEPA, 2012);
- Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments (Scottish Government, January 2017);
- Floating Roads on Peat - Report into Good Practice in Design, Construction and Use of Floating Roads on Peat with reference to Wind Farm Developments in Scotland (Forestry Commission Scotland & Scottish Natural Heritage, 2010);
- The Waste Management Licensing (Scotland) Regulations 2011; and
- Developments on Peat and Off-Site Uses of Waste Peat (SEPA, 2017).

1.5.1 Requirements of National Planning Policy 4

The intent of Policy 5 (Soils) of National Planning Policy 4 (NPF4)[1] is *"to protect carbon rich soils, restore peatlands and minimise the disturbance of soils from development".*

The Policy states [5(a)] that development proposals should only be supported if they are designed and constructed:

- in accordance with the mitigation hierarchy by first avoiding and then minimising the amount of disturbance to soils on undeveloped land; and
- in a manner that protects soils from damage including from compaction and erosion, and that minimises soils sealing.

Further [5(c)] confirms that development proposals on peatland, carbon rich soils, and priority peatland will only be supported if they are:

- essential infrastructure and there is a specific locational need and no other suitable site;
- the generation of energy from renewable sources that optimises the contribution of the area to greenhouse gas emissions reductions targets;
- small-scale development directly linked to a rural business, farm or croft;
- supporting a fragile community in a rural or island area; or
- restoration of peatland habitats.

And [5(d)] confirms that where development on peatland, carbon-rich soils or priority peatland habitat is proposed, a detailed site specific assessment will be required to identify:

- the baseline depth, habitat condition quality and stability of carbon rich soils;
- the likely effects of the development on peatland, including on soil disturbance; and

1 Scottish Government (2023). https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2022/11/national-planning-framework-4-revised-draft/documents/national-planning-framework-4-revised-draft/national-planning-framework-4-revised-draft/govscot%3Adocument/national-planning-framework-4-revised-draft.pdf

- the likely net effects of the development on climate emissions and loss of carbon.

Policy 5 also confirms that the site specific (above) assessment [5(d)] *"should inform careful project design and ensure, in accordance with relevant guidance and the mitigation hierarchy, that adverse impacts are first avoided and then minimised through best practice. A peat management plan will be required to demonstrate that this approach has been followed, alongside other appropriate plans required for restoring and/ or enhancing the site into a functioning peatland system capable of achieving carbon sequestration".*

This Stage 1 Outline PMP considers the protection and safeguarding of peat and seeks to fulfil the requirements of Policy 5(d) with further detail on peatland habitat and peatland restoration proposals provided in **SEI Technical Appendix 8.5 Outline Habitat Management Plan (OHMP)**.

1.5.2 Mitigation Hierarchy

SEPA[2,3] has provided a hierarchy of management approaches through which the effectiveness of the approach to peat management is optimised at development sites, as summarised below.

The objectives have been achieved by completion of the following and this terminology has been used throughout the report where applicable:

- **Prevention**: The best management option for waste peat is to prevent or limit its production. This can be done through design, positioning infrastructure in shallower peat or through consideration of alternative construction methods or engineering solutions e.g., floated roads or piling solutions;
- **Reinstatement:** Placement (including partial reinstatement) of peat back into the original location of excavation; e.g. reinstatement of temporary hardstanding areas and temporary excavations, partial reinstatement of tracks;
- **Reuse (on-site)**: Using excavated peat in within the proposed development away from the original location of excavation e.g; reuse for visual tie-in of verges or reuse in borrow pits to form long-term viable peat stores and habitats;
- **Restoration:** onsite or offsite for peatland restoration;
- **Recycling / Recovery / Treatment:** Where peat cannot be reused onsite or offsite for restoration, it may be used for agricultural benefit or treated/blended with other materials to form a soil substitute or used in other relevant works. This use would require a waste management license or registration as an exempt activity and compliance with the legal requirements;
- **Storage:** Temporary storage of peat onsite (for example, during short periods in the construction phase) and then reuse or reinstatement. Should the peat become unsuitable for reuse or reinstatement during storage, it would be classed as a waste material. Storage of peat up to a depth of 2m is not classified as a waste and does not require authorisation from SEPA, however care must be taken to ensure that it does not cause environmental pollution.
- **Disposal (Waste):** Only after all other options have been explored and discounted would this option be considered.

2 Scottish Environment Protection Agency. 2010. Regulatory Position Statement – Developments on Peat.

3 Scottish Renewables, Scottish Environment Protection Agency. 2012. Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste.

Many of the issues associated with peat on a wind farm site can be accommodated by modifying the development layout to avoid potentially difficult or sensitive areas. Such areas would include:

- Areas of deep peat, requiring potentially large volumes of excavation;
- Areas of very wet peat (such as flushes, pool and hummock complexes and gullied peatland) which might be important for hydrological connectivity;
- Areas of moderate to steep slopes (where site infrastructure might increase the chance of peat instability); and
- Areas of sensitive habitat.

Design evolution for the proposed development has taken all of the above points into consideration and the layout of infrastructure has been revised accordingly. This is detailed in **SEI Chapter 2: Site Description and Design Evolution**.

2.0 Baseline Conditions

2.1 Soils and Geology

2.1.1 Soils

The principal soil type underlying the proposed development are peaty gleys, with mineral podzols and peat also present. The peaty gleys and podzols are drifts derived from Lewisian gneisses. The Soils map of the proposed development is detailed within the **SEI Figure 10.2.**

2.1.2 Geology

The British Geological Survey (BGS) indicates the presence of limited superficial cover with a small localised area of Glacial Till mapped within the south western corner of the proposed development and a small area of peat mapped in the western area of the proposed development. In areas of higher elevation and steeper gradients, the BGS mapping indicates no superficial deposits being present and shallow bedrock at surface throughout the proposed development.

The bedrock surface dominates the topography throughout the proposed development often confines areas of peat due to the size, dip and shape end extensive outcropping bedrock. This is a particularly dominant feature in the south of the proposed development where there are flatter expanses with peat situated on hilltops, confined by the outcropping bedrock on the hillsides and slopes. In flatter areas in the centre of the proposed development, the peat is situated in confined bowls between outcropping bedrock.

The bedrock and superficial geology of the proposed development are detailed within the **SEI Figures 10.4** and **10.5.**

2.2 Hydrology

2.2.1 Hydrology

Freshwater drainage across the Site is characterised by a network of streams, rivers and lochs. The large majority of drainage channels were located in the centre, north and south of the Site. The drainage in the northern area of the Site drains to the south into the Abhainn Cheothadail.

There are frequent minor lochs and lochans situated throughout the area, predominantly in the centre, north and east of the Site, within the flatter expanses. These lochs typically drain to the south and south east into Loch Eisgein.

The minor lochans in the southern area of the Site, in the area around T20 and T24, drain to the south into Loch Sealg.

The largest river within the Site is Abhainn Cheothadail located in the south of the Site, which is fed by Loch na Beirighe and multiple streams located on the northern and southern flanks of the river valley. This river flows east, discharging into Loch Feoir, Loch Eisgein and ultimately Loch Sealg.

The central section of the proposed access track also drains to the Loch Seaford whilst the northern extent of the access track is located within the catchment of the Abhainn Mhor, which drains to the Loch Erisort approximately 1km north west of the proposed access point.

The Soils map of the Site is detailed within the **SEI Figure 10.1**.

2.2.1.1 Artificial Drainage

There are areas of linear artificial drainage across the east, centre and south of the Site, as shown in the geomorphology plan provided in **SEI Figure 10.1.5**.

2.3 Peat Conditions

The carbon and peatland map 2016 provides information regarding peat and soil coverage within the Site and is provided in **SEI Figure 10.3**.

Peat is present throughout the majority of the Site comprising of peaty soils and localised areas of deep peat. Published priority peatland mapping by NatureScot indicates that most of the proposed development is located within Class 1 and Class 2 peatland which is considered to be of high conservation value. Based on observations from site visits blanket bog was present with peat identified as being pseudo fibrous and noted to become amorphous at depth in the flatter areas of the Site with more fibrous to pseudo fibrous peat recorded on the slopes.

SEI Technical Appendix 8.5 OHMP, provides further details on the extents of blanket bog habitat and peatland condition within the Site.

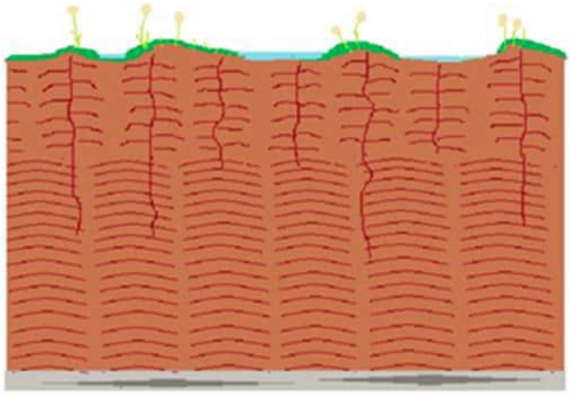
2.4 Definitions of Peat

Peat is defined as a material consisting of the partially decomposed remains of plant material and organic matter preserved over a period in a waterlogged environment resulting in anaerobic conditions, with a depth > 0.5m. Where the organic material is <0.5m depth then this is not defined as peat. This definition is supported by the following text presented in the following guidance;

- Scottish Government, Scottish Natural Heritage, SEPA (2017) Peatland Survey. Guidance on Developments on Peatland Section 3.3 which states that "*Peat soil is an organic soil which contains more than 60 percent of organic matter and exceeds 50cm in thickness."*
- Scottish Government. Scotland's Soils. Soil Survey of Scotland *"Peaty soils have an organic layer at the surface which is less than 50 cm thick"*
- The Macaulay Land Use Research Institute define shallow peat as having "*a prescribed depth of organic matter of 50 – 100 cm"*

Peat can be classed as two principal types, the acrotelm layer, and the catotelm layer as shown on **Plate 1-1**.

Plate 2-1: Drawing of two layered Structure of Active Bog Peatlands above Non-Active Peat



The acrotelm layer is found in the upper layer of peat where conditions are relatively dry and comprises living vegetation and partially decomposed plant material which are typically <0.5m in thickness. Hydraulic conductivity in this layer tends to be higher in relation to distance from the water table. The thickness of the acrotelm layer varies depending on topography such as steepness of slope, peat hags, and hummocks. In particular, the acrotelm layer can be affected during periods of drought or as a consequence of drainage. Fibrous in texture, the acrotelm layer has some tensile strength and is generally considered to be stable for storage and re-use.

The catotelm layer is found under the acrotelm layer and comprises decayed plant material and organisms and is denser and with a very low hydraulic conductivity. The catotelm layer sits below the water table resulting in permanent anaerobic conditions. The catotelm layer can be amorphous and may have lower tensile strength making it less suitable for storage and re-use.

2.5 Peat Depth Survey

Peat depth surveys have been undertaken across a number of phases by SLR and other parties. Existing peat probe data was carried out in support of the 2004 Muaitheabhal Wind Farm application, the 2010 Muaitheabhal Wind Farm Eastern Extension, and the 2013 Muaitheabhal Wind Farm application (all now consented).

The SLR surveys were carried out in in August 2022, November 2022, January 2023 and February 2024 and followed best practice guidance for developments on peatland [4,5]. Low resolution Phase 1 peat probing resulted in probing on a 100m grid to allow for initial assessment of the Site which was used in preliminary site layout designs and supplemented by utilising historic peat probing data available for the proposed development.

A further three phases of high resolution probing saw detailed probing undertaken across the proposed layout, focusing on access tracks, turbine locations and other site infrastructure. Existing tracks proposed for upgrade were probed on 100m spacings with new site tracks typically probed at 50m spacings. Probing density within the main areas of permanent infrastructure were typically probed on a 10m grid with allowance for micrositing.

4 Scottish Renewables & SEPA (2012) 'Developments on Peatland Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste'.

5 Scottish Natural Heritage (SNH), SEPA, Scottish Government & James Hutton Institute. (2014)' Peat Survey Guidance; Developments on Peatland: Site Surveys'.

Where surveys were undertaken by SLR, the thickness of the peat was assessed using a graduated peat probe, approximately 6mm diameter and capable of probing depths of up to 10m. This was pushed vertically into the peat to refusal and the depth recorded, together with a unique location number and the co-ordinates from a handheld Global Positioning System instrument (GPS). The accuracy of the GPS was quoted as ±2m, which was considered sufficiently accurate for this survey. All data was uploaded into a GIS database for incorporation into various drawings and analysis assessments.

Where the peat probing met refusal on a hard substrate, the ‘feel’ of the refusal can provide an insight into the nature of the substrate. The following criteria were used to assess material:

- solid and abrupt refusal – rock;
- solid but less abrupt refusal with grinding or crunching sound – sand or gravel or weathered rock;
- rapid and firm refusal – clay; or
- gradual refusal – dense peat or soft clay.

Where surveys were undertaken by SLR, an assessment of the substrate was made and recorded at each probe hole. For use within this assessment, engineering judgement has been used to assess the substate at probes undertaken by other parties.

The relative stiffness of the peat was also assessed from the resistance to penetration of the probe and to the effort required to extract the probes (retrieval of the probe was often impossible for one person). In all instances refusal was met on obstructions allowing identification of subsurface geology.

2.6 Peat Depth Survey Results

The results from all probing exercises listed above are detailed in the following sections and the peat depths identified on-site are shown in **SEI Figure 10.2.3** and **SEI Figure 10.2.4**. The Inverse Distance Weighting (IDW) method of interpolation was used to develop the peat models.

The peat was found to vary across the proposed development in terms of thickness and coverage. As indicated within **SEI Figure 10.2.3** and **SEI Figure 10.2.4**, it is evident that the larger areal extents of deep peat are generally limited to flat expanses that mimic the topographic flat lying areas. There are also very localised areas of deep peat (>1m) on-site, defined by lower gradient topography and undulating bedrock with peat forming in these hollows between outcropping bedrock. Peat coverage was extensive throughout the centre of the Site and in localised areas in the north, east and south of the Site.

A total of 21,499 peat probes were undertaken across all survey phases, with the results summarised in **Table 2-1** below.

Table 2-1: Peat Probing Data

Peat Thickness (m)	No. of Probes	Percentage (of total probes undertaken on-site)
0 (no peat)	4925	22.9
0.01 – 0.50 (peaty soil)	8430	39.2
0.51 – 0.99	4265	19.8
1.00 – 1.49	1869	8.7
1.50 – 1.99	975	4.5
2.00 – 2.49	451	2.1

Peat Thickness (m)	No. of Probes	Percentage (of total probes undertaken on-site)
2.50 – 2.99	288	1.3
3.00 – 3.49	159	0.7
3.50 – 3.99	63	0.3
> 4.0	74	0.3

2.7 Peat Condition

Peat is described using the Von Post classification. Peat samples were collected by SLR in November 2022, using a peat auger and used to inform interpretations of the peat condition and underlying substrate.

Based on interpretations from probing and peat core samples, the peat within the proposed development in the flatter expanses in areas of deeper peat are predominantly pseudo-fibrous to amorphous layers with the peat becoming predominantly amorphous and heavily decomposed with depth whilst deposits of shallow peat on slopes and in localised hollows of undulating bedrock that generally comprise fibrous to pseudo-fibrous peat.

Based on field descriptions at augering points, most of the shallow peat would be classified as between H5 in the Von Post classification, showing moderate decomposition in the shallower layers and significant decomposition with depth and high amorphous material content and generally between H7 and H10 in the Von Post classification. Peat Core logs and photographs are presented within **Annex A**.

2.8 Summary

From observations during the site surveys, peat is typically present as blanket bog throughout flatter expanses of the Site, predominantly in the centre, east and flatter expanses of the southern areas of the Site. Peat also typically accumulates in topographic depressions between areas of outcropping bedrock. The peat present in the flatter areas of the Site is generally deeper peat and more amorphous. Peat situated on slopes and hillsides is generally more shallow and more fibrous to pseudo fibrous.

3.0 Potential Impacts on Peat During Construction

There are four main types of impact on peat which can occur during construction. These are:

- Loss of structural integrity and peat strength, due to stripping off or damaging the surface vegetation turf, excavation, handling and transporting peat (particularly wet, subsurface peat);
- Erosion and gullying, caused by exposure and desiccation of bare peat surfaces primarily caused by water erosion, due to surface runoff after rainfall;
- Contamination, caused by leaks, spillages or inappropriate laydown and mixing lower organic content mineral soils with peat; and
- Peat slide, caused by laying wet peat on top of wet peat, laying other heavy materials (including excavated mineral soil or other construction materials) on top of wet peat or by inappropriate stockpiling, such as attempting to create stockpiles of peat that are too high, without bunding, engineering or geotechnical support.

The design process for the proposed development has minimised the potential for impact on peat and requirement for excavation of peat – while taking account of other constraints. This has been informed by desk study, walkover observations and targeted peat depth survey work.

The following activities are likely to generate excavation of peat and soils during the construction process:

- Wind turbine foundations;
- Crane and ancillary hardstandings;
- Substations,
- Construction compounds;
- Access tracks; and
- Borrow pits.

3.1 Wind Turbines

Wind turbine foundations in peatlands would normally require full and permanent excavation of peat to competent strata, with temporary excavation of peat from a wider diameter to enable safe access to the base of the excavation.

The resulting peat generated could be considered as a permanent loss, unless satisfactory re-use and reinstatement could be achieved within the Site. Some of this peat would normally be reused to partially reinstate track shoulders, around crane hardstandings and turbine bases, dependent on the suitability of excavated turves and acrotelm peat layer.

3.2 Crane Hardstandings

In order to assemble the wind turbine and enable servicing during operation, crane pads are constructed adjacent to each wind turbine. These must be sufficient to take the weight of both the crane and turbine components, and therefore excavation to underlying competent strata is required.

Crane pads must remain in place for the life of the proposed development to enable routine inspection and maintenance. Peat generated from these excavations would be considered a permanent loss, unless satisfactory reuse could be achieved within the Site, dependent on the suitability of excavated turf and acrotelm peat layer.

3.3 Substations and Construction Compounds

The two substations are permanent infrastructure. Temporary construction compounds are provided during the construction phase to enable storage of construction materials, turbine components and fuel, concrete batching, siting of welfare facilities and site offices.

Should peat be excavated during the construction of the proposed substations, this peat would be considered a permanent loss if it cannot be reinstated or reused on-site.

Due to their temporary nature, peat excavated for construction compounds would normally be stored locally and then will be used to fully reinstate the temporary construction compounds.

3.4 Access Tracks

Access tracks are required to enable passage of construction and servicing traffic around the proposed development. Over peatlands, the choice of access track design normally reflects the peat depths along the route, with shallow peat/organic soils <1 m deep excavated to competent strata (cut and fill tracks), and deeper peats overlain by floating tracks (with no excavation). Floating tracks are planned as part of these development proposals in areas of peat >1m and where gradient allows and following confirmation of suitable ground conditions following detailed site investigations. Any sections of floating track would not require excavation of peat.

Excavated access tracks are permanent infrastructure, peat excavated for cut and fill would be considered a permanent loss, unless the peat can be reused elsewhere within the Site.

In excavated tracks, the surface vegetation (i.e. habitat) would be lost unless stored and reused elsewhere, however the intention would be to reuse excavated turves on verges and track shoulders and hardstandings for verge restoration purposes.

Access tracks have the potential to disrupt natural hydrological drainage pathways, appropriate drainage would be designed to mitigate this. For further information, see **SEI Technical Appendix 3.1: Outline CEMP.**

3.5 Cable Trenching

Electrical cabling is typically buried or ducted adjacent to the proposed access track network where practicable (cable trenching). The grid connection cable would similarly be buried or ducted within trenches along the final selected route. Where excavation is required for trenching, peat generated from these works is normally reinstated at its point of origin, and therefore is not considered a volume loss and re-use for reinstatement is a certainty.

3.6 Borrow Pits

Where access track and hardstanding construction materials are required, it is intended to source the material from Borrow Pits within the Site.

Peat overlying superficial deposits (Glacial Till) or bedrock are excavated and temporarily stored for the duration of construction, and then re-used for Borrow Pit restoration and post construction, and therefore re-use is required within the area of the Borrow Pits. Significant areas of deep peat are not anticipated at any of the proposed Borrow Pit locations that are part of the proposed development.

4.0 Peat Management and Mitigation

4.1 Mitigation by Design

The proposed development design required to take account of a number of environmental and technical constraints. The design sought to avoid areas of known or potential deep peat where possible, taking into account other environmental and technical factors such as ecology, ornithology, archaeology, hydrology, topography and existing infrastructure.

The proposed development has largely avoided areas of peatland in near natural condition / areas of extensive blanket bog where peat is >1m, however due to the geomorphology of the Site there are very localised pockets of deep peat >1m which cannot be completely avoided. Efforts have been made through the iterative design process to minimise the footprint of site infrastructure on peat depths >0.5m as far as practicable, and this is detailed in **SEI Chapter 2: Site Description and Design Evolution**.

4.2 General Mitigation Measures

4.2.1 Excavation

Excavated peat should be excavated as turves, including the acrotelm (surface vegetation) and a layer of adjoining catotelm (more humified peat) typically up to 500mm thick in total, or as blocks of catotelm; the acrotelm should not be separated from its underlying peat;

- the turves should be as large as possible to minimise desiccation during storage, though the practicalities of handling should be considered;
- contamination of excavated peat with substrate materials to be avoided at all times; and
- consider timing of excavation activities to avoid very wet weather and avoid multiple handling to minimise the likelihood of excavated peat losing structural integrity.

If possible, extract intact full depth acrotelm layers from the top surface of the peat deposit. This technique would maintain connectivity between the surface vegetation and the partially decomposed upper layers of the catotelm.

4.2.2 Storage

The following good practice applies to the storage of peat:

- stripped materials should be carefully separated to keep peat and other soils apart;
- to minimise handling and haulage distances, excavated material should be stored local to the site of excavation or end point of restoration;
- peat turves should be stored in wet conditions or irrigated in order to prevent desiccation (once dried, peat would not rewet);
- stockpiling of peat should be in large volumes to minimise exposure to wind and sun (and desiccation), but with due consideration for slope stability, but should not exceed 1m in height to maintain stability of stockpile;
- stockpiles should be isolated from watercourses or drains with appropriate bunding to minimise pollution risks;
- excavated peat and topsoil stored separately, should be stored to a maximum of 1m thickness;
- stores of non-turf (catotelm) peat should be bladed off to reduce the surface area and desiccation of the stored peat; and

- peat storage areas should be monitoring during periods of very wet weather, or during snowmelt, to identify early signs of peat instability.

4.2.3 Temporary Storage

Any peat to be removed during construction would require a temporary storage area near to the construction works/area of proposed reinstatement or re-use. Where peat cannot be transferred immediately to an appropriate restoration area, short-term storage would be required. In this case, the following good practice applies:

- Temporary storage areas should be outside any areas of medium or high risk as identified by the **SEI Technical Appendix 10.1: Peat Landslide Hazard Risk Assessment**.
- detailed ground investigation should be undertaken at each proposed temporary peat storage areas to characterise the underlying ground conditions and develop any mitigation measures. Design of peat storage areas should be undertaken using detailed investigation data, by a suitably qualified Geotechnical Engineer;
- the ECoW should work with an appointed Geotechnical Engineer to review the placement and condition of stored peat;
- monitor areas to ensure stability of placed and existing peat and to avoid any slippages or failures;
- ensure any bunds constraining peat are fit for purpose i.e. constructed of suitable material and of adequate dimensions;
- ensure adequate drainage of storage areas, avoid placing peat on flooded area/ ponded water;
- avoid placement of excavated peat on steep slopes, or adding to already emplaced peat. Ensure placed peat is kept sufficiently distant from top of slopes to avoid slippage;
- peat should be stored around the infrastructure perimeter at sufficient distance from the cut face to prevent overburden induced failure;
- local gullies, diffuse drainage lines (or very wet ground) and locally steep slopes should be avoided for peat storage; and
- drying of stored peat should be avoided by irrigation to mitigate against drying out (although this is unlikely to be significant for peat materials stored less than 2 months).

For longer term storage requirements (e.g. at turbines, hardstandings, borrow pits and compounds), the following good practice applies:

- where practicable, peat generated from excavations should be transported directly to its allocated restoration location, to minimise the volume being stockpiled with the possibility of drying out;
- stores of catotelmic peat should be bladed off to reduce their surface area and minimise desiccation;
- where transport cannot be undertaken immediately, stored peat should be irrigated to limit drying and stored on a geotextile mat to promote stability; and
- monitoring of large areas of peat storage during wet weather or snowmelt should be undertaken to identify any early signs of peat instability.

Following temporary storage, peat is to be reused or reinstated. If the peat is unsuitable for re-use or reinstatement during storage, it would be classed as a waste material and disposed of.

4.2.4 Transport

The following good practice applies to transport:

- movement of turves should be kept to a minimum once excavated, and therefore it is preferable to transport peat planned for translocation and reinstatement to its destination at the time of excavation; and
- if Heavy Goods Vehicles (HGVs)/dump trucks that are used for transporting non-peat material are also to be used for peat materials, measures should be taken to minimise cross-contamination of peat with other materials.

4.2.5 Handling

Following refinement of the excavated peat model, a detailed storage and handling plan should be prepared as a detailed PMP forming part of the detailed Construction and Environmental Management Plan (CEMP), including:

- best estimate excavation volume at each infrastructure location (including peat volumes split into area/volume of ‘acrotelm’ or ‘turf’, and volume of catotelm);
- volume to be stored locally and volume to be transferred directly on excavation to restoration areas elsewhere (e.g. borrow pits or peatland habitat restoration areas) in order to minimise handling;
- location and size of storage area relative to infrastructure foundations/areas and natural peat morphology / drainage features; and
- irrigation requirements and methods to minimise desiccation of excavated peat during short term storage.

These parameters are best determined post-consent in light of detailed ground investigation with the final design areas for each element of infrastructure.

4.3 Restoration

Any peat not re-used or utilised for reinstatement or verge restoration purposes will be considered for relocation and use in habitat restoration and enhancement. Excavated turves and acrotelmic peat may be utilised to support restoration activities in relation to enhancement of Blanket Bog habitats particularly in areas with existing anthropogenic drainage channels detailed in **SEI Technical Appendix 8.5 OHMP**.

Photo 1: View of drainage channels at the Abhainn Cheothadail (south of river) facing south from NGR NB 30952 12590

Excavated acrotelmic peat could be used for restoration of drainage channels within the peatland restoration areas. The restoration areas are detailed in the **SEI Technical Appendix 8.5 OHMP,** and an example of potentially appropriate drainage channels are provided in **Photo 1** above.

During restoration of peat onsite or offsite, the following best practice should be followed:

- carefully evaluate potential restoration sites, such as borrow pits for their suitability, and agree that these sites are appropriate with the Environmental Clerk of Works (ECoW), landowners and relevant consultees;
- consider early engagement with a specialist seeding contractor to aid reseeding works;
- consider use of a specialist contractor with experience of working in peatland and peatland restoration for all peat excavation works;
- select restoration areas in close proximity to existing track or proposed track infrastructure to minimise transportation distances;
- undertake restoration and revegetation or reseeding work as soon as possible;
- where required, consider exclusion of livestock from areas of the proposed development undergoing restoration, to minimise impacts on revegetation; and
- as far as reasonably practicable, restoration should be carried out concurrently with construction rather than at its conclusion.

4.4 Monitoring and Inspection

There would be frequent, routine and regular inspections of peat in all stockpiles and temporary storage areas as part of the PMP audit process. Inspections would assess in situ peat physical conditions, integrity of containment and temporary drainage conditions, and they would seek to confirm that stockpile design and management was adequate to prevent erosion and peat slide. These inspections would take place weekly during stockpile creation and storage.

Should any problems be observed during regular visual inspections of peat stockpiles, this would invoke implementation of an appropriate corrective action which would be recorded and monitored for effectiveness. Types of corrective actions would include, but would not necessarily be limited to; modification of temporary drainage, additional or modified bunding, incorporating of sediment fencing if required, light re-grading to correct any areas of surface erosion, etc.

Regular, frequent inspections of peat conditions during construction and restoration phases of work would be carried out by the Geotechnical Engineer and ECoW as follows:

- peat surface, peat profile and peat consistency conditions would be carried out as part of ground investigations prior to the start of construction. This information would provide detailed information on the baseline conditions for each part of the infrastructure footprint;
- re-use, restored and re-instated peat conditions would be inspected immediately after restoration to ensure that the methods detailed in the PMP had been correctly implemented and to inform any corrective actions should they be required; and
- the physical condition of peats would be retained as carefully as possible both at the peat storage and the peat restoration stages. This is particularly important for vegetation establishment.

4.5 Specific Mitigation

There are a number of ways in which detailed design and construction activities can be specified to minimise impacts on peatlands. The following section outlines briefly the likely mitigation required to minimise impact, based on the re-use of peat specific to key elements of the Proposed Development.

4.5.1 Wind Turbine Foundations and Crane Hardstandings

Wind turbine foundations represent permanent excavation and the primary mitigation measure is to locate the wind turbines to avoid the areas of deepest peat, thereby reducing excavated volumes. In relation to crane hardstanding, guidance is to avoid their full reinstatement post-construction and these areas of the crane hardstanding would represent permanent excavation given the likelihood of re-use for maintenance activities associated with the wind turbines. The primary mitigation is to locate the crane hard standings to avoid the areas of deepest peat, thereby reducing excavated volumes and reinstatement of temporary areas of hardstanding. Areas of temporary hardstanding would be reinstated. Therefore, the following good practice guidance applies to reinstatement of compound areas:

- peat stripped from hardstanding areas would not be stored higher than 1m and could require to be seeded in the short term to prevent drying out, if stored for long residence times;
- stripped turves are used for final reinstatement, however where turves are insufficient or vegetation regeneration requires reseeding, temporary fencing may be considered around hardstanding areas undergoing reinstatement in order to prevent grazing; and
- the choice of seed mix for reseeding should be appropriate to the ecological and hydrological conditions of the reinstated hard standing location and surrounding habitats and should be advised by the ECoW.

The average peat depths located on all turbines and hardstandings is <1m with the exception of the Temporary Hardstanding at T24 which has an average peat depth of 1.01m. This is related to a very localised pocket of deep peat and design changes to the crane hardstandings have been undertaken to orientate the areas of non-excavation of peat and surface clearance only over the areas of wider extents of deep peat >1m.

4.5.2 Access Tracks

There is much guidance[6,7] available to support access track design in upland areas including peatlands. Guidance is generally focused on floating tracks and new and upgraded excavated tracks and is summarised below.

Based on the avoidance of significant areas of deep peat during design iterations the access tracks are typically present on more localised areas of peat <1.0m with the average depth of peat and soils recorded at 0.74m along proposed new, floated and upgraded tracks. Based on the site gradients and the extents of peat it is anticipated that tracks would be a combination of floating and excavated tracks.

Excavated tracks require complete excavation of any peat (where present) to a competent substrate. Excavated tracks would generally be undertaken where peat depths are less than 1m. The excavated peat would require temporary storage ahead of re-use elsewhere within the Site in accordance with guidance detailed in Section 4.2.2 and 4.2.3 which would ensure the integrity of the peat is retained and there is no peat loss. Good practice guidance relates mainly to drainage in association with excavated tracks:

- trackside ditches should capture surface water (within the acrotelm) before it reaches the road;
- interceptor drains should be shallow and flat bottomed (and preferably entirely within the acrotelm to limit drawdown of the water table);
- any stripped peat turves should be placed back in the invert and sides of the ditch to assist regeneration and prevent erosion to the peat and wash out that could occur; and;
- culverts and cross drains should be installed under excavated tracks to maintain subsurface drainage pathways (such as natural soil pipes or flushes). Discharge from constructed drainage should allow for as much diffuse dispersion of clean (silt free) water as possible while minimising disturbance to existing peatland as far as possible. Silt mitigation measures would be incorporated into all constructed drainage as per the requirements of the **SEI Technical Appendix 3.1: Outline CEMP**.

Although excavation is normally undertaken in peat of minor thickness (< 1.0m), there is a possibility of minor slippage from the cut face of the peat mass. Accordingly:

- free faces should be inspected for evidence of instability (cracking, bulging, excessive discharge of water or sudden cessation in discharge); and
- where significant depths of peat are to be stored adjacent to an excavation, stability analysis should be conducted to determine Factor of Safety (FoS) and an acceptable FoS adopted for loaded areas.

Regular routine monitoring should be scheduled post-construction to ensure that hydrological pathways and track integrity have been suitably maintained.

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6 Scottish Renewables, Scottish Natural Heritage, Scottish Environmental Protection Agency, Forestry Commission Scotland, Historic Environment Scotland, Marine Scotland, AEECoW (2019)., Good Practice During Wind Farm Construction. 4th Edition.

7 Scottish Natural Heritage, Forestry Commission (August 2010)., Floating Roads on Peat

4.5.3 Use of Soil and Peat as Trackside Shoulders - Excavated Tracks

Excavated soil will generally be reused on site for partial track shoulder reinstatement and of constructed access tracks. Some limited reuse of peat for trackside verges can be considered using good practice at the margins of an access track under the following conditions:

- peat is only re-used at the edges of tracks if:
  - there is valid need and it provides an environmental benefit, e.g. reduces or buffers runoff, encourages habitat restoration, stabilises verges, minimises visual impact;
  - re-used peat consists of turves and drier acrotelm peat only, which is anticipated on this site;
  - widths of reinstated verges are kept to a minimum, defined on a case by case basis and be fully justified;
- care should be taken when forming verges and landscaping with soil and peat so as not to over-deposit arisings to the detriment of the works. Therefore, low verges are used on the sides of the track to permit any surface water to drain naturally, and diffusely, where it arises;
- reuse and reinstatement is only applied in stretches of low longitudinal track gradient (e.g. <5°) to ensure stability, with batters used to form stable slopes;
- rapid revegetation of the soil and peat surface through the use of stored turves or re-seeding is encouraged to stabilise the reuse and reinstated areas and minimise erosion;
- buffer zones are maintained around surface water bodies where no peat reuse or reinstatement is carried out; and
- verges may also be suitable locations for burying cables to avoid excavating cable trenches in undisturbed peat material. If this is planned, then the verges should be constructed wider to accommodate the cabling.

Careful assessment and selection of peat by the ECoW to be used for reuse and reinstatement, in line with the guidelines set out above, will ensure that peat integrity is retained and there will be no loss of peat through this process.

4.5.4 Floating Access Tracks

The use of floating access track is proposed as part of the development proposals and following more detailed site investigations, the following guidance should be followed.

Over deeper peat (typically >1.0m), floating tracks are used to remove the requirement for peat excavation and limit disruption of hydrological pathways. The success of construction requires careful planning to take account of the unique characteristics of peat soils. Specific guidance is available on design, the duration and timing of construction, the sequence of construction and the re-use of peat on the shoulders of the floating access track. Floated tracks will be utilised where possible when peat depths of greater than 1.0m are identified along with shallow topography in the area (generally below 5%) and the section is long enough to make floating track appropriate.

4.5.4.1 Design of Floating Access Tracks

The following issues should be considered during detailed design of floating access tracks:

- adopting conservative values for peat geotechnical properties during detailed design (post-consent);

- applying a maximum depth rule whereby an individual layer of geogrid and aggregate should not normally exceed 450mm without another layer of geogrid being added;
- on gently sloping ground and where the access track runs transverse to the prevailing slope, accommodating natural hydrological pathways such as flushes and peat pipes through installation of a permanent conduit within or underneath the track and allowing for as much diffuse discharge (while minimising disturbance to existing peatland) on the downslope as possible;
- ensuring transitions between floating tracks and excavated tracks (or other forms of track not subject to long term settlement) are staged in order to minimise likelihood of track failure at the boundary between construction types;
- scheduling access track construction to accommodate for, and reduce peat settlement characteristics; and
- reuse of existing roads (with upgrading if required), where possible.

4.5.4.2 Duration and Timing of Construction of Floating Access Tracks

The critical factor in successful construction of floating access tracks is the timescale of construction, and the following good practice guidance is provided:

- the settlement characteristics of peat; should be accommodated by appropriate scheduling of access track construction, as follows:

Sequence of Construction

The sequence of construction is normally stipulated in guidance provided by the supplier of the geotextile or geogrid layer, and suppliers are often involved in the detailed access track design. Good practice in relation to the sequence of access track construction is as follows:

- retaining rather than stripping the vegetation layer (i.e. the acrotelm, providing tensile strength), and laying the first geotextile/geogrid directly on the peat surface;
- adding the first rock layer;
- adding the second geotextile/geogrid, and add overlying graded rock fill as a running surface;
- heavy plant and Heavy Goods Vehicles (HGV) using the access tracks during the construction period should be trafficked slowly in the centre of the track to minimise dynamic loading from cornering, breaking and accelerating;
- ensuring wheel loads should remain at least 0.5m from the edge of the geogrid, markers should be laid out, monitored and maintained on the access track surface to clearly emphasise these boundaries; and
- ongoing ‘toolbox’ talks and subsequent feedback to construction and maintenance workers and drivers to emphasise the importance of the implementing the above measures.

Re-use of Peat as Trackside Shoulders- Floating Road

There is potential for reuse of excavated peat (from other areas of the Site) in landscaping of floating access tracks. Wedge-shaped reuse at the margins of a floating access track (which is elevated above the peat surface) is termed shoulders, and good practice guidance is as follows:

- peat is only reused at the edges of tracks if:
  - there is valid need and it provides an environmental benefit, e.g. reduces or buffers runoff, encourages habitat restoration, stabilises verges, minimises visual impact;

  - re-used peat consists of turves and drier acrotelm peat only, which is anticipated on this site;
  - widths of reinstated verges are kept to a minimum, defined on a case by case basis and be fully justified;
- re-using peat excavated from elsewhere on site as shoulders adjacent to the floating track;
- peat shoulders should taper from just below the track sides (thereby preventing over high shoulders from causing ponding on the track surface) to join the surrounding peat surface, keeping as natural a profile as possible to tie in with existing slope profiles;
- limiting the width of peat shoulders to avoid unnecessary smothering of intact vegetation adjacent to the floating track;
- peat must not be laid too thinly (minimum 0.5m) to avoid drying out;
- peat must not be compressed during reinstatement to prevent cracking; and

Where possible these should be capped with turves or seeded as quickly as possible to prevent run off erosion and should not be left bare for excessive periods.

4.5.5 Temporary Construction Compound Areas

All construction compounds are considered temporary and peat would be used for full reinstatement following completion of the construction phase.

In relation to compound areas, these would used for storage and maintenance activities associated with the construction phase of the proposed development. Therefore, the following good practice guidance applies to reinstatement of compound areas:

- peat stripped from compound areas would not be stored higher than 1m and could require to be seeded in the short term to prevent drying out, if stored for long residence times;
- stripped turves are used for final restoration, however where turves are insufficient or vegetation regeneration requires reseeding, temporary fencing may be considered around compound areas undergoing restoration in order to prevent grazing; and
- the choice of seed mix for reseeding should be appropriate to the ecological and hydrological conditions of the restored compound location and surrounding habitats and should be advised by the ECoW.

4.5.6 Substation

The substations will require permanent excavations prior to construction and the northern substation forms part of Borrow Pit 7 which will be excavated during formation of the Borrow Pit. The primary mitigation measure for all permanent structures has been to locate the relevant infrastructure to avoid the areas of deepest peat, thereby reducing excavated volumes of peat. All permanent excavations should follow the procedures detailed in Section 4.2.1 . The following good practice guidance applies to re-use of peat for restoration of these areas:

- stripped turves are used for final restoration, however where turves are insufficient or vegetation regeneration requires reseeding, temporary fencing may be considered around areas undergoing restoration in order to prevent grazing; and
- the choice of seed mix for reseeding should be appropriate to the ecological and hydrological conditions of the restored compound location and surrounding habitats and should be advised by the ECoW.

4.5.7 Borrow Pits

Peat is proposed for re-use within borrow pits for the purpose of re-use and habitat restoration as detailed in the **SEI Technical Appendix 8.5 OHMP**. This is subject to method of re-use being consistent with the environmental reinstatement objectives of the proposed development and does not present residual risks from pollution of the environment or harm to human health. Key issues for borrow pit restoration are:

- prevention of desiccation and carbon losses from peat used in the restoration;
- development of complete vegetation cover through emplacement of peat turves or seeding with an appropriate species; and
- fencing where required, to exclude grazing stock and to encourage vegetation establishment.

5.0 Peat Balance Assessment

Table 5-1 provides an estimate of peat and peaty soil volumes to be excavated and re-used during the construction of the proposed development. The peat and peaty soil excavation and re-use volumes are detailed for each infrastructure element in **Annex A**. The excavated materials data from **Annex A** indicates that the areas of infrastructure within the proposed development are typically located in areas of peaty soils and peat with limited infrastructure present in areas of extensive areas of peat >1m.

5.1 Excavated Volumes

Peat excavation volumes associated with the construction of the proposed development have been calculated using the results from the peat depth surveys and interpolation using the GIS package ArcGIS. Peat excavation volumes are detailed in **Table 5-1** and **Annex A** and based on the following assumptions:

- interpolation of peat depth was undertaken using the Inverse Distance Weighting (IDW) interpolation method;
- the volumes have been calculated based on the average peat depth across the area of each item of infrastructure and linear infrastructure based on peat depth survey results;
- an assumption that the peat probe depths are representative of the actual depth of peat (validated by the peat coring); and
- the acrotelm volumes calculated for use in restoration have been based on a 0.5m acrotelm thickness and based on peat depth survey observations and peat coring.

The excavated volumes will comprise primarily peat and peaty soils.

5.2 Reuse Volumes

The volume of peat to be reused around the Site is detailed in **Table 5-1** and **Annex B** and based on the following assumptions:

- in appropriate locations around the infrastructure perimeter such as track verges, the edges of permanent structures a 1.5m wide strip either side of the track at a thickness of approximately 0.8m (turves and acrotelmic peat).
- in appropriate locations around the perimeter of substations to tie into existing habitats with a 1m wide strip and with an average peat depth of 0.5m.
- reinstatement of temporary compound areas with an average peat depth of 1.0m to ensure integration with the adjacent habitat areas where possible which comprise blanket bog.
- borrow pits to reuse peat with an average peat depth of 1.0m to ensure integration with the adjacent habitat areas as detailed in **SEI Technical Appendix 8.5 OHMP**.

5.3 Net Peat Balance

Table 5-1 provides a summary of the estimate of peat volumes to be excavated and reused during the construction of the infrastructure identified in **Table 5-1**.

Table 5-1: Peat Balance Assessment Summary

Infrastructure	Volume of Peat/Peaty Soils Excavated (m^3)	Volume of Peat/Peaty Soils Reused and Reinstated (m^3)
New Access Track	56,744	41,653
Upgraded Access Track	28,354	30,598
Floating Access Track	0	6,249
Turbines and Permanent Hardstanding	20,872	810
Temporary Hardstanding around Turbine	48,657	48,657
Substations	2,592	700
Temporary Construction Compounds	9,085	15,451
Borrow Pits	23,054	48,126
Total	**189,358**	**192,244**

The total volume of peat predicted to be excavated of 189,358m^3, does not exceed the intended total peat reuse volume of 192,244m^3, therefore no excess peat is required to be disposed off-site for the proposed development.

5.4 Peatland Restoration

As detailed in Section 4.3 there is potential scope for potential reuse of excavated acrotelmic peat as part of the peatland restoration works subject to a full blanket bog restoration assessment as detailed in the **SEI Technical Appendix 8.5 OHMP**.

Assuming reuse of acrotelmic peat in the proposed peatland restoration areas at the Abhainn Cheothadail (south of the river), Eishken Lodge, area south of Turbine 16 and adjacent to Turbine 18 a total volume of 11,705 m^3 may be available for peatland restoration. Further details are provided in **Annex B**.

6.0 Waste Classification

This section of the Stage 1 Outline PMP includes the method for dealing with peat which could potentially be classified as waste (only if the above volumes estimate significant quantities of catotelmic peat, which cannot be re-used).

Table 6-1 outlines where those materials that are likely to be generated on-site, fall within the Waste Management Licensing (Scotland) Regulations 2011.

Based on the results presented in **Table 6-1**, it has been concluded that all of the materials to be excavated on-site would fall within the non-waste classification as the peat would be re-used on-site. Based on a detailed probing exercise and visual inspection of the peat, it is predominantly found to be pseudo fibrous and becoming amorphous with depth within the areas of proposed development. The design of the proposed development has typically avoided the areas of more amorphous peat.

The majority of the excavated peat is therefore entirely re-useable as it is predominantly fibrous and easily re-used on-site. Areas of extensive amorphous deep peat have been avoided by design where possible.

Table 6-1: Excavated Materials – Assessment of Suitability

Excavated Material	Indicative Volume on Site by % of total excavated soils	Is there a suitable use for material	Is the Material required for use on Site	Material Classified as Waste	Re-use Potential	Re-use on Site
Turf (Surface layer of vegetation and fibrous matt) and Acrotelmic Peat	95	Yes	Yes	Not classified as waste	Yes	Will be re-used in reinstatement of floated access track verges, cut and fill verges, road verges, side slopes and check drains. Peripheral embankments of turbine bases, crane hardstandings and reinstatement of borrow pits. Potential re-use in restoration.
Catotelmic peat	5	Yes	Yes*	Not classified as waste	Yes	Will be re-used in reinstatement of floated access track verges, cut and fill verges, road verges, side slopes and check drains. Peripheral embankments of turbine bases, crane hardstandings and reinstatement of borrow pits. Potential re-use in restoration.
Amorphous Catotelmic Peat (amorphous material unable to stand unsupported when stockpiled >1m)	Not anticipated as it has been avoided by design.	Potentially	Potentially **	Potentially if not required as justifiable restoration of peatland habitat management works	Limited	If peat does not require treatment prior to re-use it can be used on-site providing adequate justification and method statements are provided and approved by SEPA. If it is unsuitable for use without treatment then it may be regarded as a waste. However every attempt to avoid this type of peat has been incorporated into the design.

*Significant volumes of catotelmic peat is considered unlikely to be excavated in the flatter expanses of peatland as tracks will be floated in these areas, however if encountered during excavations on slopes the field investigations have confirmed this material is more pseudo fibrous and is considered suitable for reuse.

**Such uses for this type of material are limited, however there may be justification for use in the base of borrow pits to maintain waterlogged conditions and prevent desiccation of restored area and in some habitat management works such as gully or ditch blocking where saturated peat is required to mimic mire type habitats and encourage establishment of sphagnum.

7.0 Conclusion

This Stage 1 PMP presents a pre-construction assessment of the estimated peat excavation and reuse volumes associated with the works phase of the construction of the proposed development. The PMP also provides the guiding principles which would be applied during the construction of the proposed development.

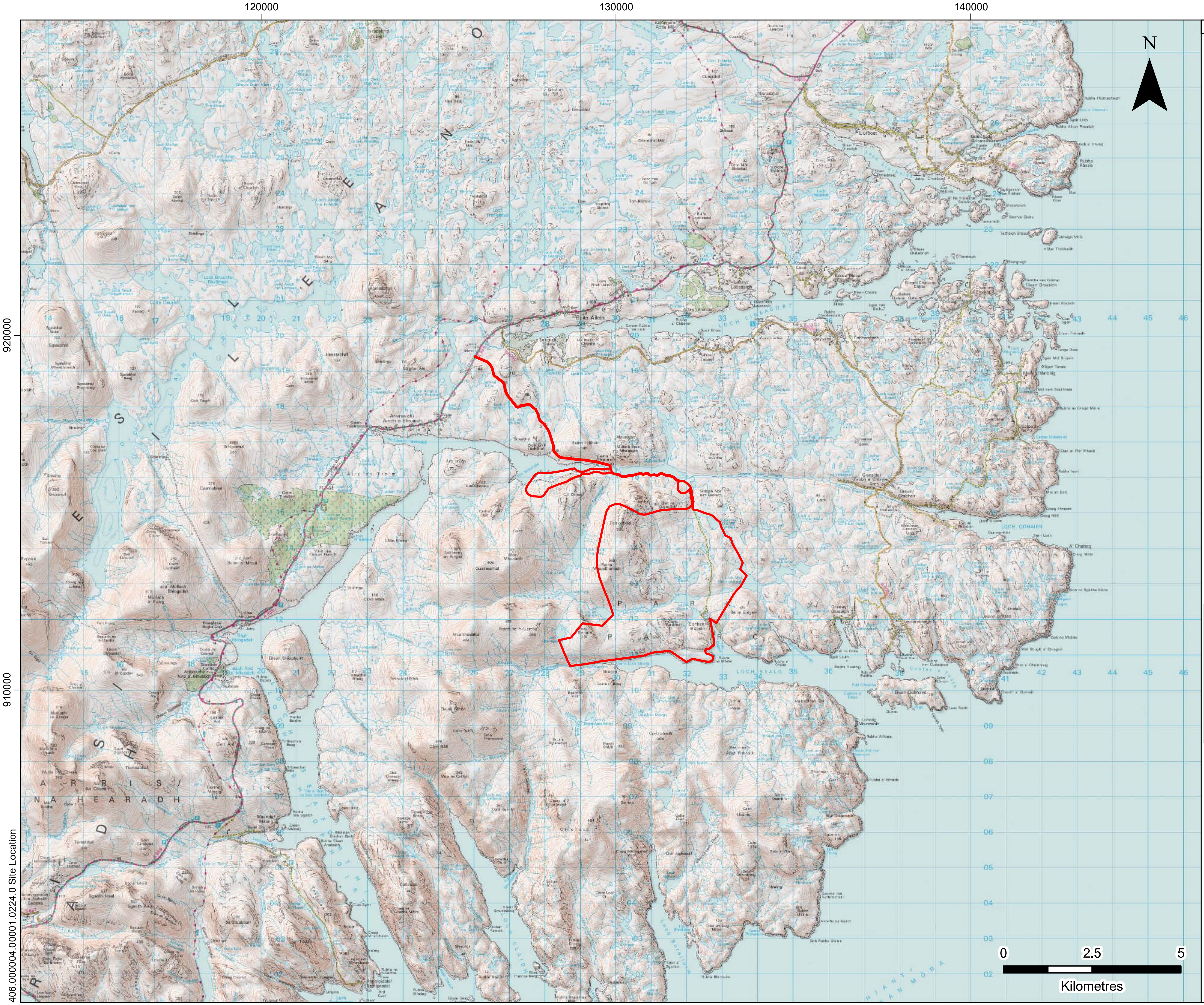
Through a process of continued design refinement (focused on minimising peat excavation volumes) and adoption of best practice working methods, the development is expected to achieve an overall peat balance. Thus, all excavated material would be required for reuse as part of the works and no surplus peat is anticipated.

The PMP addresses the following peat related issues:

- the depth and condition of peat deposits at site;
- the volumes of peat that are predicted to be excavated and its suitability for reuse;
- the capacity to reuse the peat onsite;
- peat handling and temporary storage; and
- potential restoration and monitoring of peatland habitat.

The figures detailed within this report are to be considered indicative, at this stage. The total peat volumes are based on a series of assumptions for the layout of the proposed development and the results of multiple phases of peat probing. Such parameters can still vary over small scale areas and therefore topographic changes in the bedrock profile could impact the total accuracy of the volume calculations.

The various calculations presented here would be updated and expanded upon as part of detailed design works, taking account of pre-construction site investigations and micro-siting, to confirm actual quantities of arising peat. The applicant would achieve an actual balance between arising peat and reinstatement by prioritising the areas for reinstatement, following advice from the project ECoW and Geotechnical Engineer. It is anticipated that a detailed, construction phase PMP would be developed, which would be maintained and updated in conjunction with a Geotechnical Risk Register. The implementation of the detailed PMP would ensure a robust commitment to excavating, storing and reinstating peat in a manner that follows best practice and ensures the protection of peat throughout the construction and post-construction phases.



LEGEND

Application Boundary

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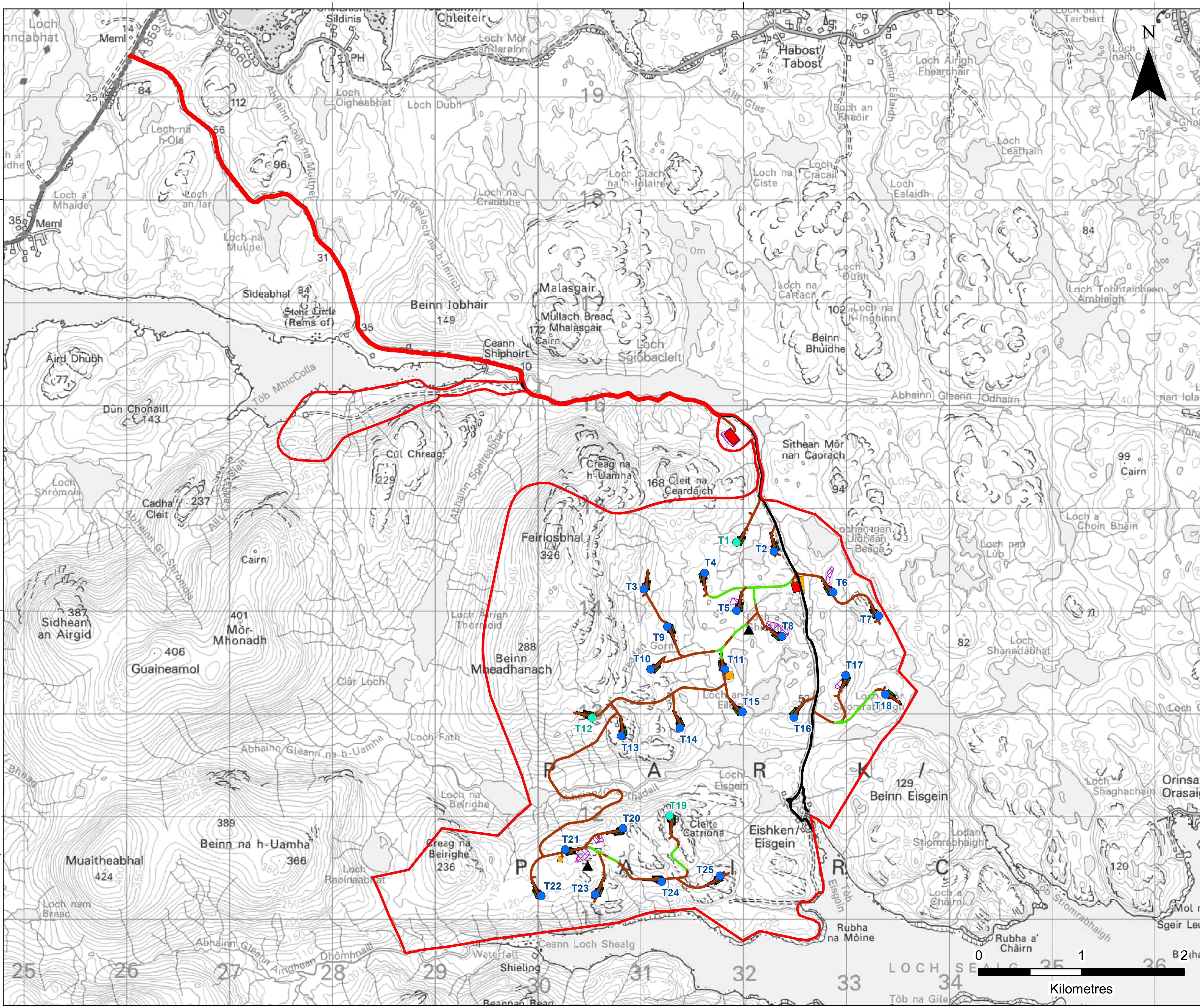
UISENIS WIND FARM - SEI

PMP

SITE LOCATION

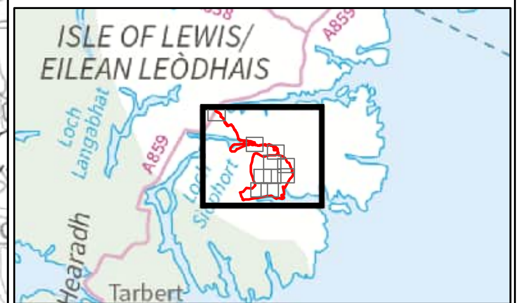
SEI FIGURE 10.2.1

Scale	Date
1:100,000 @ A3	MAY 2024



LEGEND

- Application Boundary
- Proposed Turbine Location (180 m Blade Tip Height)
- Proposed Turbine Location (200 m Blade Tip Height)
- Proposed Permanent Met Mast
- Proposed Bespoke Hardstanding Envelope
- Proposed Permanent Substation
- Proposed Permanent Hardstanding
- Proposed Temporary Hardstanding
- Proposed Temporary Bridge Alignment
- Proposed Temporary Construction Compound
- Proposed Clearance Area
- Potential Borrow Pit
- Proposed Floating Access Track
- Proposed Access Track / Turning Head
- Existing Road (To Be Upgraded)



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UISENIS WIND FARM - SEI

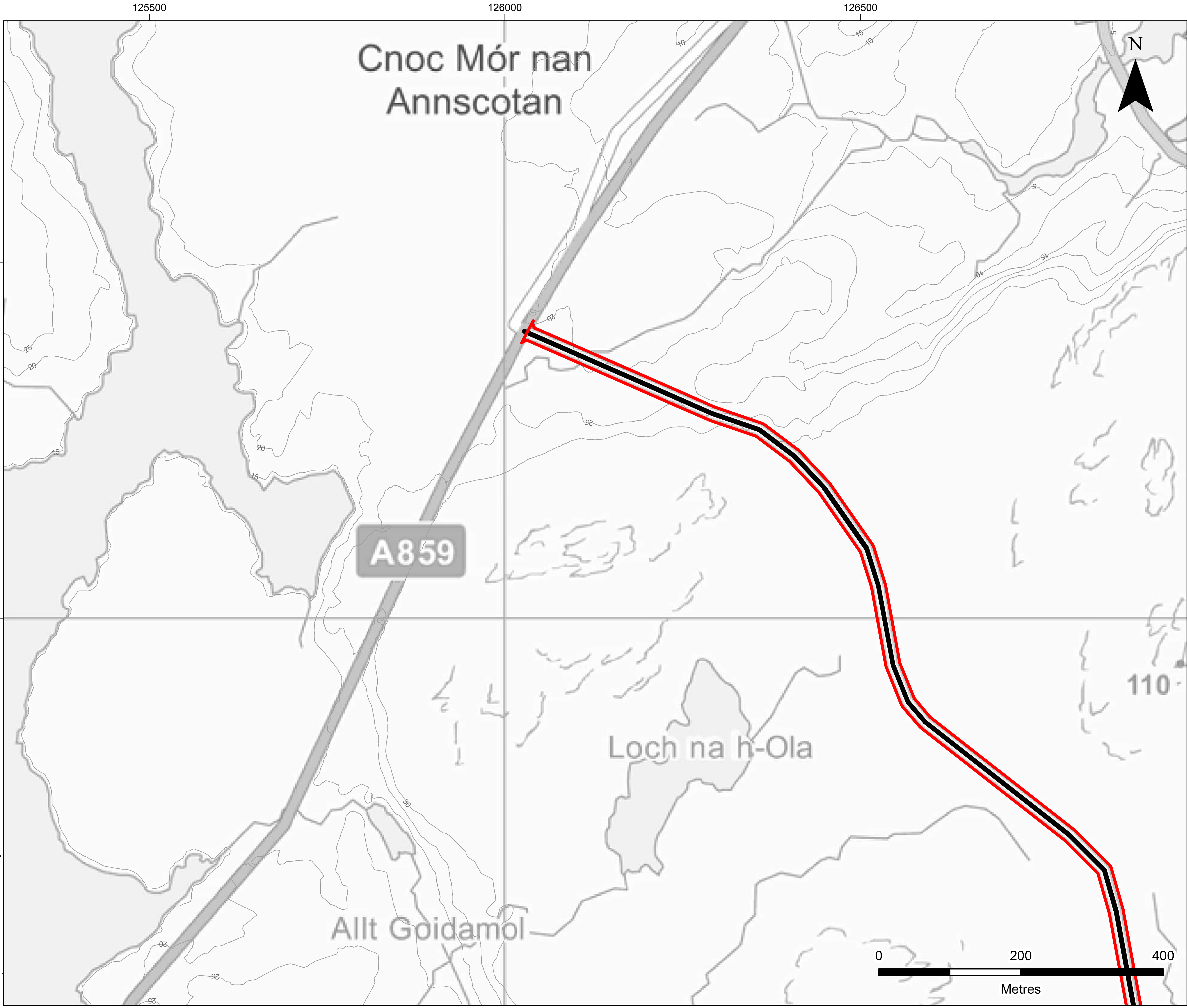
PMP

SITE LAYOUT

SEI FIGURE 10.2.2a

Scale	Date
1:35,000 @ A3	MAY 2024

406.000004.00001.0225.0 Site Layout



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UISENIS WIND FARM - SEI

PMP

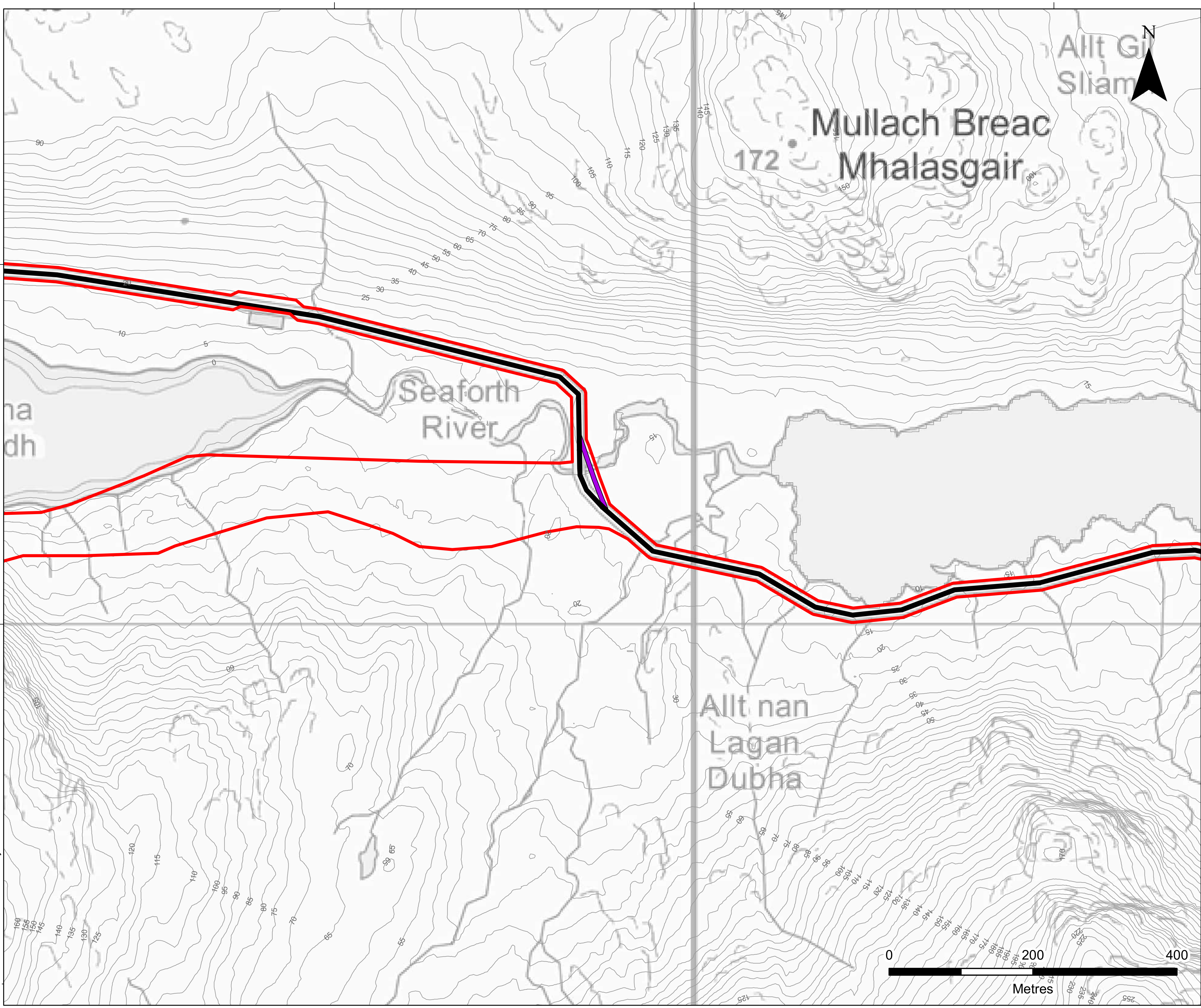
SITE LAYOUT

SEI FIGURE 10.2.2b

Scale 1:5,000 @ A3

Date JUNE 2024

406.000004.00001.0226.1 Site Layout DDP



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UISENIS WIND FARM - SEI

PMP

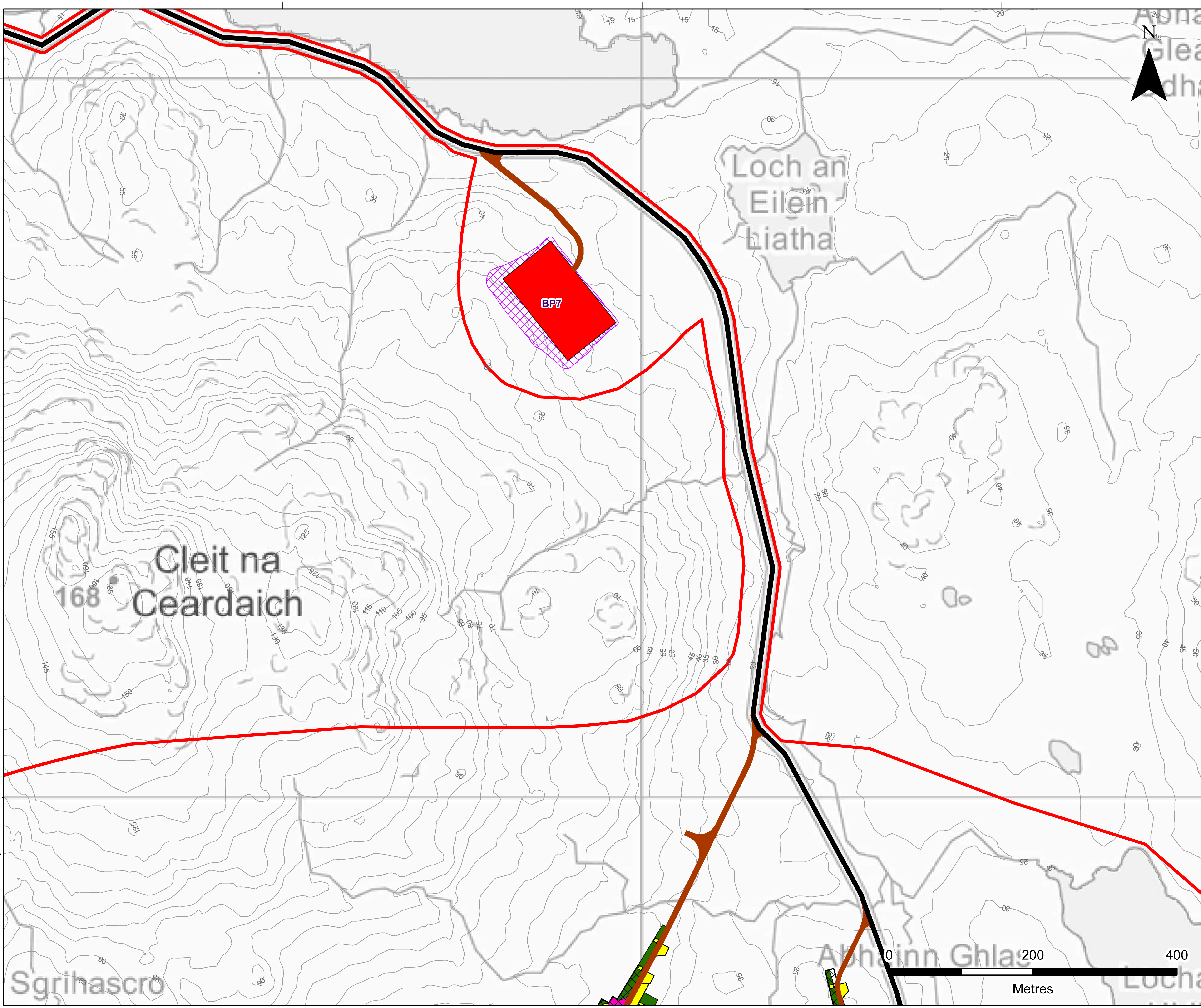
SITE LAYOUT

SEI FIGURE 10.2.2c

Scale 1:5,000 @ A3

Date JUNE 2024

406.000004.00001.0226.1 Site Layout DDP



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UISENIS WIND FARM - SEI

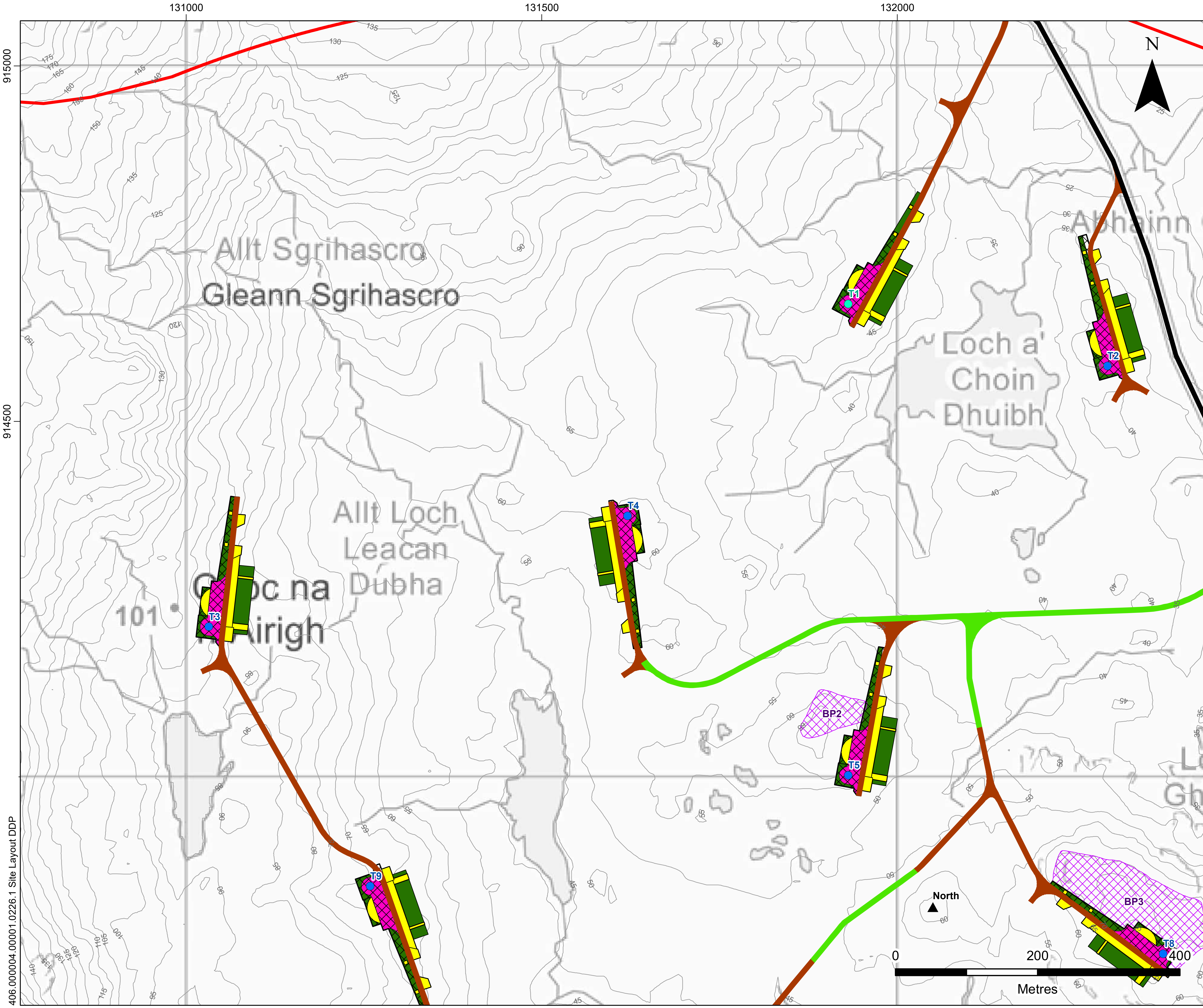
PMP

SITE LAYOUT

SEI FIGURE 10.2.2d

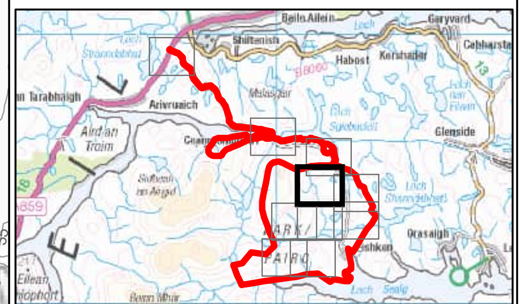
Scale	Date
1:5,000 @ A3	JUNE 2024

406.00004.00001.0226.1 Site Layout DDP



LEGEND

- Application Boundary
- Proposed Turbine Location (180 m Blade Tip Height)
- Proposed Turbine Location (200 m Blade Tip Height)
- Proposed Permanent Met Mast
- Proposed Bespoke Hardstanding Envelope
- Proposed Permanent Hardstanding
- Proposed Temporary Hardstanding
- Proposed Clearance Area
- Potential Borrow Pit
- Proposed Access Track / Turning Head
- Proposed Floating Access Track
- Existing Road (To Be Upgraded)



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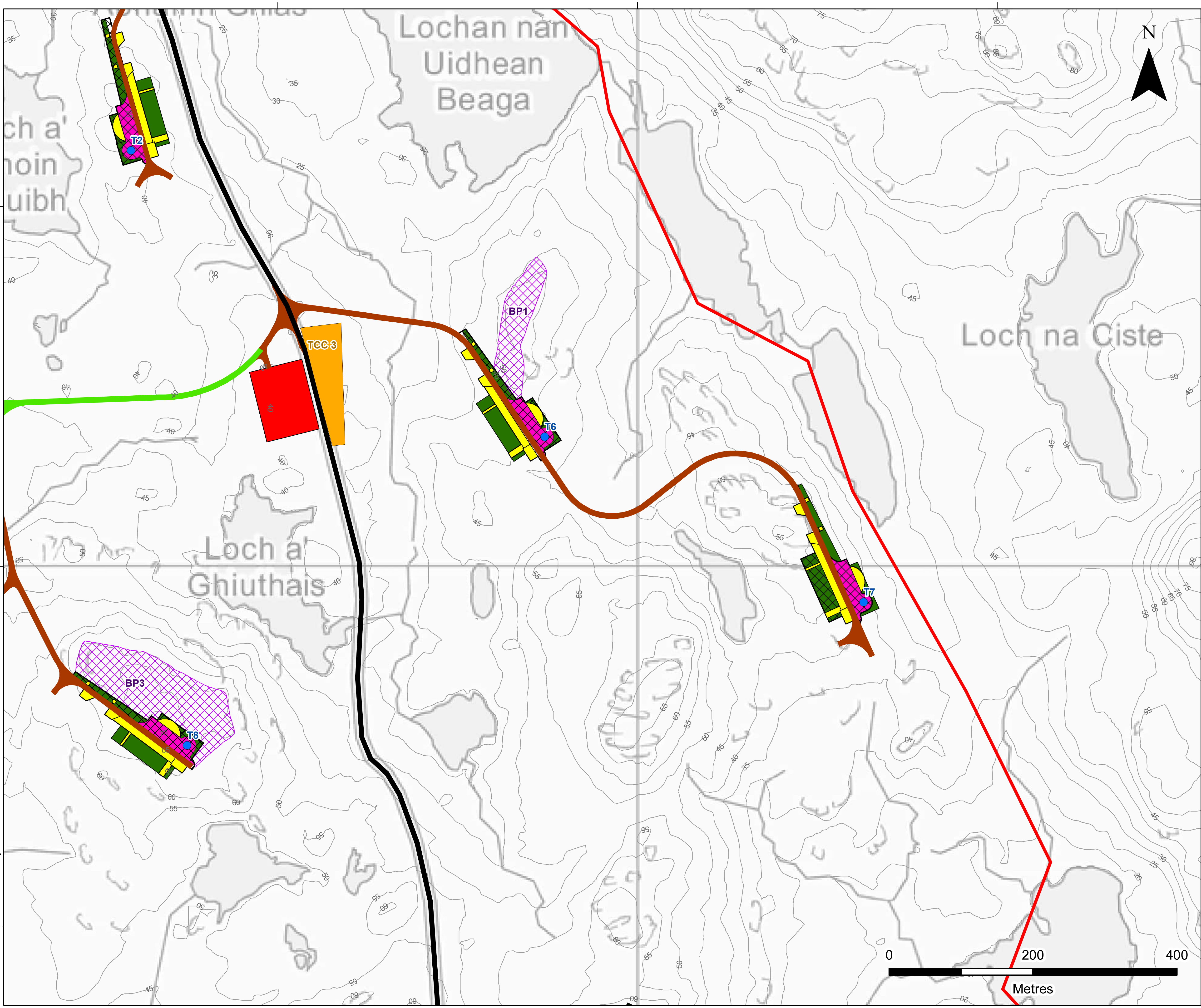
UISENIS WIND FARM - SEI

PMP

SITE LAYOUT

SEI FIGURE 10.2.2e

Scale	Date
1:5,000 @ A3	JUNE 2024



LEGEND

- Application Boundary
- Proposed Turbine Location (200 m Blade Tip Height)
- Proposed Bespoke Hardstanding Envelope
- Proposed Permanent Substation
- Proposed Permanent Hardstanding
- Proposed Temporary Hardstanding
- Proposed Temporary Construction Compound
- Proposed Clearance Area
- Potential Borrow Pit
- Proposed Access Track / Turning Head
- Proposed Floating Access Track
- Existing Road (To Be Upgraded)

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UISENIS WIND FARM - SEI

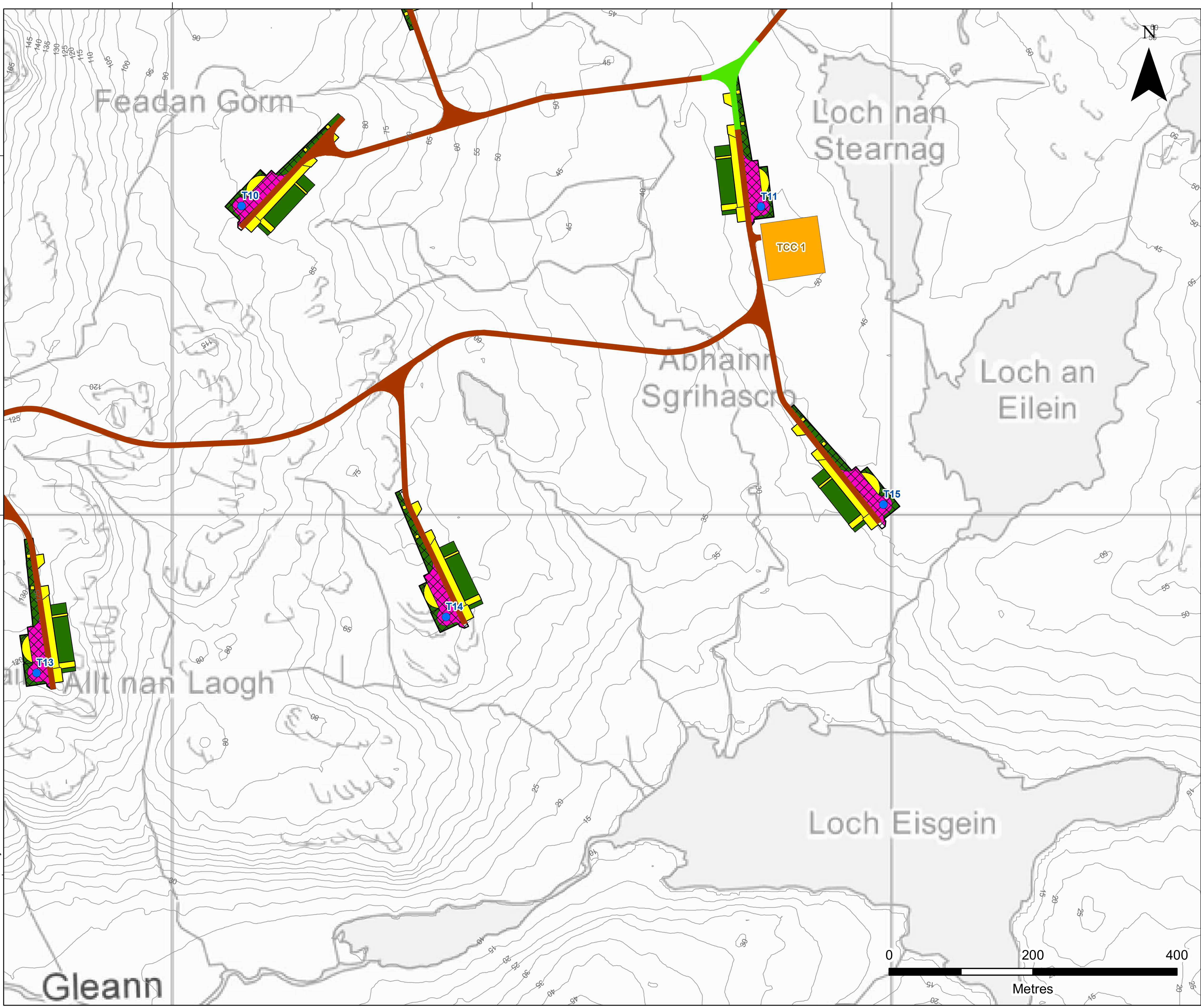
PMP

SITE LAYOUT

SEI FIGURE 10.2.2f

Scale 1:5,000 @ A3

Date JUNE 2024



LEGEND

- Application Boundary
- Proposed Turbine Location (200 m Blade Tip Height)
- Proposed Bespoke Hardstanding Envelope
- Proposed Permanent Hardstanding
- Proposed Temporary Hardstanding
- Proposed Temporary Construction Compound
- Proposed Clearance Area
- Proposed Access Track / Turning Head
- Proposed Floating Access Track

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UISENIS WIND FARM - SEI

PMP

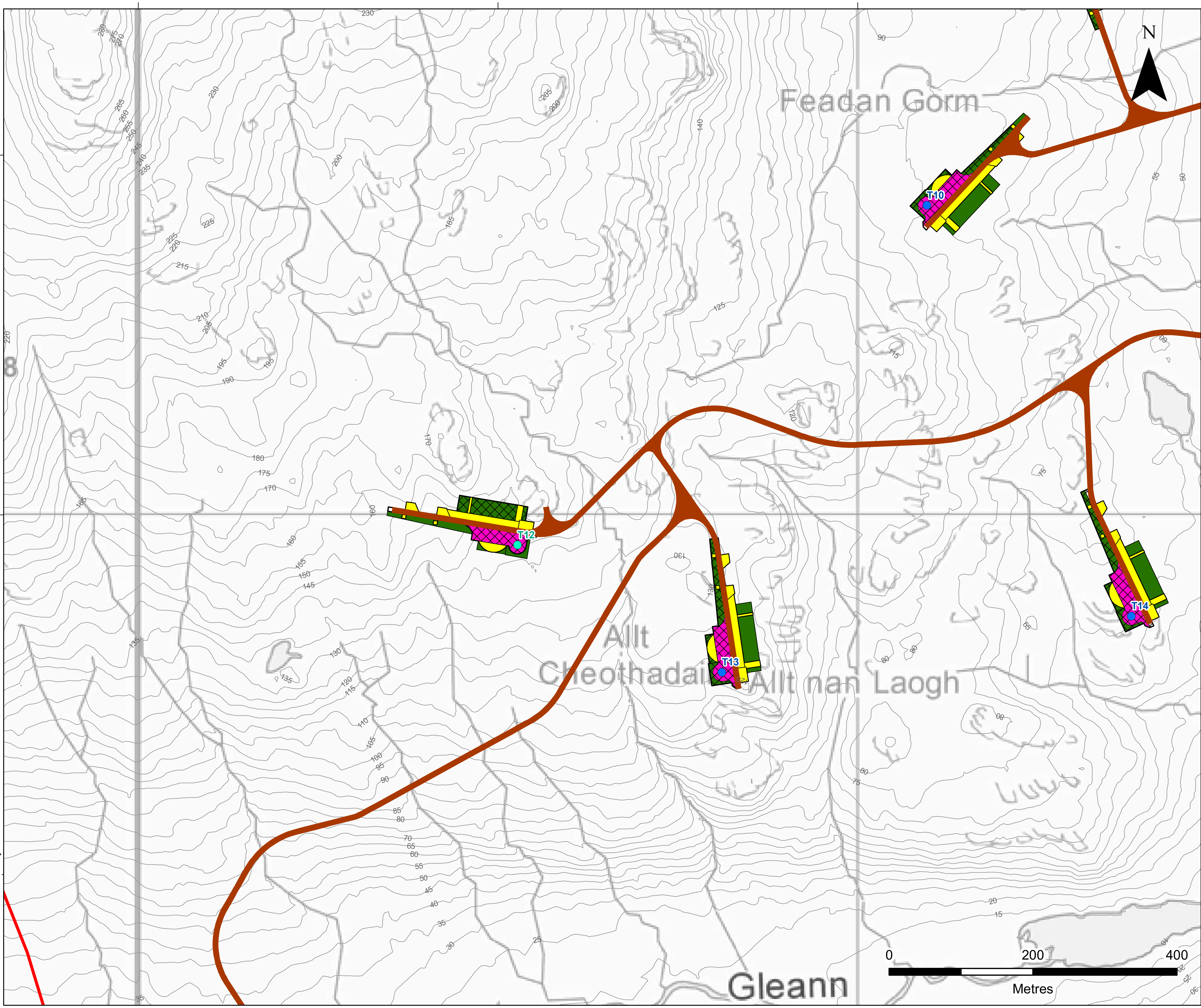
SITE LAYOUT

SEI FIGURE 10.2.2g

Scale 1:5,000 @ A3

Date JUNE 2024

406.000004.00001.0226.1 Site Layout DDP



LEGEND

- Application Boundary
- Proposed Turbine Location (180 m Blade Tip Height)
- Proposed Turbine Location (200 m Blade Tip Height)
- Proposed Bespoke Hardstanding Envelope
- Proposed Permanent Hardstanding
- Proposed Temporary Hardstanding
- Proposed Clearance Area
- Proposed Access Track / Turning Head

Eurowind Energy

SLR

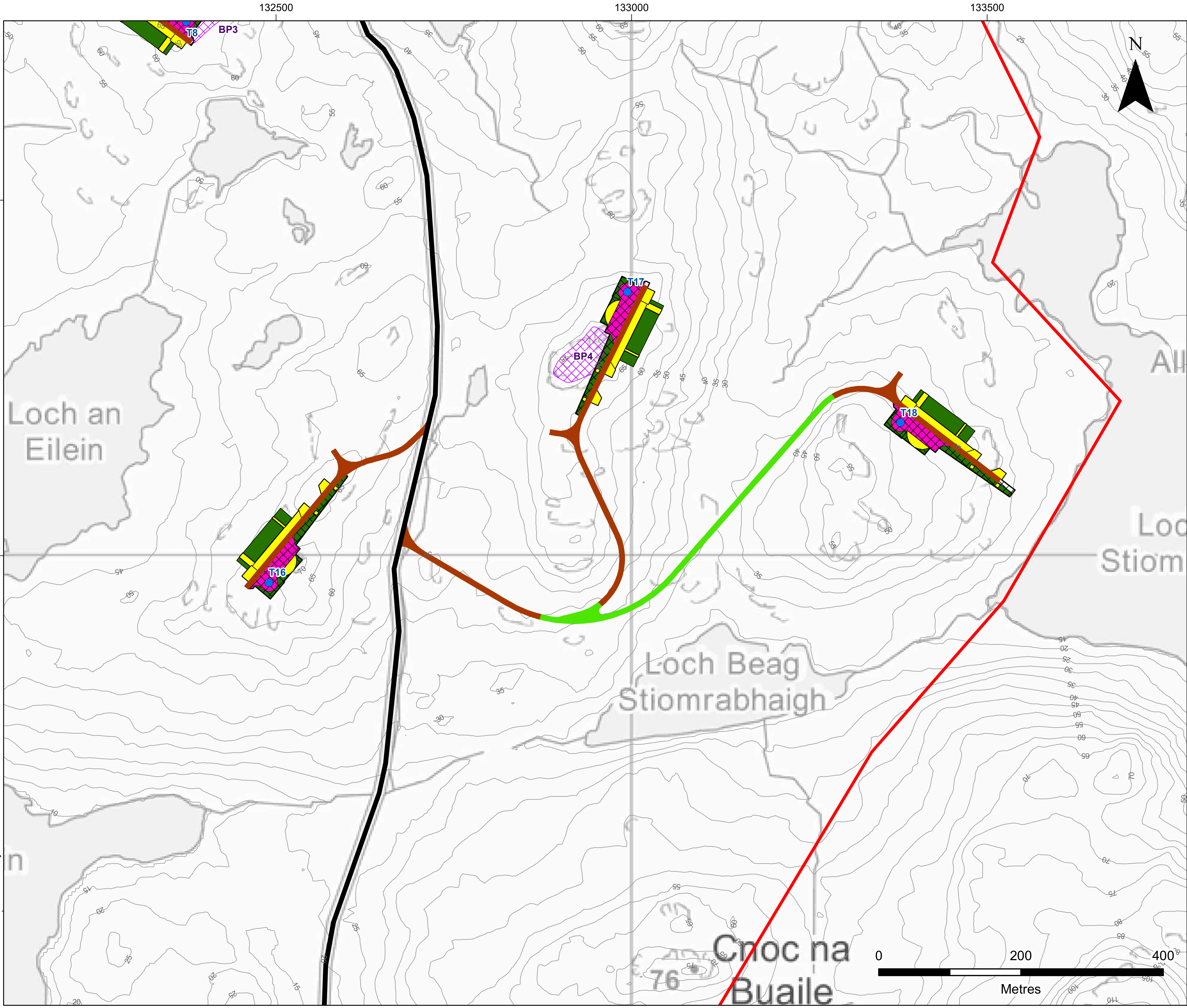
UISENIS WIND FARM - SEI

PMP

SITE LAYOUT

SEI FIGURE 10.2.2h

Scale	Date
1:5,000 @ A3	JUNE 2024



LEGEND

- Application Boundary
- Proposed Turbine Location (200 m Blade Tip Height)
- Proposed Bespoke Hardstanding Envelope
- Proposed Permanent Hardstanding
- Proposed Temporary Hardstanding
- Proposed Clearance Area
- Potential Borrow Pit
- Proposed Access Track / Turning Head
- Proposed Floating Access Track
- Existing Road (To Be Upgraded)

Eurowind Energy

SLR

UISENIS WIND FARM - SEI

PMP

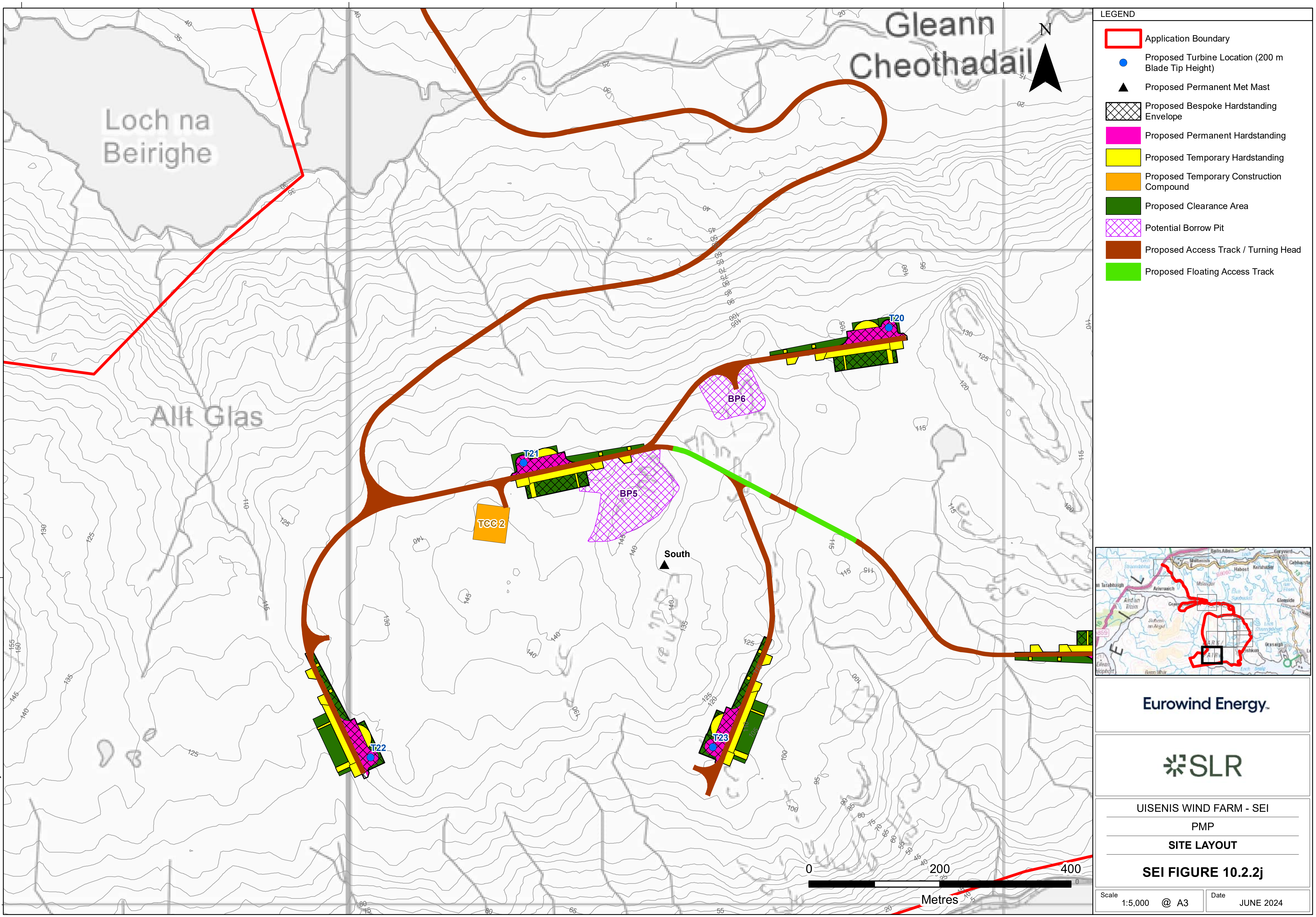
SITE LAYOUT

SEI FIGURE 10.2.2i

Scale 1:5,000 @ A3

Date JUNE 2024

406.000004.00001.0226.1 Site Layout DDP



Eurowind Energy

SLR

UISENIS WIND FARM - SEI

PMP

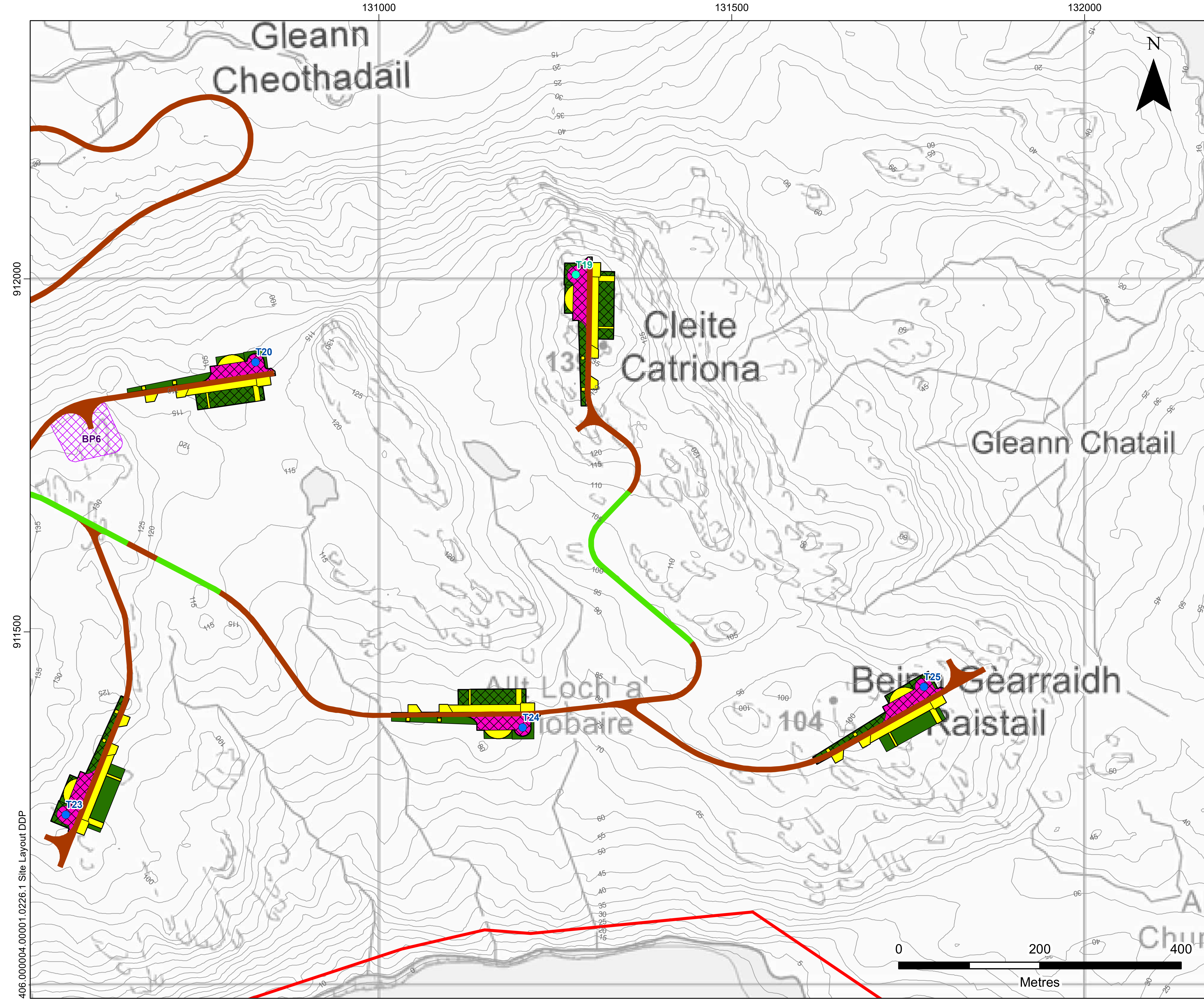
SITE LAYOUT

SEI FIGURE 10.2.2j

Scale 1:5,000 @ A3

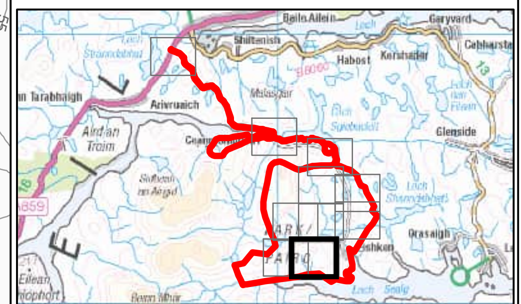
Date JUNE 2024

406.000004.00001.0226.1 Site Layout DDP



LEGEND

- Application Boundary
- Proposed Turbine Location (180 m Blade Tip Height)
- Proposed Turbine Location (200 m Blade Tip Height)
- Proposed Bespoke Hardstanding Envelope
- Proposed Permanent Hardstanding
- Proposed Temporary Hardstanding
- Proposed Clearance Area
- Potential Borrow Pit
- Proposed Access Track / Turning Head
- Proposed Floating Access Track



Eurowind Energy

SLR

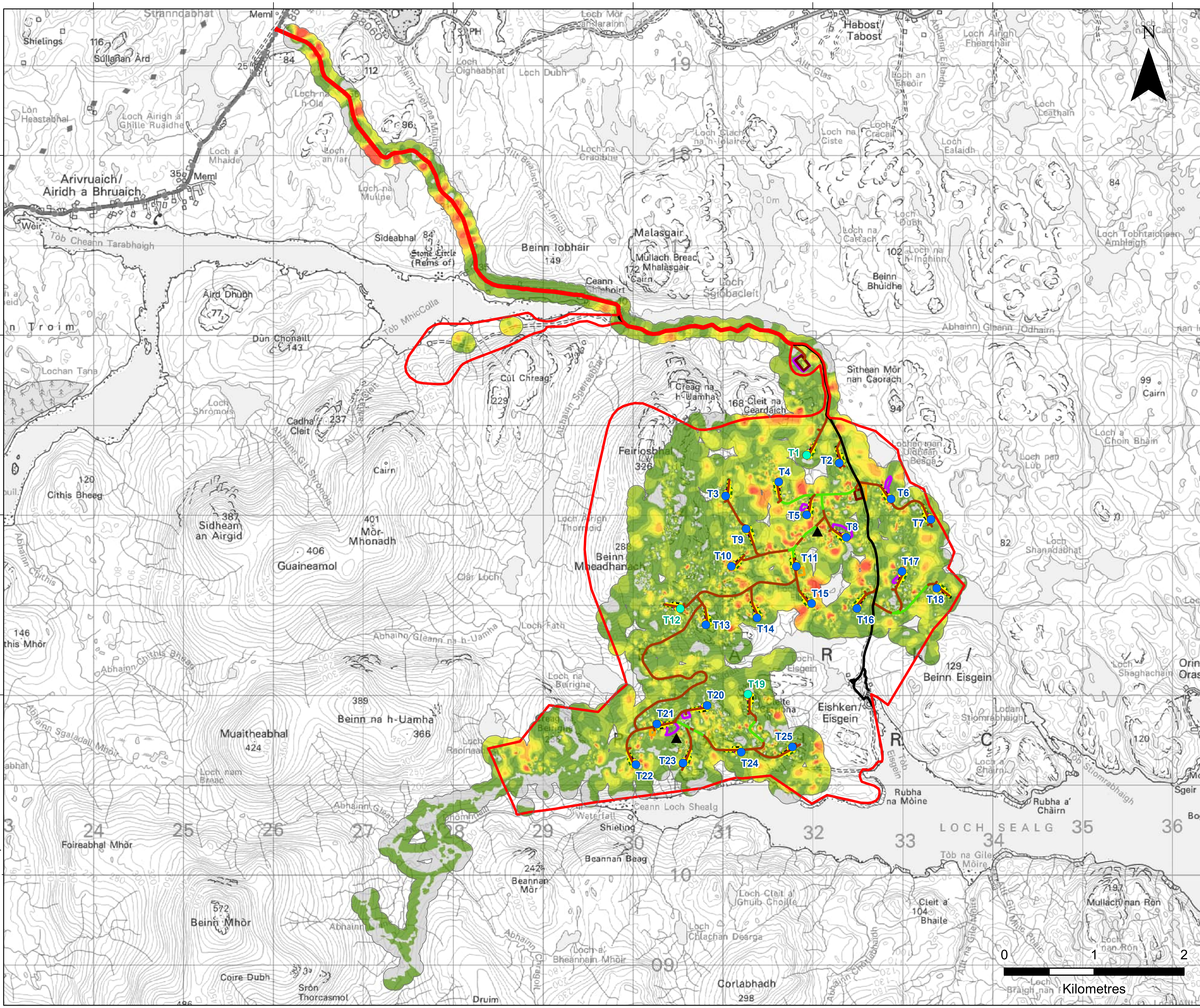
UISENIS WIND FARM - SEI

PMP

SITE LAYOUT

SEI FIGURE 10.2.2k

Scale	Date
1:5,000 @ A3	JUNE 2024



LEGEND

- Application Boundary
- Proposed Turbine Location (180 m Blade Tip Height)
- Proposed Turbine Location (200 m Blade Tip Height)
- Proposed Permanent Met Mast
- Proposed Bespoke Hardstanding Envelope
- Proposed Permanent Substation
- Proposed Permanent Hardstanding
- Proposed Temporary Hardstanding
- Proposed Temporary Bridge Alignment
- Proposed Temporary Construction Compound
- Proposed Clearance Area
- Potential Borrow Pit
- Proposed Access Track / Turning Head
- Proposed Floating Access Track
- Existing Road (To Be Upgraded)

Peat Depth (m)

- 0
- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- > 3

Eurowind Energy

SLR

UISENIS WIND FARM - SEI

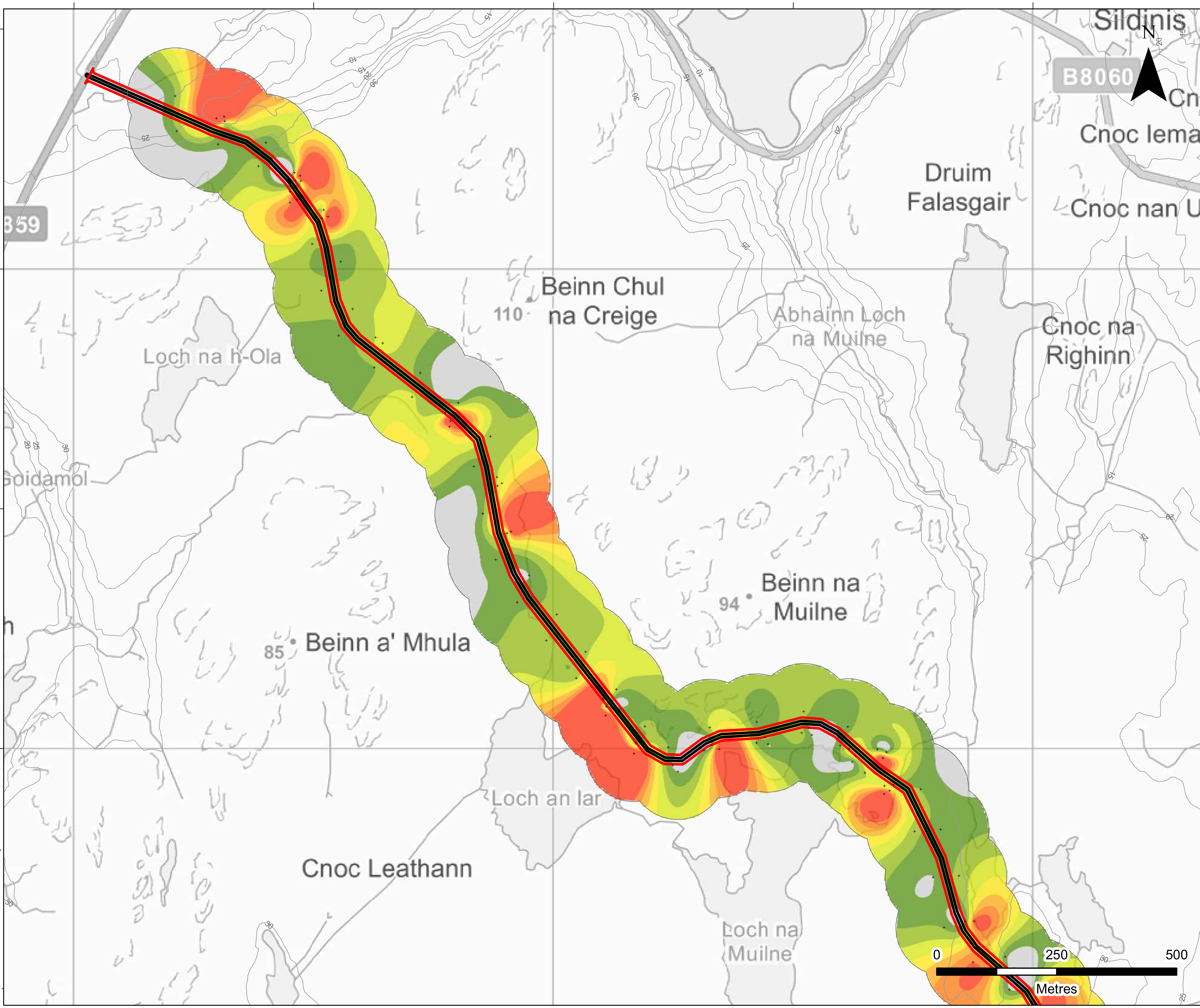
PMP

PEAT DEPTH (M)

SEI FIGURE 10.1.3a

Scale	Date
1:40,000 @ A3	JUNE 2024

406.00000 4.00001.0227.1 Peat Depth

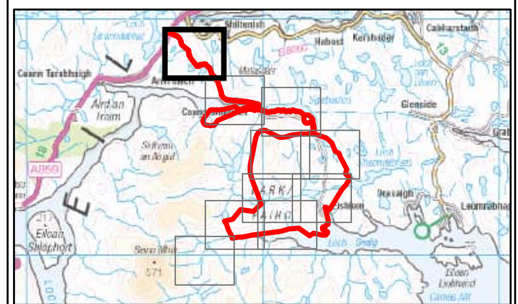


LEGEND

- Application Boundary
- Existing Road (To Be Upgraded)
- Peat Probe Location

Peat Depth (m)

- 0
- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- > 3



Eurowind Energy

SLR

UISENIS WIND FARM - SEI

PMP

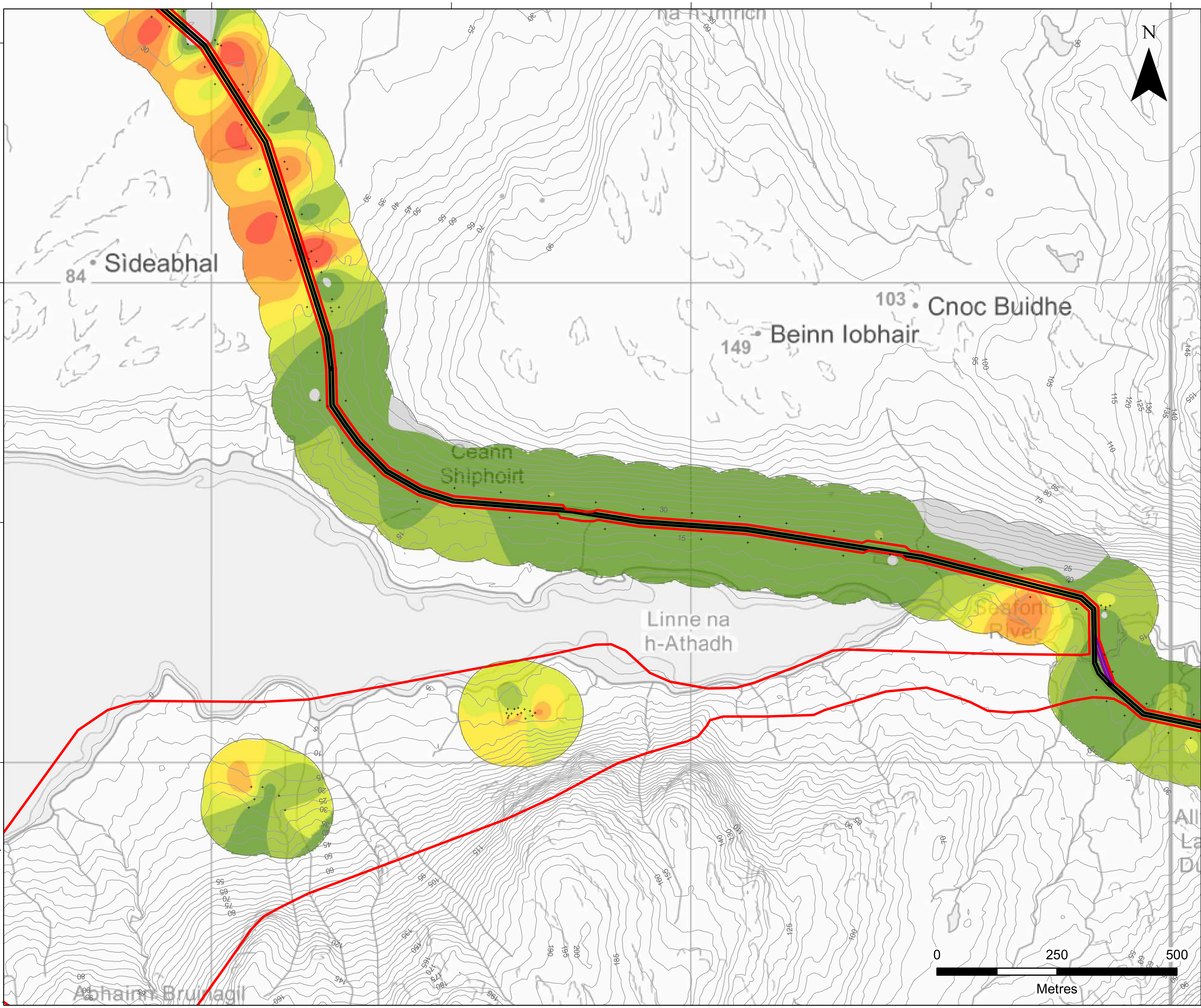
PEAT DEPTH (M)

SEI FIGURE 10.2.3b

Scale 1:7,500 @ A3

Date JUNE 2024

406.000004.00001.0228.1 Peat Depth DDP



LEGEND

Application Boundary

Proposed Temporary Bridge Alignment

Existing Road (To Be Upgraded)

Peat Probe Location

Peat Depth (m)

0

0 - 0.5

0.5 - 1

1 - 1.5

1.5 - 2

2 - 2.5

2.5 - 3

> 3

Eurowind Energy

SLR

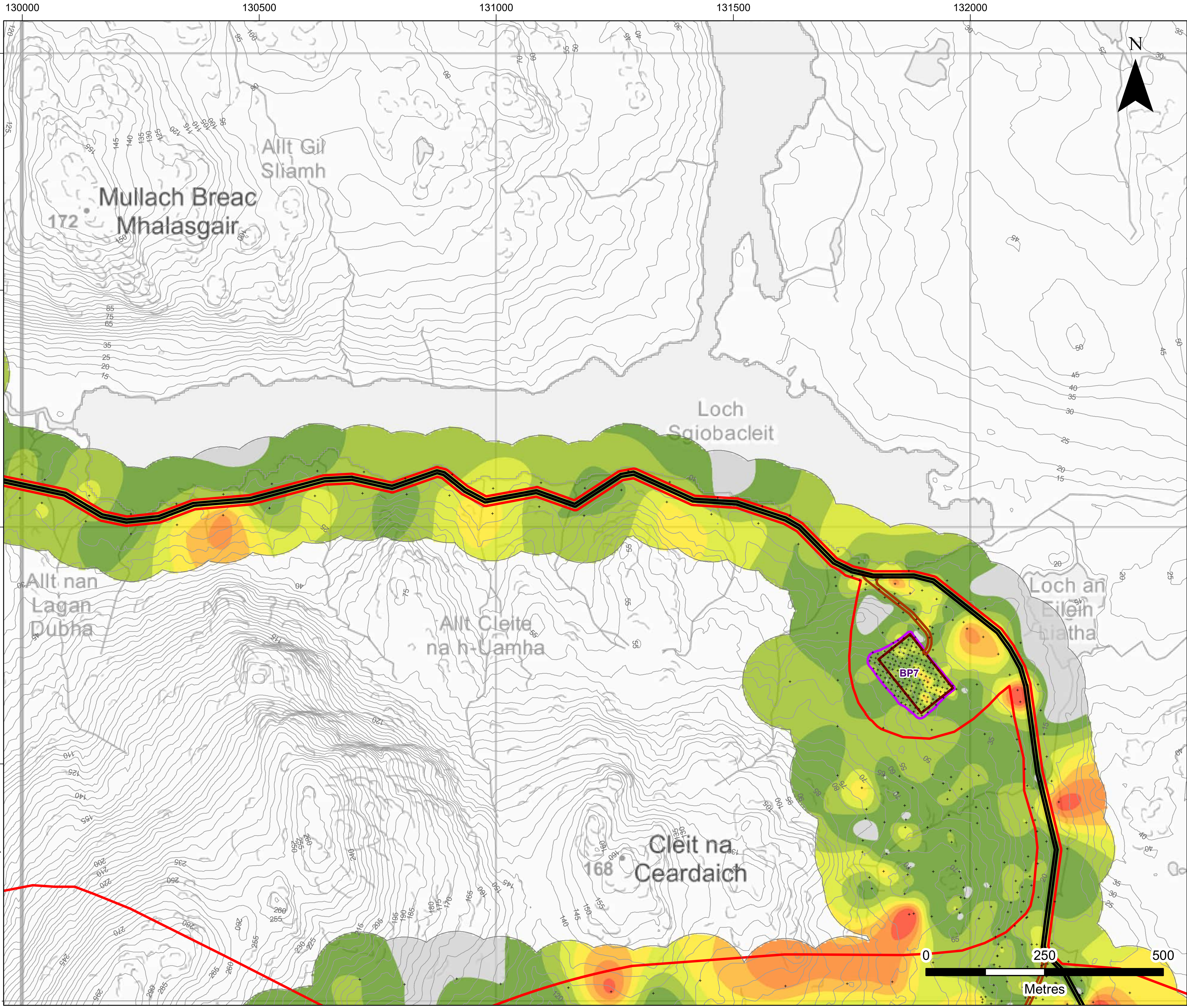
UISENIS WIND FARM - SEI

PMP

PEAT DEPTH (M)

SEI FIGURE 10.2.3c

Scale	Date
1:7,500 @ A3	JUNE 2024



LEGEND

- Application Boundary
- Proposed Permanent Substation
- Potential Borrow Pit
- Proposed Access Track / Turning Head
- Existing Road (To Be Upgraded)
- Peat Probe Location

Peat Depth (m)

- 0
- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- > 3

Eurowind Energy

SLR

UISENIS WIND FARM - SEI

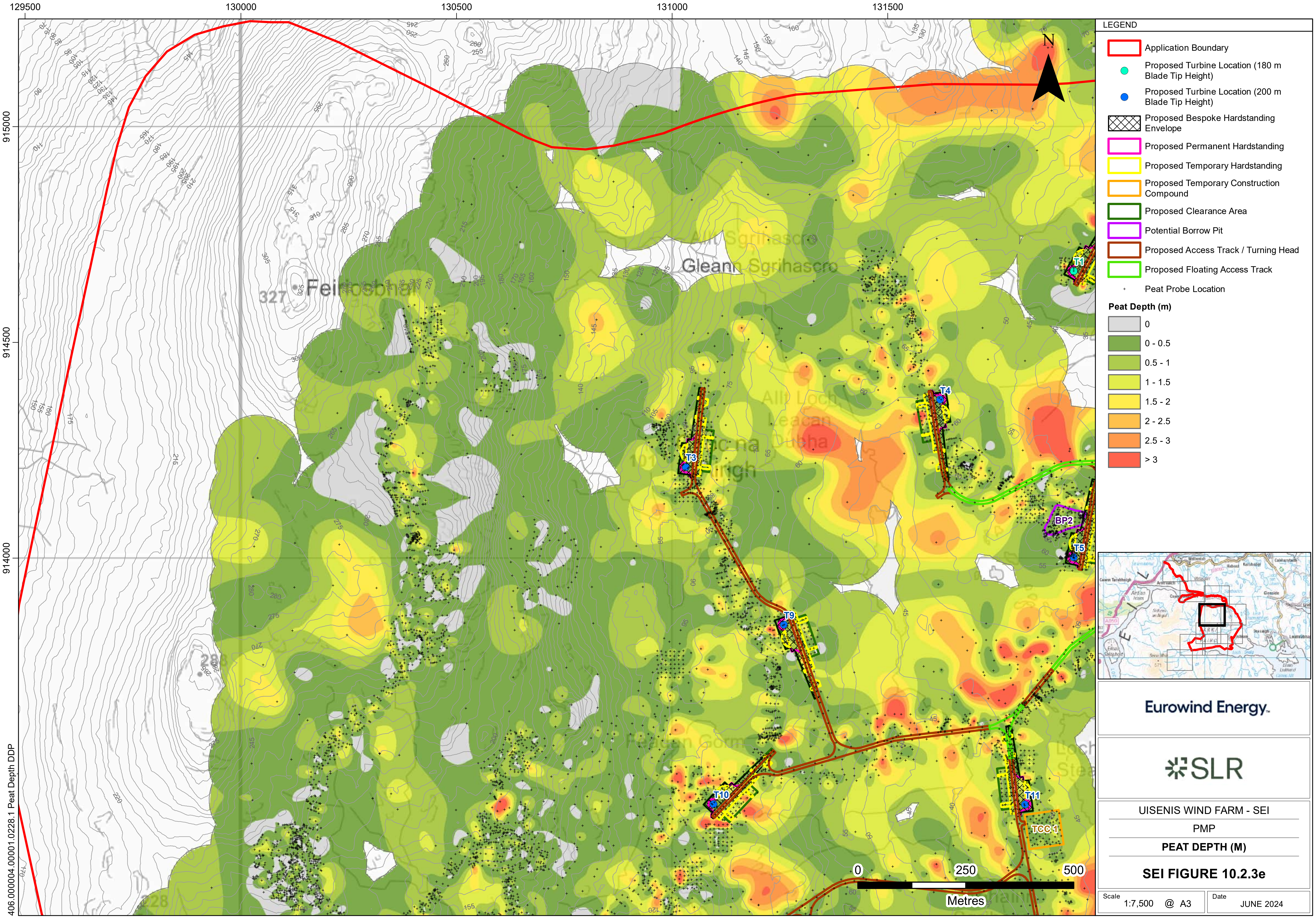
PMP

PEAT DEPTH (M)

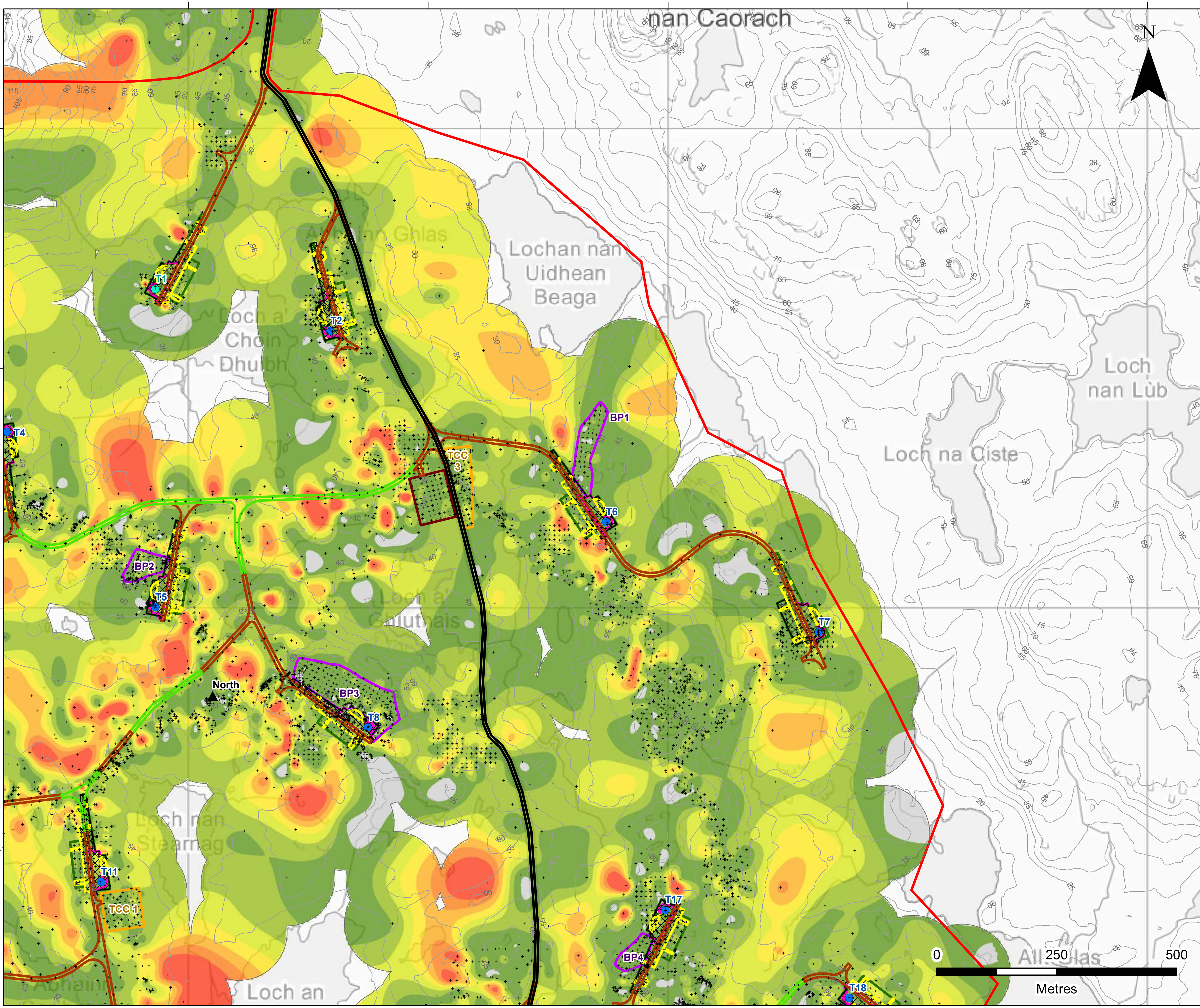
SEI FIGURE 10.2.3d

Scale 1:7,500 @ A3

Date JUNE 2024



LEGEND
Application Boundary
Proposed Turbine Location (180 m Blade Tip Height)
Proposed Turbine Location (200 m Blade Tip Height)
Proposed Bespoke Hardstanding Envelope
Proposed Permanent Hardstanding
Proposed Temporary Hardstanding
Proposed Temporary Construction Compound
Proposed Clearance Area
Potential Borrow Pit
Proposed Access Track / Turning Head
Proposed Floating Access Track
Peat Probe Location
Peat Depth (m)
0
0 - 0.5
0.5 - 1
1 - 1.5
1.5 - 2
2 - 2.5
2.5 - 3
> 3
Eurowind Energy
SLR
UISENIS WIND FARM - SEI
PMP
PEAT DEPTH (M)
SEI FIGURE 10.2.3e
Scale 1:7,500 @ A3
Date JUNE 2024
0 250 500
Metres
N
T1
T3
T4
T5
T9
T10
T11
BP2
TCC 1
Gleann Sgrìhascro
129500
130000
130500
131000
131500
915000
914500
914000
406.000004.00001.0228.1 Peat Depth DDP



LEGEND

- Application Boundary
- Proposed Turbine Location (180 m Blade Tip Height)
- Proposed Turbine Location (200 m Blade Tip Height)
- Proposed Permanent Met Mast
- Proposed Bespoke Hardstanding Envelope
- Proposed Permanent Substation
- Proposed Permanent Hardstanding
- Proposed Temporary Hardstanding
- Proposed Temporary Construction Compound
- Proposed Clearance Area
- Potential Borrow Pit
- Proposed Access Track / Turning Head
- Proposed Floating Access Track
- Existing Road (To Be Upgraded)
- Peat Probe Location

Peat Depth (m)

- 0
- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- > 3

Eurowind Energy

SLR

UISENIS WIND FARM - SEI

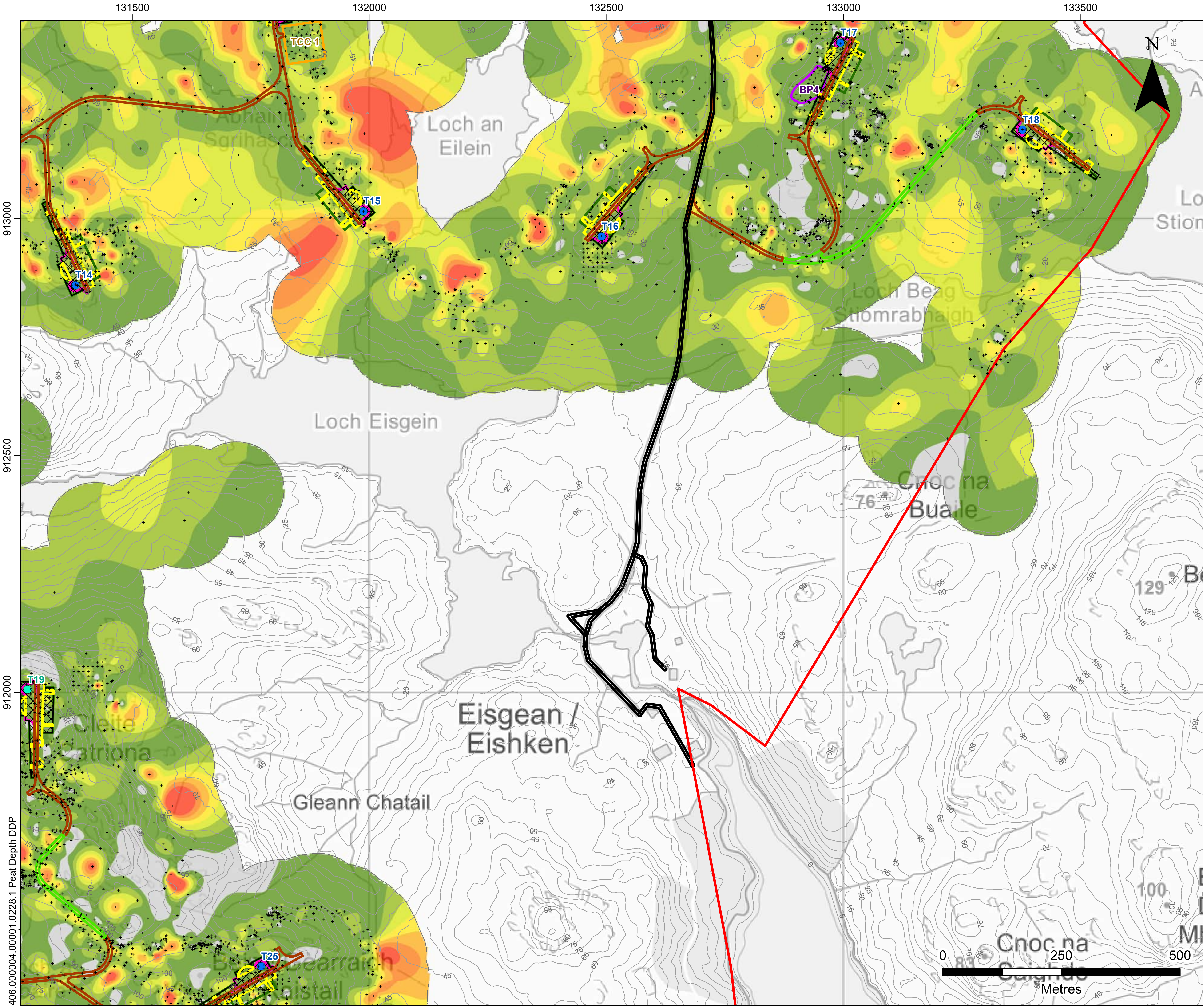
PMP

PEAT DEPTH (M)

SEI FIGURE 10.2.3f

Scale 1:7,500 @ A3

Date JUNE 2024



406.00004.00001.0228.1 Peat Depth DDP

LEGEND

- Application Boundary
- Proposed Turbine Location (180 m Blade Tip Height)
- Proposed Turbine Location (200 m Blade Tip Height)
- Proposed Bespoke Hardstanding Envelope
- Proposed Permanent Hardstanding
- Proposed Temporary Hardstanding
- Proposed Temporary Construction Compound
- Proposed Clearance Area
- Potential Borrow Pit
- Proposed Access Track / Turning Head
- Proposed Floating Access Track
- Existing Road (To Be Upgraded)
- Peat Probe Location

Peat Depth (m)

- 0
- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- > 3

Eurowind Energy

SLR

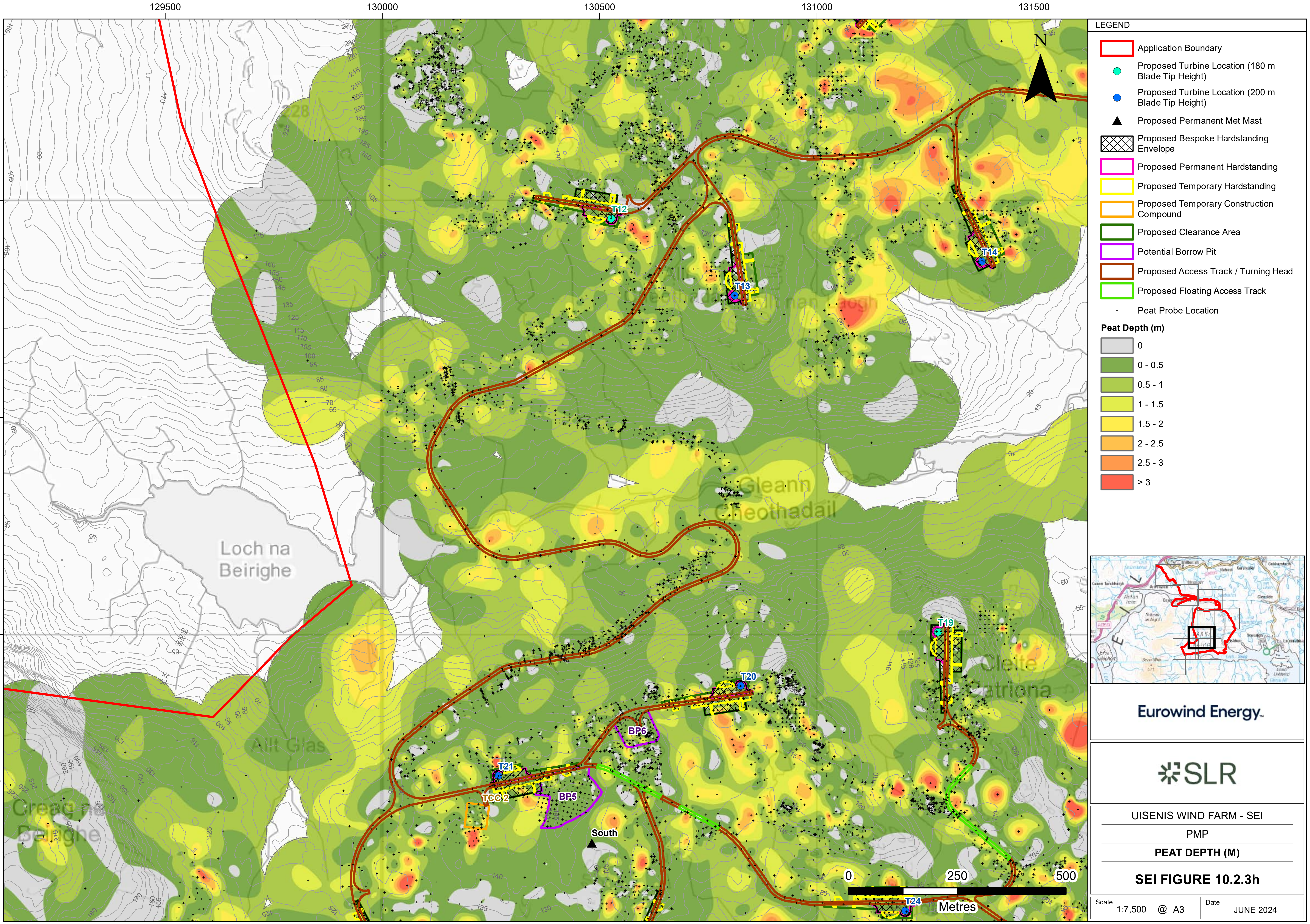
UISENIS WIND FARM - SEI

PMP

PEAT DEPTH (M)

SEI FIGURE 10.2.3g

Scale	Date
1:7,500 @ A3	JUNE 2024



Eurowind Energy

SLR

UISENIS WIND FARM - SEI

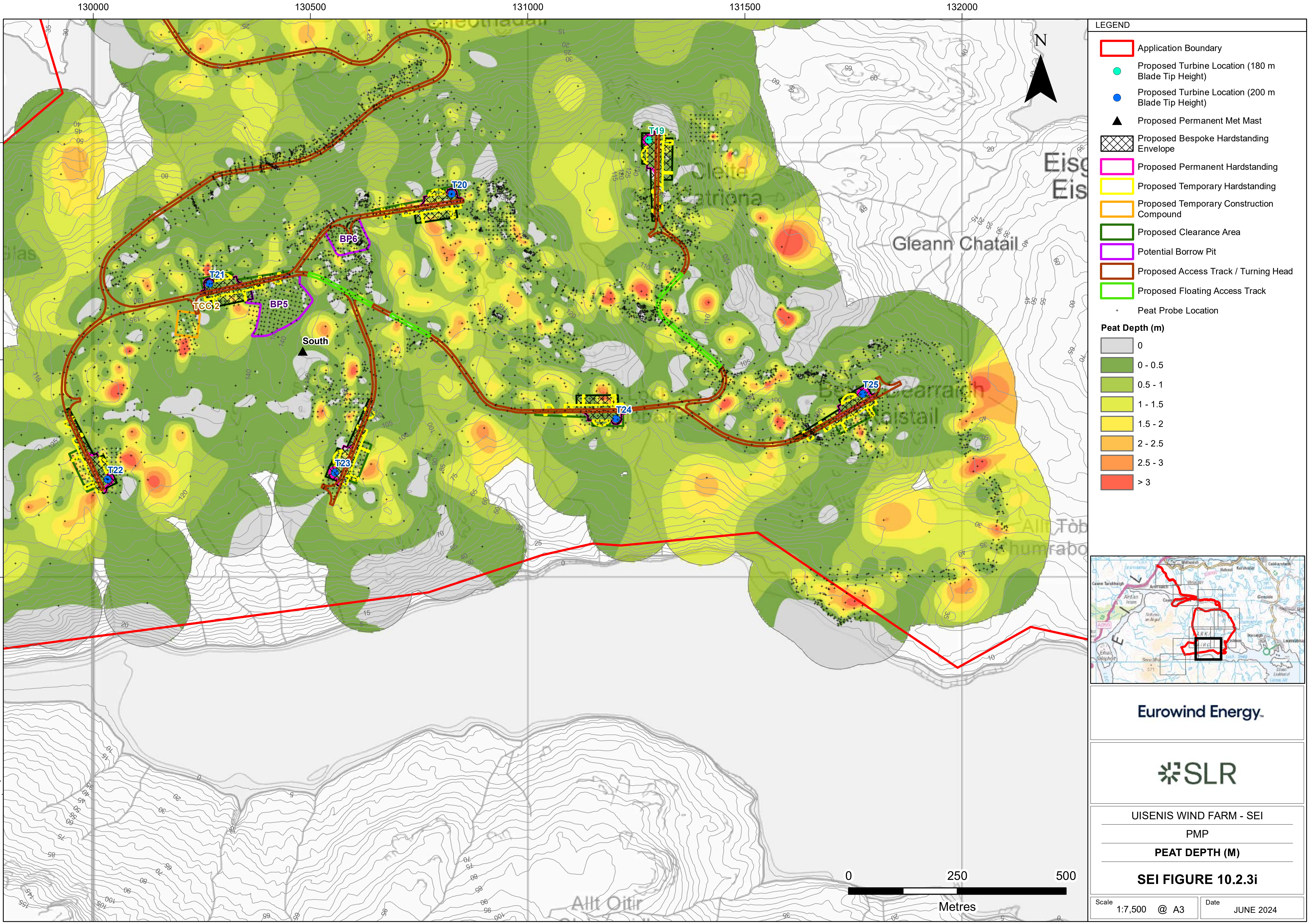
PMP

PEAT DEPTH (M)

SEI FIGURE 10.2.3h

Scale 1:7,500 @ A3

Date JUNE 2024



Eurowind Energy

SLR

UISENIS WIND FARM - SEI

PMP

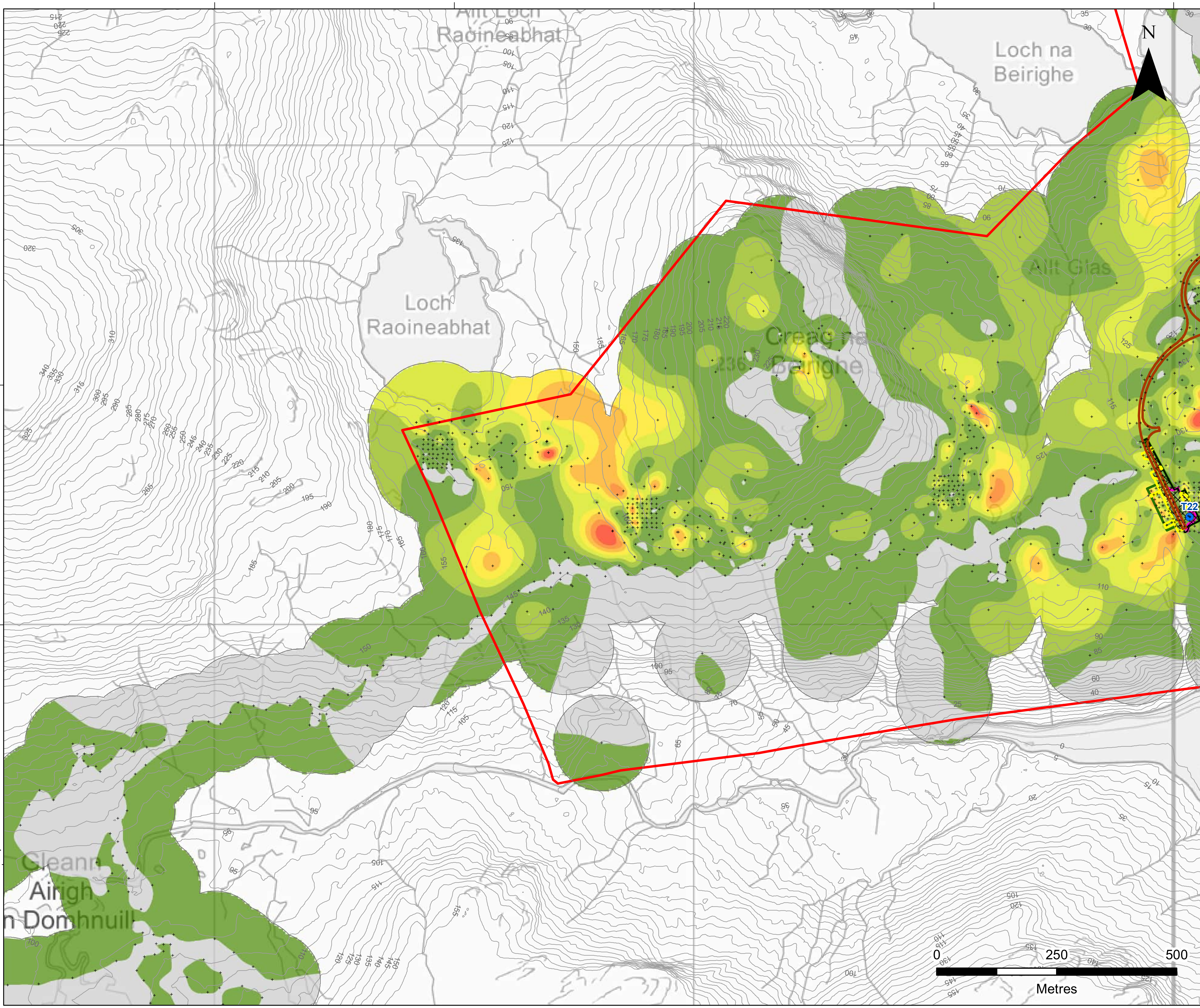
PEAT DEPTH (M)

SEI FIGURE 10.2.3i

Scale 1:7,500 @ A3

Date JUNE 2024

406.00004.00001.0228.1 Peat Depth DDP

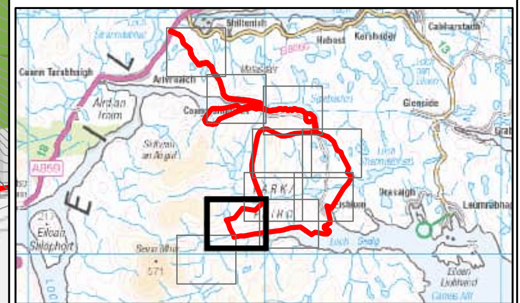


LEGEND

- Application Boundary
- Proposed Turbine Location (200 m Blade Tip Height)
- Proposed Bespoke Hardstanding Envelope
- Proposed Permanent Hardstanding
- Proposed Temporary Hardstanding
- Proposed Clearance Area
- Proposed Access Track / Turning Head
- Peat Probe Location

Peat Depth (m)

- 0
- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- > 3



Eurowind Energy

SLR

UISENIS WIND FARM - SEI

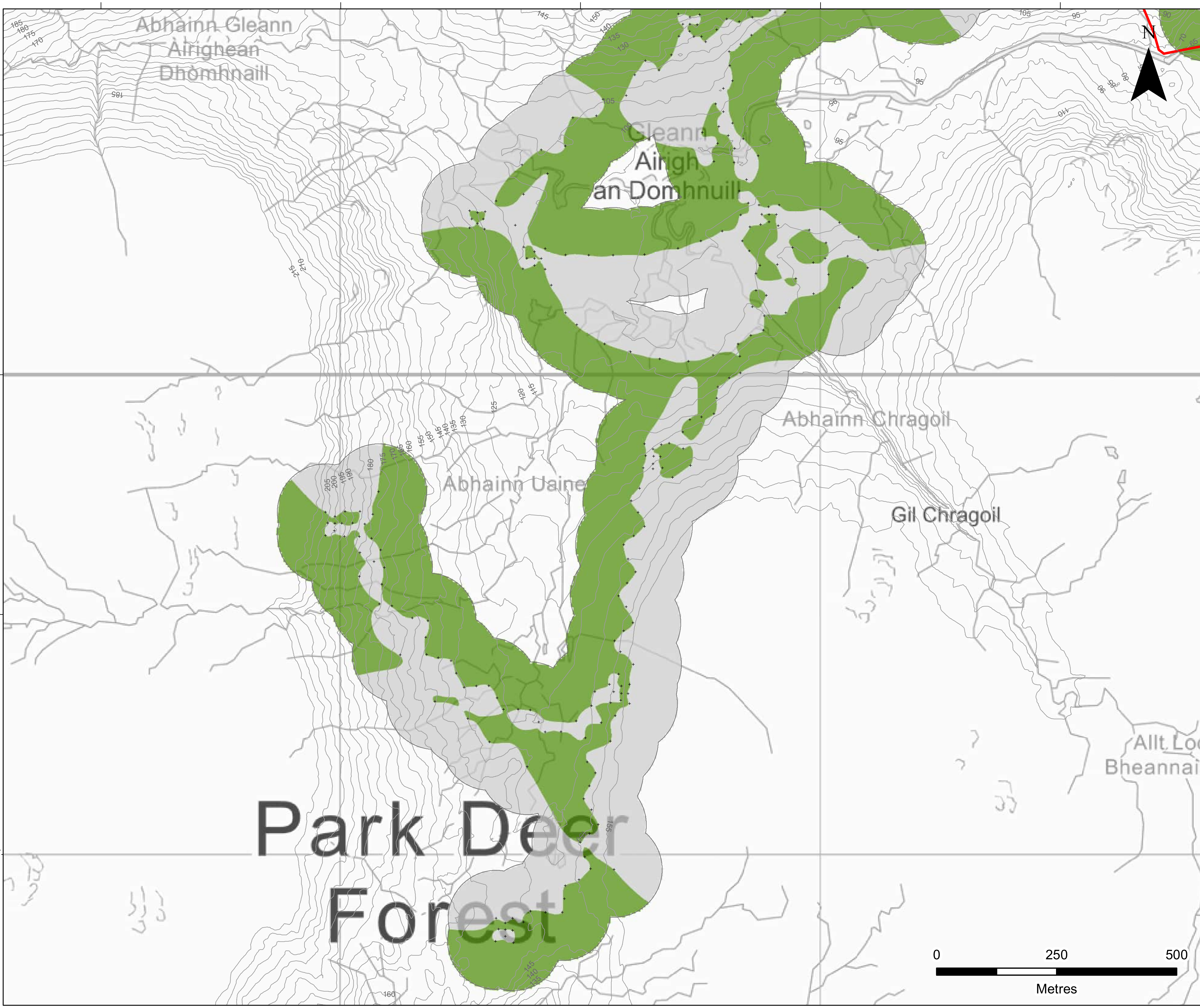
PMP

PEAT DEPTH (M)

SEI FIGURE 10.2.3j

Scale	Date
1:7,500 @ A3	JUNE 2024

406.00004.00001.0228.1 Peat Depth DDP



LEGEND

Application Boundary

Peat Probe Location

Peat Depth (m)

0

0 - 0.5

Eurowind Energy

SLR

UISENIS WIND FARM - SEI

PMP

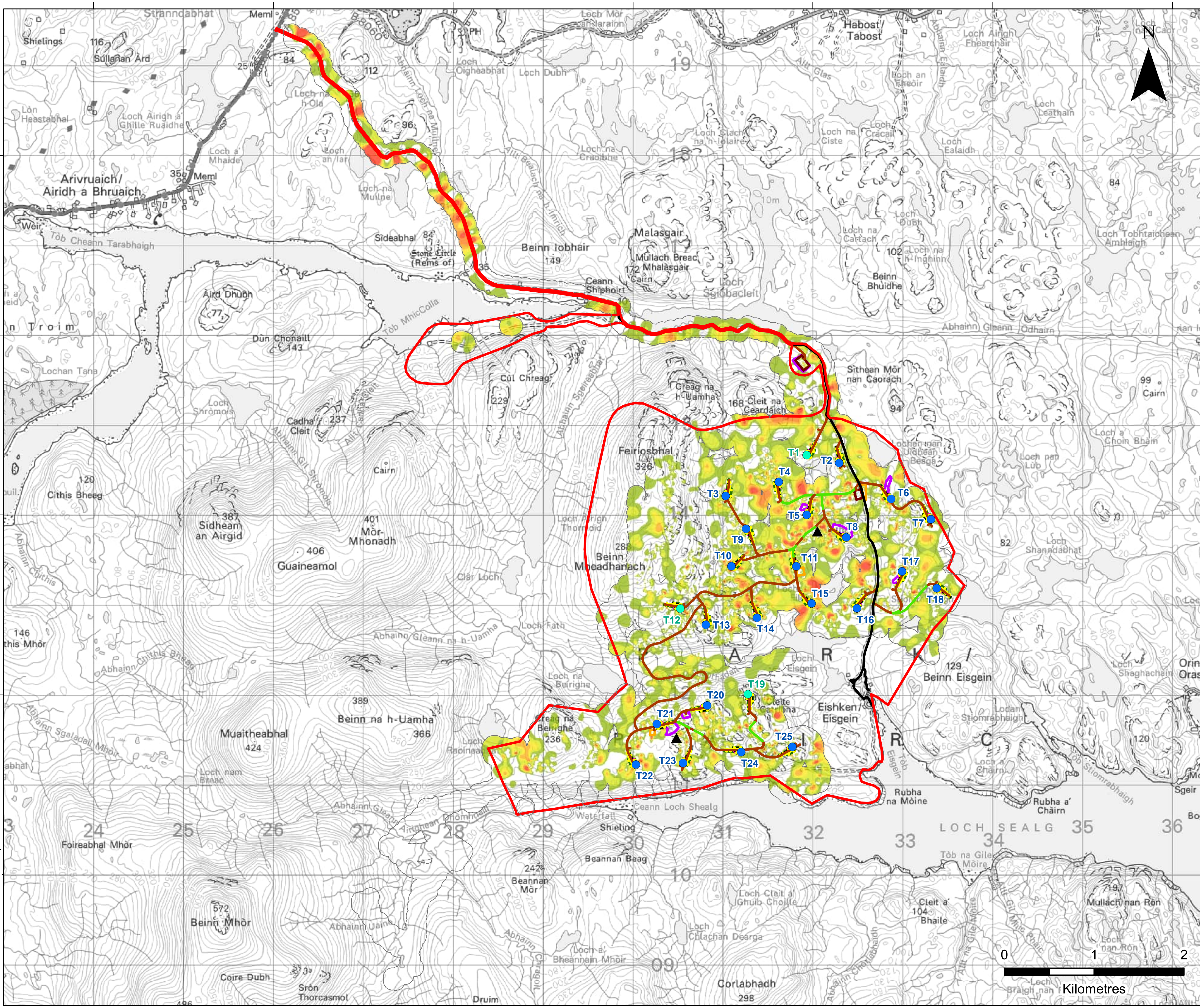
PEAT DEPTH (M)

SEI FIGURE 10.2.3k

Scale 1:7,500 @ A3

Date JUNE 2024

406.000004.00001.0228.1 Peat Depth DDP

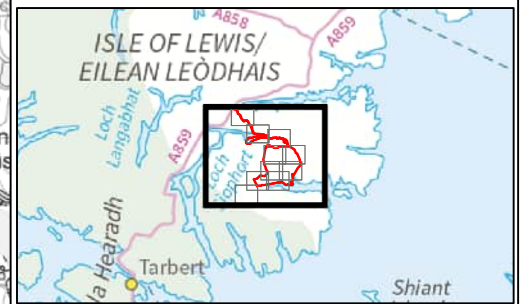


LEGEND

- Application Boundary
- Proposed Turbine Location (180 m Blade Tip Height)
- Proposed Turbine Location (200 m Blade Tip Height)
- Proposed Permanent Met Mast
- Proposed Bespoke Hardstanding Envelope
- Proposed Permanent Substation
- Proposed Permanent Hardstanding
- Proposed Temporary Hardstanding
- Proposed Temporary Bridge Alignment
- Proposed Temporary Construction Compound
- Proposed Clearance Area
- Potential Borrow Pit
- Proposed Access Track / Turning Head
- Proposed Floating Access Track
- Existing Road (To Be Upgraded)

Peat Depth (m)

- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- > 3



Eurowind Energy

SLR

UISENIS WIND FARM - SEI

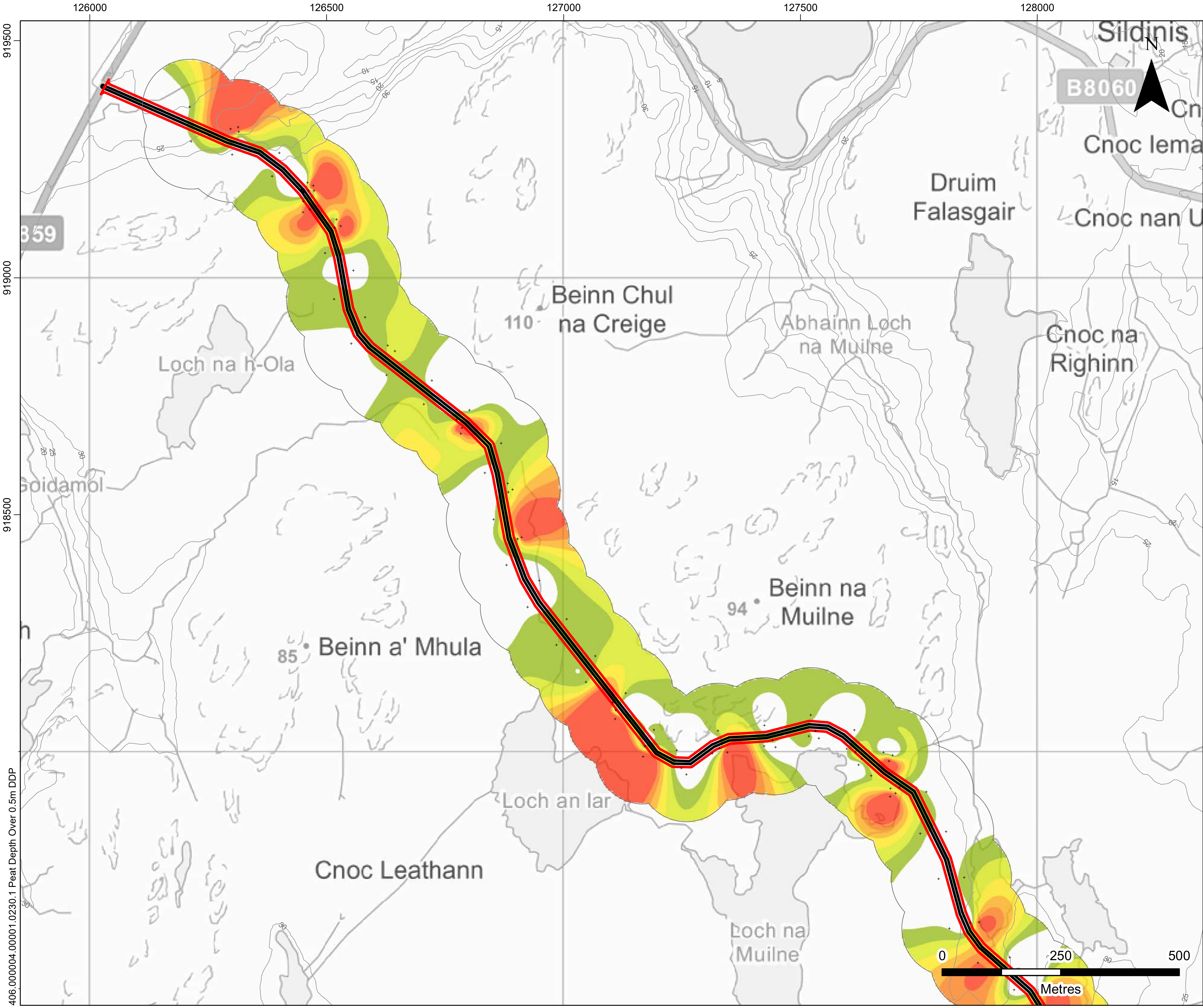
PMP

PEAT DEPTH > 0.5M

SEI FIGURE 10.2.4a

Scale 1:40,000 @ A3

Date JUNE 2024



LEGEND

- Application Boundary
- Existing Road (To Be Upgraded)
- Peat Probe Location

Peat Depth (m)

- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- > 3

Eurowind Energy

SLR

UISENIS WIND FARM - SEI

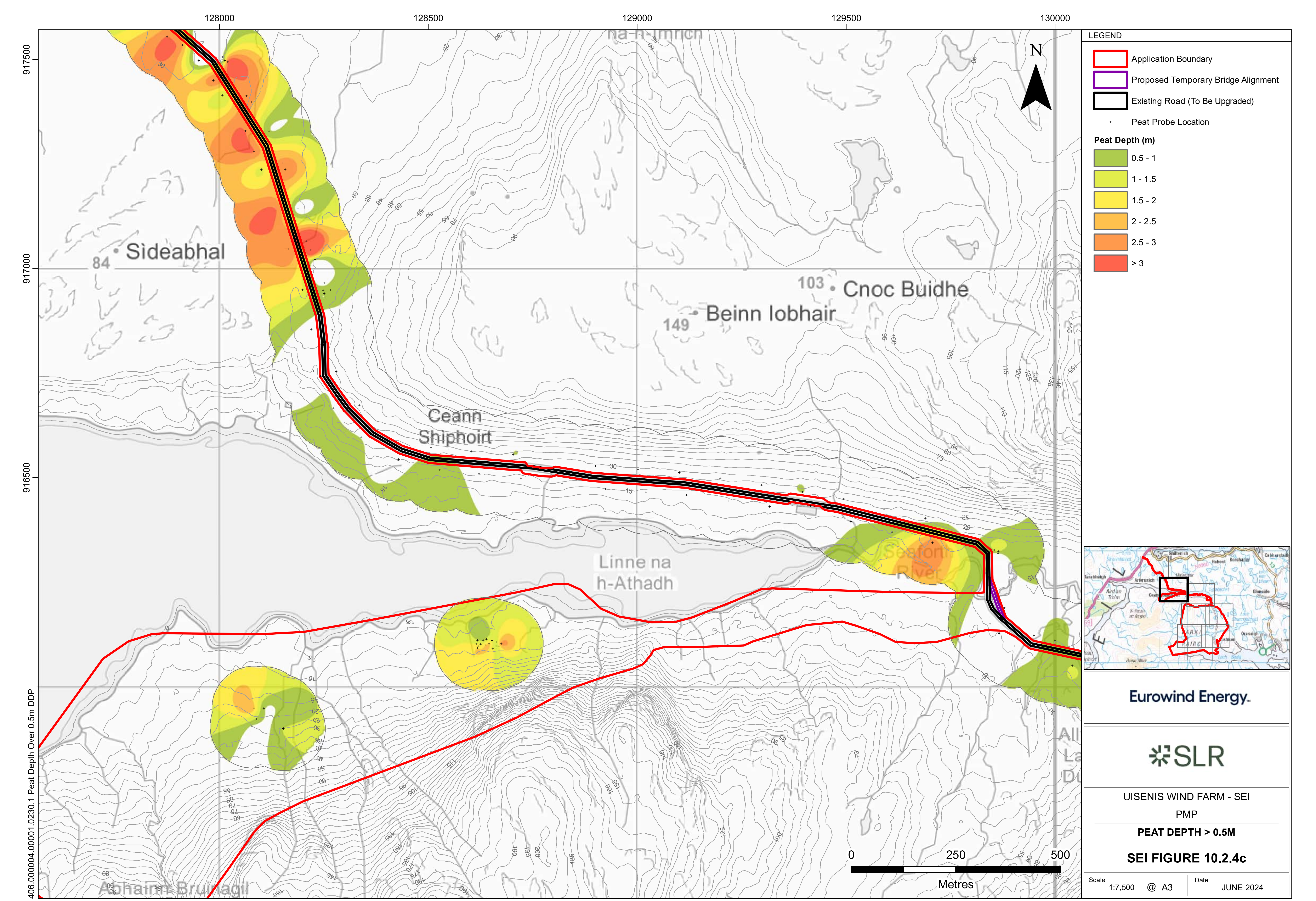
PMP

PEAT DEPTH > 0.5M

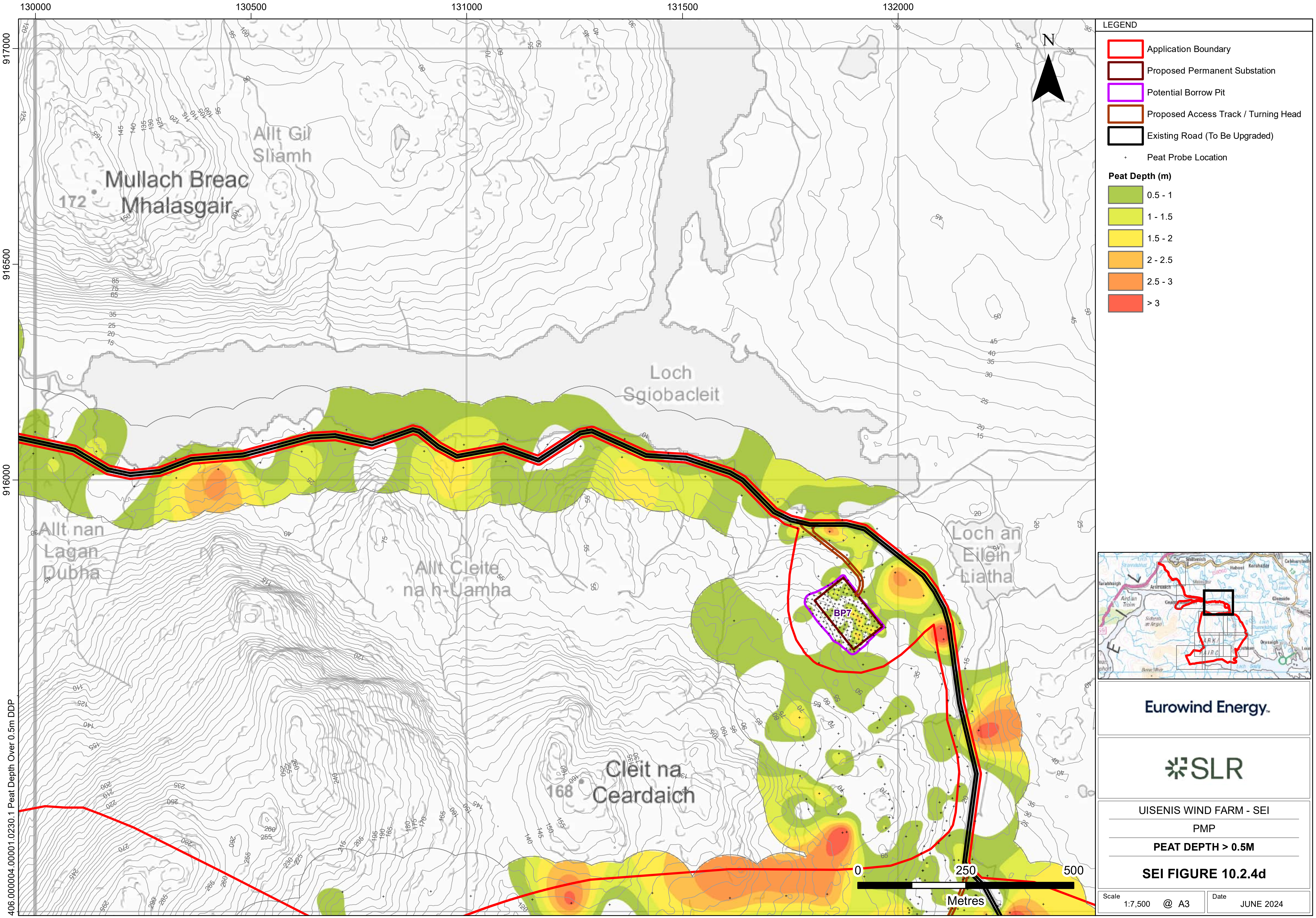
SEI FIGURE 10.2.4b

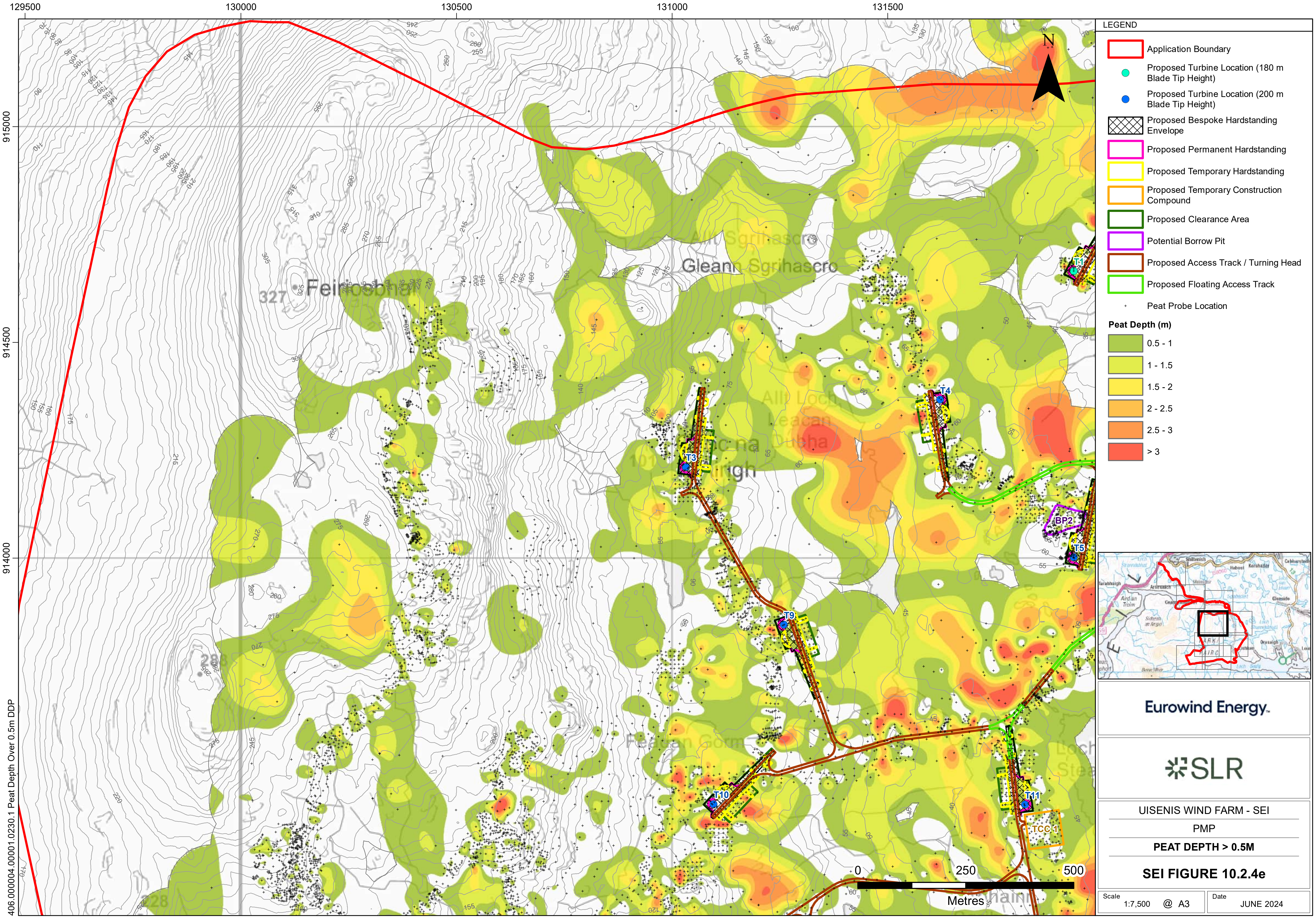
Scale 1:7,500 @ A3

Date JUNE 2024

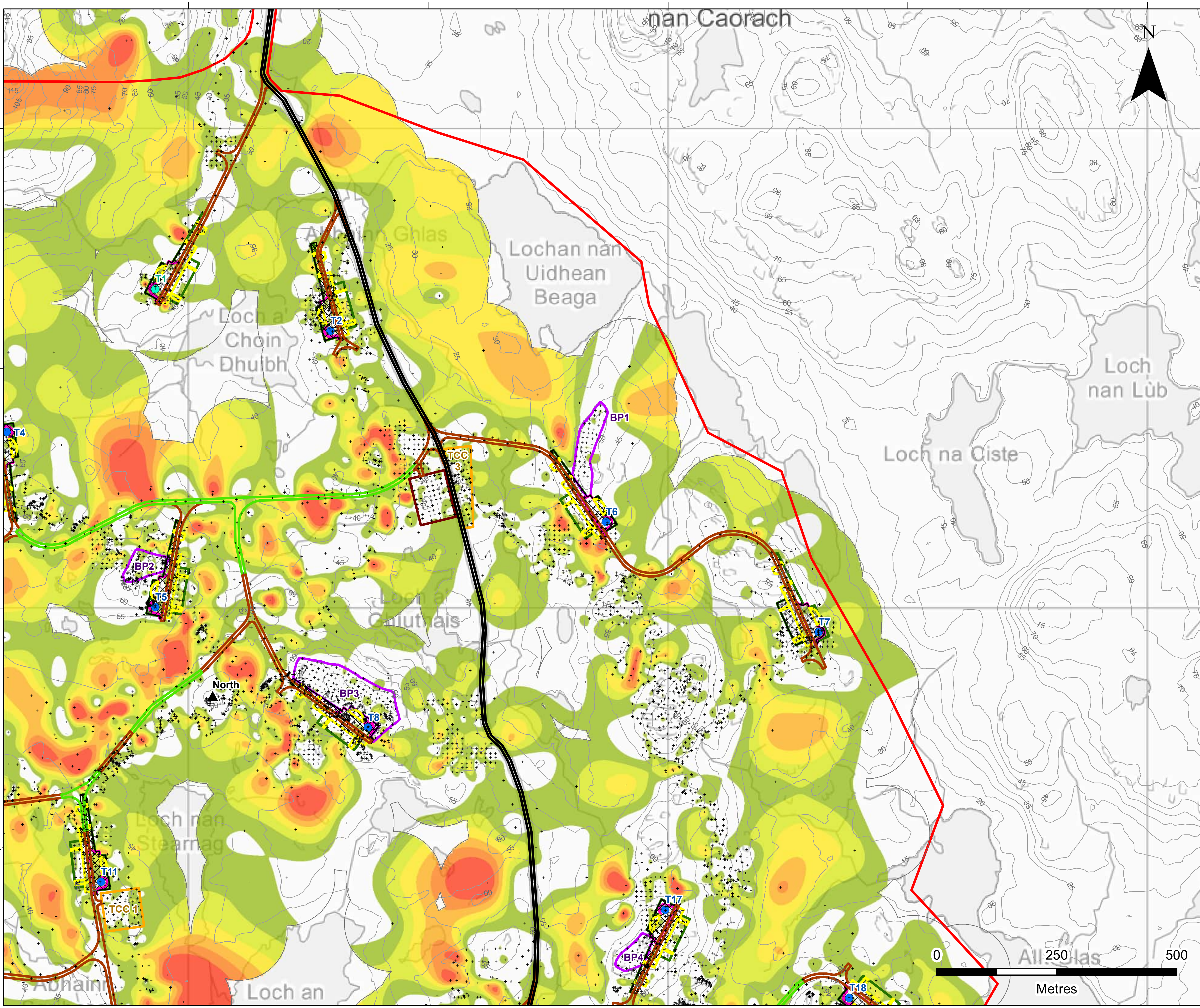


LEGEND
Application Boundary
Proposed Temporary Bridge Alignment
Existing Road (To Be Upgraded)
Peat Probe Location
Peat Depth (m)
0.5 - 1
1 - 1.5
1.5 - 2
2 - 2.5
2.5 - 3
> 3
Sideabhal
Cnoc Buidhe
Beinn Iobhair
Ceann Shiphoirt
Linne na h-Athadh
Seaforth River
Abhainn Bruinagil
0
250
500
Metres
Eurowind Energy
SLR
UISENIS WIND FARM - SEI
PMP
PEAT DEPTH > 0.5M
SEI FIGURE 10.2.4c
Scale 1:7,500 @ A3
Date JUNE 2024
406.00004.00001.0230.1 Peat Depth Over 0.5m DDP


130000
130500
131000
131500
132000
917000
916500
916000
Mullach Breac Mhalasgair
172
Allt Gil Sliamh
Loch Sgiobacleit
Allt nan Lagan Dubha
Allt Cleite na h-Uamha
Cleit na Ceardaich
168
Loch an Eilein Liatha
BP7
N
0
250
500
Metres
LEGEND
Application Boundary
Proposed Permanent Substation
Potential Borrow Pit
Proposed Access Track / Turning Head
Existing Road (To Be Upgraded)
Peat Probe Location
Peat Depth (m)
0.5 - 1
1 - 1.5
1.5 - 2
2 - 2.5
2.5 - 3
> 3
Eurowind Energy
SLR
UISENIS WIND FARM - SEI
PMP
PEAT DEPTH > 0.5M
SEI FIGURE 10.2.4d
Scale 1:7,500 @ A3
Date JUNE 2024
406.000004.00001.0230.1 Peat Depth Over 0.5m DDP



129500
130000
130500
131000
131500
915000
914500
914000
LEGEND
Application Boundary
Proposed Turbine Location (180 m Blade Tip Height)
Proposed Turbine Location (200 m Blade Tip Height)
Proposed Bespoke Hardstanding Envelope
Proposed Permanent Hardstanding
Proposed Temporary Hardstanding
Proposed Temporary Construction Compound
Proposed Clearance Area
Potential Borrow Pit
Proposed Access Track / Turning Head
Proposed Floating Access Track
Peat Probe Location
Peat Depth (m)
0.5 - 1
1 - 1.5
1.5 - 2
2 - 2.5
2.5 - 3
> 3
T1
T3
T4
T5
T9
T10
T11
BP2
TCC 1
Gleann Sgrihascro
Feirgobhal
0
250
500
Metres
Eurowind Energy
SLR
UISENIS WIND FARM - SEI
PMP
PEAT DEPTH > 0.5M
SEI FIGURE 10.2.4e
Scale 1:7,500 @ A3
Date JUNE 2024
406.00004.00001.0230.1 Peat Depth Over 0.5m DDP

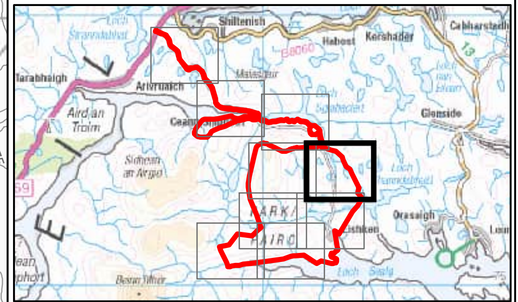


LEGEND

- Application Boundary
- Proposed Turbine Location (180 m Blade Tip Height)
- Proposed Turbine Location (200 m Blade Tip Height)
- Proposed Permanent Met Mast
- Proposed Bespoke Hardstanding Envelope
- Proposed Permanent Substation
- Proposed Permanent Hardstanding
- Proposed Temporary Hardstanding
- Proposed Temporary Construction Compound
- Proposed Clearance Area
- Potential Borrow Pit
- Proposed Access Track / Turning Head
- Proposed Floating Access Track
- Existing Road (To Be Upgraded)
- Peat Probe Location

Peat Depth (m)

- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- > 3



Eurowind Energy

SLR

UISENIS WIND FARM - SEI

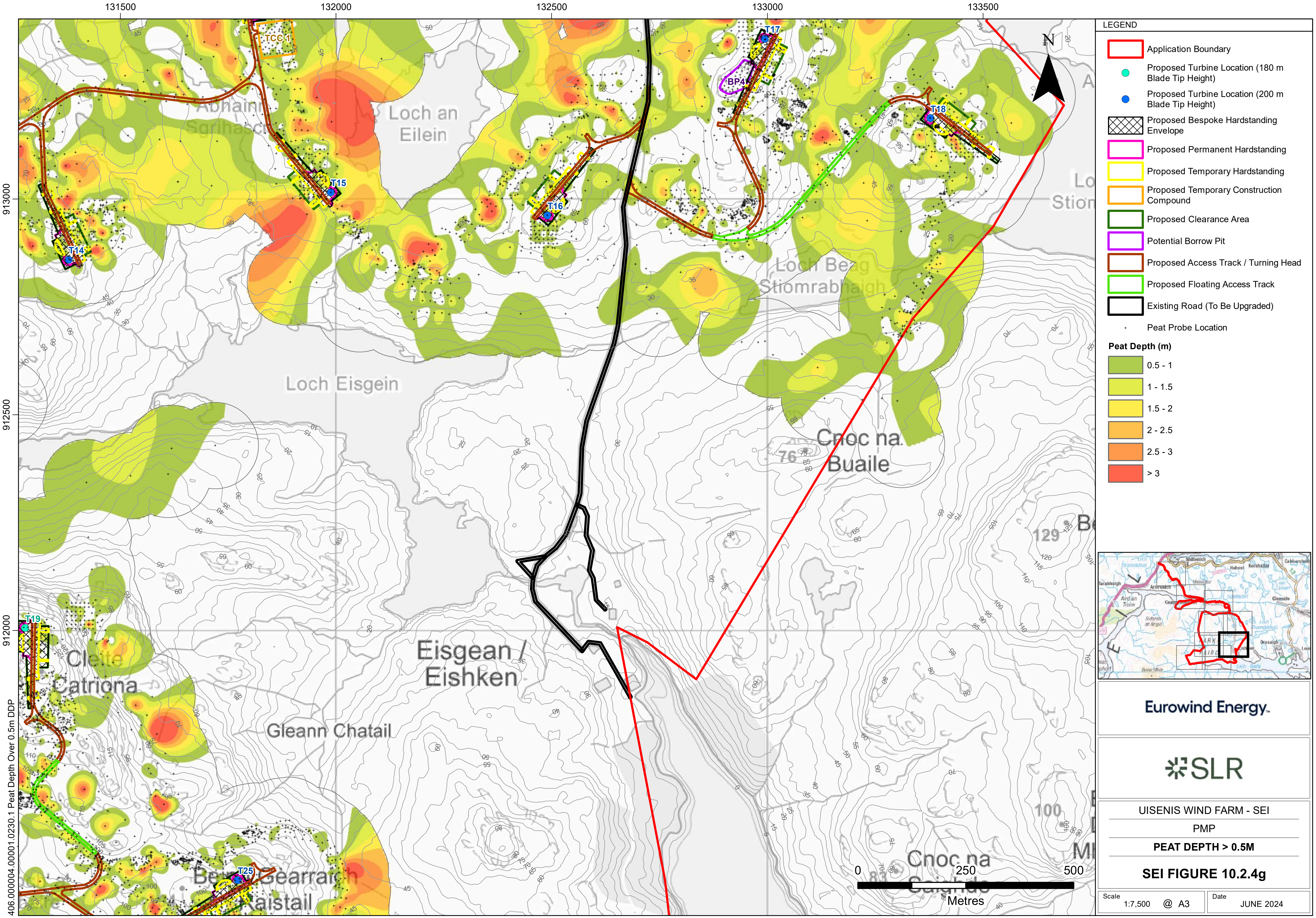
PMP

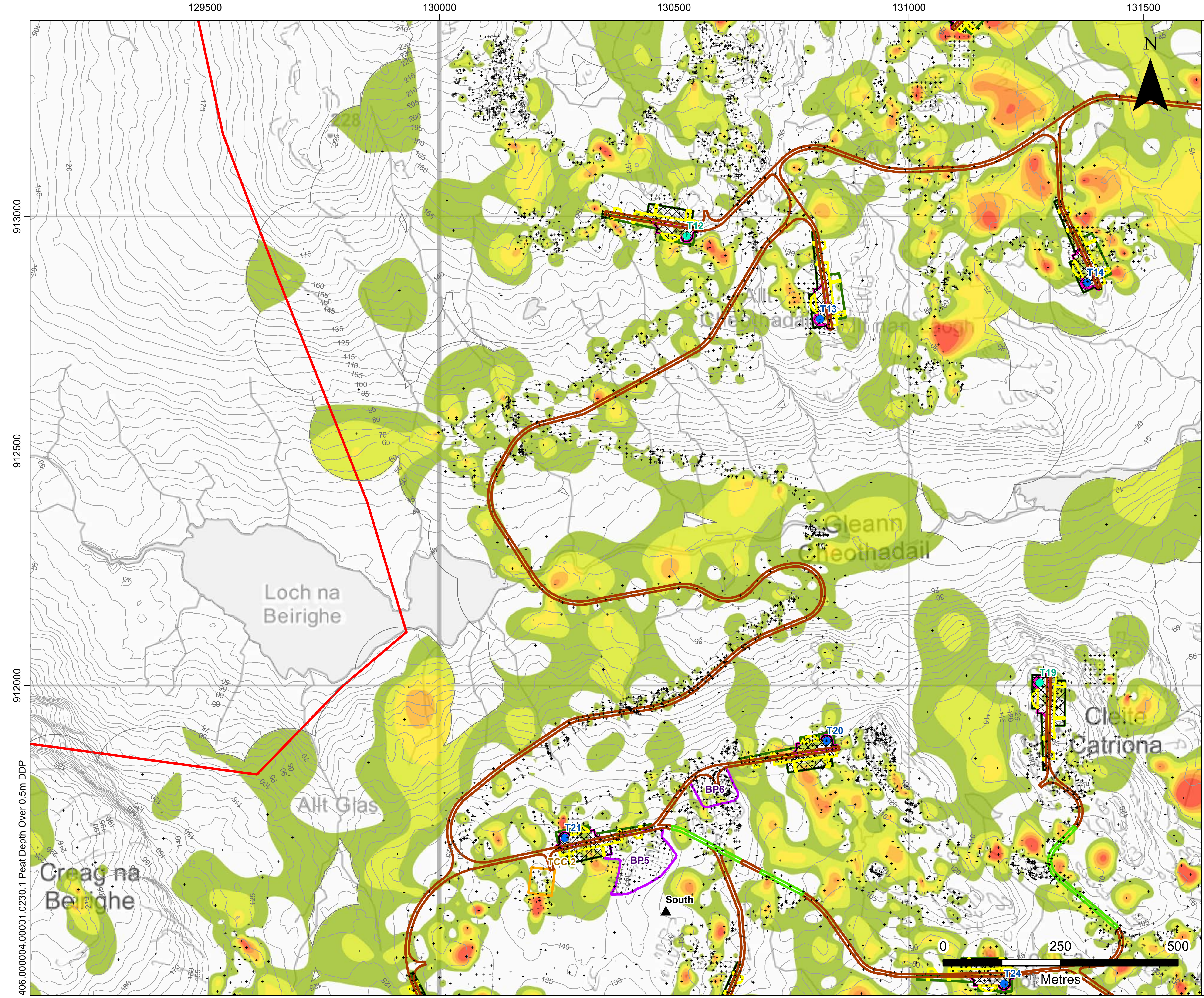
PEAT DEPTH > 0.5M

SEI FIGURE 10.2.4f

Scale	Date
1:7,500 @ A3	JUNE 2024

406.00004.00001.0230.1 Peat Depth Over 0.5m DDP


LEGEND
Application Boundary
Proposed Turbine Location (180 m Blade Tip Height)
Proposed Turbine Location (200 m Blade Tip Height)
Proposed Bespoke Hardstanding Envelope
Proposed Permanent Hardstanding
Proposed Temporary Hardstanding
Proposed Temporary Construction Compound
Proposed Clearance Area
Potential Borrow Pit
Proposed Access Track / Turning Head
Proposed Floating Access Track
Existing Road (To Be Upgraded)
Peat Probe Location
Peat Depth (m)
0.5 - 1
1 - 1.5
1.5 - 2
2 - 2.5
2.5 - 3
> 3
Loch an Eilein
Loch Eisgein
Loch Beag Stiomrabhaigh
Cnoc na Buaile
Eisgean / Eishken
Gleann Chatail
Cleite Catriona
T14
T15
T16
T17
T18
T19
T25
BP4
TCC 1
0 250 500
Metres
Eurowind Energy
SLR
UISENIS WIND FARM - SEI
PMP
PEAT DEPTH > 0.5M
SEI FIGURE 10.2.4g
Scale 1:7,500 @ A3
Date JUNE 2024
406.00004.00001.0230.1 Peat Depth Over 0.5m DDP



Eurowind Energy

SLR

UISENIS WIND FARM - SEI

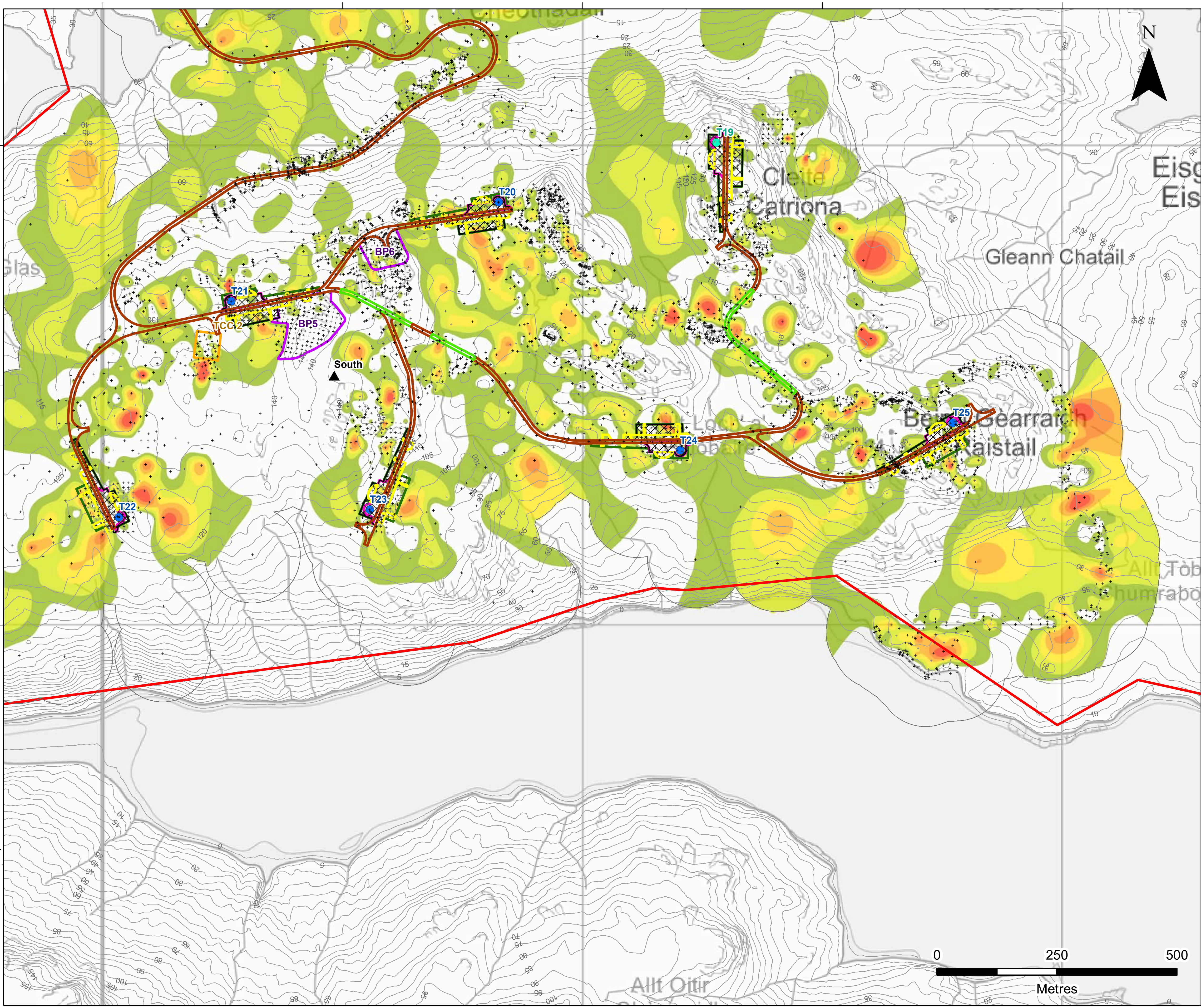
PMP

PEAT DEPTH > 0.5M

SEI FIGURE 10.2.4h

Scale 1:7,500 @ A3

Date JUNE 2024

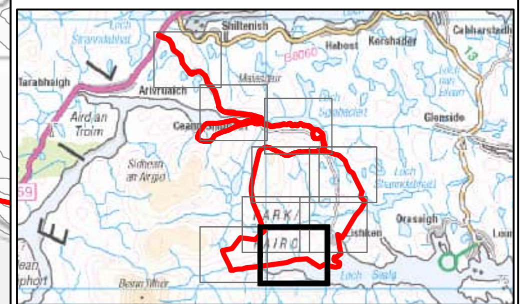


LEGEND

- Application Boundary
- Proposed Turbine Location (180 m Blade Tip Height)
- Proposed Turbine Location (200 m Blade Tip Height)
- Proposed Permanent Met Mast
- Proposed Bespoke Hardstanding Envelope
- Proposed Permanent Hardstanding
- Proposed Temporary Hardstanding
- Proposed Temporary Construction Compound
- Proposed Clearance Area
- Potential Borrow Pit
- Proposed Access Track / Turning Head
- Proposed Floating Access Track
- Peat Probe Location

Peat Depth (m)

- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- > 3



Eurowind Energy

SLR

UISENIS WIND FARM - SEI

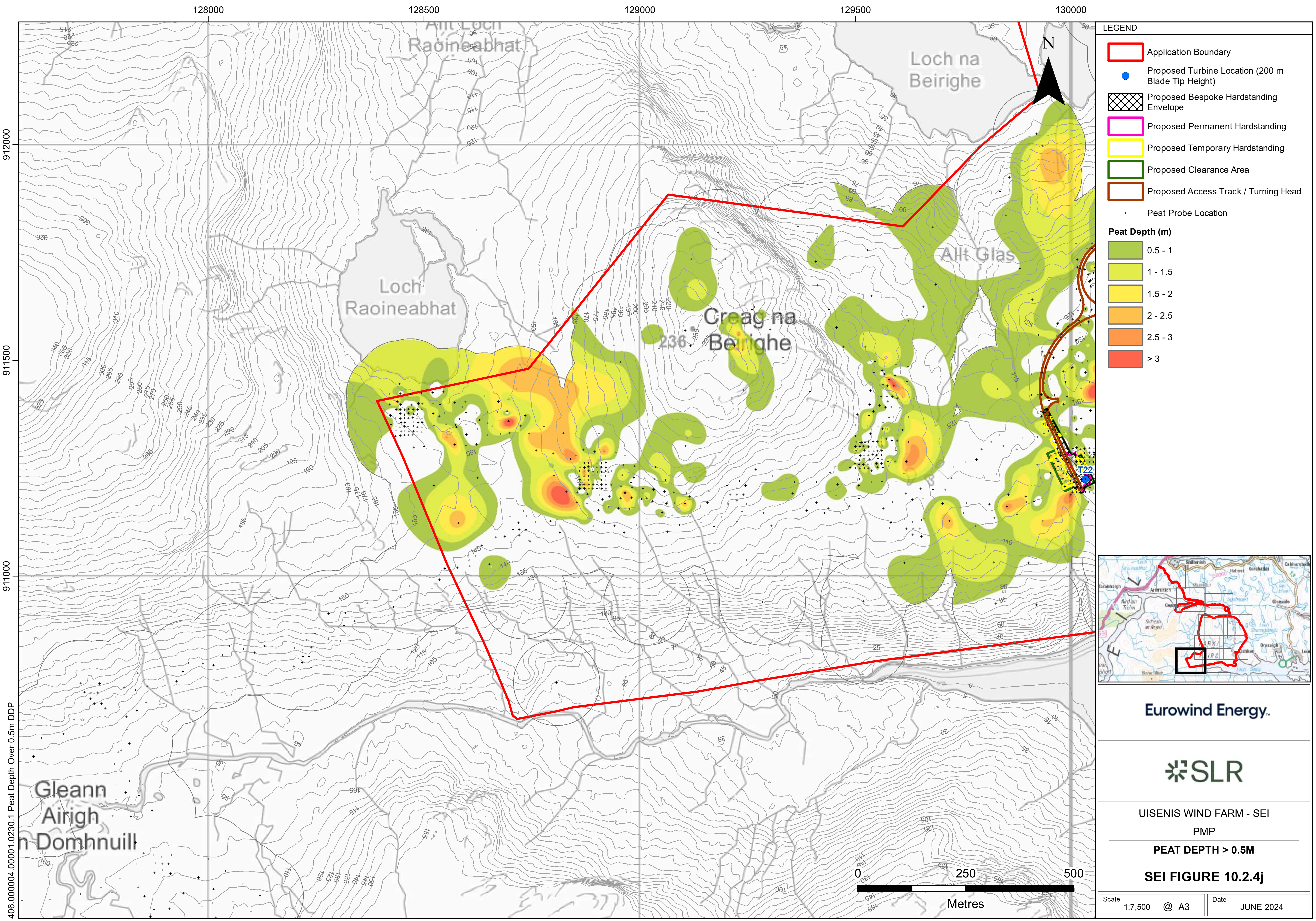
PMP

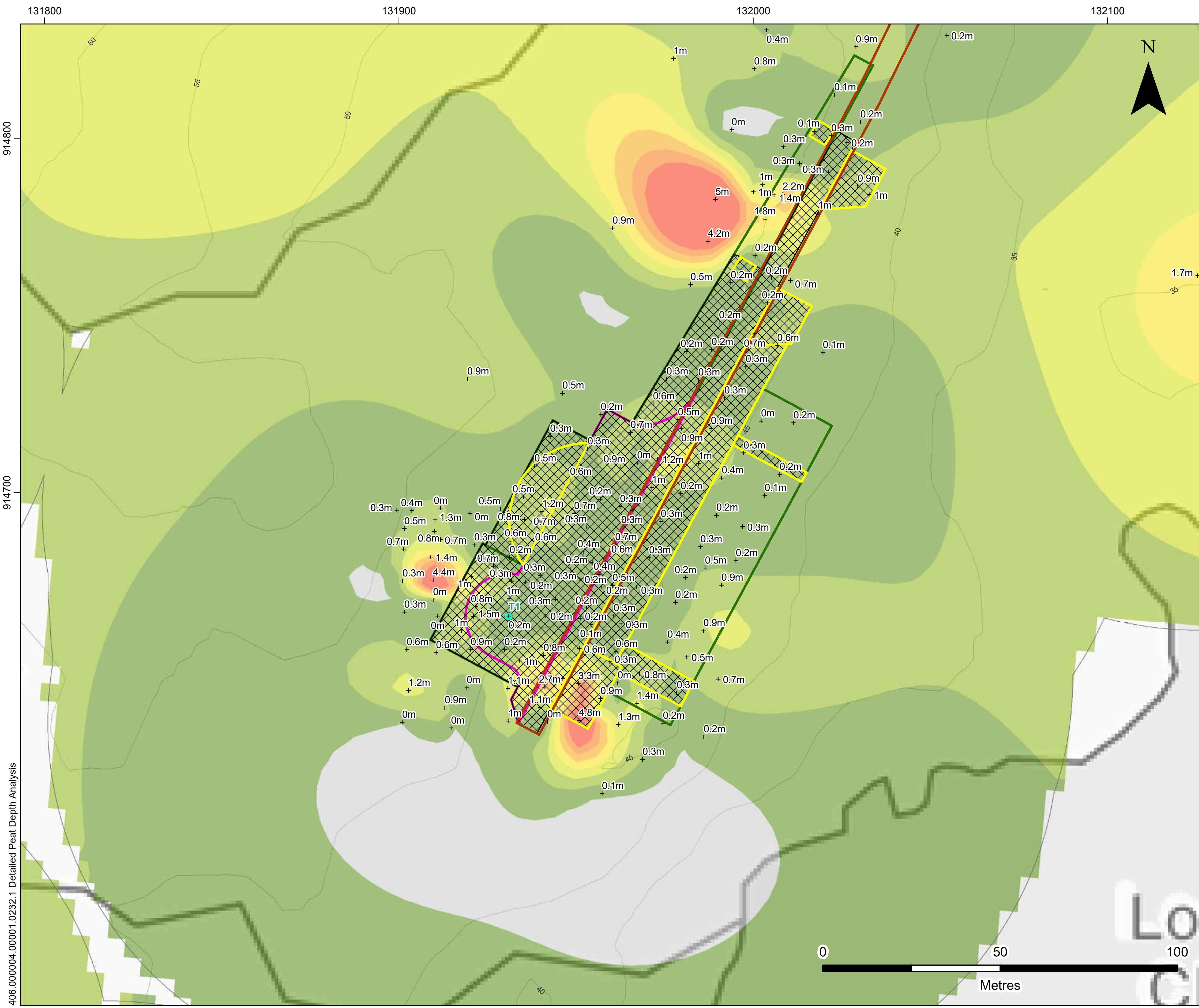
PEAT DEPTH > 0.5M

SEI FIGURE 10.2.4i

Scale	Date
1:7,500 @ A3	JUNE 2024

406.000004.00001.0230.1 Peat Depth Over 0.5m DDP


128000
128500
129000
129500
130000
912000
911500
911000
Allt Loch Raoineabhat
Loch na Beirighe
Loch Raoineabhat
Creag na Beirighe
236
Allt Glas
Gleann Airigh
n Domhnuill
T22
N
LEGEND
Application Boundary
Proposed Turbine Location (200 m Blade Tip Height)
Proposed Bespoke Hardstanding Envelope
Proposed Permanent Hardstanding
Proposed Temporary Hardstanding
Proposed Clearance Area
Proposed Access Track / Turning Head
Peat Probe Location
Peat Depth (m)
0.5 - 1
1 - 1.5
1.5 - 2
2 - 2.5
2.5 - 3
> 3
0
250
500
Metres
Eurowind Energy
SLR
UISENIS WIND FARM - SEI
PMP
PEAT DEPTH > 0.5M
SEI FIGURE 10.2.4j
Scale
1:7,500 @ A3
Date
JUNE 2024
406.00004.00001.0230.1 Peat Depth Over 0.5m DDP

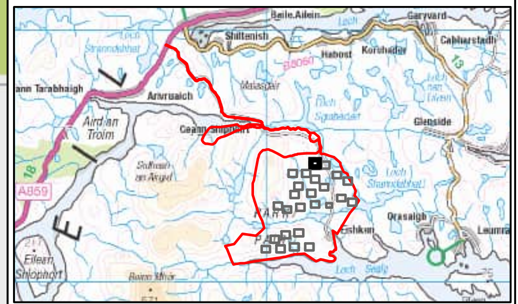


LEGEND

- Application Boundary
- Proposed Turbine Location (180 m Blade Tip Height)
- Proposed Bespoke Hardstanding Envelope
- Proposed Permanent Hardstanding
- Proposed Temporary Hardstanding
- Proposed Clearance Area
- Proposed Access Track / Turning Head
- + Peat Probe Location

Peat Depth (m)

- 0
- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- > 3



Eurowind Energy.

SLR

UISENIS WIND FARM - SEI

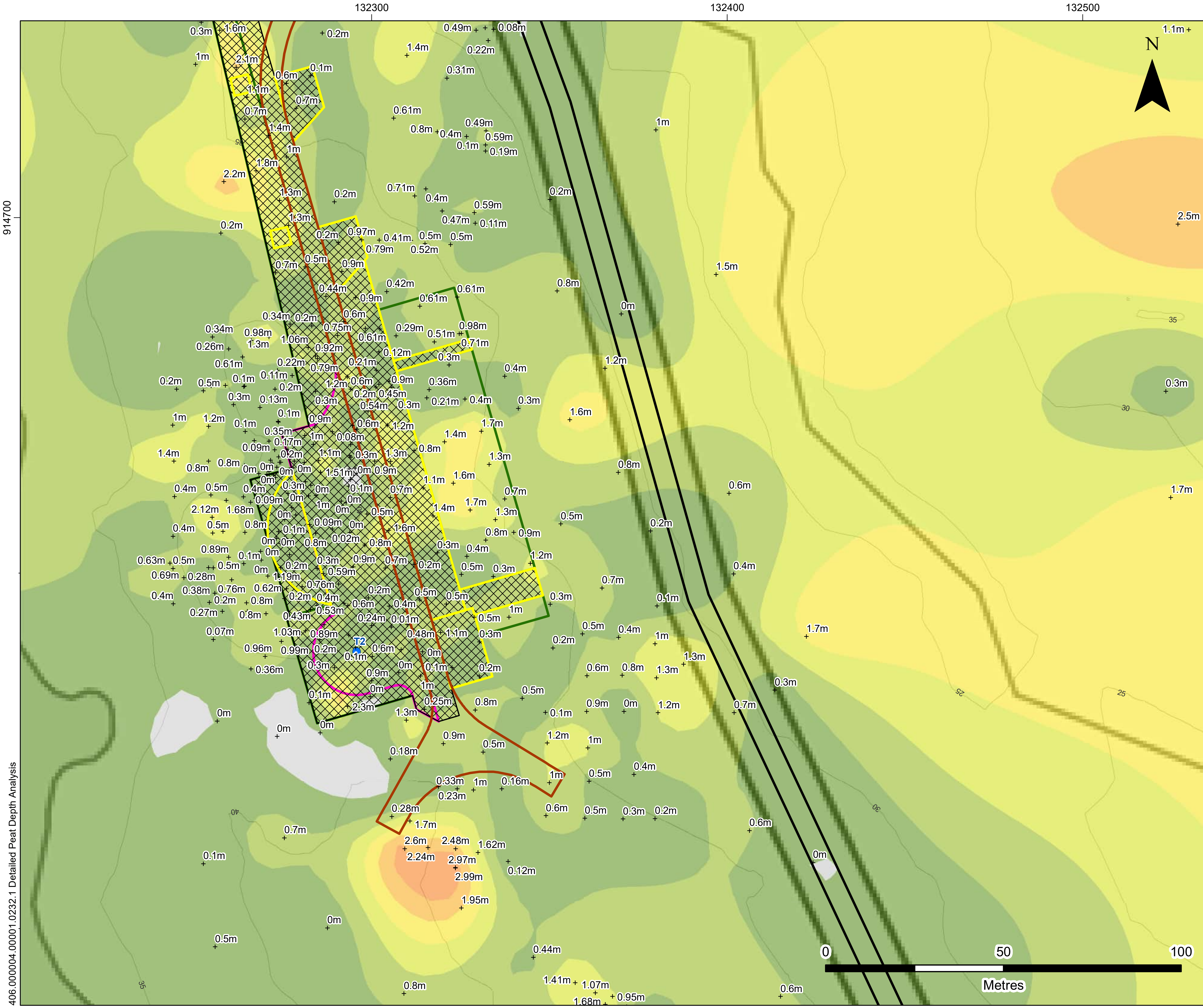
PMP

DETAILED PEAT DEPTH ANALYSIS FOR TURBINES

FIGURE 10.2.5a

Scale	Date
1:1,000 @ A3	JUNE 2024

406.00004.00001.0232.1 Detailed Peat Depth Analysis

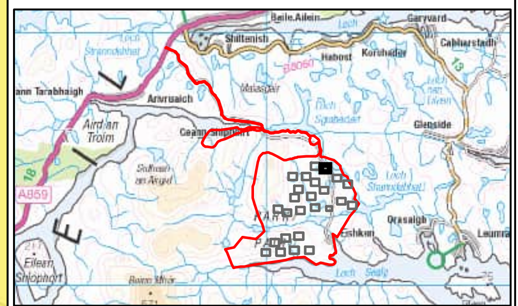


LEGEND

- Application Boundary
- Proposed Turbine Location (200 m Blade Tip Height)
- Proposed Bespoke Hardstanding Envelope
- Proposed Permanent Hardstanding
- Proposed Temporary Hardstanding
- Proposed Clearance Area
- Proposed Access Track / Turning Head
- Existing Road (To Be Upgraded)
- Peat Probe Location

Peat Depth (m)

- 0
- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3



Eurowind Energy

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UISENIS WIND FARM - SEI

PMP

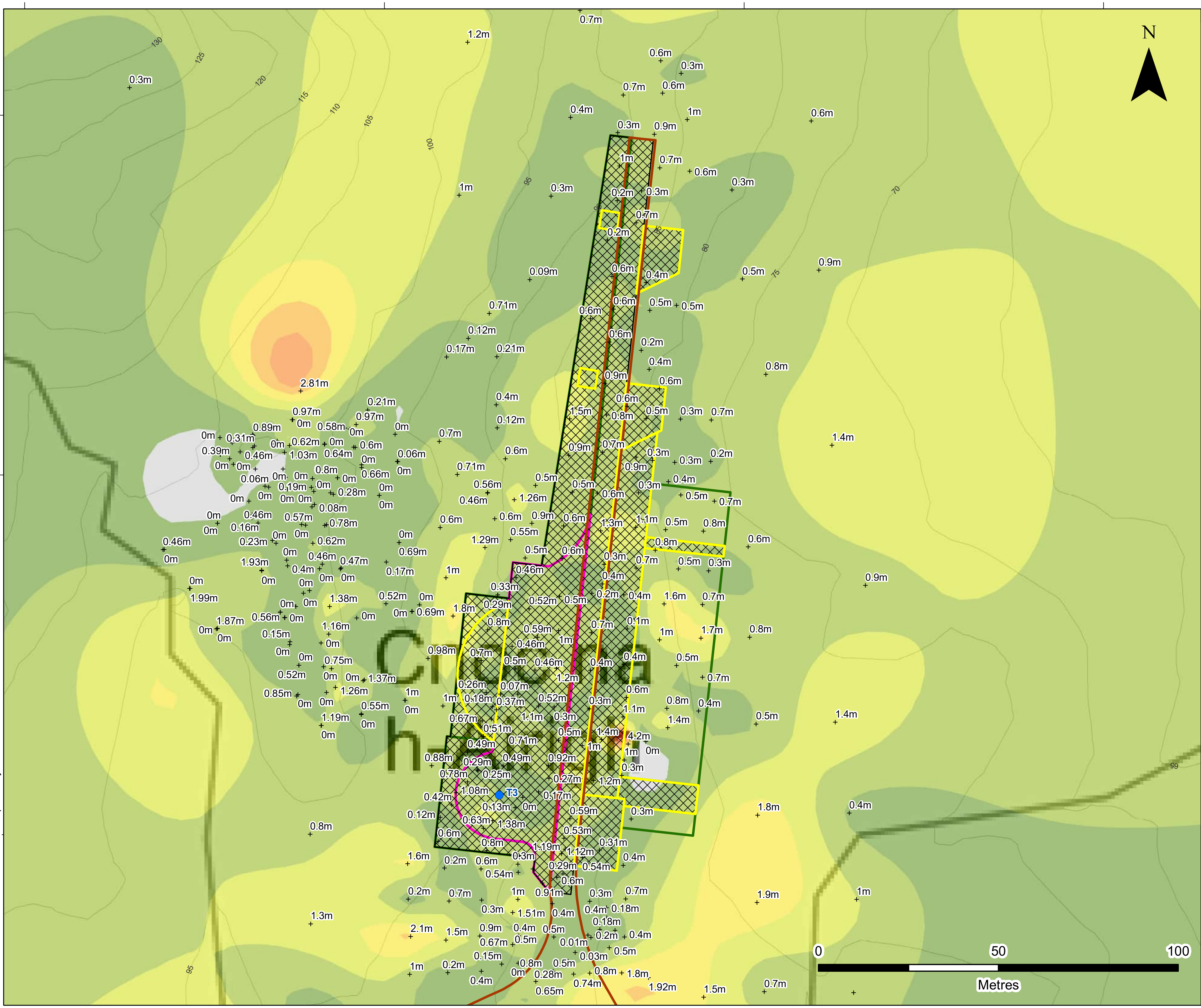
DETAILED PEAT DEPTH ANALYSIS FOR TURBINES

FIGURE 10.2.5b

Scale 1:1,000 @ A3

Date JUNE 2024

406.000004.00001.0232.1 Detailed Peat Depth Analysis



LEGEND

- Application Boundary
- Proposed Turbine Location (200 m Blade Tip Height)
- Proposed Bespoke Hardstanding Envelope
- Proposed Permanent Hardstanding
- Proposed Temporary Hardstanding
- Proposed Clearance Area
- Proposed Access Track / Turning Head
- Peat Probe Location

Peat Depth (m)

- 0
- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- > 3

Eurowind Energy

SLR

UISENIS WIND FARM - SEI

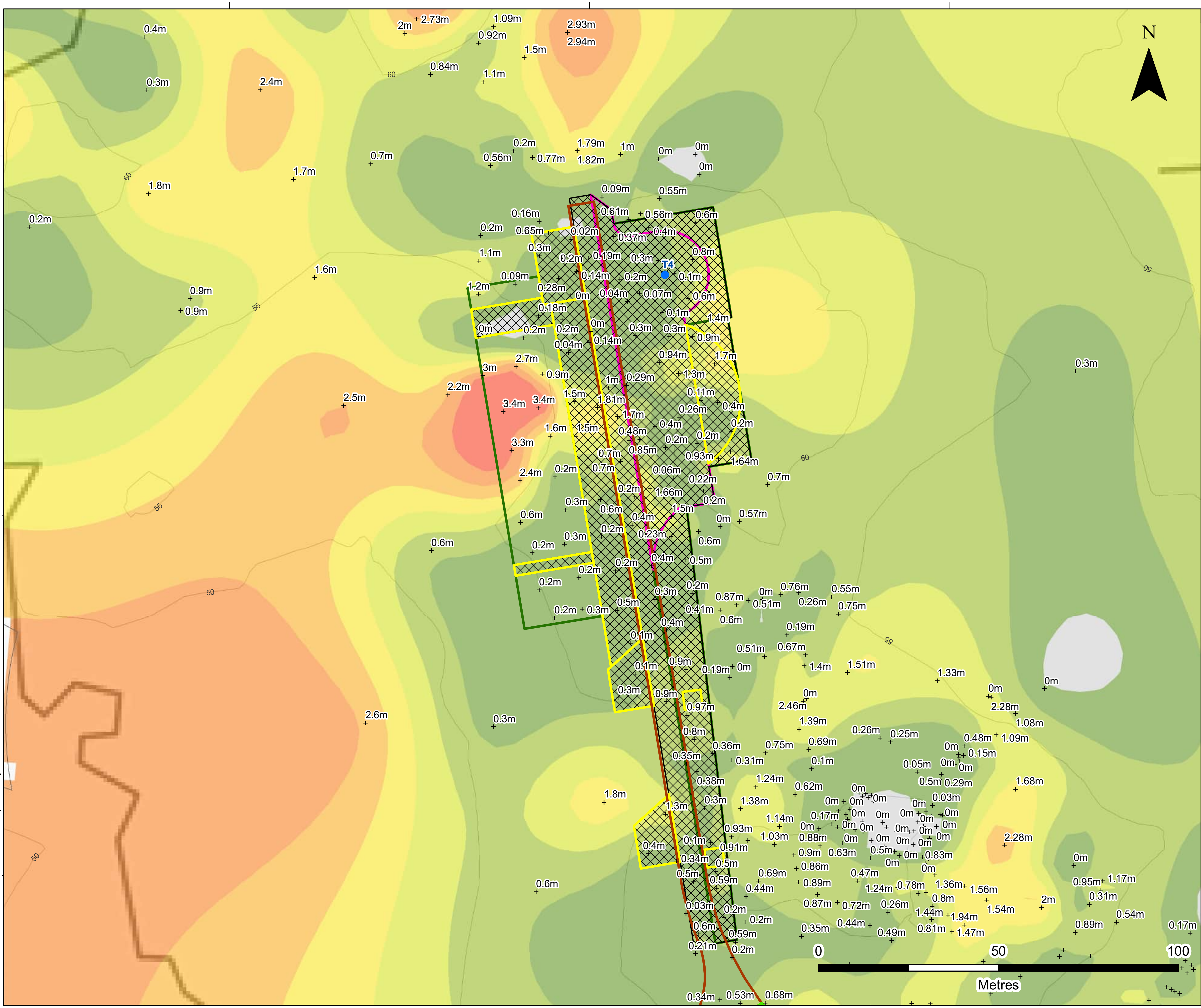
PMP

DETAILED PEAT DEPTH ANALYSIS FOR TURBINES

FIGURE 10.2.5c

Scale	Date
1:1,000 @ A3	JUNE 2024

406.00004.00001.0232.1 Detailed Peat Depth Analysis



Eurowind Energy

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UISENIS WIND FARM - SEI

PMP

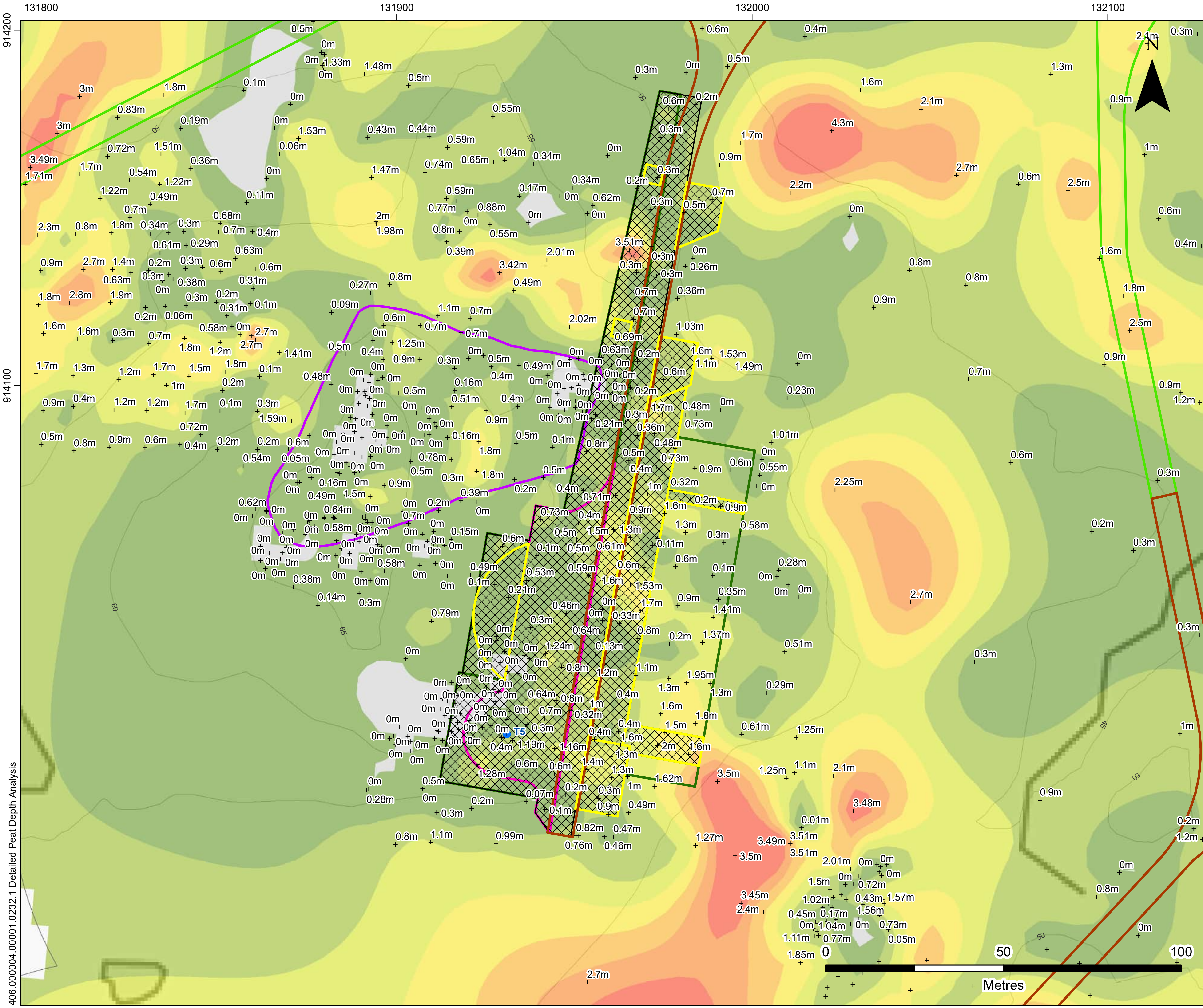
DETAILED PEAT DEPTH ANALYSIS FOR TURBINES

FIGURE 10.2.5d

Scale 1:1,000 @ A3

Date JUNE 2024

406.000004.00001.0232.1 Detailed Peat Depth Analysis



LEGEND

- Application Boundary
- Proposed Turbine Location (200 m Blade Tip Height)
- Proposed Bespoke Hardstanding Envelope
- Proposed Permanent Hardstanding
- Proposed Temporary Hardstanding
- Proposed Clearance Area
- Potential Borrow Pit
- Proposed Access Track / Turning Head
- Proposed Floating Access Track
- Peat Probe Location

Peat Depth (m)

- 0
- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- > 3

Eurowind Energy

SLR

UISENIS WIND FARM - SEI

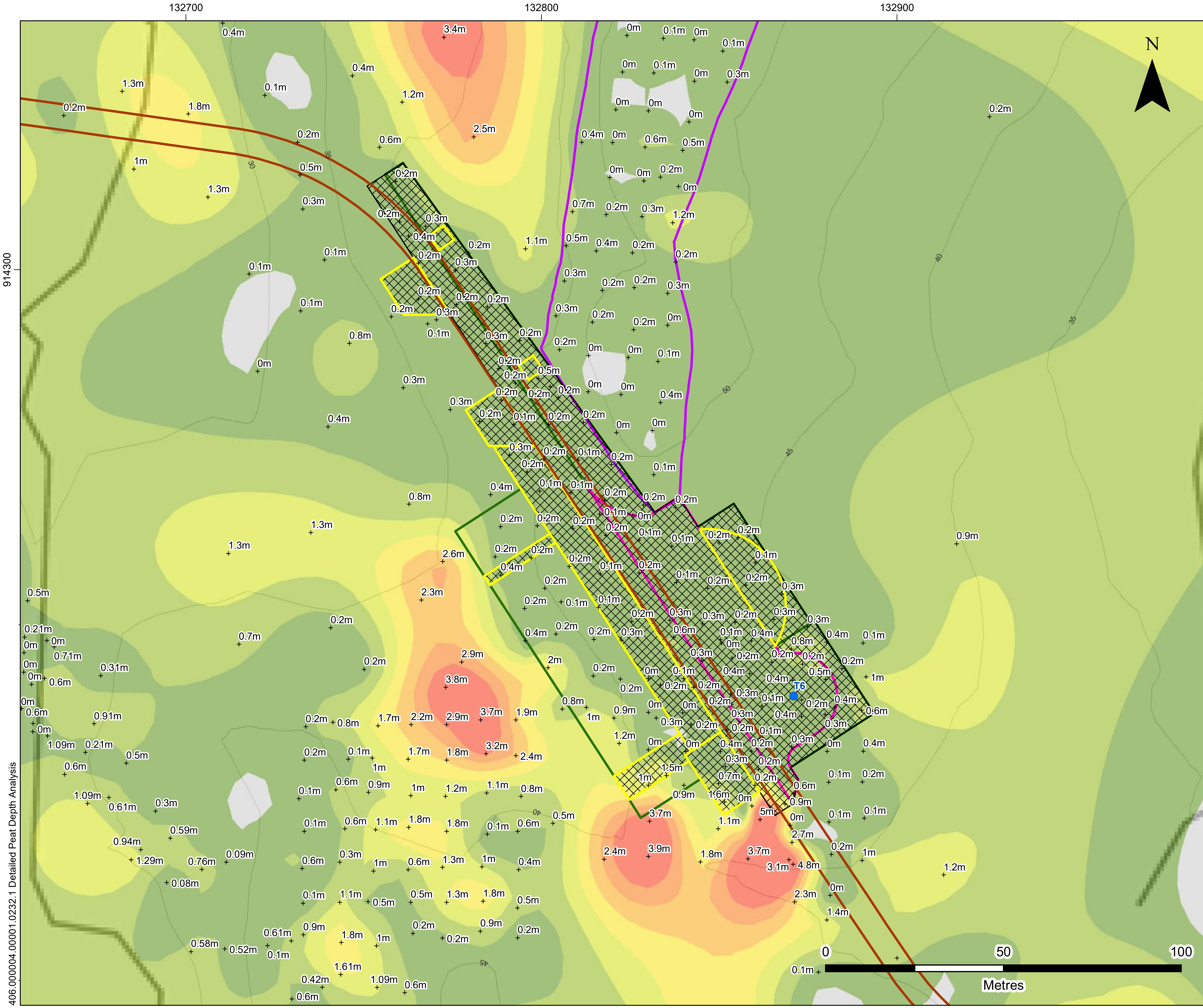
PMP

DETAILED PEAT DEPTH ANALYSIS FOR TURBINES

FIGURE 10.2.5e

Scale	Date
1:1,000 @ A3	JUNE 2024

406.000004.00001.0232.1 Detailed Peat Depth Analysis

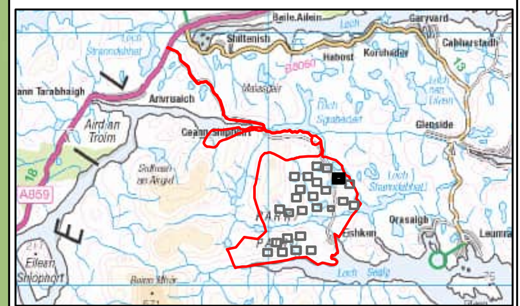


LEGEND

- Application Boundary
- Proposed Turbine Location (200 m Blade Tip Height)
- Proposed Bespoke Hardstanding Envelope
- Proposed Permanent Hardstanding
- Proposed Temporary Hardstanding
- Proposed Clearance Area
- Potential Borrow Pit
- Proposed Access Track / Turning Head
- Peat Probe Location

Peat Depth (m)

- 0
- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- > 3



Eurowind Energy

SLR

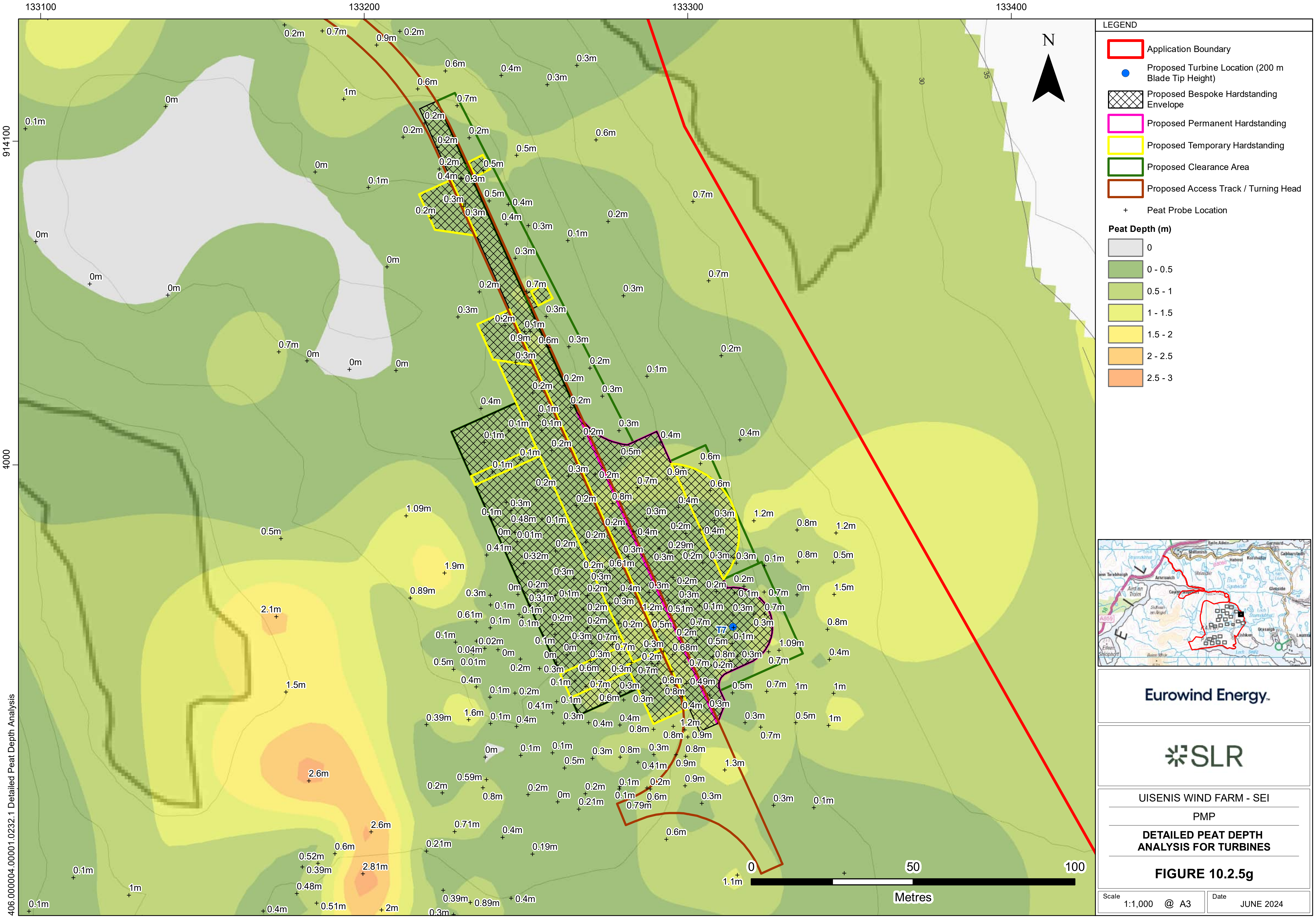
UISENIS WIND FARM - SEI

PMP

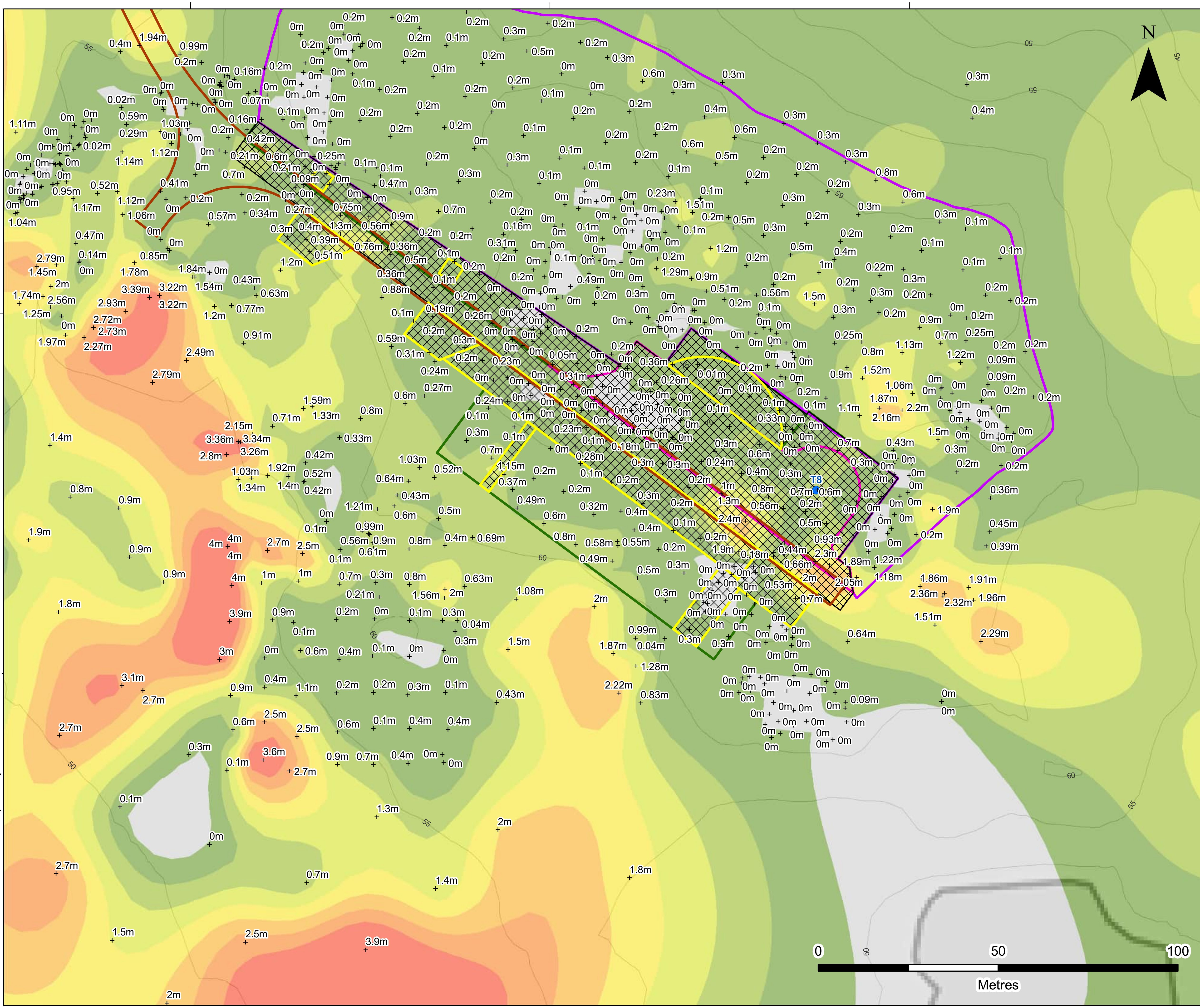
DETAILED PEAT DEPTH ANALYSIS FOR TURBINES

FIGURE 10.2.5f

Scale	Date
1:1,000 @ A3	JUNE 2024



133100
133200
133300
133400
914100
4000
406.000004.00001.0232.1 Detailed Peat Depth Analysis
N
T7
LEGEND
Application Boundary
Proposed Turbine Location (200 m Blade Tip Height)
Proposed Bespoke Hardstanding Envelope
Proposed Permanent Hardstanding
Proposed Temporary Hardstanding
Proposed Clearance Area
Proposed Access Track / Turning Head
Peat Probe Location
Peat Depth (m)
0
0 - 0.5
0.5 - 1
1 - 1.5
1.5 - 2
2 - 2.5
2.5 - 3
0
50
100
Metres
Eurowind Energy
SLR
UISENIS WIND FARM - SEI
PMP
DETAILED PEAT DEPTH ANALYSIS FOR TURBINES
FIGURE 10.2.5g
Scale
1:1,000 @ A3
Date
JUNE 2024

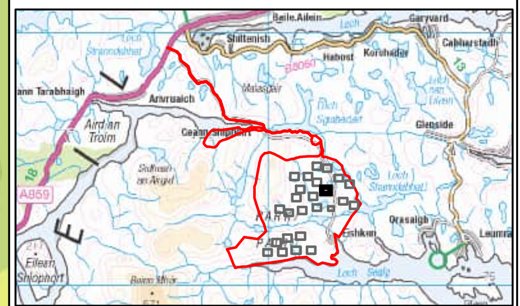


LEGEND

- Application Boundary
- Proposed Turbine Location (200 m Blade Tip Height)
- Proposed Bespoke Hardstanding Envelope
- Proposed Permanent Hardstanding
- Proposed Temporary Hardstanding
- Proposed Clearance Area
- Potential Borrow Pit
- Proposed Access Track / Turning Head
- + Peat Probe Location

Peat Depth (m)

- 0
- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- > 3



Eurowind Energy

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UISENIS WIND FARM - SEI

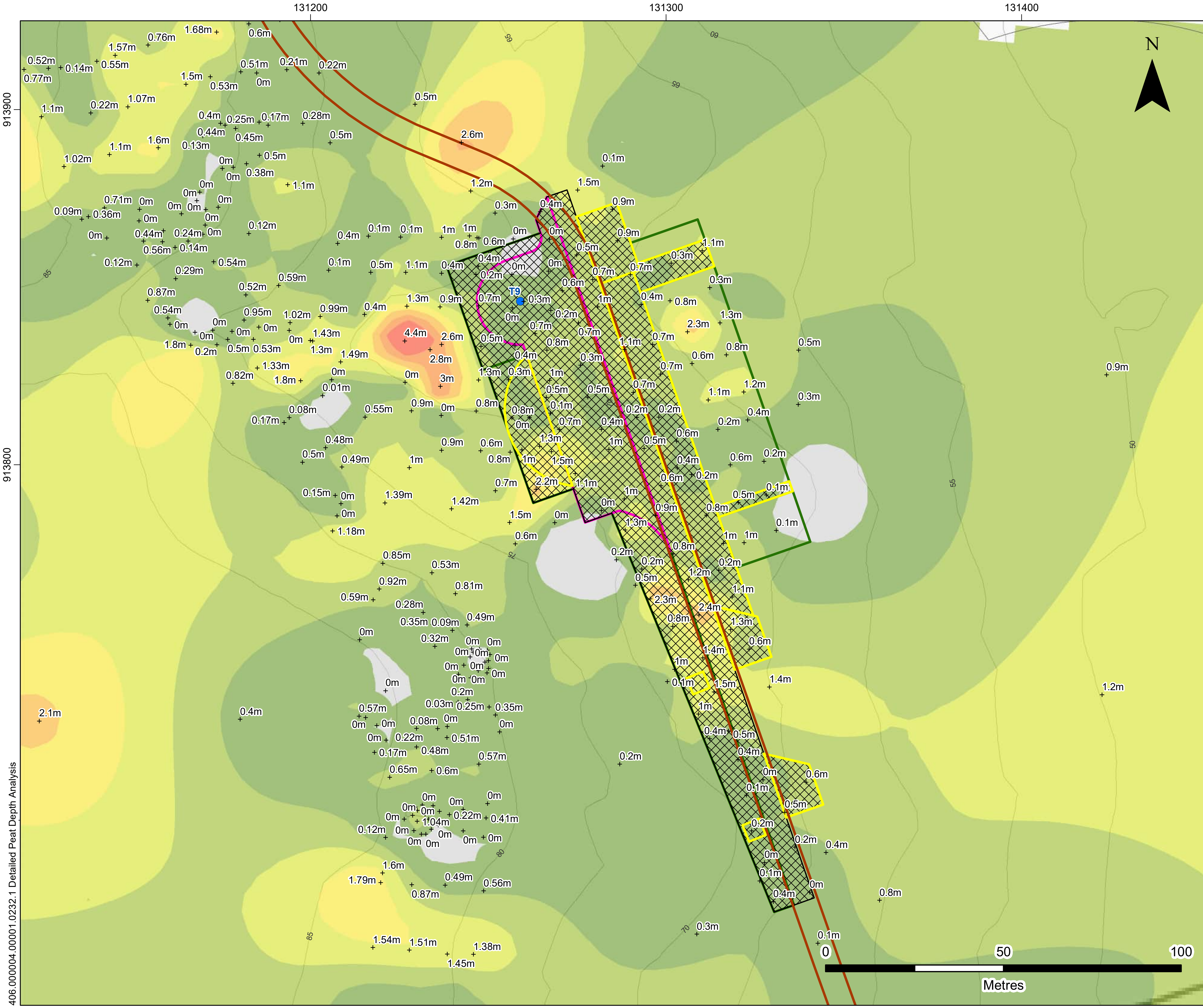
PMP

DETAILED PEAT DEPTH ANALYSIS FOR TURBINES

FIGURE 10.2.5h

Scale	Date
1:1,000 @ A3	JUNE 2024

406.00004.00001.0232.1 Detailed Peat Depth Analysis

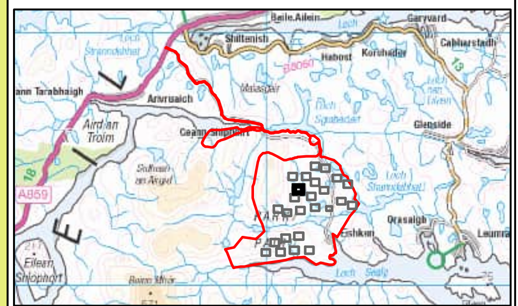


LEGEND

- Application Boundary
- Proposed Turbine Location (200 m Blade Tip Height)
- Proposed Bespoke Hardstanding Envelope
- Proposed Permanent Hardstanding
- Proposed Temporary Hardstanding
- Proposed Clearance Area
- Proposed Access Track / Turning Head
- Peat Probe Location

Peat Depth (m)

- 0
- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- > 3



Eurowind Energy

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PMP

DETAILED PEAT DEPTH ANALYSIS FOR TURBINES

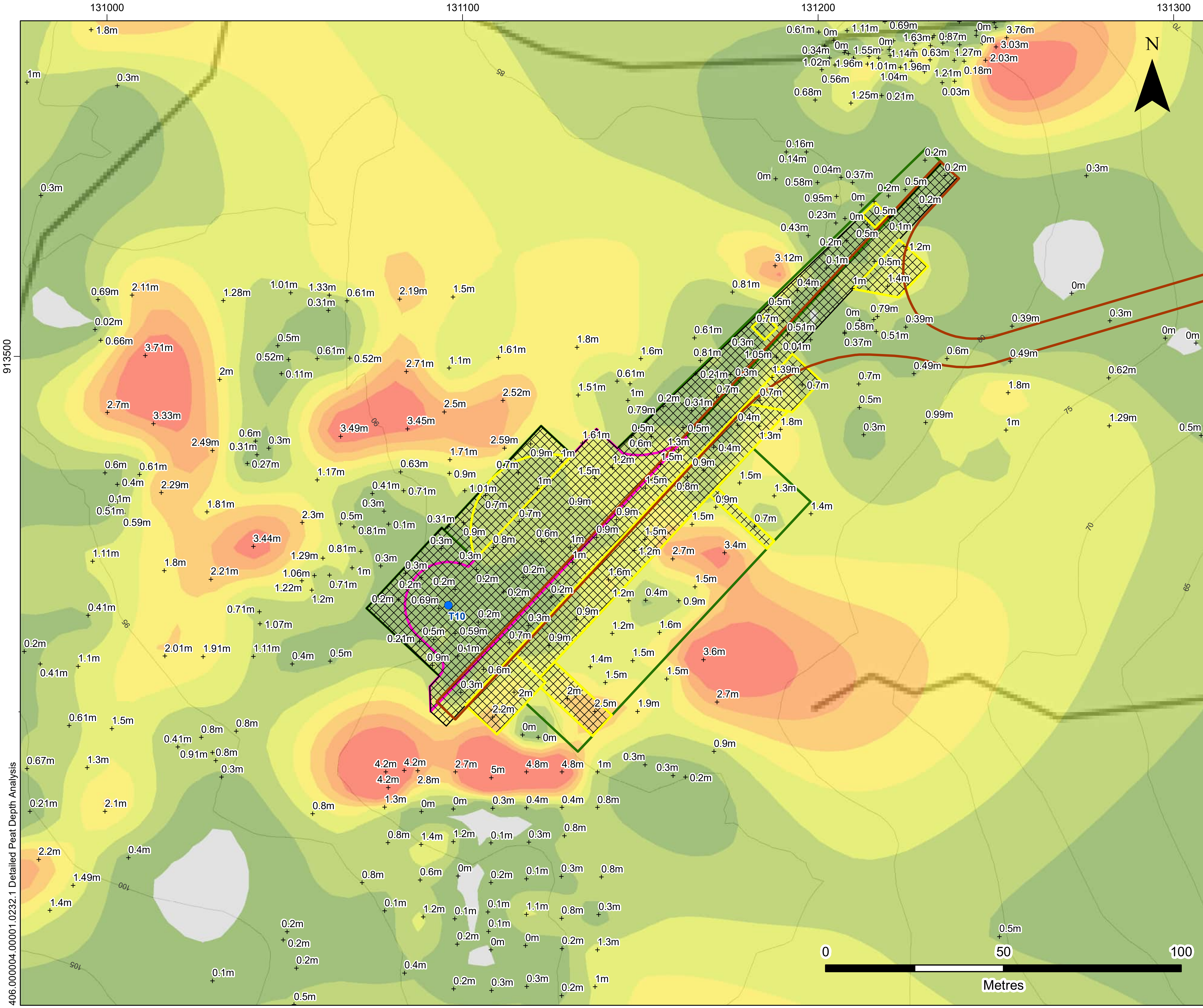
FIGURE 10.2.5i

0 50 100 Metres

Scale 1:1,000 @ A3

Date JUNE 2024

406.000004.00001.0232.1 Detailed Peat Depth Analysis

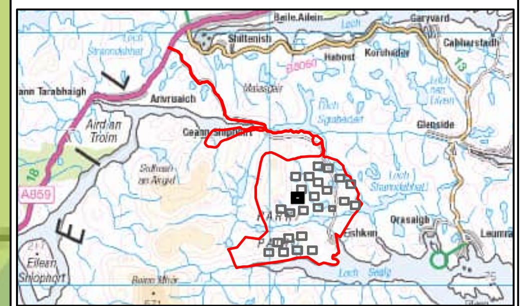


LEGEND

- Application Boundary
- Proposed Turbine Location (200 m Blade Tip Height)
- Proposed Bespoke Hardstanding Envelope
- Proposed Permanent Hardstanding
- Proposed Temporary Hardstanding
- Proposed Clearance Area
- Proposed Access Track / Turning Head
- Peat Probe Location

Peat Depth (m)

- 0
- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- > 3



Eurowind Energy

SLR

UISENIS WIND FARM - SEI

PMP

DETAILED PEAT DEPTH ANALYSIS FOR TURBINES

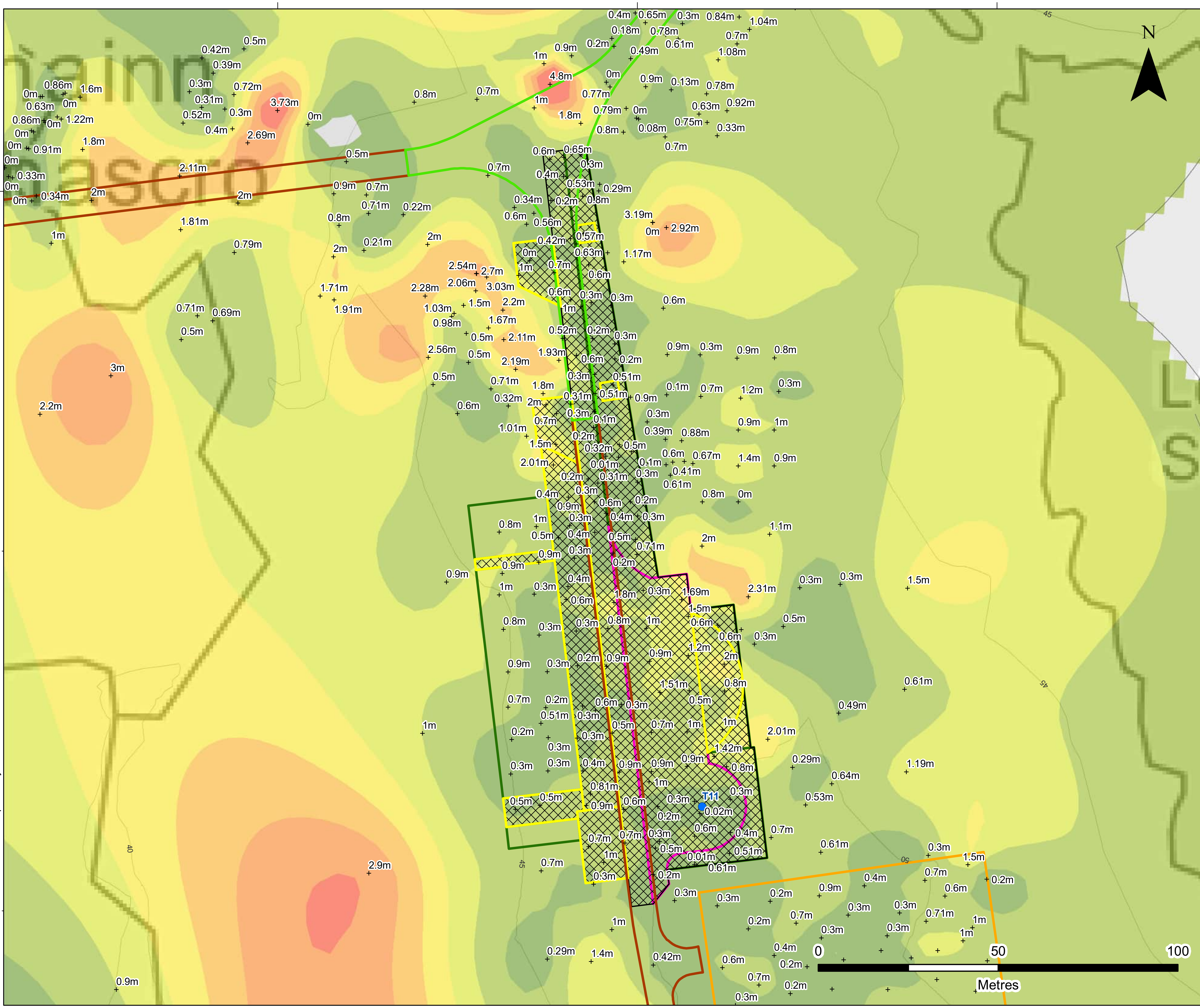
FIGURE 10.2.5j

Scale	Date
1:1,000 @ A3	JUNE 2024

406.00004.00001.0232.1 Detailed Peat Depth Analysis

131700 131800 131900

913600

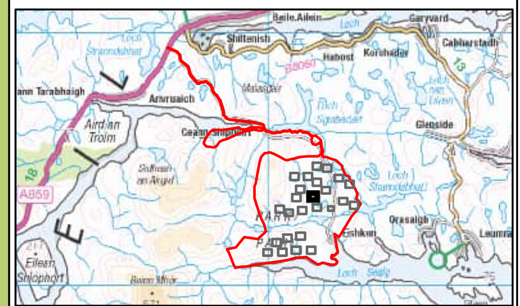


LEGEND

- Application Boundary
- Proposed Turbine Location (200 m Blade Tip Height)
- Proposed Bespoke Hardstanding Envelope
- Proposed Permanent Hardstanding
- Proposed Temporary Hardstanding
- Proposed Temporary Construction Compound
- Proposed Clearance Area
- Proposed Access Track / Turning Head
- Proposed Floating Access Track
- Peat Probe Location

Peat Depth (m)

- 0
- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- > 3



Eurowind Energy

SLR

UISENIS WIND FARM - SEI

PMP

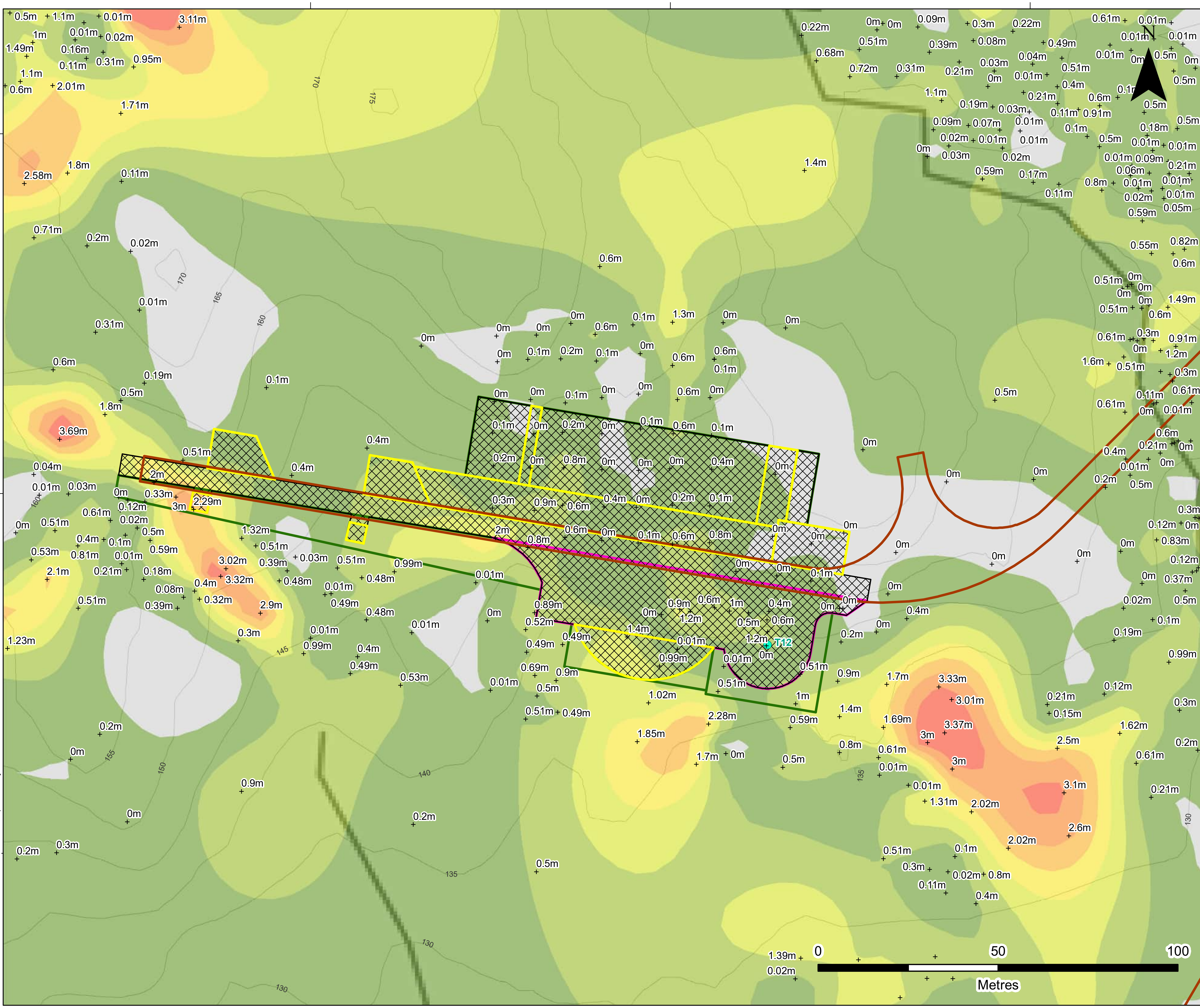
DETAILED PEAT DEPTH ANALYSIS FOR TURBINES

FIGURE 10.2.5k

Scale 1:1,000 @ A3

Date JUNE 2024

406.000004.00001.0232.1 Detailed Peat Depth Analysis



LEGEND

- Application Boundary
- Proposed Turbine Location (180 m Blade Tip Height)
- Proposed Bespoke Hardstanding Envelope
- Proposed Permanent Hardstanding
- Proposed Temporary Hardstanding
- Proposed Clearance Area
- Proposed Access Track / Turning Head
- Peat Probe Location

Peat Depth (m)

- 0
- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- > 3

Eurowind Energy

SLR

UISENIS WIND FARM - SEI

PMP

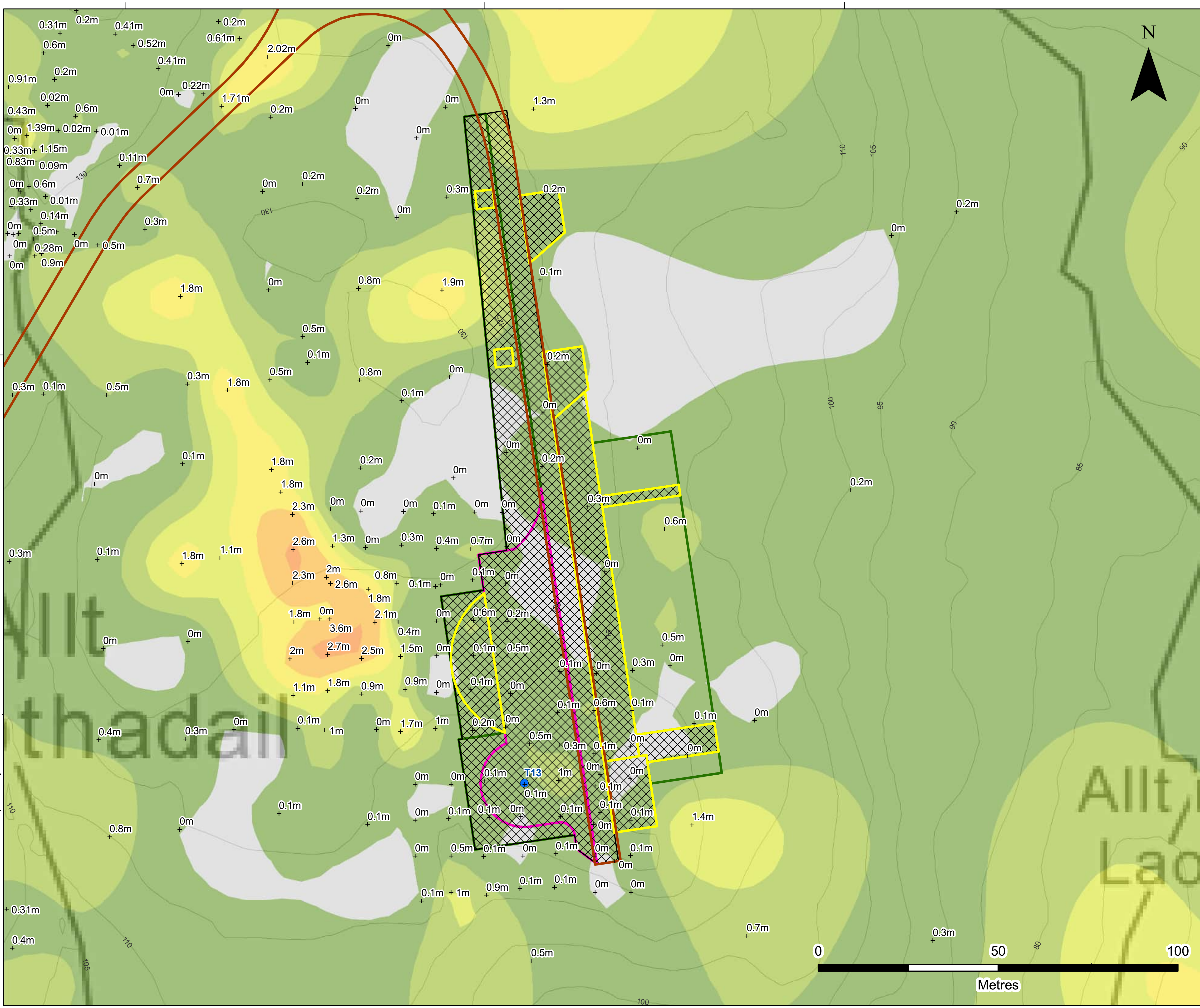
DETAILED PEAT DEPTH ANALYSIS FOR TURBINES

FIGURE 10.2.5I

Scale 1:1,000 @ A3

Date JUNE 2024

406.00004.00001.0232.1 Detailed Peat Depth Analysis



Eurowind Energy

SLR

UISENIS WIND FARM - SEI

PMP

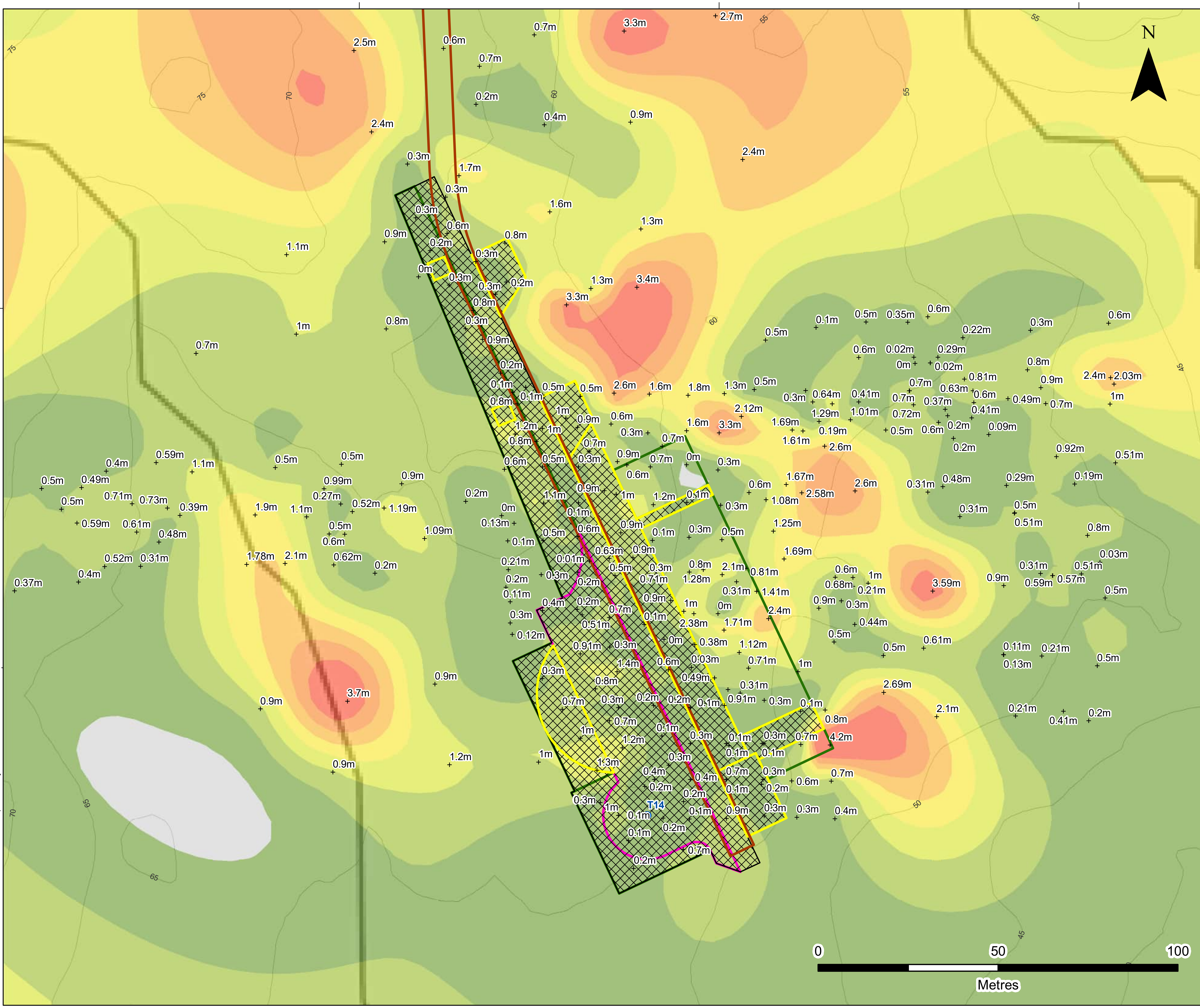
DETAILED PEAT DEPTH ANALYSIS FOR TURBINES

FIGURE 10.2.5m

Scale 1:1,000 @ A3

Date JUNE 2024

406.000004.00001.0232.1 Detailed Peat Depth Analysis

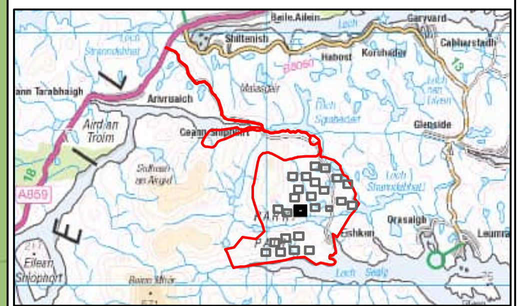


LEGEND

- Application Boundary
- Proposed Turbine Location (200 m Blade Tip Height)
- Proposed Bespoke Hardstanding Envelope
- Proposed Permanent Hardstanding
- Proposed Temporary Hardstanding
- Proposed Clearance Area
- Proposed Access Track / Turning Head
- Peat Probe Location

Peat Depth (m)

- 0
- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- > 3



Eurowind Energy

SLR

UISENIS WIND FARM - SEI

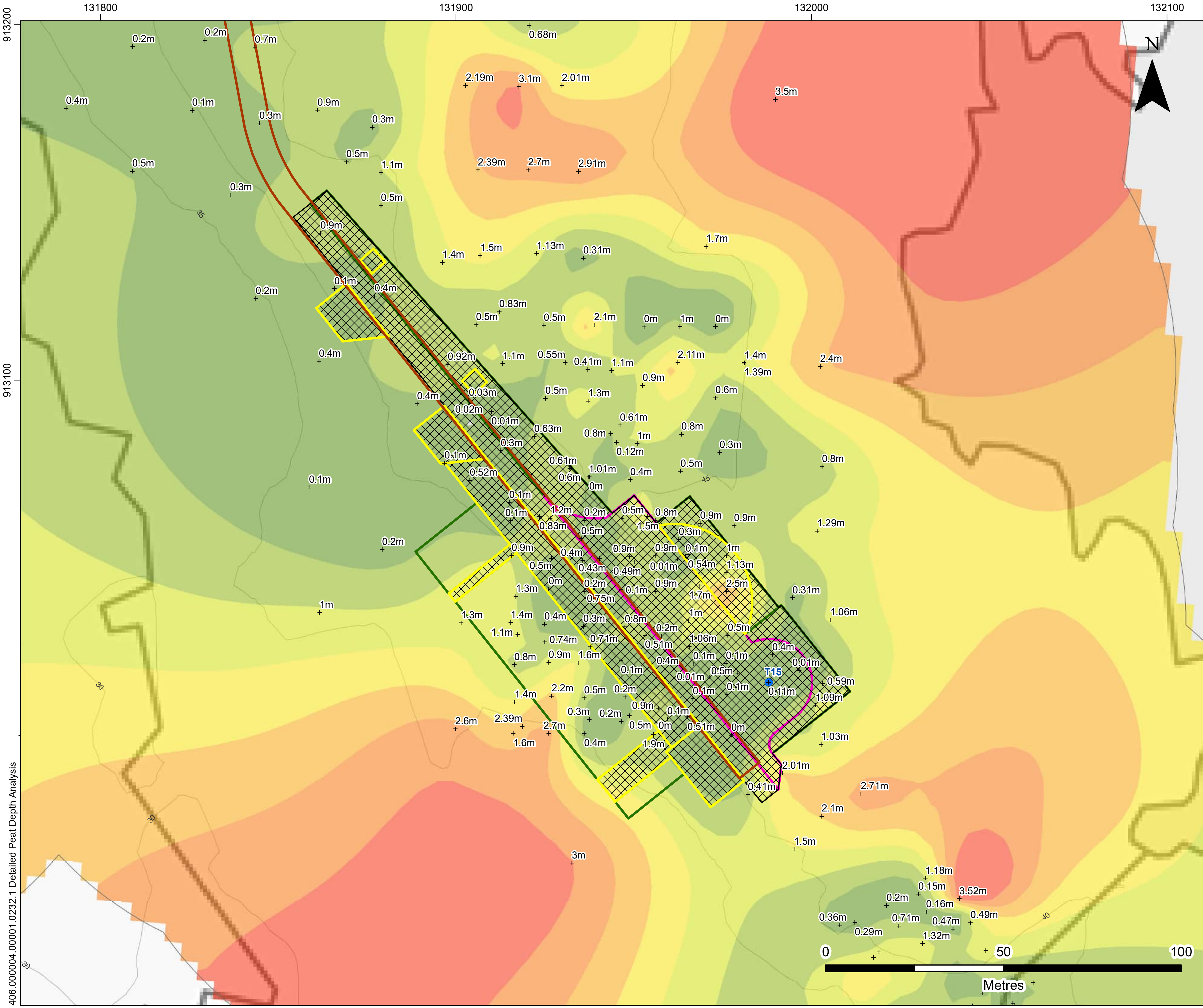
PMP

DETAILED PEAT DEPTH ANALYSIS FOR TURBINES

FIGURE 10.2.5n

Scale	Date
1:1,000 @ A3	JUNE 2024

406.000004.00001.0232.1 Detailed Peat Depth Analysis

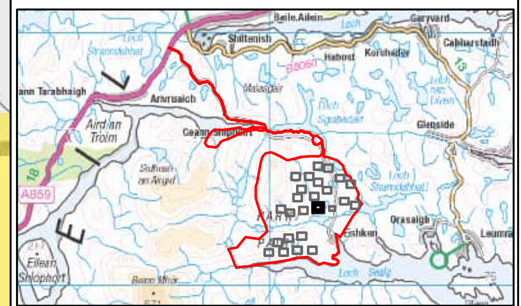


LEGEND

- Application Boundary
- Proposed Turbine Location (200 m Blade Tip Height)
- Proposed Bespoke Hardstanding Envelope
- Proposed Permanent Hardstanding
- Proposed Temporary Hardstanding
- Proposed Clearance Area
- Proposed Access Track / Turning Head
- Peat Probe Location

Peat Depth (m)

- 0
- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- > 3



Eurowind Energy

SLR

UISENIS WIND FARM - SEI

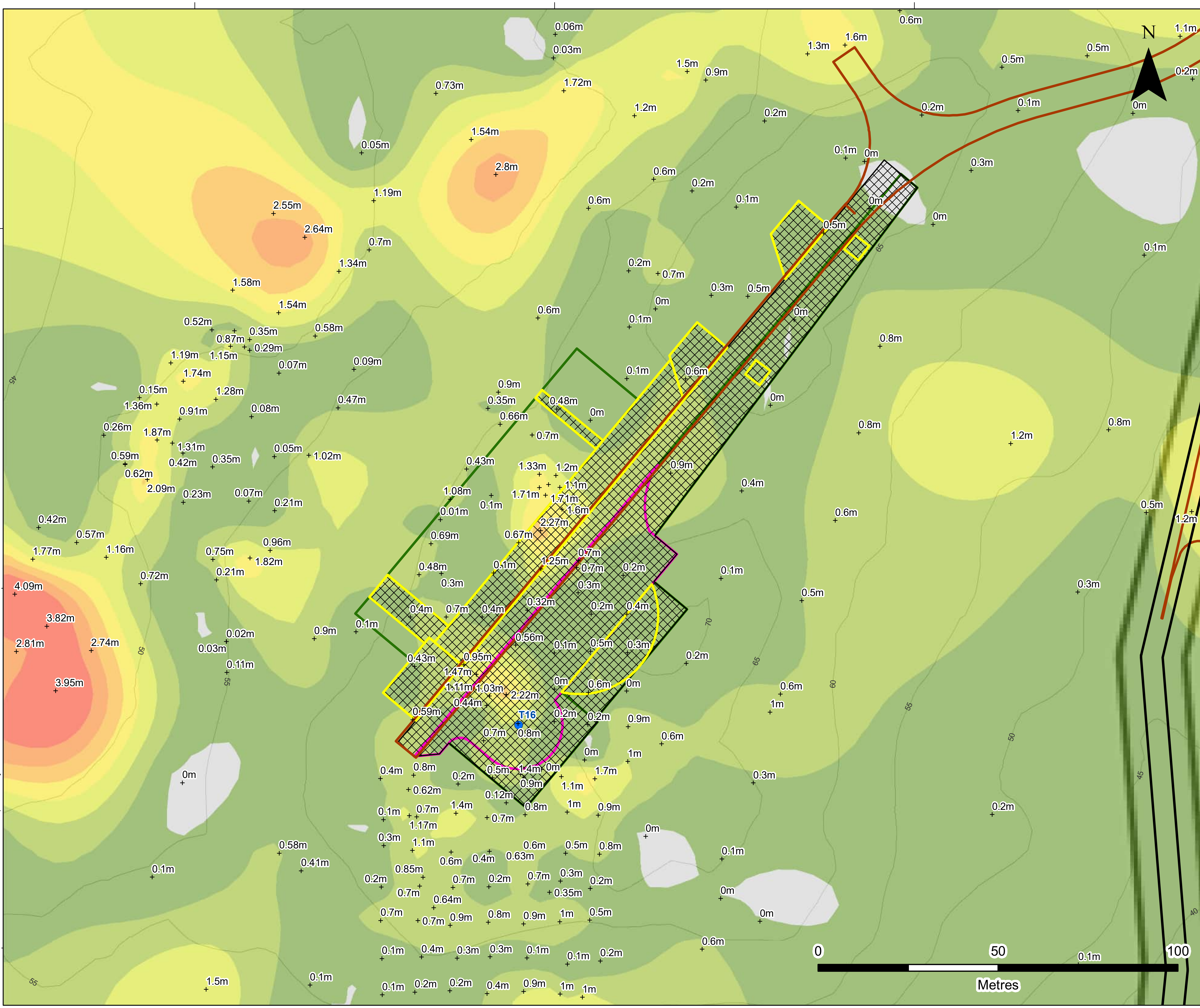
PMP

DETAILED PEAT DEPTH ANALYSIS FOR TURBINES

FIGURE 10.2.5o

Scale	Date
1:1,000 @ A3	JUNE 2024

406.00004.00001.0232.1 Detailed Peat Depth Analysis



LEGEND

- Application Boundary
- Proposed Turbine Location (200 m Blade Tip Height)
- Proposed Bespoke Hardstanding Envelope
- Proposed Permanent Hardstanding
- Proposed Temporary Hardstanding
- Proposed Clearance Area
- Proposed Access Track / Turning Head
- Existing Road (To Be Upgraded)
- Peat Probe Location

Peat Depth (m)

- 0
- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- > 3

Eurowind Energy

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UISENIS WIND FARM - SEI

PMP

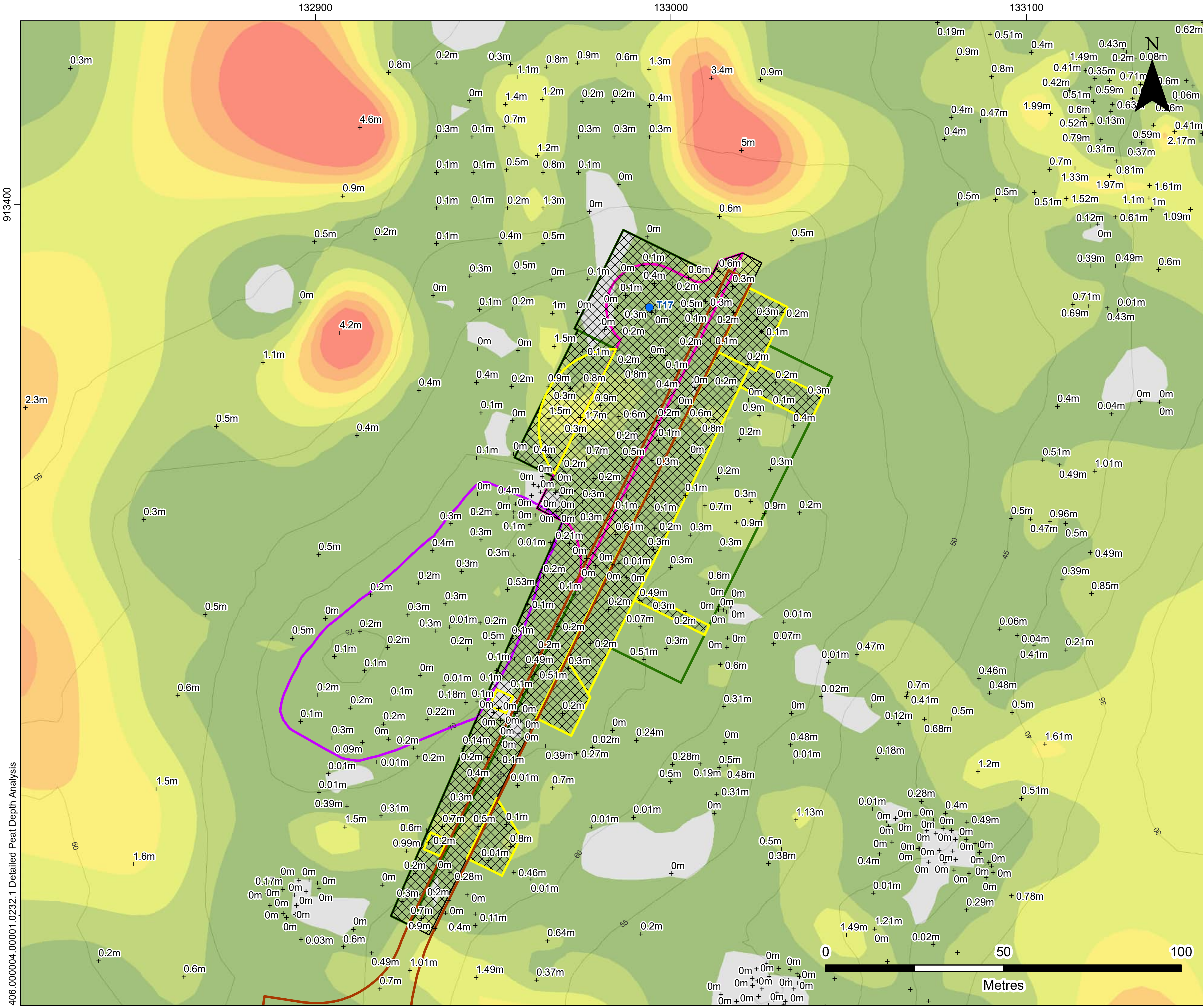
DETAILED PEAT DEPTH ANALYSIS FOR TURBINES

FIGURE 10.2.5p

Scale 1:1,000 @ A3

Date JUNE 2024

406.00004.00001.0232.1 Detailed Peat Depth Analysis

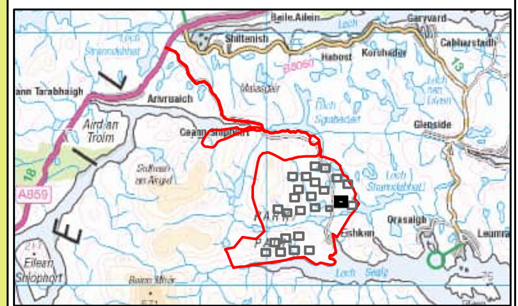


LEGEND

- Application Boundary
- Proposed Turbine Location (200 m Blade Tip Height)
- Proposed Bespoke Hardstanding Envelope
- Proposed Permanent Hardstanding
- Proposed Temporary Hardstanding
- Proposed Clearance Area
- Potential Borrow Pit
- Proposed Access Track / Turning Head
- Peat Probe Location

Peat Depth (m)

- 0
- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- > 3



Eurowind Energy

SLR

UISENIS WIND FARM - SEI

PMP

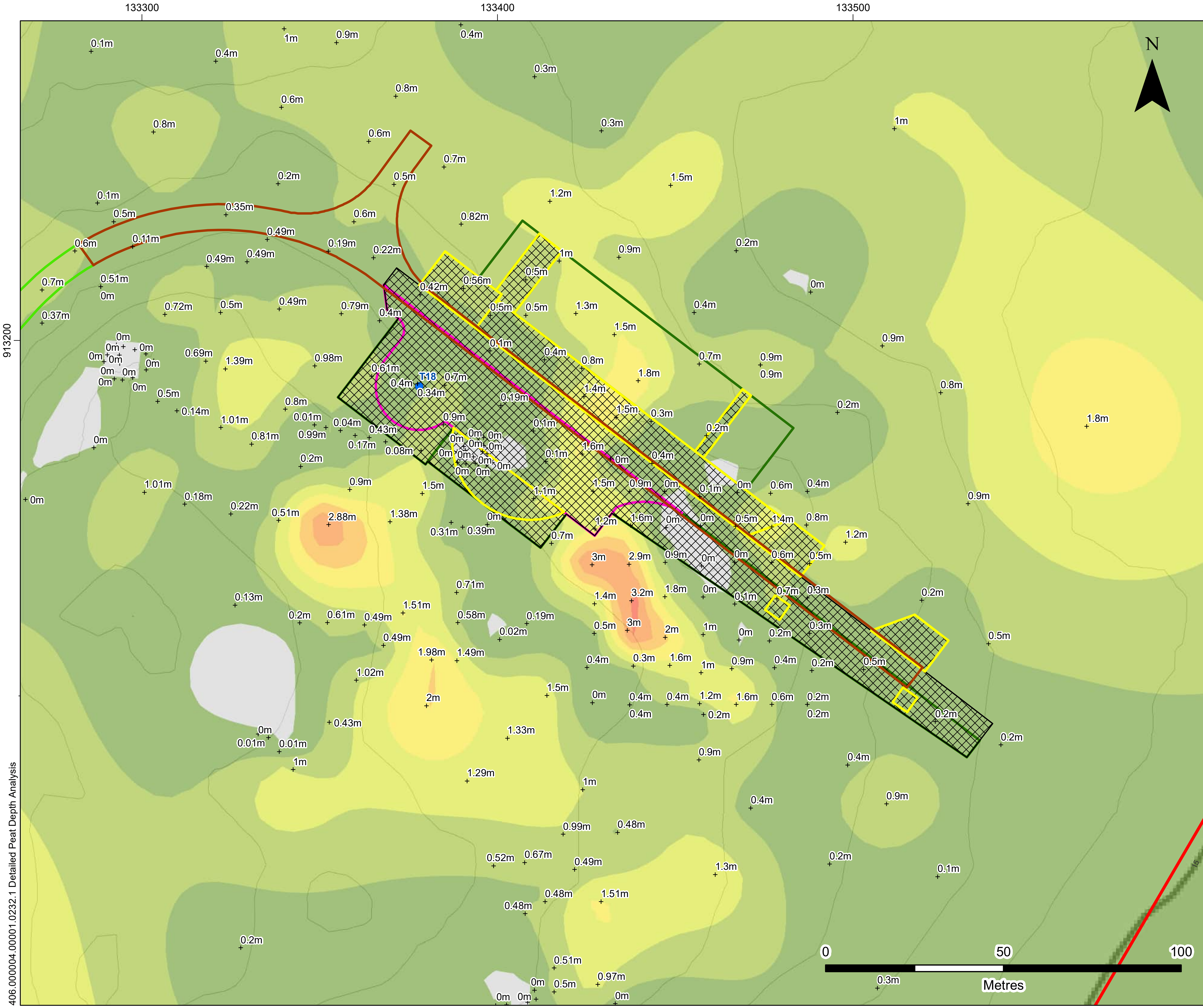
DETAILED PEAT DEPTH ANALYSIS FOR TURBINES

FIGURE 10.2.5q

Scale 1:1,000 @ A3

Date JUNE 2024

0 50 100 Metres

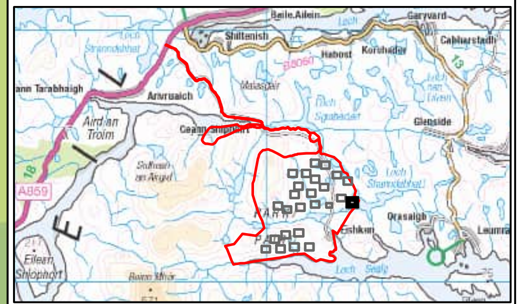


LEGEND

- Application Boundary
- Proposed Turbine Location (200 m Blade Tip Height)
- Proposed Bespoke Hardstanding Envelope
- Proposed Permanent Hardstanding
- Proposed Temporary Hardstanding
- Proposed Clearance Area
- Proposed Access Track / Turning Head
- Proposed Floating Access Track
- Peat Probe Location

Peat Depth (m)

- 0
- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- > 3



Eurowind Energy

SLR

UISENIS WIND FARM - SEI

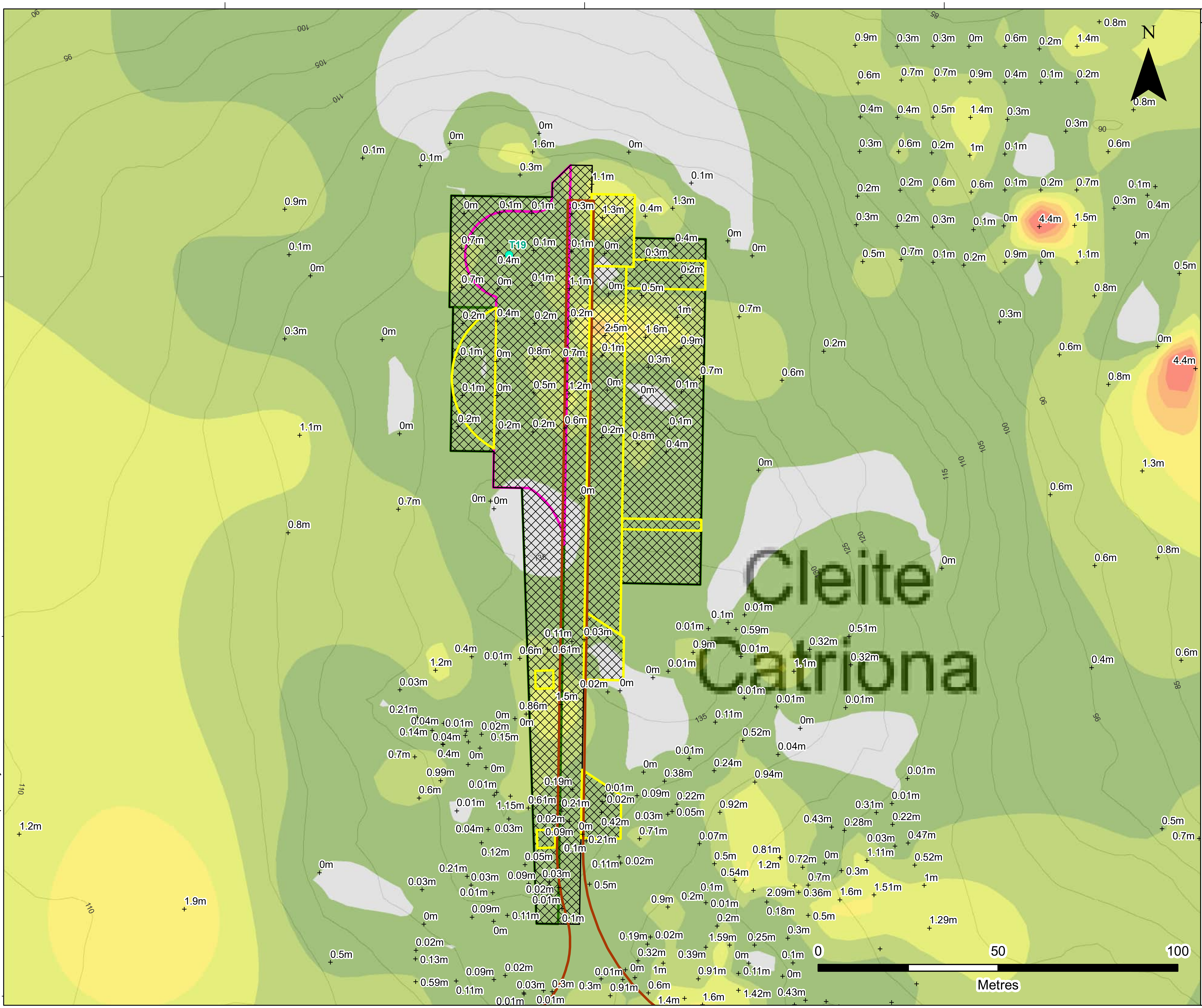
PMP

DETAILED PEAT DEPTH ANALYSIS FOR TURBINES

FIGURE 10.2.5r

Scale	Date
1:1,000 @ A3	JUNE 2024

406.000004.00001.0232.1 Detailed Peat Depth Analysis

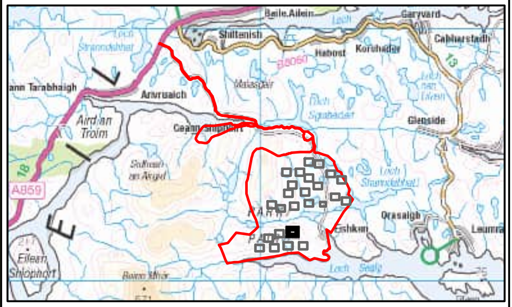


LEGEND

- Application Boundary
- Proposed Turbine Location (180 m Blade Tip Height)
- Proposed Bespoke Hardstanding Envelope
- Proposed Permanent Hardstanding
- Proposed Temporary Hardstanding
- Proposed Clearance Area
- Proposed Access Track / Turning Head
- Peat Probe Location

Peat Depth (m)

- 0
- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- > 3



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UISENIS WIND FARM - SEI

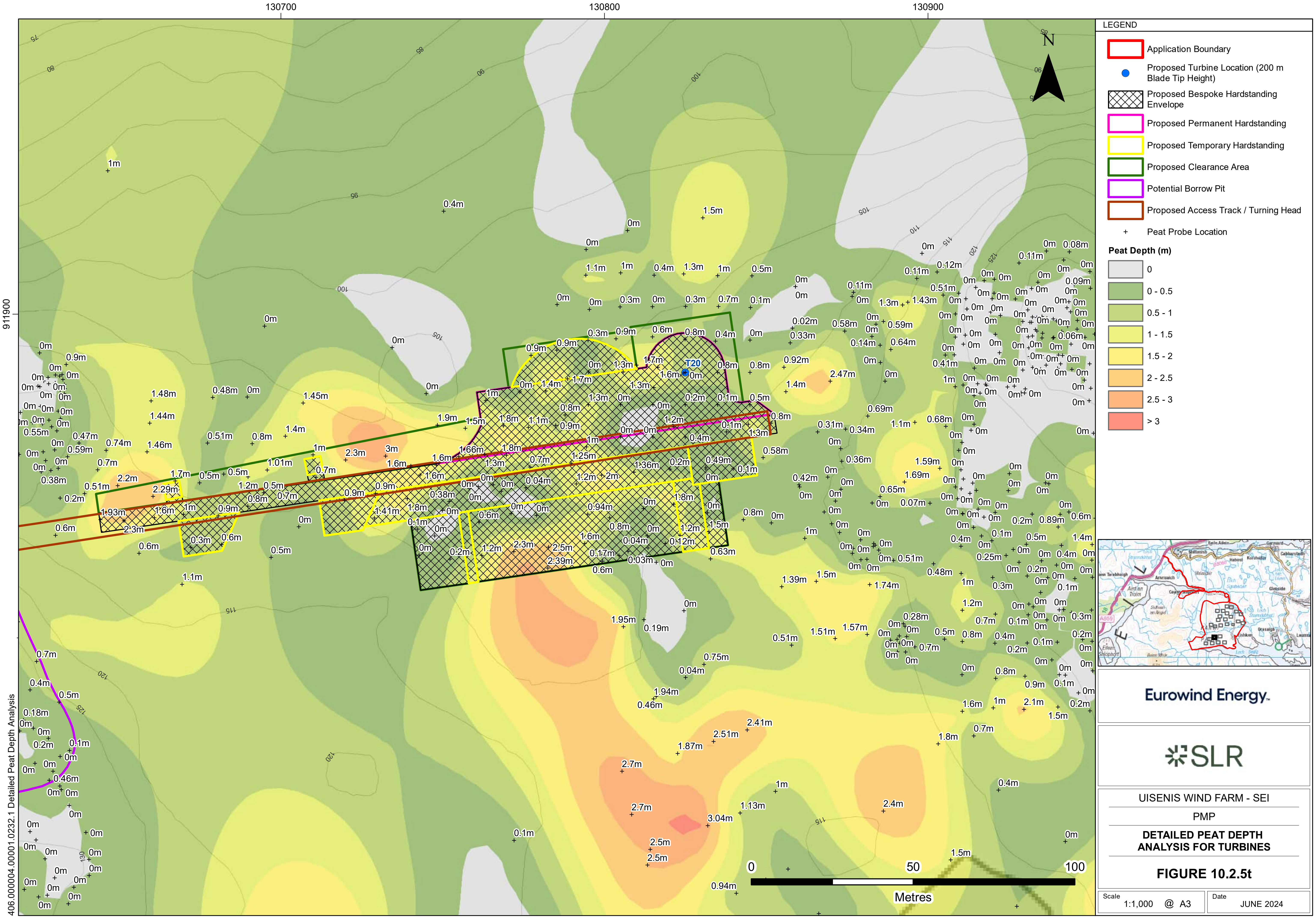
PMP

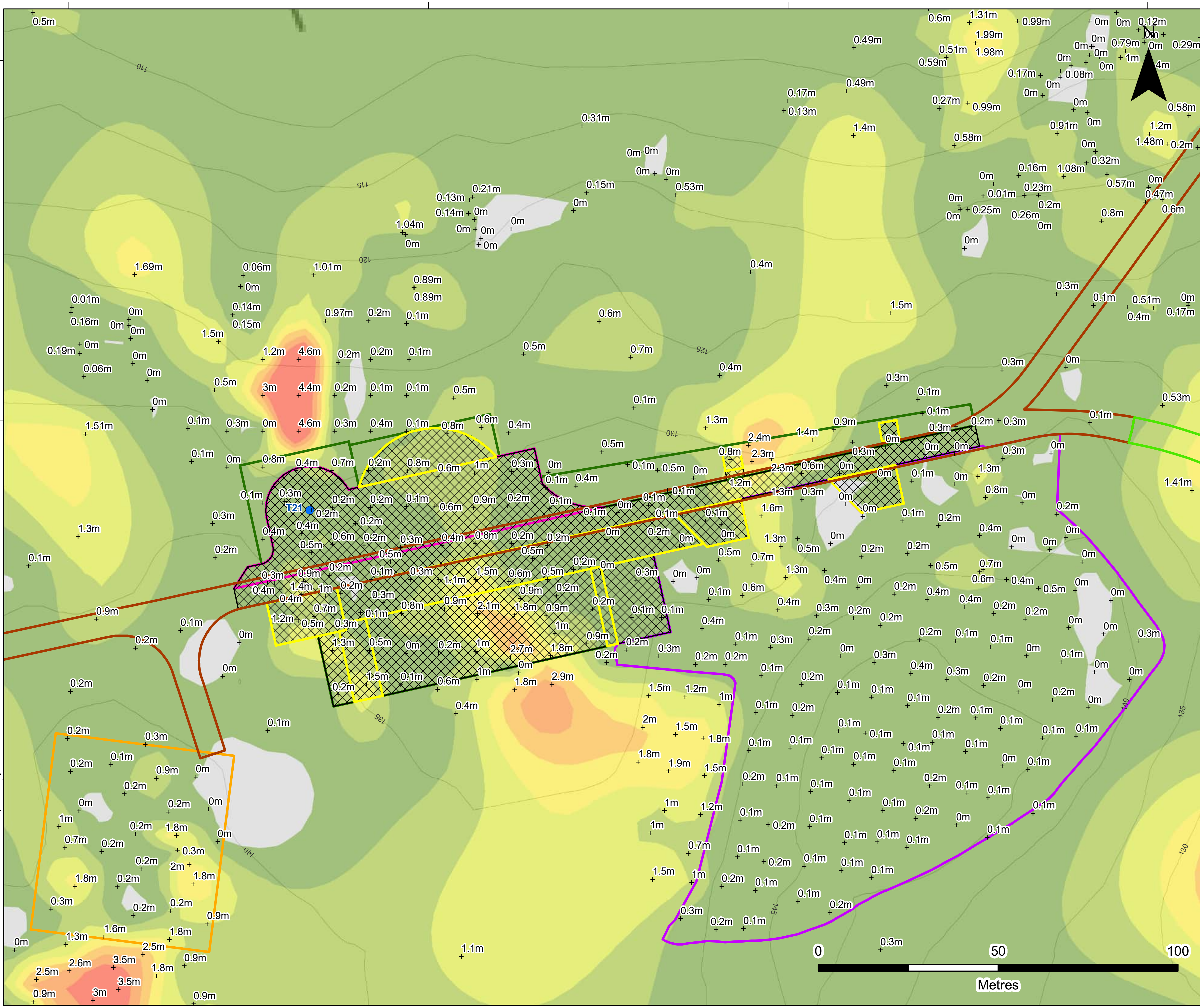
DETAILED PEAT DEPTH ANALYSIS FOR TURBINES

FIGURE 10.2.5s

Scale 1:1,000 @ A3 | Date JUNE 2024

406.000004.00001.0232.1 Detailed Peat Depth Analysis


130700
130800
130900
911900
N
T20
LEGEND
Application Boundary
Proposed Turbine Location (200 m Blade Tip Height)
Proposed Bespoke Hardstanding Envelope
Proposed Permanent Hardstanding
Proposed Temporary Hardstanding
Proposed Clearance Area
Potential Borrow Pit
Proposed Access Track / Turning Head
Peat Probe Location
Peat Depth (m)
0
0 - 0.5
0.5 - 1
1 - 1.5
1.5 - 2
2 - 2.5
2.5 - 3
> 3
0
50
100
Metres
Eurowind Energy
SLR
UISENIS WIND FARM - SEI
PMP
DETAILED PEAT DEPTH ANALYSIS FOR TURBINES
FIGURE 10.2.5t
Scale
1:1,000 @ A3
Date
JUNE 2024
406.000004.00001.0232.1 Detailed Peat Depth Analysis

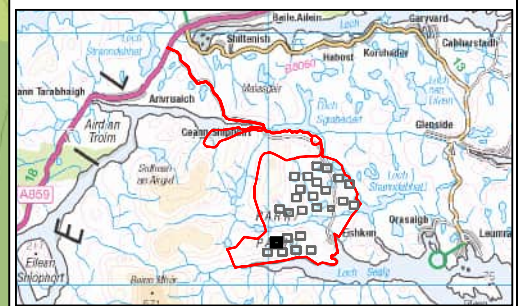


LEGEND

- Application Boundary
- Proposed Turbine Location (200 m Blade Tip Height)
- Proposed Bespoke Hardstanding Envelope
- Proposed Permanent Hardstanding
- Proposed Temporary Hardstanding
- Proposed Temporary Construction Compound
- Proposed Clearance Area
- Potential Borrow Pit
- Proposed Access Track / Turning Head
- Proposed Floating Access Track
- \+ Peat Probe Location

Peat Depth (m)

- 0
- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- > 3



Eurowind Energy

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UISENIS WIND FARM - SEI

PMP

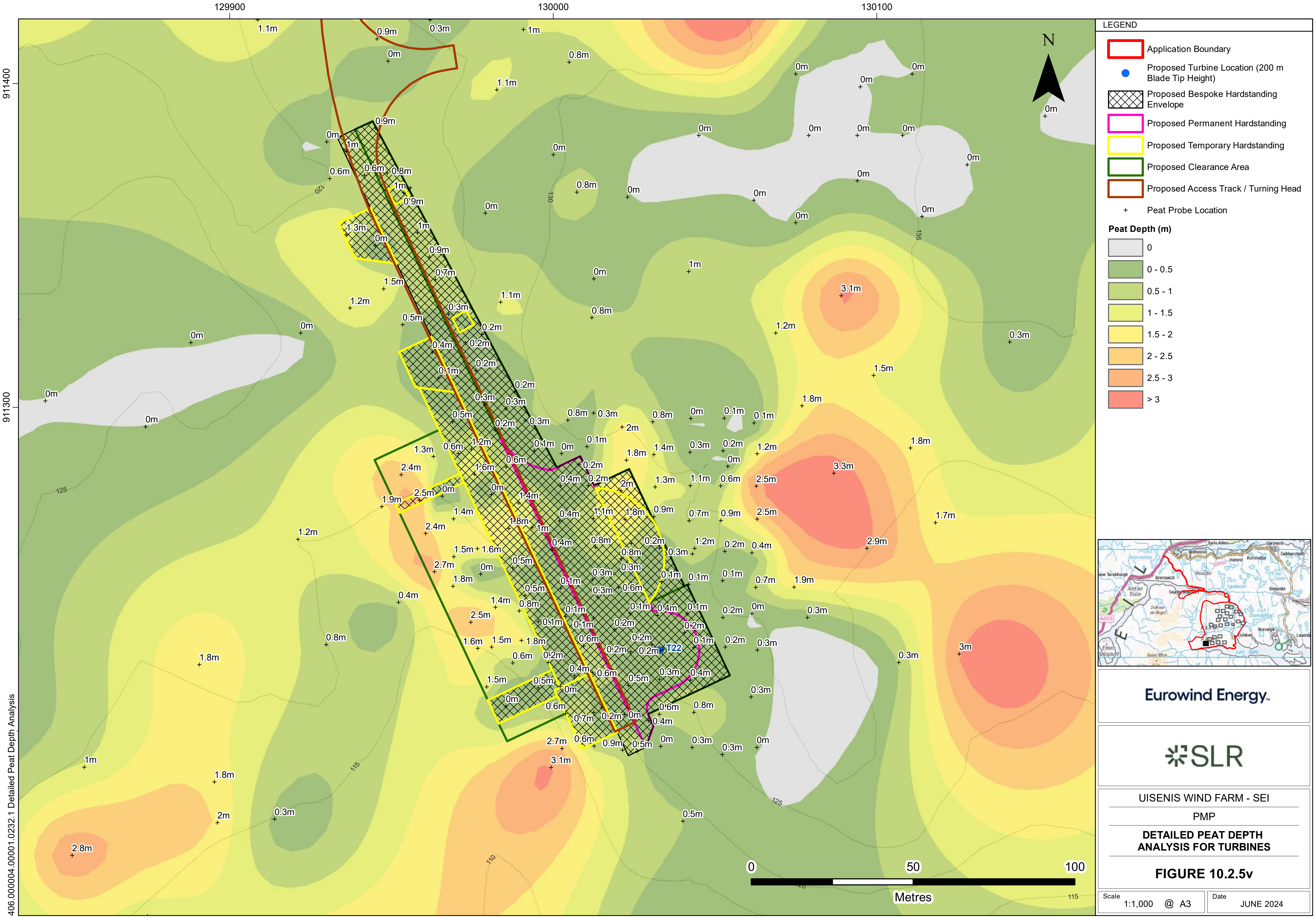
DETAILED PEAT DEPTH ANALYSIS FOR TURBINES

FIGURE 10.2.5u

Scale 1:1,000 @ A3

Date JUNE 2024

406.000004.00001.0232.1 Detailed Peat Depth Analysis



129900
130000
130100
911400
911300
N
T22
LEGEND
Application Boundary
Proposed Turbine Location (200 m Blade Tip Height)
Proposed Bespoke Hardstanding Envelope
Proposed Permanent Hardstanding
Proposed Temporary Hardstanding
Proposed Clearance Area
Proposed Access Track / Turning Head
Peat Probe Location
Peat Depth (m)
0
0 - 0.5
0.5 - 1
1 - 1.5
1.5 - 2
2 - 2.5
2.5 - 3
> 3
0
50
100
Metres
Eurowind Energy
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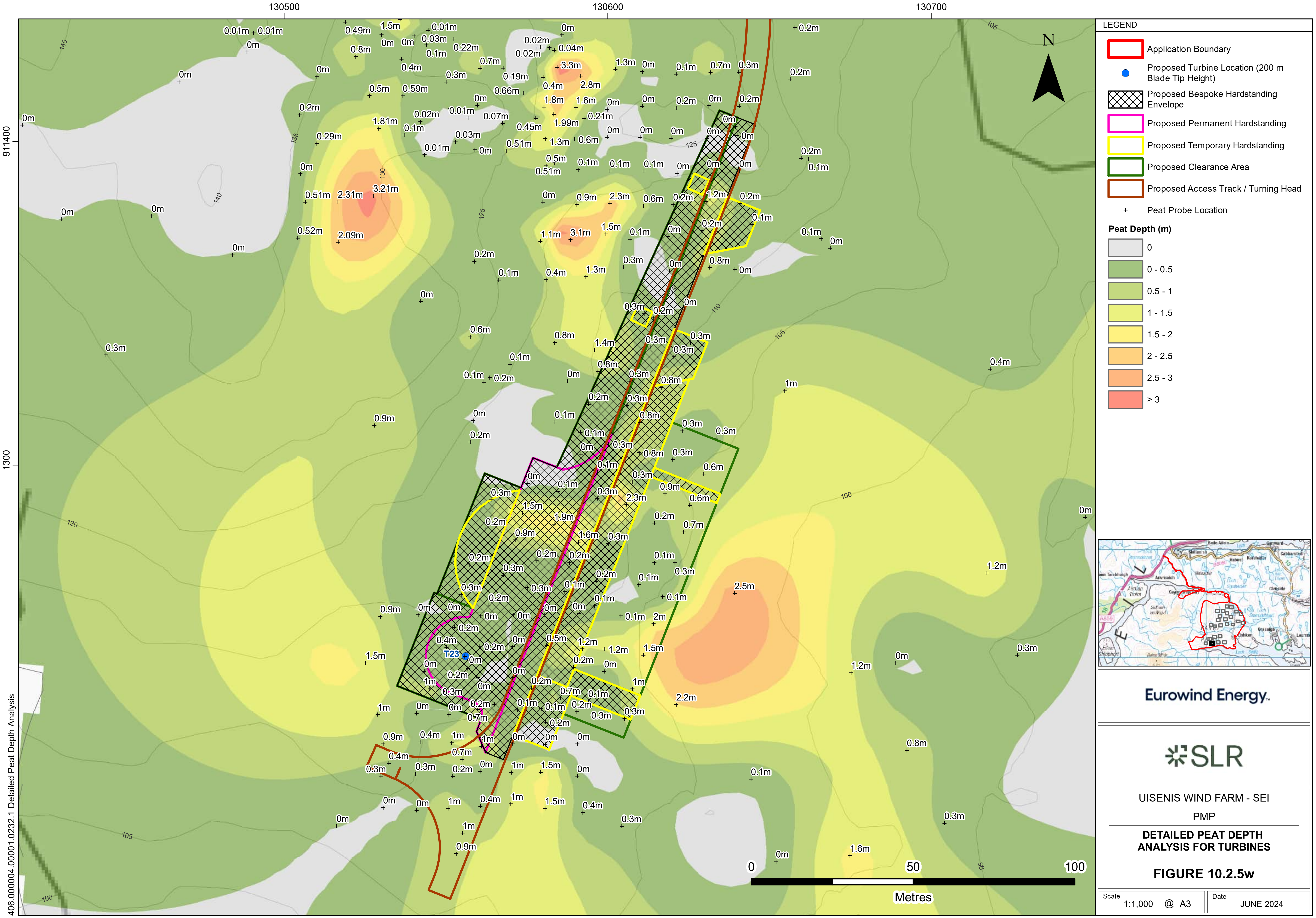
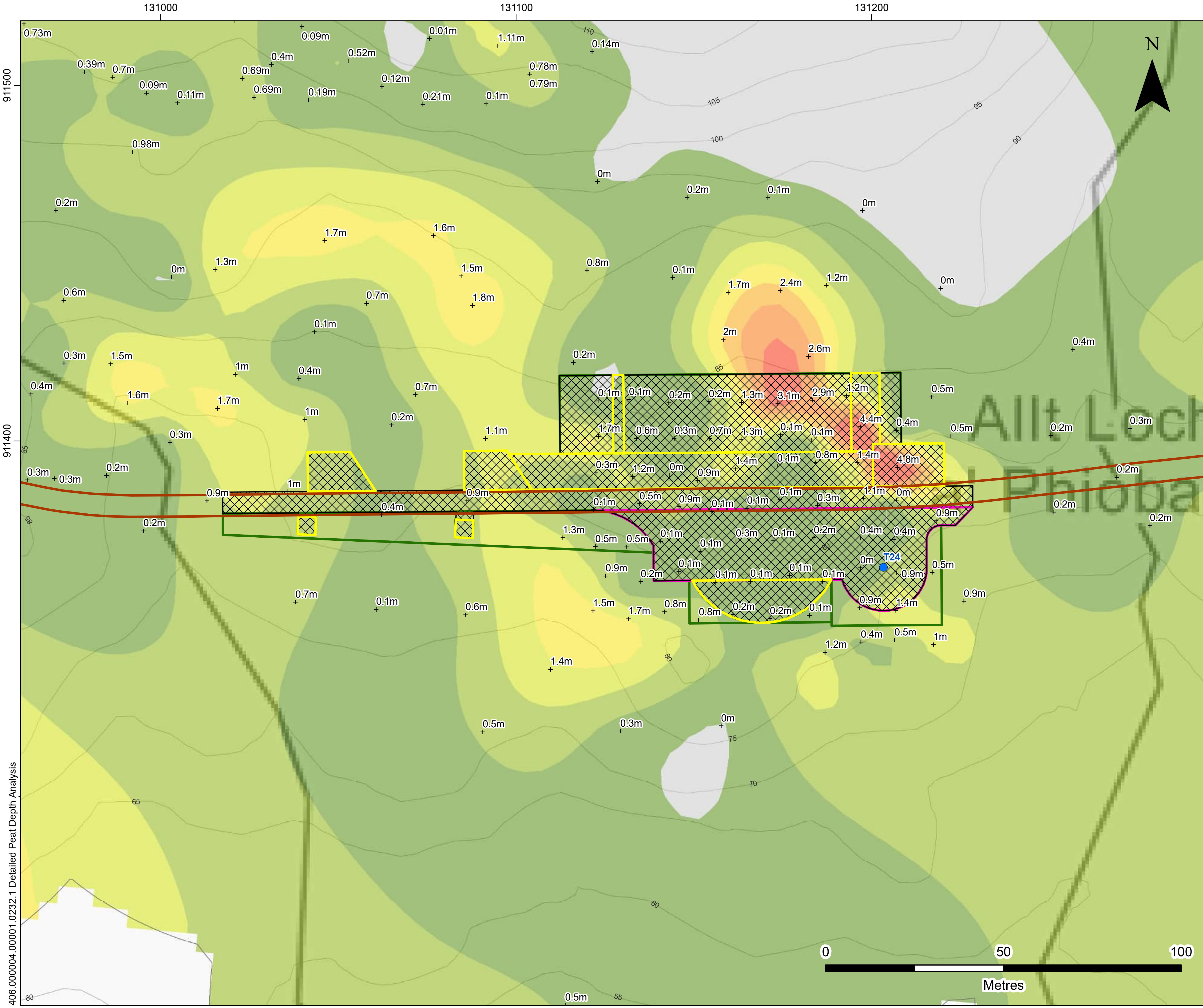
UISENIS WIND FARM - SEI
PMP
DETAILED PEAT DEPTH ANALYSIS FOR TURBINES
FIGURE 10.2.5v
Scale 1:1,000 @ A3
Date JUNE 2024
406.000004.00001.0232.1 Detailed Peat Depth Analysis


130500
130600
130700
911400
1300
LEGEND
Application Boundary
Proposed Turbine Location (200 m Blade Tip Height)
Proposed Bespoke Hardstanding Envelope
Proposed Permanent Hardstanding
Proposed Temporary Hardstanding
Proposed Clearance Area
Proposed Access Track / Turning Head
Peat Probe Location
Peat Depth (m)
0
0 - 0.5
0.5 - 1
1 - 1.5
1.5 - 2
2 - 2.5
2.5 - 3
> 3
N
T23
0
50
100
Metres
Eurowind Energy
SLR
UISENIS WIND FARM - SEI
PMP
DETAILED PEAT DEPTH ANALYSIS FOR TURBINES
FIGURE 10.2.5w
Scale 1:1,000 @ A3
Date JUNE 2024
406.000004.00001.0232.1 Detailed Peat Depth Analysis

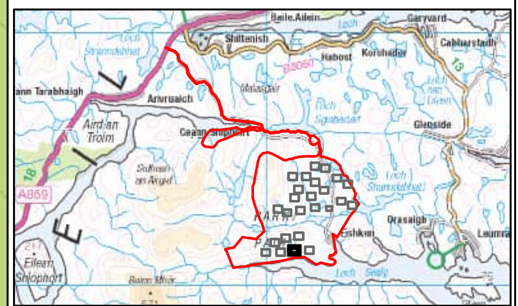


LEGEND

- Application Boundary
- Proposed Turbine Location (200 m Blade Tip Height)
- Proposed Bespoke Hardstanding Envelope
- Proposed Permanent Hardstanding
- Proposed Temporary Hardstanding
- Proposed Clearance Area
- Proposed Access Track / Turning Head
- Peat Probe Location

Peat Depth (m)

- 0
- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- > 3



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UISENIS WIND FARM - SEI

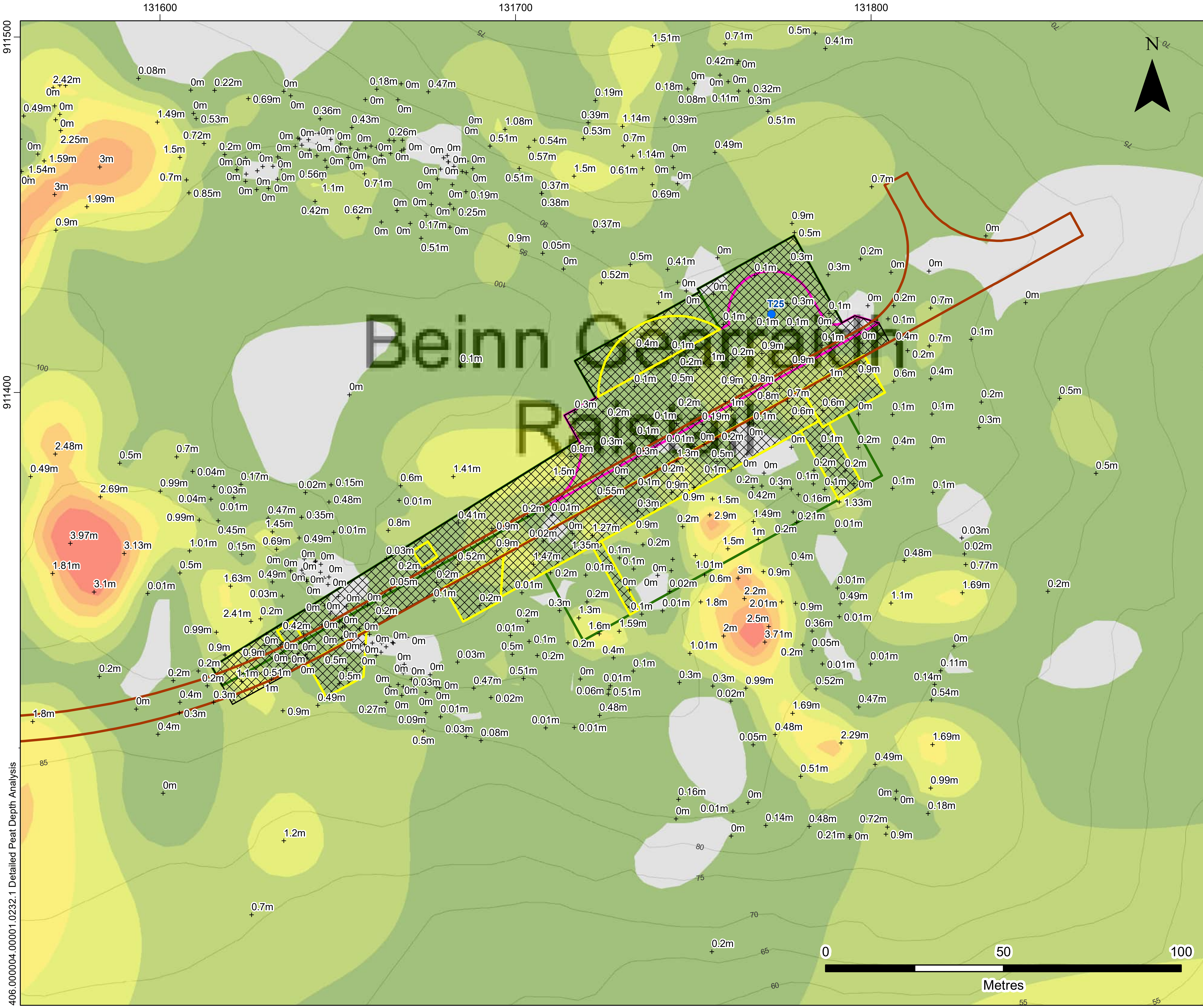
PMP

DETAILED PEAT DEPTH ANALYSIS FOR TURBINES

FIGURE 10.2.5x

Scale	Date
1:1,000 @ A3	JUNE 2024

406.00004.00001.0232.1 Detailed Peat Depth Analysis

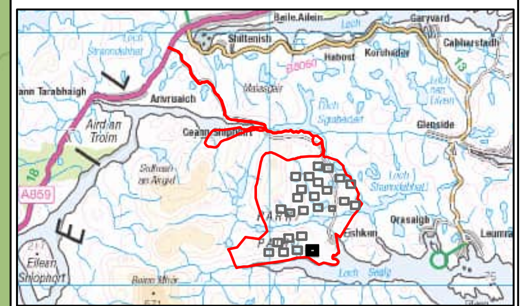


LEGEND

- Application Boundary
- Proposed Turbine Location (200 m Blade Tip Height)
- Proposed Bespoke Hardstanding Envelope
- Proposed Permanent Hardstanding
- Proposed Temporary Hardstanding
- Proposed Clearance Area
- Proposed Access Track / Turning Head
- Peat Probe Location

Peat Depth (m)

- 0
- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- > 3



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UISENIS WIND FARM - SEI

PMP

DETAILED PEAT DEPTH ANALYSIS FOR TURBINES

FIGURE 10.2.5y

Scale	Date
1:1,000 @ A3	JUNE 2024

406.00004.00001.0232.1 Detailed Peat Depth Analysis

Annex A Peat Core Logs & Photographs

SEI Technical Appendix 10.2: Peat Management Plan

Uisenis Wind Farm

Uisenis Power Ltd

SLR Project No.: 405.V64341.00001

18 June 2024

Peat Core Log

Hole No.	PC01
Sheet 1 of 1	

Project: Uisenis Wind Farm EIA	Client: Eurowind Energy Ltd	Date: 03/11/2023
Project No: 405.V64341.00001	Logger: ET	Coordinates: E: 130805.00 N: 911759.00
Location: Isle of Lewis	Hole Type: PC / Method:	Vertical Scale: 1:26

Water	Depth (m)	Sample Type	Depth	Recovery (%)	Depth (m) / Discontinuity Detail	Level (mAOD)	Legend	Stratum Description
	0.00 - 0.50	C	0.00 - 0.50	Recovery = 100%	0.50			Dark brown amorphous PEAT. Moderate decomposition, plant structure is recongisable but vague. Considerable amount of amorphous material. When squeezed, muddy water and some peat extruded. Residue strongly pasty (H5).
	0.50 - 1.00	C	0.50 - 1.00	Recovery = 100%				
	1.00 - 1.50	C	1.00 - 1.50	Recovery = 100%	1.50			Dark brown amorphous PEAT. Moderately strong decomposition, indistinct plant structure. Considerable amount of amorphous material. When squeezed, approximately 1/3 of peat squeezed out and some dark brown muddy water. Residue strongly pasty (H6).
	1.50 - 2.00	C	1.50 - 2.00	Recovery = 100%	2.00			Dark brown amorphous PEAT. Poor recovery due to complete degradation and high water content. Plant structure non discernable. Very high content of amorphous material and when squeezed, all peat passes between fingers (H10).
	2.00 - 2.50	C	2.00 - 2.50	Recovery = 100%				
	2.50 - 2.70	C	2.50 - 2.70	Recovery = 100%	2.70			Dark brown amorphous PEAT. Decomposition nearly complete, plant structure almost unrecognisable. Very high content of amorphous material. Nearly all peat squeezed out as uniform paste (H9).
								Peat Core Complete at 2.70m

1
2
3
4
5

Remarks:

Peat core recovered using peat sampler.

Peat Core Log

Project: Uisenis Wind Farm EIA	Client: Eurowind Energy Ltd	Date: 03/11/2023
Project No: 405.V64341.00001	Logger: ET	Coordinates: E: 130814.00 N: 911735.00
Location: Isle of Lewis	Hole Type: PC / Method:	Vertical Scale: 1:26

Hole No. **PC02**

Sheet 1 of 1

Water	Depth (m)	Sample Type	Depth	Recovery (%)	Depth (m) / Discontinuity Detail	Level (mAOD)	Legend	Stratum Description
	0.00 - 0.50	C	0.00 - 0.50	Recovery = 100%	0.50			Dark brown amorphous PEAT. Moderate decomposition, plant structure is recongisable but vague. Considerable amount of amorphous material. When squeezed, muddy water and some peat extruded. Residue strongly pasty (H5).
	0.50 - 1.00	C	0.50 - 1.00	Recovery = 100%				Dark brown amorphous PEAT. Strong decomposition, faintly recognisable plant structure. High content of amorphous material and approximately 1/2 peat squeezed out with very dark brown water. Residue strongly pasty (H7).
	1.00 - 1.50	C	1.00 - 1.50	Recovery = 100%	1.50			
	1.50 - 2.00	C	1.50 - 2.00	Recovery = 100%	2.00			Dark brown amorphous PEAT. Poor recovery due to complete degradation and high water content. Plant structure non discernable. Very high content of amorphous material and when squeezed, all peat passes between fingers (H10).
	2.00 - 2.50	C	2.00 - 2.50	Recovery = 100%	2.50			Dark brown amorphous PEAT. Decomposition nearly complete, plant structure almost unrecognisable. Very high content of amorphous material. Nearly all peat squeezed out as uniform paste (H9).

Peat Core Complete at 2.50m

Remarks:

Peat core recovered using peat sampler.

Peat Core Log

Hole No.	PC03
	Sheet 1 of 1

Project: Uisenis Wind Farm EIA	Client: Eurowind Energy Ltd	Date: 03/11/2023
Project No: 405.V64341.00001	Logger: ET	Coordinates: E: 131922.00 N: 914253.00
Location: Isle of Lewis	Hole Type: PC / Method:	Vertical Scale: 1:26

Water	Depth (m)	Sample Type	Depth	Recovery (%)	Depth (m) / Discontinuity Detail	Level (mAOD)	Legend	Stratum Description
	0.00 - 0.50	C	0.00 - 0.50	Recovery = 100%	0.50			Dark brown amorphous PEAT. Moderate decomposition, plant structure is recongisable but vague. Considerable amount of amorphous material. When squeezed, muddy water and some peat extruded. Residue strongly pasty (H5).
	0.50 - 1.00	C	0.50 - 1.00	Recovery = 100%				Dark brown amorphous PEAT. Strong decomposition, faintly recognisable plant structure. High content of amorphous material and approximately 1/2 peat squeezed out with very dark brown water. Residue strongly pasty (H7).
	1.00 - 1.50	C	1.00 - 1.50	Recovery = 100%				
	1.50 - 2.00	C	1.50 - 2.00	Recovery = 100%	2.00			
	2.00 - 2.50	C	2.00 - 2.50	Recovery = 100%	2.50			Dark brown amorphous PEAT. Very strong decomposition, very indistinct plant structure. High content of amorphous material. Approximately 2/3 peat squeezed out with some pasty water (H8).
	2.50 - 3.00	C	2.50 - 3.00	Recovery = 100%	3.00			Dark brown amorphous PEAT. Decomposition nearly complete, plant structure almost unrecognisable. Very high content of amorphous material. Nearly all peat squeezed out as uniform paste (H9).
								Peat Core Complete at 3.00m

Remarks:

Peat core recovered using peat sampler.

Peat Core Log

SLR	Hole No. PC04 Sheet 1 of 1

Project: Uisenis Wind Farm EIA	Client: Eurowind Energy Ltd	Date: 03/11/2023	
Project No: 405.V64341.00001	Logger: ET	Coordinates: E: 131854.00 N: 914238.00	
Location: Isle of Lewis	Hole Type: PC	Method:	Vertical Scale: 1:26

Water	Depth (m)	Sample Type	Depth	Recovery (%)	Depth (m) / Discontinuity Detail	Level (mAOD)	Legend	Stratum Description
	0.00 - 0.50	C	0.00 - 0.50	Recovery = 100%				
	0.50 - 1.00	C	0.50 - 1.00	Recovery = 100%	1.00			Dark brown amorphous PEAT. Moderately strong decomposition, indistinct plant structure. Considerable amount of amorphous material. When squeezed, approximately 1/3 of peat squeezed out and some dark brown muddy water. Residue strongly pasty (H6).
	1.00 - 1.50	C	1.00 - 1.50	Recovery = 100%	1.50			Dark brown amorphous PEAT. Strong decomposition, faintly recognisable plant structure. High content of amorphous material and approximately 1/2 peat squeezed out with very dark brown water. Residue strongly pasty (H7).
	1.50 - 2.00	C	1.50 - 2.00	Recovery = 100%	2.20			Dark brown amorphous PEAT. Very strong decomposition, very indistinct plant structure. High content of amorphous material. Approximately 2/3 peat squeezed out with some pasty water (H8). *1.80 Orangish brown organic inclusion - potentially weathered wood*
	2.00 - 2.50	C	2.00 - 2.50	Recovery = 100%				
	2.50 - 2.70	C	2.50 - 2.70	Recovery = 100%	2.70			Dark brown amorphous PEAT. Decomposition nearly complete, plant structure almost unrecognisable. Very high content of amorphous material. Nearly all peat squeezed out as uniform paste (H9). Frequent orangish brown organic inclusions - potentially weathered wood. *2.39 Orangish brown organic inclusions - potentially weathered wood*
								Peat Core Complete at 2.70m

Remarks:

Peat core recovered using peat sampler.

Peat Auger 01
0 – 0.5m

Peat Auger 01
0.5 – 1.0m

global environmental solutions

Floor 2
4/5 Lochside View
Edinburgh Park
Edinburgh
EH12 9DH

Tel: 0131 335 6830
Fax: 0131 335 6831
Web: www.slrconsulting.com

Uisenis Wind Farm

Eurowind Energy Ltd.

Project No.: 405.V64341.00001

Photograph Date: November 2022

Peat Auger 01
1.0 – 1.5m

Peat Auger 01
1.5 – 2.0m

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4/5 Lochside View
Edinburgh Park
Edinburgh
EH12 9DH

Tel: 0131 335 6830
Fax: 0131 335 6831
Web: www.slrconsulting.com

Uisenis Wind Farm

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Project No.: 405.V64341.00001

Photograph Date: November 2022

Peat Auger 01
2.0 – 2.5m

Peat Auger 01
2.5 – 2.7m

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4/5 Lochside View
Edinburgh Park
Edinburgh
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Fax: 0131 335 6831
Web: www.slrconsulting.com

Uisenis Wind Farm

Eurowind Energy Ltd.

Project No.: 405.V64341.00001

Photograph Date: November 2022

Peat Auger 02
0 – 0.5m

Peat Auger 02
0.5 – 1.0m

Floor 2
4/5 Lochside View
Edinburgh Park
Edinburgh
EH12 9DH

Tel: 0131 335 6830
Fax: 0131 335 6831
Web: www.slrconsulting.com

Uisenis Wind Farm

Eurowind Energy Ltd.

Project No.: 405.V64341.00001

Photograph Date: November 2022

Peat Auger 02
1.0 – 1.5m

Peat Auger 02
1.5 – 2.0m

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4/5 Lochside View
Edinburgh Park
Edinburgh
EH12 9DH

Tel: 0131 335 6830
Fax: 0131 335 6831
Web: www.slrconsulting.com

Uisenis Wind Farm

Eurowind Energy Ltd.

Project No.: 405.V64341.00001

Photograph Date: November 2022

Peat Auger 02
2.0 - 2.5m

Peat Auger 03
0 – 0.5m

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Floor 2
4/5 Lochside View
Edinburgh Park
Edinburgh
EH12 9DH

Tel: 0131 335 6830
Fax: 0131 335 6831
Web: www.slrconsulting.com

Uisenis Wind Farm

Eurowind Energy Ltd.

Project No.: 405.V64341.00001

Photograph Date: November 2022

Peat Auger 03
0.5 - 1.0m

Peat Auger 03
1.0 – 1.5m

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Floor 2
4/5 Lochside View
Edinburgh Park
Edinburgh
EH12 9DH

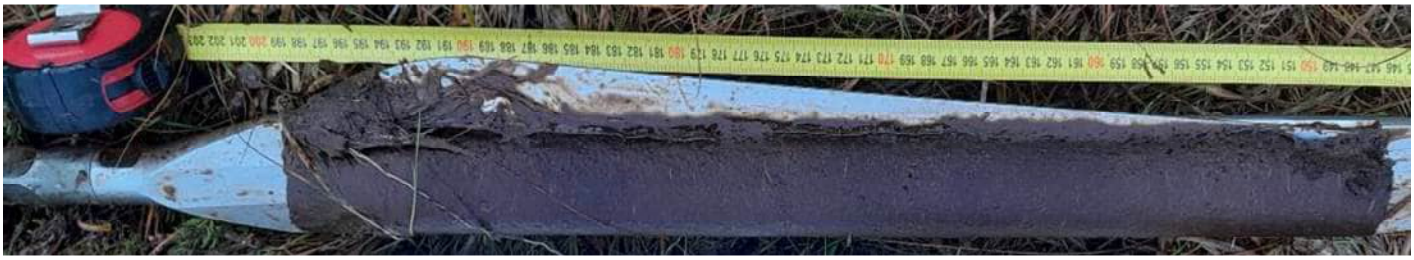
Tel: 0131 335 6830
Fax: 0131 335 6831
Web: www.slrconsulting.com

Uisenis Wind Farm

Eurowind Energy Ltd.

Project No.: 405.V64341.00001

Photograph Date: November 2022



Peat Auger 03
1.5 – 2.0m

Peat Auger 03
2.0 – 2.5m

Floor 2
4/5 Lochside View
Edinburgh Park
Edinburgh
EH12 9DH

Tel: 0131 335 6830
Fax: 0131 335 6831
Web: www.slrconsulting.com

Uisenis Wind Farm

Eurowind Energy Ltd.

Project No.: 405.V64341.00001

Photograph Date: November 2022

Peat Auger 03
2.5 – 3.0m

Peat Auger 04
0 – 0.5m

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Floor 2
4/5 Lochside View
Edinburgh Park
Edinburgh
EH12 9DH

Tel: 0131 335 6830
Fax: 0131 335 6831
Web: www.slrconsulting.com

Uisenis Wind Farm

Eurowind Energy Ltd.

Project No.: 405.V64341.00001

Photograph Date: November 2022

Peat Auger 04
0.5 – 1.0m

Peat Auger 04
1.0 – 1.5m

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4/5 Lochside View
Edinburgh Park
Edinburgh
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Tel: 0131 335 6830
Fax: 0131 335 6831
Web: www.slrconsulting.com

Uisenis Wind Farm

Eurowind Energy Ltd.

Project No.: 405.V64341.00001

Photograph Date: November 2022

Peat Auger 04
1.5 – 2.0m

Peat Auger 04
2.0 – 2.5m

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Floor 2
4/5 Lochside View
Edinburgh Park
Edinburgh
EH12 9DH

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Fax: 0131 335 6831
Web: www.slrconsulting.com

Uisenis Wind Farm

Eurowind Energy Ltd.

Project No.: 405.V64341.00001

Photograph Date: November 2022

Peat Auger 04
2.5 – 2.7m

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Floor 2
4/5 Lochside View
Edinburgh Park
Edinburgh
EH12 9DH

Tel: 0131 335 6830
Fax: 0131 335 6831
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Eurowind Energy Ltd.

Project No.: 405.V64341.00001

Photograph Date: November 2022

Annex B Excavated Materials Calculator

SEI Technical Appendix 10.2: Peat Management Plan

Uisenis Wind Farm

Uisenis Power Ltd

SLR Project No.: 405.V64341.00001

18 June 2024

Infrastructure	Length (m)	Width (m)	Area (m2)	Average Depth (m)	Number	Total Volume Excavated (m3)	Length (m)	Width (m)	Area (m2)	Average Depth (m)	Number	Total Re-use Volume (m3)	Detail
New Excavated Access Track	17355	6	129891	0.54	1	56744	17355	1.5	-	0.80	2	41653	Verge reinstatement to tie into adjacent habitats.
Existing / Upgraded Access Track	12749	3	76455	0.74	1	28354	12749	1.5	-	0.80	2	30598	Verge reinstatement to tie into adjacent habitats.
New Floating Access Track	2604	6	19810	0.94	0	0	2604	1.5	-	0.80	2	6249	Verge reinstatement to tie into adjacent habitats.
Substation (South)	-	-	7500	0.35	1	2592	350	1	-	0.50	1	175	Assume re-use of peat on the perimeter to tie into adjacent habitat.
Substation located in Borrow Pit 7. (North)	-	-	12326	0.68	0	0	525	1	-	1.00	1	525	Assume re-use of peat on the perimeter to tie into adjacent habitat. Excavated volume covered in BP7 calcs.
Temporary Construction Compound 1	-	-	6301	0.64	1	4062	-	-	6301	1.00	1	6301	Full reinstatement at location of excavation.
Temporary Construction Compound 2	-	-	2750	0.55	1	1505	-	-	2750	1.00	1	2750	Full reinstatement at location of excavation.
Temporary Construction Compound 3	-		6400	0.55	1	3518	-	-	6400	1.00	1	6400	Full reinstatement at location of excavation.
Borrow Pit 1	-	-	6591	0.19	1	1248	-	-	6591	1.00	1	6591	Reinstatement and reuse of peat for habitat restoration of borrow pit area.
Borrow Pit 2	-	-	4009	0.38	1	1534	-	-	4009	1.00	1	4009	Reinstatement and reuse of peat for habitat restoration of borrow pit area.
Borrow Pit 3	-	-	16171	0.29	1	4718	-	-	16171	1.00	1	16171	Reinstatement and reuse of peat for habitat restoration of borrow pit area.
Borrow Pit 4	-	-	3348	0.20	1	660	-	-	3348	1.00	1	3348	Reinstatement and reuse of peat for habitat restoration of borrow pit area.
Borrow Pit 5	-	-	12809	0.20	1	2528	-	-	12809	1.00	1	12809	Reinstatement and reuse of peat for habitat restoration of borrow pit area.
Borrow Pit 6	-	-	5199	0.35	1	1828	-	-	5199	1.00	1	5199	Reinstatement and reuse of peat for habitat restoration of borrow pit area.
Borrow Pit 7	-	-	17821	0.59	1	10538	-	-	17821	1.00	0	0	No restoration as located within an area of permanent infrastructure. (Substation)
T1 - Permanent Hardstanding			1797	0.50	1	905	27	1.5	41	0.80	1	32	Includes turbine area. Assume re-use of peat on the perimeter of the permananent hardstanding to tie into adjacent habitat.
T1 - Proposed Temporary Hardstanding	-	-	3048	0.60	1	1825	-	-	3048	0.60	1	1825	Bespoke hardstanding area minus the permanent area and track areas. Full reinstatement of temporary hardstanding.
T2 - Permanent Hardstanding	-	-	1797	0.47	1	846	27	1.5	41	0.80	1	32	Includes turbine area. Assume re-use of peat on the perimeter of the permananent hardstanding to tie into adjacent habitat.
T2 - Proposed Temporary Hardstanding	-	-	3757	0.72	1	2714	-	-	3757	0.72	1	2714	Bespoke hardstanding area minus the permanent area and track areas. Full reinstatement of temporary hardstanding.
T3 - Permanent Hardstanding	-	-	1797	0.62	1	1107	27	1.5	41	0.80	1	32	Includes turbine area. Assume re-use of peat on the perimeter of the permananent hardstanding to tie into adjacent habitat.
T3 - Proposed Temporary Hardstanding	-	-	3482	0.65	1	2270	-	-	3482	0.65	1	2270	Bespoke hardstanding area minus the permanent area and track areas. Full reinstatement of temporary hardstanding.
T4 - Permanent Hardstanding	-	-	1797	0.47	1	846	27	1.5	41	0.80	1	32	Includes turbine area. Assume re-use of peat on the perimeter of the permananent hardstanding to tie into adjacent habitat.
T4 - Proposed Temporary Hardstanding	-	-	3484	0.57	1	2003	-	-	3484	0.57	1	2003	Bespoke hardstanding area minus the permanent area and track areas. Full reinstatement of temporary hardstanding.
T5 - Permanent Hardstanding	-	-	1797	0.46	1	818	27	1.5	41	0.80	1	32	Includes turbine area. Assume re-use of peat on the perimeter of the permananent hardstanding to tie into adjacent habitat.
T5 - Proposed Temporary Hardstanding	-	-	3512	0.65	1	2279	-	-	3512	0.65	1	2279	Bespoke hardstanding area minus the permanent area and track areas. Full reinstatement of temporary hardstanding.
T6 - Permanent Hardstanding	-	-	1797	0.24	1	431	27	1.5	41	0.80	1	32	Includes turbine area. Assume re-use of peat on the perimeter of the permananent hardstanding to tie into adjacent habitat.
T6 - Proposed Temporary Hardstanding	-	-	3702	0.29	1	1064	-	-	3702	0.29	1	1064	Bespoke hardstanding area minus the permanent area and track areas. Full reinstatement of temporary hardstanding.
T7 - Permanent Hardstanding	-	-	1797	0.39	1	693	27	1.5	41	0.80	1	32	Includes turbine area. Assume re-use of peat on the perimeter of the permananent hardstanding to tie into adjacent habitat.
T7 - Proposed Temporary Hardstanding	-	-	3971	0.30	1	1174	-	-	3971	0.30	1	1174	Bespoke hardstanding area minus the permanent area and track areas. Full reinstatement of temporary hardstanding.
T8 - Permanent Hardstanding	-	-	1797	0.43	1	770	27	1.5	41	0.80	1	32	Includes turbine area. Assume re-use of peat on the perimeter of the permananent hardstanding to tie into adjacent habitat.
T8 - Proposed Temporary Hardstanding	-	-	3501	0.27	1	949	-	-	3501	0.27	1	949	Bespoke hardstanding area minus the permanent area and track areas. Full reinstatement of temporary hardstanding.
T9 - Permanent Hardstanding	-	-	1797	0.57	1	1033	27	1.5	41	0.80	1	32	Includes turbine area. Assume re-use of peat on the perimeter of the permananent hardstanding to tie into adjacent habitat.
T9 - Proposed Temporary Hardstanding	-	-	3524	0.72	1	2553	-	-	3524	0.72	1	2553	Bespoke hardstanding area minus the permanent area and track areas. Full reinstatement of temporary hardstanding.
T10 - Permanent Hardstanding	-	-	1797	0.62	1	1116	27	1.5	41	0.80	1	32	Includes turbine area. Assume re-use of peat on the perimeter of the permananent hardstanding to tie into adjacent habitat.
T10 - Proposed Temporary Hardstanding	-	-	3174	0.93	1	2952	-	-	3174	0.93	1	2952	Bespoke hardstanding area minus the permanent area and track areas. Full reinstatement of temporary hardstanding.
T11 - Permanent Hardstanding	-	-	1797	0.73	1	1307	27	1.5	41	0.80	1	32	Includes turbine area. Assume re-use of peat on the perimeter of the permananent hardstanding to tie into adjacent habitat.
T11 - Proposed Temporary Hardstanding	-	-	3440	0.68	1	2352	-	-	3440	0.68	1	2352	Bespoke hardstanding area minus the permanent area and track areas. Full reinstatement of temporary hardstanding.
T12 - Permanent Hardstanding	-	-	1797	0.46	1	828	27	1.5	41	0.80	1	32	Includes turbine area. Assume re-use of peat on the perimeter of the permananent hardstanding to tie into adjacent habitat.
T12 - Proposed Temporary Hardstanding	-	-	4031	0.31	1	1238	-	-	4031	0.31	1	1238	Bespoke hardstanding area minus the permanent area and track areas. Full reinstatement of temporary hardstanding.
T13 - Permanent Hardstanding	-	-	1797	0.19	1	346	27	1.5	41	0.80	1	32	Includes turbine area. Assume re-use of peat on the perimeter of the permananent hardstanding to tie into adjacent habitat.
T13 - Proposed Temporary Hardstanding	-	-	3471	0.18	1	608	-	-	3471	0.18	1	608	Bespoke hardstanding area minus the permanent area and track areas. Full reinstatement of temporary hardstanding.
T14 - Permanent Hardstanding	-	-	1797	0.51	1	911	27	1.5	41	0.80	1	32	Includes turbine area. Assume re-use of peat on the perimeter of the permananent hardstanding to tie into adjacent habitat.
T14 - Proposed Temporary Hardstanding	-	-	3562	0.53	1	1889	-	-	3562	0.53	1	1889	Bespoke hardstanding area minus the permanent area and track areas. Full reinstatement of temporary hardstanding.
T15 - Permanent Hardstanding	-	-	1797	0.59	1	1055	27	1.5	41	0.80	1	32	Includes turbine area. Assume re-use of peat on the perimeter of the permananent hardstanding to tie into adjacent habitat.
T15 - Proposed Temporary Hardstanding	-	-	3538	0.59	1	2100	-	-	3538	0.59	1	2100	Bespoke hardstanding area minus the permanent area and track areas. Full reinstatement of temporary hardstanding.
T16 - Permanent Hardstanding	-	-	1797	0.55	1	996	27	1.5	41	0.80	1	32	Includes turbine area. Assume re-use of peat on the perimeter of the permananent hardstanding to tie into adjacent habitat.
T16 - Proposed Temporary Hardstanding	-	-	3461	0.49	1	1693	-	-	3461	0.49	1	1693	Bespoke hardstanding area minus the permanent area and track areas. Full reinstatement of temporary hardstanding.
T17 - Permanent Hardstanding	-	-	1797	0.33	1	595	27	1.5	41	0.80	1	32	Includes turbine area. Assume re-use of peat on the perimeter of the permananent hardstanding to tie into adjacent habitat.
T17 - Proposed Temporary Hardstanding	-	-	3572	0.26	1	936	-	-	3572	0.26	1	936	Bespoke hardstanding area minus the permanent area and track areas. Full reinstatement of temporary hardstanding.
T18 - Permanent Hardstanding	-	-	1797	0.55	1	996	27	1.5	41	0.80	1	32	Includes turbine area. Assume re-use of peat on the perimeter of the permananent hardstanding to tie into adjacent habitat.
T18 - Proposed Temporary Hardstanding	-	-	3652	0.43	1	1586	-	-	3652	0.43	1	1586	Bespoke hardstanding area minus the permanent area and track areas. Full reinstatement of temporary hardstanding.
T19 - Permanent Hardstanding	-	-	1797	0.27	1	488	27	1.5	41	0.80	1	32	Includes turbine area. Assume re-use of peat on the perimeter of the permananent hardstanding to tie into adjacent habitat.
T19 - Proposed Temporary Hardstanding	-	-	5424	0.38	1	2046	-	-	5424	0.38	1	2046	Bespoke hardstanding area minus the permanent area and track areas. Full reinstatement of temporary hardstanding.
T20 - Permanent Hardstanding	-	-	1797	0.76	1	1371	27	1.5	41	0.80	1	32	Includes turbine area. Assume re-use of peat on the perimeter of the permananent hardstanding to tie into adjacent habitat.
T20 - Proposed Temporary Hardstanding	-	-	3993	0.79	1	3140	-	-	3993	0.79	1	3140	Bespoke hardstanding area minus the permanent area and track areas. Full reinstatement of temporary hardstanding.
T21 - Permanent Hardstanding	-	-	1797	0.37	1	670	27	1.5	41	0.80	1	32	Includes turbine area. Assume re-use of peat on the perimeter of the permananent hardstanding to tie into adjacent habitat.
T21 - Proposed Temporary Hardstanding	-	-	4033	0.60	1	2406	-	-	4033	0.60	1	2406	Bespoke hardstanding area minus the permanent area and track areas. Full reinstatement of temporary hardstanding.
T22 - Permanent Hardstanding	-	-	1797	0.40	1	712	27	1.5	41	0.80	1	32	Includes turbine area. Assume re-use of peat on the perimeter of the permananent hardstanding to tie into adjacent habitat.
T22 - Proposed Temporary Hardstanding	-	-	3490	0.58	1	2040	-	-	3490	0.58	1	2040	Bespoke hardstanding area minus the permanent area and track areas. Full reinstatement of temporary hardstanding.
T23 - Permanent Hardstanding	-	-	1797	0.36	1	651	27	1.5	41	0.80	1	32	Includes turbine area. Assume re-use of peat on the perimeter of the permananent hardstanding to tie into adjacent habitat.
T23 - Proposed Temporary Hardstanding	-	-	3474	0.38	1	1321	-	-	3474	0.38	1	1321	Bespoke hardstanding area minus the permanent area and track areas. Full reinstatement of temporary hardstanding.
T24 - Permanent Hardstanding	-	-	1797	0.30	1	538	27	1.5	41	0.80	1	32	Includes turbine area. Assume re-use of peat on the perimeter of the permananent hardstanding to tie into adjacent habitat.
T24 - Proposed Temporary Hardstanding	-	-	4148	1.01	1	4205	-	-	4148	1.01	1	4205	Bespoke hardstanding area minus the permanent area and track areas. Full reinstatement of temporary hardstanding.
T25 - Permanent Hardstanding	-	-	1797	0.47	1	842	27	1.5	41	0.80	1	32	Includes turbine area. Assume re-use of peat on the perimeter of the permananent hardstanding to tie into adjacent habitat.
T25 - Proposed Temporary Hardstanding			3470	0.38	1	1315	-	-	3470	0.38	1	1315	Bespoke hardstanding area minus the permanent area and track areas. Full reinstatement of temporary hardstanding.
Potential Peatland Restoration Areas	-	-	-	-	-	-	46820	0.5	-	0.50	1	11705	Potential restoration subject to further detailed assessment. Assumes restoration of excavated drainage channels within the five Peatland Restoration areas using excavated acrotelmic peat.

Total Excavated Volume (m3)	189358
Total Re-use Volume (m3)	192244
Net Balance (m3) not including potential peatland restoration	-2885.8

Making Sustainability Happen

Uisenis Wind Farm

Supplementary Environmental Information Technical Appendix 9-5: Outline Eagle Conservation Programme

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1.1	Revised to include NatureScot and RSPB comments on v1	Rafe Dewar	13/06/2024

CONTENTS

1 INTRODUCTION

This report provides an outline of the targeted management measures available to protect, increase and better understand the Outer Hebrides populations of golden eagle and white-tailed eagle as part of an Eagle Conservation Programme (ECP). The ECP forms part of the Eurowind Energy Supplementary Environmental Information (SEI) application for the proposed Uisenis Wind Farm ('the proposed development'). It was written by Robin Reid of Redwing Ecological Surveys, with input from Rafe Dewar of MacArthur Green.

1.1 Consented and proposed wind farm development

The proposed development is located on the Eisgein (Eishken) Estate, approximately 20km southwest of Stornoway on the Isle of Lewis. The site has an existing consent (under Section 36 of the Electricity Act 1989) for the development of the Muaitheabhal Wind Farm comprising 45 turbines with varying tip heights up to 150 m.

The proposed development is located on the same site as Muaitheabhal Wind Farm ('the consented development'). If consented, the Uisenis proposal (up to 25 turbines) would be built instead of the 45 turbines associated with the Muaitheabhal consent.

The proposed development application was formally submitted to the Scottish Government's Energy Consents Unit as a new Section 36 application for consent to build and operate the wind farm (Energy Consents Unit application ref ECU00004568).

The proposed development's 2023 Environmental Impact Assessment (EIA) Report, Chapter 9: Ornithology, predicted adverse effects on golden eagle and white-tailed eagle, which in the case of the latter, requires mitigation measures to avoid a significant effect on the Outer Hebrides population due to collision mortality. Based on results from research carried out in Norway (May et al. 2020), it is proposed that the blades of some turbines are painted black as mitigation to reduce collision mortality to white-tailed eagles.

For golden eagle, it was predicted that there would be possible abandonment of one active territory (or a reduction in productivity of the territorial pair), and potential adverse impacts on breeding birds within a second territory.

Due to the predicted adverse effects on eagles, a programme of research and improvements is therefore proposed through the implementation of an ECP, which the owner of Eishken Estate made a commitment to in 2019.

1.2 Eagle Conservation Programme

In 2019, Nick Oppenheim, the owner of Eishken Estate, approached NatureScot (at that time Scottish Natural Heritage, SNH) and RSPB Scotland proposing that an ECP would be delivered alongside the consented development on the estate.

Eishken Limited entered into a formal agreement with SNH, committing Eishken Limited to insert a clause into any lease granted to any developer of the wind farm requiring the developer to fund the ECP, to the extent of £150,000 per annum index linked to CPI, for the whole of the construction phase and the whole of the operational phase of the wind farm.

The agreement detailed that a new company would be incorporated with the exclusive purpose of delivering the ECP. The agreement also granted access to large parts of Eishken estate for the purpose of work to meet the aims of the ECP.

RSPB Scotland's advice was sought, and they provided a letter of support not withstanding their continued opposition to the consented development due to concerns over the likely impacts on golden eagles and white-tailed eagles.

RSPB Scotland has requested that the implementation of the ECP is attached as a condition to any planning consent given.

At the time of the 2019 agreement RSPB Scotland provided a brief list of potential measures to be considered for inclusion in the ECP. NatureScot has confirmed that no further progress was made at that time in developing the programme.

Previously, and associated with an earlier wind farm proposal on the estate, a Natural and Cultural Regeneration plan was developed which included measures to undertake research into the effect of the wind farm on eagles and a programme of habitat enhancement across the estate (Land Use Consultants 2007).

1.3 Purpose of this document

Further to the submission of the Uisenis EIA Report, NatureScot and RSPB Scotland asked for further detail on the proposed ECP, and this is provided here as part of the SEI application.

The purpose of this document is to outline the proposed actions, aims and range of implementation measures available, together with supporting rationale, that would form the basis for the ECP. This is intended as a starting point to inform further discussion and consultation required to select the most appropriate research and management, and develop a detailed programme. The information provided is based on 20 years of intensive eagle study on the Western Isles by R. Reid, published and un-published research data, and consultation with RSPB Scotland, NatureScot and other eagle experts.

2 EAGLE POPULATION STATUS AND POTENTIAL CONSTRAINTS

2.1 The population status of Golden Eagle and White-tailed Eagle on Lewis & Harris

Lewis & Harris supported 69 pairs of golden eagle during the last national survey in 2015 (Hayhow et al. 2017), approximately 14% of the Scottish population. This represented a significant increase since 2003 when the previous national survey recorded 51 pairs (Eaton et al. 2003). However, although there has clearly been an increase in golden eagle numbers over recent decades, some of the observed increase is certainly a result of increased monitoring effort since 2003. During this period a number of previously unknown territories with evidence of prior occupation were identified. Since the 2015 survey around one third of the Lewis & Harris golden eagle population has been monitored annually by the Raptor Study Group. During this time, it is known that there have been at least two territory re-occupations and at least four territories have become vacant (Lewis & Harris Raptor Study Group, unpublished data). This suggests that the population is stable and likely at carrying capacity. The few remaining vacant historical sites may simply be alternate nest sites of occupied neighbouring territories and not viable separate territories.

The golden eagle population on the Western Isles is considered to be in favourable conservation status, passing the tests set out in the conservation framework for golden eagles in Scotland (Whitfield et al. 2008). Recent research based on genetics, ringing recoveries and satellite tagging data has found that the Western Isles golden eagle population is largely isolated from the rest of Scotland with few individuals crossing the Minch (Fielding et al. 2024, Ogden et al. 2015). The most recent satellite tagging data also suggests that the Sound of Harris presents a partial barrier to movement of golden eagles from Lewis & Harris to the southern Isles of Uist (Fielding et al 2024).

The white-tailed eagle population has increased rapidly over the last two decades following Scottish re-introductions that commenced in 1975. There are currently 42 known territories on Lewis and Harris and the occupancy rate of monitored territories is over 90%. It is therefore estimated that there are currently at least 38 territorial pairs on Lewis & Harris with one or more new territories located in most years as the population continues to expand (Lewis & Harris Raptor Study Group, unpublished data). This corresponds to 20-25% of the Scottish population.

2.2 The status of Golden Eagle and White-tailed Eagle on Eishken Estate

The Eishken estate holds an exceptional density of eagles and probably supports more eagle territories than any other single land holding in Scotland. There are currently 11 occupied golden eagle territories and eight white-tailed eagle territories with nest sites on the 16,400 ha estate. It is known from recent satellite tagging data that in addition to the territorial pairs, the estate is also an important area for non-territorial sub-adults of both eagle species. The Pairc peninsula (Eishken estate and the Pairc estate) is listed as an Important Bird Area for golden eagle by BirdLife International (BirdLife International 2024).

However, golden eagle breeding success on Eishken estate is poor and below that of the rest of Lewis & Harris. Long term fledging success estimates for Lewis & Harris range from 0.3 to 0.47 young/pair/year based on national surveys and Scottish Raptor Monitoring Scheme data. On Eishken estate an intensive three-year study 2003-2005 recorded a fledging rate of 0.20 young/pair/year (Reid 2008) and the last complete survey on Eishken in 2015 recorded 0.27 young/pair. It is estimated that in Scotland a fledging success rate of 0.28 is required to maintain a stable population (Whitfield et al. 2008) so the Eishken group of golden eagle territories may not be self-sustaining and could be acting as a sink. A study into golden eagles nesting on North Harris and Eishken estate found that eagle breeding success was negatively correlated with deer density (Reid 2008). This is likely due to high browsing pressure by red deer resulting in a low abundance of the favoured live prey species such as red grouse and mountain hare.

White-tailed eagle breeding success on Eishken estate is comparable to other parts of Lewis & Harris and the wider Scottish population and the Pairc peninsula is a Scottish stronghold for the species, supporting the highest density within the Western Isles.

2.3 Current and potential future constraints to eagle populations on Lewis & Harris

2.3.1 Golden Eagle

Previous research has identified a number of potential and actual constraints to the Scottish golden eagle population. These have included persecution, afforestation, wind farms, recreational disturbance, overgrazing by sheep and/or red deer, competition with white-tailed eagles and weather effects (Hayhow et al. 2018, Whitfield et al. 2008).

The effects of continued illegal persecution associated with the management of driven grouse moors has been identified as the main constraint influencing population size and distribution in Scotland (Whitfield & Fielding 2017), but this is not the case on Lewis & Harris where persecution incidents are now rare. Afforestation is not a constraint on Lewis & Harris where open habitats available to golden eagles are almost continuous. Recreational disturbance may affect breeding success at a small number of nests sites located close to paths and habitation. However, much of the Lewis and Harris landscape is remote, particularly away from the coast and most golden eagle nest sites are located in areas that are infrequently visited. Therefore, disturbance is currently not likely to be a significant constraint to golden eagles on Lewis & Harris.

As the Lewis & Harris golden eagle population is considered to be at capacity and isolated from the rest of the Scottish population, available space is likely to be the main constraint on the island currently. Despite the extensive areas available to foraging eagles, the habitat is of varying quality with large areas degraded through chronic overgrazing by sheep and deer, and through burning. Breeding success is variable and lower than in some other parts of Scotland. This may be partly due to intense resource competition in a high-density population, but it is also likely that low breeding success is linked to low live prey abundance as a result of overgrazing and the associated impacts on the habitat and populations of prey species such as red grouse. Whitfield et al. (2008) identified low food availability resulting from overgrazing by sheep and deer as the main constraint impacting golden eagles in parts of western Scotland. The distributions and abundance of red deer and sheep are currently changing on Lewis & Harris and this is likely to result in shifts in the availability of food resources over time and between areas.

Weather effects such as high rainfall can impact breeding success either through direct impact on the ability of eagles to hunt and shelter young, or indirectly through impacts on prey populations (Haworth et al. 2009, Watson et al. 2003). With a changing climate that is projected to become wetter in western Scotland, increased rainfall and more frequent extreme weather events have the potential to reduce golden eagle breeding success.

In the future there may be competition between golden eagles and the increasing white-tailed eagle population for food resources and nest sites which could result in displacement of golden eagles from some coastal territories. However, research to date from Scotland has not found any substantial basis of competition between the two species (Evans et al. 2009, Whitfield et al. 2013).

The cumulative effects of consented and proposed wind farms on Lewis & Harris are predicted to result in loss of habitat through displacement effects and collision mortality effects which could impact survival rates. New electricity transmission infrastructure associated with renewables development could also result in increased collision risk. To date, one golden eagle turbine collision has been confirmed on Lewis. This incident was reported by a member of the public and in the absence of routine carcass searches it is not possible ascertain whether further collisions have occurred with the limited number of turbines that are currently operational on Lewis & Harris.

Electrocutions have largely been overlooked as a potential source of mortality to golden eagles in Scotland but there is evidence that electrocutions on the overhead line (OHL) distribution network on Lewis & Harris could be a significant cause of mortality. Elsewhere, in Norway and Germany, electrocutions are known to be common cause of white-tailed eagle mortality (Cole & Dahl 2013, Krone et al. 2009). In eastern Scotland the fates of radio tagged white-tailed eagles have demonstrated that electrocution is also a significant cause of mortality here (RSPB unpublished data).

The Western Isles golden eagle population will be particularly sensitive to any changes in the key demographic parameters (in order of importance: adult survival, sub-adult survival and fledging rate) because it is a closed population with very little, if any, immigration from elsewhere.

2.3.2 White-tailed eagle

The white-tailed eagle population is still in a recovery growth phase following re-introduction and as a result the constraints acting on this species in Scotland are not as well understood as in the golden eagle. In the future it is likely that the white-tailed eagle population will be constrained by some of the same factors affecting golden eagles such as through electrocutions on the OHL network. Elsewhere it has been found that white-tailed eagles are more susceptible to collisions with wind turbines and energy infrastructure (Nygård et al. 2010) and the unmitigated cumulative collision risk to white tailed eagles from proposed wind farms on Lewis & Harris was assessed as being significant in the proposed development's EIA Report.

The availability of suitable sheltered and undisturbed nest sites may also soon become a constraint on Lewis & Harris. Dietary analysis has shown that during the breeding season white-tailed eagles on Lewis & Harris rely largely on marine food sources, particularly seabirds (Reid et al. 2023). Therefore, further declines in seabird populations and climate change impacts on marine ecosystems are also likely to impact white-tailed eagles in the future. One marked difference between the golden eagle and white-tailed eagle population on the Western Isles is that white-tailed eagles are known to range more widely than golden eagles and the Minch does not present a barrier to movement.

Highly pathogenic avian influenza (HPAI) is a recent threat to bird populations and both species of eagle experienced declines in breeding success across Scotland in 2022 consistent with impacts of the HPAI, with the largest declines seen on Lewis & Harris (Wilson et al. 2023). However, although breeding success was impacted in that year, the territory occupancy rates in both eagle species remained high suggesting that the survival of adult eagles was not significantly affected. The carcasses of two golden eagles recovered on Harris in that year did test positive for HPAI but it is not known whether HPAI was the cause of death. Breeding success improved in 2023 suggesting that HPAI impacts on breeding success may have been temporary. In the longer-term declines in the populations of prey species as a result of HPAI, particularly seabirds that form an important component of white-tailed eagle diet, may have a more significant impact on eagles.

3 SCALE OF DELIVERY AND ACTIONS

It is proposed that the ECP operates at the scale of Lewis & Harris or the Western Isles reflecting the geographical extent of the local golden eagle population.

Due to the large size of eagle territories (10-30 km² for golden eagle on Lewis & Harris), conservation measures would need to be undertaken across large areas within the Western Isles to deliver measurable benefits.

Eishken Estate covers some 16,400 ha (164 km²) and the proposed development would occupy approximately 10% of that area. With a 1km buffer around the proposed development this would leave approximately 80% of the estate potentially available for eagle conservation management. Given that the Eishken estate is behind the ECP it would make sense for habitat and conservation management to be focused within the estate and with further work undertaken elsewhere on an opportunistic basis. Relying on delivering the ECP outside the boundaries of Eishken estate would be a significant risk to the programme as the ECP would then be dependent on influencing other landowners and managers where there may be conflicting land management pressures that are not aligned with the aims of the ECP.

The following two main actions are proposed:

1. To undertake research and monitoring to increase understanding of the impact of wind farms on golden eagles and white-tailed eagles in a high-density situation, in order to inform future policy, decision making and conservation management.
2. To carry out conservation management measures to address constraints acting on golden eagle and white-tailed eagle populations on Lewis & Harris with the aims of:
   - Improving breeding success in golden eagles;
   - Maintaining the size of the current golden eagle population; and
   - Allowing the white-tailed eagle population to continue to increase to reach carrying capacity on the island.

4 PROPOSED IMPLEMENTATION MEASURES

4.1 Research and monitoring

Building a large wind farm in an area with such a high density of resident eagles would likely be unprecedented in a global context for golden eagle and in a Scottish context for white-tailed eagle. A comprehensive research programme with the aim of understanding the impacts of the wind farm at a local and Lewis & Harris wide scale should therefore be an integral part of the ECP. There is currently considerable uncertainty over the effects of the proposed windfarm on eagles through collisions and displacement. Collision mortality calculations are based on a number of assumptions and the responses of golden eagles to turbines may differ where they occur at high density compared to elsewhere (Fielding et al. 2022). There is also uncertainty over displacement effects and how eagle pairs occupying neighbouring territories or transient non-territorial sub-adults would use the area around the wind farm if displacement of one or more territorial pairs occurred. The proposed approach of painting turbine blade tips black is also a new approach in Scotland.

For any research programme, gathering baseline data for several years ahead of wind farm construction would be essential in order to measure the impact of the wind farm.

Below is an outline of proposed research activities.

4.1.1 Monitoring of eagle territory occupancy and breeding success

Monitoring of the local eagle populations is essential in order to measure any effects of the proposed development on eagle territories overlapping the wind farm area and adjacent territories. Periodic monitoring across Lewis and Harris is required to assess wider population trends and breeding success.

The following monitoring is proposed:

- Annual monitoring of eagle territory occupancy and breeding success across the Pairc peninsula (Eishken and Pairc Estate) which is a well-defined geographical area currently supporting 14 golden eagle pairs and 11 white-tailed eagle pairs.
- Periodic monitoring on a five-year cycle of eagle territory occupancy and breeding success across Lewis & Harris.

4.1.2 Satellite telemetry studies

A satellite telemetry study involving the tagging of adult territorial golden eagles is already underway in the Lochs area of Lewis which overlaps with the proposed development site. This research has been instigated by Natural Research Ltd and supported through charitable funds. The data from the satellite tags allows monitoring of eagle movements in detail with accurate position fixes and a range of other data (e.g. elevation) collected every few minutes.

The results from golden eagle satellite telemetry studies across Scotland have already dramatically increased our understanding of survival and movements of golden eagles including responses to wind farms with many research papers published by Natural Research Ltd. (e.g. Fielding et al. 2023). Some of these research outputs have been partially funded by SSE through the Dunmaglass Wind Farm Regional Eagle Conservation Management Plan (RECMP) and data from the Lewis study has already contributed to these outputs (e.g. Fielding et al. 2024).

Satellite tagging of territorial golden eagles and white-tailed eagles in the local area prior to wind farm construction would allow a detailed assessment of any changes in movements and territory alignment in relation to the wind farm. Tagging of nestlings would allow assessment of how non-territorial eagles respond to the wind farm.

The following deployment of satellite tags is proposed:

- Support for the continuation of the Lewis adult golden eagle satellite telemetry project run by Natural Research Ltd.
- Satellite tagging of adult territorial white-tailed eagles on the Eishkem estate/Pairc peninsula.
- Satellite tagging of a sample of nestling golden eagles and white-tailed eagles across Lewis & Harris.

It is essential that the fitting of satellite tags commences several years before wind farm construction, and continues after construction, to allow a before and after comparison.

4.1.3 Carcass searches and collision risk

A carefully designed and rigorous programme of carcass searches would be essential to measure collision mortality rates associated with the proposed development's wind turbines. Carcass searches are difficult and time consuming to undertake as birds that collide with blades may travel some distance before they fall to the ground. Where possible, advances in technology should be utilised to improve the efficacy of carcass searches such as through the use of drones with image recognition software to identify carcasses. Assuming that more efficient and effective ways of searching for carcasses can be developed, carcases searches on the Western Isles could be undertaken less frequently than would be required elsewhere. Predatory and scavenging mammals such as foxes and badgers can quickly remove the evidence of carcasses but where these predators are absent, such as on the Western Isles, any raptor carcasses are likely to persist and remain detectable for longer.

It is important to assess the efficacy of painting turbine blades black in reducing collision mortality, and this would require an intensive monitoring programme to determine differing eagle responses to turbines with or without painted blades, through carcass searches and analysis of satellite tag data.

It may also be appropriate to conduct a research study into mortality associated with electrocution or collision risk associated with the Overhead Line (OHL) distribution network in the Outer Hebrides, potentially including carcass searches (see section 4.2.3 for more information).

4.1.4 Monitoring of habitat and eagle food availability

Where management measures are undertaken to improve eagle habitats (See section 4.2) there should be monitoring of habitat condition and abundance of key eagle prey species such as red grouse and mountain hares. This should also include monitoring the impacts of any changes in deer (and sheep) numbers and associated carrion availability on eagle diets.

This research should involve the collection of baseline data followed by periodic monitoring thereafter.

4.1.5 Avian Influenza (HPAI) testing

The effects of HPAI on eagles are currently unclear. Where researchers come into direct contact with eagles such as through satellite tagging, routine HPAI testing should be undertaken to contribute to knowledge around the persistence of HPAI in wild bird populations and its effects.

4.1.6 Outputs

Peer reviewed publications would be an essential output of the research to ensure results are shared and available to decision makers. The research outputs from satellite tagging in Scotland to date are an excellent example of where this has happened. For example, the report to the Scottish Government on the fates of satellite tagged golden eagles (Whitfield & Fielding 2017) led directly to a review of legislation associated with the shooting of gamebirds. The outcome was new legislation in the form of the Wildlife Management and Muirburn Bill which has recently been passed by the Scottish Parliament.

Breeding data would be made available to the Scottish Raptor Monitoring Scheme, so that it can contribute towards determination of national trends for eagle species.

4.2 Conservation Management

4.2.1 Golden Eagle foraging habitat enhancement

The relationship between golden eagles and large herbivores such as sheep and deer is complex. On one hand sheep and deer carrion proved an important food source for golden eagles, particularly during the winter when other food sources are scarce. On the other hand, over grazing by sheep and deer can reduce the cover and degrade the habitat of prey species that are particularly important for golden eagles during the breeding season such as red grouse and mountain hare (Watson et al. 1992).

Red grouse are known to be the most important golden eagle prey item during the breeding season on Lewis & Harris including on Eishken estate (Reid 2008). Eishken also has a large herd of c. 1900 red deer (Lewis & Harris DMG 2022 count data) although the density of deer varies considerably across the estate. Previous survey work on the estate found a marked correlation between grouse presence and the intensity of grazing by red deer alone and by deer and sheep combined. Grouse presence declined rapidly with increasing numbers of sheep and red deer (LUC 2007).

A reduction in red deer numbers would lead to a recovery of heath vegetation favoured by red grouse and mountain hare. In turn an increase in red grouse and mountain hare populations would be likely to lead to improved golden eagle breeding success on the estate. An increased deer cull to reduce the red deer herd on Eishken estate was one of the key nature conservation regeneration prescriptions proposed in the Feiriosbhal Regeneration Plan (LUC 2007).

In addition to a reduction of red deer numbers across the estate, some enclosures from which grazing animals are excluded could provide greater heterogeneity in the heathland habitat further improving the abundance of prey species and the foraging habitat for raptors.

Any habitat improvement measures should be focused on areas outside the proposed development footprint with an appropriate buffer so that eagles and other raptors are not attracted into the wind farm area.

More widely across Lewis & Harris, sheep numbers have been declining over the last two decades (Scottish Government 2023) but red deer numbers are now increasing rapidly in some areas. A recent island wide deer count recorded large deer herds on four community owned estates in Lewis for the first time in living memory (Stornoway, Galson, Barvas and Pairc). Several community estates lack the facilities (such as deer larders) to process deer carcasses efficiently and this may be a barrier to effective deer management. Supporting deer management initiatives across the island through training, the provision of equipment and facilities to increase deer management capacity could help to maintain and improve golden eagle habitat across extensive areas.

Reductions in deer numbers and improved deer management would have wider benefits by improving the condition of heath and peatland habitat. Peatland restoration projects, of which there are several on Harris & Lewis, will be more successful in the longer term if they are delivered alongside effective deer management. Other species of conservation concern such as merlin and hen harrier would also benefit from reduced grazing and browsing pressure which would result in improved nesting and foraging habitat.

4.2.2 White-tailed Eagle nesting habitat enhancement

There is anecdotal evidence that white-tailed eagle breeding success on Lewis is higher at sheltered sites, often on wooded crags, than at more exposed nest sites. In the extreme climate found on the Western Isles the shelter afforded by wooded crags is likely to be particularly important in providing opportunities for nesting. The importance of these sites is likely to increase in the future as the climate becomes wetter and the frequency of extreme weather events increases through climate change.

White-tailed eagles are also sensitive to human disturbance around their nests. Most nests are in coastal locations where there is often more human activity than elsewhere. Those nests exposed to frequent disturbance events are often less successful than at remote-undisturbed sites. In recent years, several new nest sites have also been established in conifer plantations. These nests have often been poorly supported and unstable with poor breeding success.

The remote partially wooded coastal crags on Eishken estate therefore provide a particularly important nesting habitat for white-tailed eagles. A Western Isles wide survey of remnant native woodland undertaken for SNH (Liddle 2007) found that although natural areas of native woodland were very small and fragmented, Eishken was the most important land holding hosting five of 11 natural woodland sites identified on Lewis. A recent report by McMullen (2020) suggested that up to 28% of Eishken Estate was suitable for woodland creation. Whilst McMullen likely over-estimated the extent of the estate that could support woodland, it is clear that there is significant potential for restoring and expanding native woodland at an appropriate scale on the estate. This was identified as a key objective in the Feiriosbhal Wind Farm Regeneration Plan (LUC 2007).

Protecting and expanding existing woodland, and creating new coastal woodland, gully woodland and riparian woodland on the estate (and elsewhere on Lewis and Harris where opportunities arise) would benefit white-tailed eagle. There would be other benefits in the expansion of this rare habitat in a Western Isles context with an increase in the associated woodland flora, and benefits to freshwater ecosystems from the shading (and the associated cooling effect) provided along watercourses.

Due to the remote nature and topography of existing and potential new woodland sites on Eishken estate, woodland restoration and creation in these areas is likely be expensive and currently unviable with the grant rates offered through the Forestry Grant Scheme (FGS). However, funding through the ECP potentially in combination with FGS and Carbon funding could make such projects possible.

The construction of artificial nesting platforms and the re-enforcement of existing nests in conifer plantations could improve breeding success at these locations.

4.2.3 Reduction or elimination of electrocution risk from the OHL distribution network

The design for the overhead transmission line network provides for a line separation distance greater than the wingspan of either eagle species (and any other bird species regularly occurring in Scotland). As a result, it is not possible for electrocution to occur through a bird making contact with two adjacent lines simultaneously. However, this is not the case for the lower voltage 32KV and 11KV distribution network where the separation distance is lower and less than the wingspan of golden eagles and white-tailed eagles.

In the ten-year period between 2012 and 2021, six eagle carcasses (5 golden eagle, 1 white-tailed eagle) were found under 32kv and 11kv distribution lines on Lewis & Harris (RSPB unpublished data). Of these, all five carcasses that were discovered in a fresh state showed signs of burning as a result of electrocution. Given that during this period no eagle carcasses were found under the transmission line network, it seems likely that electrocution was the cause of death (rather than collision) in several or all these cases. The carcasses reported to the RSPB were not a result of systematic searches and as there are several hundred kilometres of distribution OHL on Lewis & Harris, mostly running through remote terrain, it is likely that many eagle electrocutions go unrecorded. Electrocution on the distribution OHL network may therefore be the main cause of human induced eagle mortality on the Island.

On Lewis & Harris long stretches of the OHL network run through areas that are heavily used by both eagle species. For golden eagles, this situation may be unique to the Western Isles and some other Hebridean islands due to the nature of the topography through which the OHL run and the density of eagles. For white-tailed eagles the risk of electrocution is likely to be much more widespread as there is more overlap between the areas used by this species and the routes of OHL distribution lines across Scotland.

It is well-known how power poles and lines can be designed or modified to avoid electrocution risk in large raptors. Reducing electrocution risk has also been proposed previously as a means of offsetting mortality caused by wind farm collision in Norway (Cole & Dahl 2013).

There is an opportunity to eliminate the electrocution risk to eagles from the distribution OHL network to reduce eagle mortality through the rollout of a different OHL design with greater line separation distances. Whilst retrofitting an amendment to the pole design would likely be extremely costly to implement across the whole Lewis & Harris network, influencing SSEN to develop and use an eagle friendly OHL design for all replacement lines could be feasible. The ECP could potentially fund the development of a new OHL design and help with additional costs associated with a programme of rolling out eagle friendly OHL replacements. It would also be relatively straight forward to use the golden eagle topographical (GET) model (Fielding et al. 2020) and satellite tag data to identify the stretches of OHL distribution line carrying most risk to eagles where the rollout of an eagle friendly OHL design could be prioritised.

4.2.4 Summary of Available Conservation Management Measures

Measures to enhance golden eagle foraging habitat:

- Reduction in the size of the red deer herd on Eishken Estate.
- Creation of fenced enclosures to exclude red deer from certain areas on Eishken Estate and elsewhere where this would benefit eagle foraging habitat condition and prey populations.
- Support for deer management in other areas of Lewis & Harris through the provision of training, equipment, deer processing facilities and stalking resource.

Measures to enhance white-tailed eagle nesting habitat:

- Protection, restoration and creation of native woodland habitat on coastal crags and at other suitable nesting locations.
- Re-enforcement of existing nest structures and provision of artificial nesting structures in conifer plantations where existing nests are unstable.

Measures to reduce or eliminate electrocution risk to eagles on the OHL electricity distribution network:

- Influence and support SSEN with the development of a design of an eagle friendly distribution OHL with increased line separation distance that eliminates the risk of electrocution.

- Modelling to identify sections of the current OHL distribution line network that carry the greatest risk of electrocution to eagles for prioritisation of eagle friendly OHL rollout.
- Support for increased costs likely to be associated with roll out of the amended design for OHL replacements.

5 DELIVERY MECHANISM

The original ECP agreement between Eishken Limited and SNH specified that a new Limited company would be incorporated to deliver the ECP. Another model which has been very successful in delivering the RECMP would be for the ECP to be hosted by an existing independent organisation such as Natural Research Ltd with the existing expertise required to deliver the programme. For the RECMP, the appointment of independent experienced oversight and delivery personnel who report to and take advice from a panel of advisors has been critical to its success. Regular review of the scope and implementation measures should also be an important element of the ECP.

An ECP steering group would be established at the earliest opportunity to determine the scope of management and research, and be consulted at regular intervals throughout the lifetime of the ECP to inform decision making on whether any amendments are required to the programme. It is anticipated that the steering group would comprise Eishken Estate, Eurowind Energy, Pairc Estate, NatureScot, RSPB Scotland, Comhairle nan Eilean Siar, and any other involved landowners and ecological consultants.

6 RESOURCES REQUIRED

Funding originally proposed by Nick Oppenheim in 2019 (£150,000 per annum index linked to CPI) has been committed to, in order to create well-designed research programme and implement management measures at an appropriate scale in the context of the likely impacts of the proposed development. There may also be scope for several wind farm developers to provide additional funding towards the measures identified for the ECP.

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Uisenis Wind Farm

Supplementary Environmental Information Technical Appendix 9-6: Golden Eagle Population Viability Analysis Model

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CONTENTS

1 INTRODUCTION

A counterfactual population model has been developed to aid investigation into the population-level impacts of additional mortality on golden eagles as a consequence of predicted annual collision rates associated with the proposed Uisenis Wind Farm on the Isle of Lewis (the 'proposed development') (see SEI Report Chapter 9: Ornithology for further details).

The model was created to address RSPB Scotland's concerns on impacts on golden eagle, as outlined within their response to the Uisenis EIA Report (letter dated 8th December 2023), which requested:

"A Golden Eagle Population Viability Analysis (PVA) model with counterfactual outputs to allow the population-level impacts to be better understood."

Further information on RSPB Scotland's response is presented in Table 9-1 of SEI Report Chapter 9: Ornithology.

A deterministic matrix golden eagle population model was produced for the EIA (EIA Report, Technical Appendix 9.4), and most of the input parameters used in that model are applicable for this counterfactual model. The counterfactual model is similar to the one created for assessing the impacts of the proposed development on white-tailed eagles (see EIA Report, Technical Appendix 9.3), and similar to the one developed on behalf of NatureScot to predict the population trajectory of white-tailed eagles in Scotland after a series of reintroduction programmes since the mid-1970s (Sansom *et al.* 2016[1]).

2 MODEL METHODS AND ASSUMPTIONS

Sansom *et al.* (2016) show how alternative scenarios can be modelled to obtain predicted rates of white-tailed eagle population growth over a duration of up to 25 years, with varying rates of additional mortality on adults and/or sub-adults due to identified threats such as illegal killing or wind farm collision mortality. The predicted population growth rate and the expected number of occupied territories after a period of 25 years can be reviewed whilst varying levels of additional mortality. The Sansom *et al.* (2016) used the Population Viability Analysis (PVA) software Vortex (Lacy et al., 2005[2]) to model population growth covering the period over which there were observed estimates of the number of territorial pairs (1975-2014). They also ran predictive models for periods of 10 (2025) and 25 (2040) years.

A similar PVA, structured as a stochastic Leslie matrix model, was used for the current assessment to explore how additional golden eagle mortality may affect predicted growth rates of the appropriate reference population, in this case, the Outer Hebrides (equivalent to the Natural Heritage Zone 3 population).

There are four key demographic parameters in the model:

- number of occupied ranges;

[1] Sansom, A., Evans, R. & Roos, S. 2016. Population and future range modelling of reintroduced Scottish golden eagles (Haliaeetus albicilla). Scottish Natural Heritage Commissioned Report No. 898.
[2] Lacy, R. C., Borbat, M. & Pollak, J. P. 2005. Vortex: A stochastic simulation of the extinction process. Chicago Zoological Society, 9.50, Brookfield, IL.

- mean number of young fledged per pair per year;
- annual survival rate of young birds; and
- annual survival rate of adult, range-holding birds.

Estimates for the first two are available with a reasonably high degree of confidence. The latter two survival parameters are more difficult to estimate at the level of regional populations and therefore the values in Whitfield *et al.* (2008[3]) have been used. The parameters used in the model are outlined in **Table 1** below.

During population projections, to simulate environmental stochasticity, at each time step demographic rates were drawn at random from appropriate probability distributions (beta for survival, bounded at 0-1 and a stretched beta bounded at 0 and 3 for productivity) and used to estimate the population at the following time step. Since small populations are at an elevated risk due to chance events, demographic stochasticity was also incorporated using a binomial method.

Table 1 Parameters used in the Golden Eagle Population Model

Parameter	Values used in model	Rationale
Number of breeding pairs	95	The Scottish Raptor Monitoring Scheme (SRMS) report (Challis *et al.* 2016[4]) covering the most recent national census in 2015 recorded 95 home ranges in Lewis & Harris and Uist occupied by pairs.
Carrying capacity	101 pairs	The Scottish Raptor Monitoring Scheme (SRMS) report (Challis et al. 2016) stated that 101 home ranges in Lewis & Harris and Uist were checked in 2015.
Survival rates from fledging to adult	0-1: 0.77 1-2: 0.85 2-3: 0.92 3-4: 0.92 4+: 0.9512	Whitfield & Fielding (2017[5]) concluded that USA golden eagle survival rates were relevant for Scottish birds for the first three age classes (77%, 85% and 92%) once a 10 % reduction had been made on the USA values to account for human-caused mortality for each age class. An adult survival rate of 95.12% was used by Whitfield et al. (2006[6], 2008[3]) and Haworth (2014[7]). This is a precautionary estimate which equates to a minimal adult survival rate (20 years of occupation) which predicts stability or expansion for any credible measure of productivity which has been identified. No NHZ information is available.
Initial population in each age class	0-1: 26 1-2: 20 2-3: 16	Total numbers in each age class (266 total individuals).

[3] Whitfield, D P, Fielding, A H, McLeod, D R A and Haworth, P F (2008). A conservation framework for golden eagles: implications for their conservation and management in Scotland. Scottish Natural Heritage.
[4] Challis, A., Wilson, M.W., Holling, M., Roos, S., Stevenson, A. & Stirling-Aird, P. (2016). Scottish Raptor Monitoring Scheme Report 2015. BTO Scotland, Stirling. Available at: https://raptormonitoring.org/annual-report
[5] Whitfield, D.P. & Fielding, A.H. 2017. Analyses of the fates of satellite tracked golden eagles in Scotland. Scottish Natural Heritage Commissioned Report No. 982.
[6] Whitfield, D. P., Fielding, A. H., McLeod, D. R. A., Haworth, P. F. & Watson, J. 2006. A conservation framework for the golden eagle in Scotland: refining condition targets and assessment of constraint influences. Biological Conservation, 130(4), 465-480.
[7] Haworth, P. (2014). The Dunmaglass Wind Farm Regional Eagle Conservation Management Plan. Haworth Conservation.

Parameter	Values used in model	Rationale
	3-4: 14 4+: 190	
Age of first breeding	5	Whitfield et al. (2008) assessed adult birds to be over 4 years old. Whitfield & Fielding (2017) started that from studies of non-tagged birds the age of first breeding is typically in the 4th, 5th or 6th year of life although it can also occur earlier, in the 3rd year of life.
Productivity: Number of chicks fledged per territorial pair	0.5164	Mean fledging rate for Outer Hebrides from 2015 to 2021, taken from Scottish Raptor Monitoring Scheme annual reports. Mean productivity in 2022 was excluded because it was considered to be an outlier, due to avian influenza. Based on expert opinion (e.g. see SEI Technical Appendix 9.1, Eagle Conservation Programme) this is unlikely to be representative of future years.

3 MODEL RESULTS

3.1 Baseline Scenario

The baseline scenario represents the predicted population growth of the Outer Hebrides golden eagle population, without any additional mortality associated with the proposed development.

Under the baseline scenario, an average annual growth rate of 1.011 (1.1%) was predicted, assuming that there is a population cap at 101 pairs, which would be reached within c.5 years (Figure 1).

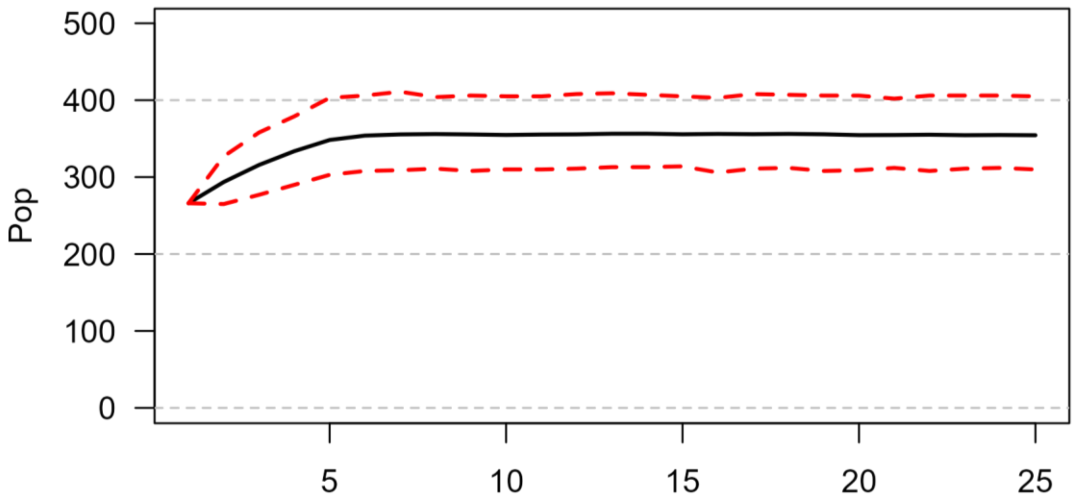

Figure 1. Projected golden eagle population on the Outer Hebrides for a period of 25 years. The average population prediction is shown in black, 95% confidence intervals in red (dashed).

3.2 Additional Mortality

The predicted mean annual golden eagle collision rate for the proposed development is 0.995, or one collision per year (see SEI Chapter 9: Ornithology). Additional annual mortality of up to two individuals per year, at increments of 0.1, was added to the model, split across each age class in proportion to their presence. Because this would have required applying mortalities of less than one individual to the individual age classes, the effect was instead applied by reducing the relevant survival rates by the equivalent amount.

Outputs are presented below as mean counterfactuals of population size (CPS) as well as the upper and lower confidence intervals surrounding the mean (see **Table 2** and **Figure 2**). It is important to note that due to stochasticity in the models, there is variability around the CPS means as evidenced by the confidence intervals. The counterfactuals of population growth rate (CPRG) are not presented because for a density dependent PVA the growth rates remain essentially 1.0 (or very close) for both baseline and impact (see **Figure 3**).

The results show that, as an example, at an additional annual mortality of one individual, there is very little change to the population size (decrease of 0.26%, CPS = 0.9973771) compared with the baseline population, and that the mean annual growth rate is essentially unchanged from the baseline (at 1.1%).

Table 2: Predicted counterfactuals of population size (CPS) and population growth rate (CPGR) for the NHZ 6 population for a range of potential mortality values between 0 to 0.5 individual per annum. Mean CPS and CPGR as well as lower (2.50%) and upper 97.50% confidence intervals are presented.

Mean annual mortality (individuals)	Mean CPS	2.5%	97.5%
0.0	1.0007811	0.9567719	1.048297
0.1	0.9993319	0.9539286	1.048435
0.2	0.9993344	0.9531064	1.044976
0.3	1.0000631	0.9576239	1.045468
0.4	1.0009484	0.9575071	1.046722
0.5	1.0000030	0.9565122	1.046323
0.6	0.9989309	0.9532863	1.045184
0.7	0.9979642	0.9510865	1.045870
0.8	0.9973207	0.9523778	1.041683
0.9	0.9967396	0.9514659	1.041439
1.0	0.9973771	0.9503862	1.043107
1.1	0.9962722	0.9515670	1.043078
1.2	0.9964896	0.9502730	1.042986
1.3	0.9976834	0.9539169	1.048807
1.4	0.9966813	0.9495436	1.044205
1.5	0.9961212	0.9505069	1.042716
1.6	0.9966697	0.9492871	1.043621
1.7	0.9964797	0.9503888	1.042866
1.8	0.9943454	0.9482732	1.044209
1.9	0.9946729	0.9465227	1.039778
2.0	0.9942810	0.9490531	1.038589

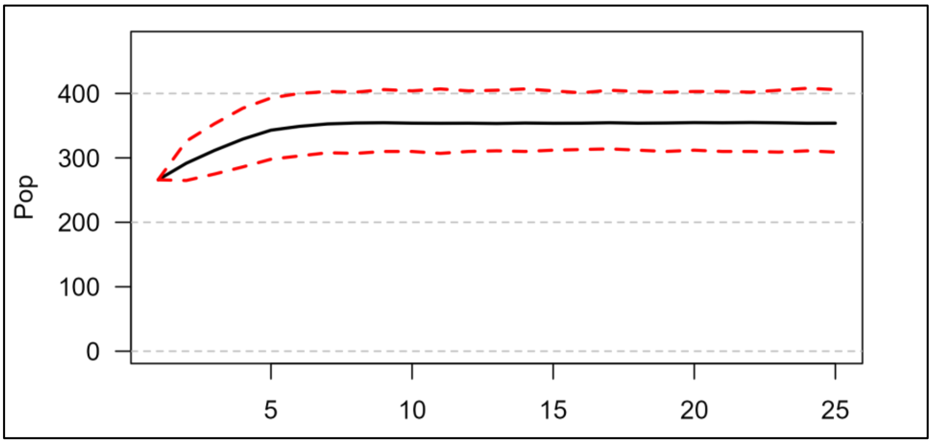

Figure 2. Projected golden eagle population on the Outer Hebrides for a period of 25 years, including an additional mortality of one individual per year. Impact growth rate is 1.011%. The average population prediction is shown in black, 95% confidence intervals in red (dashed).

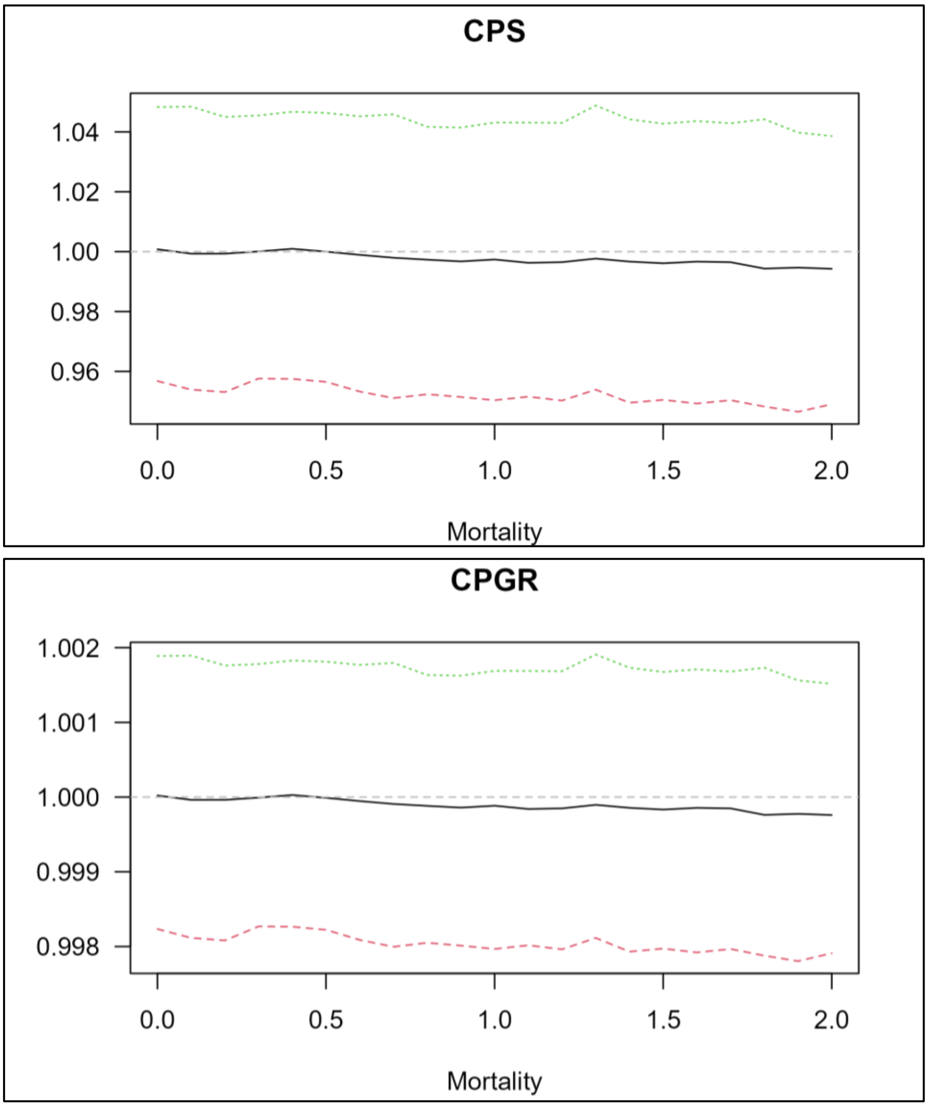

Figure 3: Predicted counterfactuals of population size (CPS) and population growth rate (CPGR) for the Outer Hebrides golden eagle population for a range of potential mortality values between 0 to 2 individuals per annum. The average population prediction is shown in black, upper and lower 95% confidence intervals in green and red (dashed) lines respectively.

Uisenis Wind Farm

Supplementary Environmental Information Technical Appendix 9-7: 2017-2019 Surveys

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CONTENTS

1 INTRODUCTION

This technical appendix to the Uisenis Wind Farm Supplementary Environmental Information (SEI) Report summarises the flight activity surveys carried out within the proposed development site from 2017-19 by Natural Research (Projects) Ltd (NRP). The flight activity survey data were used to conduct collision risk modelling (CRM) for the proposed development, as presented in the 2023 Uisenis Wind Farm Environmental Impact Assessment (EIA) Report Technical Appendix 9.1 and summarised in EIA Report Chapter 9: Ornithology. The methods and results of the CRM are presented here.

This report was prepared as a result of the request made by RSPB Scotland in their consultation response to the EIA Report (letter dated 8th December 2023) to provide this information, and the comment by NatureScot in their response (letter dated 4th December 2023) that the CRM results from 2017-19 were not presented in the EIA Report (see Table 9-1 of SEI Report Chapter 9: Ornithology for details).

2 FLIGHT ACTIVITY SURVEYS

2.1 Methods

NRP flight activity surveys during the 2018 breeding season and 2017/2018 and 2018/2019 non-breeding seasons were undertaken from five Vantage Point (VPs), as shown in **Figure 1** below. VPs 1-4 were consistent with those used during the 2022-2023 surveys (see EIA Report Figure 9.1), but the location of VP5 was changed for the 2022-2023 surveys due to the reduction of the 25-turbine proposed development footprint, from the 45-turbine consented development.

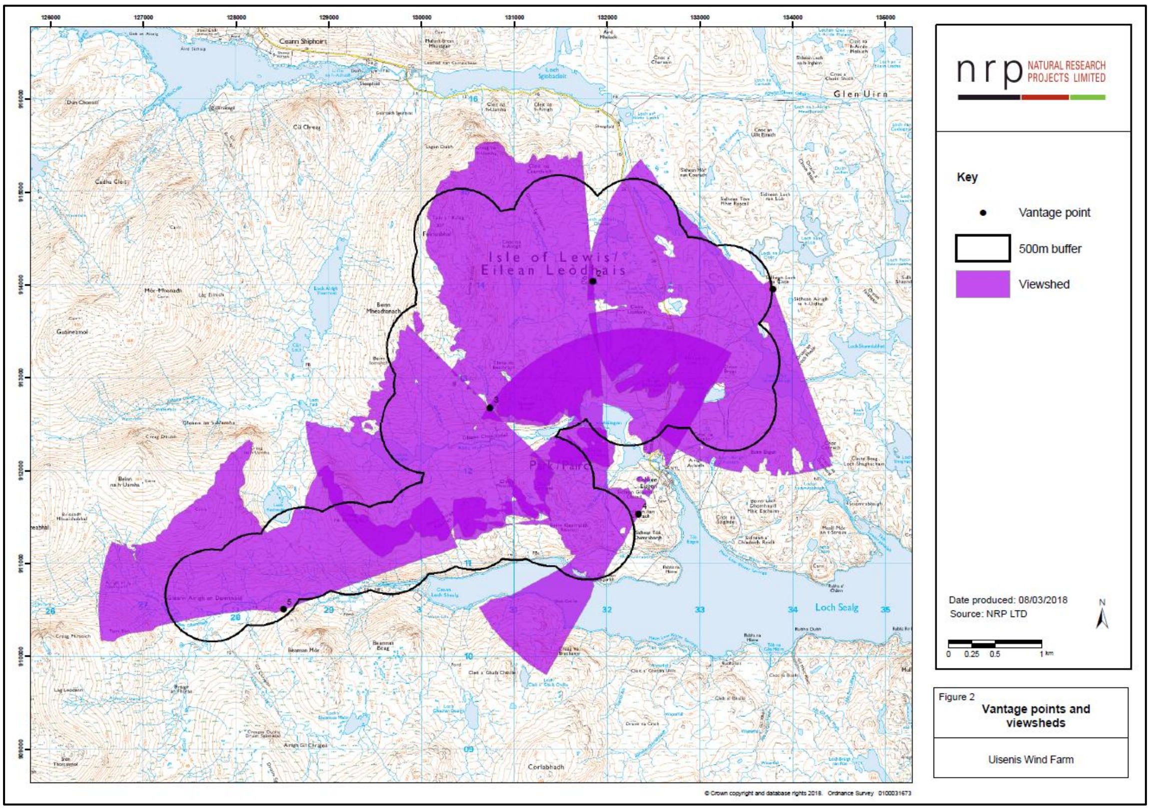

Figure 1: NRP flight activity survey coverage 2017 to 2019, based on consented development turbine layout.

During each survey the methodologies detailed below were used.

2.1.1 Focal bird sampling - timed

The viewing arc was scanned constantly until a Target A species[1] was detected in flight. Once detected, the bird was followed until it ceased flying or was lost to view. The time the bird was initially detected and the time it spent flying (to the nearest second) were recorded. The route followed by the bird was plotted in the field onto an enlarged 1:25,000 scale map, with the direction of flight indicated. The bird's flying elevation above the ground was estimated at the point of detection and at 15 second intervals thereafter, using a countdown timer with an audible alarm. Flying elevation was classified as <20 m, 20-150 m, 150-200 m, 200-250 m, or >250 m.

In some circumstances, instead of mapping a flight line, a 'flight area' denoting the area in which a bout of flight activity occurred was plotted on the field map (see e.g. EIA Report Figure 9.13 for golden eagle activity). Recording the spatial extent of a flight bout with a flight area was preferable in circumstance where;

- simultaneous flight activity by a number of birds was observed;
- an individual flight bout is observed over a long period of time;
- an individual flight bout is too complicated, i.e. a display flight, or
- any combination of the above.

2.1.2 Focal bird sampling – untimed

The same scanning procedure as described above was used. However, flights of Target B species (see **Annex A**) were not timed, instead the flight path was mapped and flying elevation was recorded at the start and when it changed during the recorded bout. Where a flock was observed a central flight line representative of the route was estimated.

2.1.3 Activity summaries.

At the end of each 5-min period, flight activity within the survey area by species of lesser conservation importance (Secondary Species) was summarised. Each VP watch was sub-divided into 5-minute periods and at the end of each 5-minute period the total number of individuals of each secondary target species seen flying in the study area was recorded. The height, direction and number of individuals involved in notable bird movements were recorded.

2.1.4 Survey effort

Valid flight activity survey effort[2] from 2017-19 is detailed in

[1] Target species were drawn from those listed in Annex I of the Birds Directive and Schedule 1 of the WCA. Other species considered important in a regional or local context may also be included. A list of target species is presented in **Annex A**.

[2] Hours where visibility was >1 km are not considered valid for use in collision risk modelling as less than half the 2 km viewshed can be seen.

Table 1**,** and full details are contained in **Annex C**.

Table 1 Summary of total hours of valid survey per VP in each season

VP	2017/2018 non-breeding season	2018 breeding season	2018/2019 non-breeding season
1	36	36	35.5
2	36	36	36
3	36	36	36
4	36	36	36
5	36	36	38

2.2 Results

A total of eight target species were recorded during the 2017-19 flight activity surveys (see **Annex D** for full results). For each species across the whole flight activity survey period, **Table 2** shows the total number of flights recorded and the total number of birds recorded[3]. The bird seconds are calculated for each observation as the product of flight duration and number of individuals. This is then summed per species to give the total bird seconds recorded across the entire surveyed period.

Table 2 Target species recorded and total number of flights recorded during flight activity surveys, 2017-2019

Species	Total number of flightlines recorded	Total number of birds recorded	Total bird seconds recorded*
Black-throated diver	2	5	133
Golden eagle	473	566	110718
Golden plover	1	1	191
Hen harrier	2	2	296
Merlin	10	11	537
Red-throated diver	6	10	811
White-tailed eagle	160	176	41208
Whooper swan	4	27	446

** total bird seconds is calculated by multiplying the number of birds within each flight event (e.g. a flock of five birds) by the duration of that flight event.*

3 COLLISION RISK MODEL

The 2017-19 NRP flight activity survey data were used in the CRM presented in the EIA Report. The recorded flight activity used for the CRM was that which took place within the north (18-turbine) and south (7-turbine) 'Collision Risk Analysis Areas' (CRAAs) (i.e. the area to be occupied by operational turbines, together with a 500 m buffer). These CRAAs were consistent with the ones used for the CRM using the 2022-23 survey data, as presented in EIA Report Technical Appendix 9.1, and shown on EIA Report Figures 9.13 to 9.18.

3.1 Flightlines Used in Collision Risk Modelling

Only flightlines (or flight areas, see section 2.1.1) identified to be within the CRAA and recorded within the 2 km viewshed of the associated VP were considered in the collision risk modelling. **Annex B** provides details of the bird seconds from flights identified to be 'at- risk'.

[3] This includes flights that would not technically be 'at-risk' of collision (e.g. recorded outwith the CRAAs and/or not at rotor height).

- 'At-risk' is defined as – a flight or flight area having at least part of its duration (i) at Potential Collision Height (PCH)[4]; (ii) within the CRAA; and (iii) recorded within the 2 km viewshed of the associated VP.

- PCH is defined as – the distance between the minimum and maximum blade height above ground level[5] of the candidate turbine type.

Whooper swan was recorded during flight activity surveys but no flights were considered to be 'at-risk'. This species is not considered further.

3.2 Collision Risk Model Outputs

The bird seconds for target species flights within the CRAAs at PCH were input into the CRM to calculate the predicted collision rates per season. The CRM calculations for each species can be found in **Annex B**. **Table 3** provides the estimated collision rates and number of seasons per collision for each species.

Table 3: Estimated collision rates per species

Species	2017-18 non-breeding season	2018 breeding season	2018-19 non-breeding season	Mean annual collision rate	Years per collision
Black-throated diver	0	0.008	0	0.008	131
Golden eagle	0.938	0.866	0.390	1.530	0.65
Golden plover	0.021	0	0	0.010	95
Hen harrier	0	0	0.007	0.004	273
Merlin	0.003	0.005	0.005	0.009	110
Red-throated diver	0.004	0.011	0	0.013	76
White-tailed eagle	1.004	1.254	1.296	2.404	0.42

4 OTHER SURVEYS

The sections below describe the methodologies used by NRP to conduct the range of other bird surveys in 2017-19. Details of survey effort are presented in the Annexes to this report, and the results are summarised in EIA Report Chapter 9: Ornithology and shown on EIA Report Figures 9.13 to 9.18 and confidential Figures C9.8 to C9.10.

4.1 Focal Vantage Point (FVP) Watches

During April to July 2018, in addition to the flight activity surveys, four FVPs were selected to gather species-specific data on red-throated diver and black-throated diver movements and to help locate breeding sites. In total, 54 hours of observation was undertaken from FVPs. Survey effort and grid references of each FVP are shown in **Annex E**.

Observers at FVPs positioned themselves to minimise their effects on bird behaviour. A viewing arc not exceeding 180 degrees was scanned. Watches were undertaken during daylight hours by a

[4] In some cases, only part of a total flight duration was recorded at PCH, and it is assumed that this proportion is also applicable for that part of the flight line or flight area within the CRAA.
[5] Where the actual rotor blade altitude differs from the pre-defined survey height bands, the collision risk model accounts for this difference on the assumption of an even flight distribution within each particular survey height band, and an adjustment can be made to estimate total flight duration at actual rotor blade altitude.

single observer in a wide range of weather conditions, mainly in conditions of good ground visibility (> 2km) and when the cloud base was higher than the most elevated parts of the survey area. During each watch the same scanning procedure as the timed focal bird sampling, described above, was used.

4.2 Moorland Breeding Bird Surveys

Moorland breeding bird territories were surveyed in April, May and June 2018, within the 500 m survey boundary (**Figure 2**). The Brown & Shepherd (1993[6]) method for upland waders was modified to also provide reliable estimates for some breeding moorland passerines by undertaking some surveys during the first few hours of daylight. All bird species listed in **Annex A** were recorded.

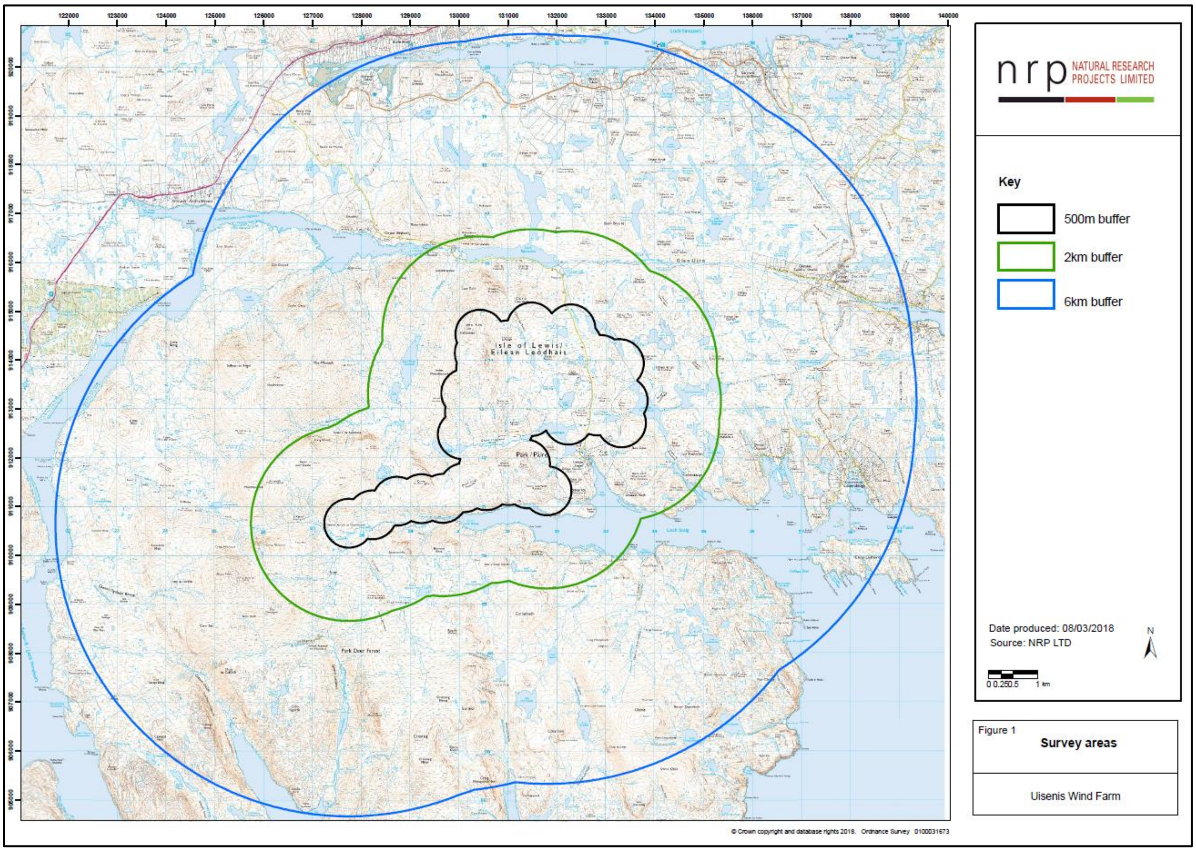

Figure 2: NRP other survey coverage 2017 to 2019, based on consented development turbine layout.

The surveys were conducted three times in the breeding season of 2018 to allow for differences in detection rates between early and late breeding species. Fieldwork was not undertaken in conditions considered likely to affect bird detection, for example strong winds (greater than Beaufort Scale Force 4), persistent precipitation, poor visibility (less than 300 m), or in unusually hot or cold temperatures. Surveys took place on 13, 14, 15 and 16 April (Visit 1), 14, 16, 17 and 19 May (Visit 2), and 12, 13, 15, 18 and 20 June (Visit 3). Survey effort is presented in **Annex F**.

The survey aimed to cover the ground systematically with a constant search effort. All suitable ground within the 500 m survey boundary was approached closely, typically to within 100 m. Water

[6] Brown, A.F. & Shepherd, K.B. (1993) A method for censusing upland breeding waders. Bird Study 40: 3 pp189 -195

bodies and isolated trees were examined carefully. Ditches and streams were followed. Surveyors paused at regular intervals to scan and listen for calling and singing birds.

Careful attention was given to recording behaviour indicative of breeding and care was taken to avoid counting the same individual more than once. Where necessary, surveyors retraced their steps in order to check the continued presence of previously recorded birds.

The location and activity of birds were mapped onto enlarged 1:25,000 scale OS maps using standard BTO codes (Marchant, 1983[7]). The position of each bird was mapped at the point it was first detected. The flight lines of birds seen flying over were recorded.

4.3 Scarce Breeding Bird Surveys

Priority was given to detecting the species considered most likely to occur: red-throated diver, black-throated diver, white-tailed eagle, golden eagle and merlin.

Surveys for red-throated diver, black-throated diver and merlin focused on areas or sites suitable for nesting and foraging within the 2 km buffer of the consented development; for white-tailed eagle and golden eagle, searches were within the 6 km survey buffer (**Figure 2**, above). Surveyors conducted 52 separate searches or watches during the 2018 breeding season, totalling over 224 hours, to search for scarce breeding species (see **Annex G**). These visits complemented search effort accrued during the course of VP watches. Methods used for individual species are summarised below;

- Diver species. All potential breeding sites within 2 km of the Development were checked for suitability and if suitable, further checks for occupancy were made at least twice per calendar month in May-July. Wherever possible lochs were scanned from a distance to search for incubating birds or other evidence of breeding. Care was taken to record possible re-lay attempts by failed pairs.
- Golden eagle/white-tailed eagle. Survey methods given in Hardy *et al.* (2013[8]) were followed.
- Merlin. Survey methods given in Hardey *et al.* (2013[8]) were followed. Within suitable habitats, old crow nests (which could be re-used by merlin), fence-posts, hummocks, bushes and trees were checked for signs of occupation (e.g. plucked prey, moulted feathers, pellets and faeces). Emphasis was given to heath bog habitats with stands of heather >0.4m tall.

4.4 Winter Walked Transects

Walkover surveys were undertaken between September and March 2017-2018 and 2018-2019. These were designed to complement surveys of breeding birds undertaken during the spring and summer (see above) and occurred within the 500 m buffer (**Figure 2**, above).

Walk routes meandered to closely examine as much ground as practical, in particular features of potential ornithological importance such as woodland edges, rocky outcrops, mires and streams.

[7] Marchant, J.H. (1983). BTO Common Birds Census Instructions. British Trust for Ornithology, Thetford
[8] Hardey, J., Crick, H., Wernham, C., Riley, H., Etheridge, B. & Thompson, D. (2013). Raptors, a field guide to survey and monitoring. The Stationery Office, Edinburgh.

Where practicable, observers used a different route on each visit to maximise the eventual spatial coverage of the proposed Development. Observers frequently paused to scan for birds.

Fifty-eight walked transects, totalling over 76 hours, were undertaken (see effort in **Annex H**). A range of meteorological conditions were sampled, although wind speeds above Beaufort force 5 were avoided to improve aural detection of species.

The walked transects were effectively mobile VP watches. The procedure employed was as follows:

- For Target Species the time each individual was first detected was recorded along with details of age, sex and behaviour. These details were cross-referenced to a 1:25,000 scale map where the location and flight route (if applicable) were plotted.
- For all other species, the number of individuals was recorded and locations they were first detected were plotted on the map.

ANNEX A. NRP TARGET SPECIES

SPECIES RECORDED FOR ASSESSMENT OF FLIGHT ACTIVITY			Additional species (e.g. breeding and/or wintering
Target A species	**Target B species**	**Secondary species**	
Diver species	Greylag goose	Cormorant	Tree pipit
Common Scoter	Barnacle goose	Grey heron	Dunnock
White-tailed eagle	White-fronted goose	Kestrel	Song thrush
Golden eagle	Pink-footed goose	Buzzard	Grasshopper warbler
Hen harrier	Brent goose	Sparrowhawk	Wood warbler
Goshawk	Bean goose	Red grouse	Spotted flycatcher
Red kite	Golden plover	Grey partridge	Marsh tit
Osprey	Dunlin	Lapwing	Willow tit
Merlin	Greenshank	Redshank	Crested tit
Peregrine	Whimbrel	Common sandpiper	Starling
Hobby	Curlew	Oystercatcher	House sparrow
Barn owl	Wood sandpiper	Snipe	Tree sparrow
Short-eared owl	Tern species	Woodcock	Linnet
Black grouse	Arctic skua	Herring gull	Twite
Capercaillie	Great skua	Cuckoo	Lesser redpoll
Nightjar		Ring ouzel	Crossbill species
Chough		Raven	Bullfinch
Whooper swan		(Any flocks >30)	Hawfinch
(Other rare raptors)			Yellow hammer
			Reed bunting
			Corn bunting
			Mute swan
			Mallard
			Goosander
			Teal

ANNEX B. COLLISION RISK MODELLING INPUTS AND OUTPUTS

Table B-1 Wind farm parameters

Size of wind farm envelope	816.4 (north) and 355.6 (south)	hectares (ha)
Number of turbines	18 (north) and 7 (south)	turbines
Rotor diameter	155	metres (m)
Hub height	122.5	m
Max. rotor depth	1.16	m (at 15° pitch angle)
Max. chord	4.5	m
Pitch	15	degrees (°)
Rotation period	6.4	seconds (secs)
Turbine operation time	85	percent (%)
Risk height: highest	45	m
Risk height: lowest	200	m
Flight risk volume	1265434793 (north) and 551195836 (south)	m^3

Table B-2 CRM parameters per species

Species	Length (m)	Wingspan (m)	Assumed flight speed (ms-1)	Avoidance rate	Probability of collision	Bird transit time (secs)
Black-throated diver	0.73	1.3	17	0.995	0.0570	0.1114
Golden eagle	0.815	2.12	15	0.99	0.0688	0.1320
Golden plover	0.28	0.72	17.9	0.98	0.0439	0.080
Hen harrier	0.48	1.1	12	0.99	0.0577	0.1370
Merlin	0.28	0.56	13	0.98	0.0491	0.1111
Red-throated diver	0.73	1.3	17	0.995	0.0595	0.1115
White-tailed eagle	0.9	2.4	13.6	0.95	0.0752	0.1518

Table B-3 Visible area within the CRAA per vantage point (North)

VP	Area (ha)
1	328.6
2	339.8
3	35.8
4	147.3
5	0

Table B-4 Visible area within the CRAA per vantage point (South)

VP	Area (ha)
1	0
2	16.2
3	145.9
4	137.3
5	41.4

Birds are assumed to be active during all the daylight hours and this is estimated by calculating the number of hours per day between sunrise and sunset (adjusting for correct latitude) for the survey seasons as defined in

Table B-5 below.

Table B-5 Season definitions per species/species group

Species	Breeding season			Non-breeding season		
	Start date	**End date**	**Hours presumed present**	**Start date**	**End date**	**Hours presumed present**
Eagles	1st February	31st August	2838	1st September	31st January	1670
Divers	15th April	31st August	2314	1st September	14th April	2194
Raptors	15th March	31st August	2716	1st September	14th March	1793
Waders	1st April	31st July	2029	1st August	31st March	2479

Outputs for the CRM for the following species are presented in the following order below:

- Black-throated diver;
- Golden eagle;
- Golden plover;
- Hen harrier;
- Merlin;
- Red-throated diver; and
- White-tailed eagle.

Black-throated Diver

Breeding Season 2018 (north)

Table B-6 Black-throated diver flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	46.89432174	9858.95704	5.33441E-07
2	0	9174.150846	0
3	0	967.6102109	0
4	0	4418.489918	0

Table B-7 Black-throated diver collision rate estimates

Mean activity in wind farm at rotor height	0.000435506	hr^{-1}
Total Combined rotor swept volume	643521.3512	m^3
Bird occupancy	1.007798585	hrs/season
Bird occupancy of rotor swept volume	1.845013017	bird-sec
No. of transits through rotors	16.5543136	per season
Estimated collisions	0.944152069	per season
Estimated collisions after correction for operation	0.802529259	per season
Estimated collisions after avoidance factor	0.004012646	per season
Equivalent to 1 bird every	249.2120977	seasons

Breeding Season 2018 (south)

Table B-8 Black-throated diver flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
2	0	437.9515561	0
3	43.09004343	3940.267069	1.22899E-06
4	0	4119.369862	0
5	0	1241.658811	0

Table B-9 Black-throated diver collision rate estimates

Mean activity in wind farm at rotor height	0.000437042	hr^{-1}
Total Combined rotor swept volume	250258.3032	m^3
Bird occupancy	1.011352971	hrs/season
Bird occupancy of rotor swept volume	1.653056979	bird-sec
No. of transits through rotors	14.83199488	per season
Estimated collisions	0.845922035	per season
Estimated collisions after correction for operation	0.71903373	per season
Estimated collisions after avoidance factor	0.003595169	per season
Equivalent to 1 bird every	278.1510681	seasons

Golden Eagle

Non-breeding Season 2017-18 (north)

Table B-10 Golden eagle flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	719.3552486	8215.797533	9.38638E-06
2	4111.384715	8494.584117	5.36467E-05
3	230.7569635	895.9353805	3.01099E-06
4	19.22821312	3682.074931	2.50896E-07

Table B-11 Golden eagle collision rate estimates

Mean activity in wind farm at rotor height	0.054123817	hr^{-1}
Total Combined rotor swept volume	672391.2133	m^3
Bird occupancy	90.37575513	hrs/season
Bird occupancy of rotor swept volume	172.8767933	bird-sec
No. of transits through rotors	1309.880601	per season
Estimated collisions	86.40716842	per season
Estimated collisions after correction for operation	73.44609316	per season
Estimated collisions after avoidance factor	0.734460932	per season
Equivalent to 1 bird every	1.361542809	seasons

Non-breeding Season 2017-18 (south)

Table B-12 Golden eagle flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
2	0	405.5107001	0
3	724.1371994	3648.395434	2.35994E-05
4	524.0962998	3432.808219	1.70801E-05
5	203.4791403	1036.785107	6.63131E-06

Table B-13 Golden eagle collision rate estimates

Mean activity in wind farm at rotor height	0.016824201	hr^{-1}
Total Combined rotor swept volume	261485.4718	m^3
Bird occupancy	28.09299052	hrs/season
Bird occupancy of rotor swept volume	47.97799668	bird-sec
No. of transits through rotors	363.5273767	per season
Estimated collisions	23.98033167	per season
Estimated collisions after correction for operation	20.38328192	per season
Estimated collisions after avoidance factor	0.203832819	per season
Equivalent to 1 bird every	4.905981304	seasons

Breeding Season 2018 (north)

Table B-14 Golden eagle flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr⁻¹)
1	1619.378683	15445.69936	1.12386E-05
2	2648.93628	15969.81814	1.83838E-05
3	820.4321037	1687.344967	5.69386E-06
4	0	6922.300871	0

Table B-15 Golden eagle collision rate estimates

Mean activity in wind farm at rotor height	0.028833	hr^{-1}
Total Combined rotor swept volume	672391.2	m^3
Bird occupancy	81.84124	hrs/season
Bird occupancy of rotor swept volume	156.5514	bird-sec
No. of transits through rotors	1186.184	per season
Estimated collisions	78.24742	per season
Estimated collisions after correction for operation	66.51031	per season
Estimated collisions after avoidance factor	0.665103	per season
Equivalent to 1 bird every	1.503526	seasons

Breeding Season 2018 (south)

Table B-16 Golden eagle flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr⁻¹)
2	32.66891319	762.3601161	5.66021E-07
3	276.522138	6871.144734	4.79101E-06
4	976.4554687	6453.679451	1.6918E-05
5	294.3708098	1945.26547	5.10026E-06

Table B-17 Golden eagle collision rate estimates

Mean activity in wind farm at rotor height	0.009734949	hr^{-1}
Total Combined rotor swept volume	261485.4718	m^3
Bird occupancy	27.63265232	hrs/season
Bird occupancy of rotor swept volume	47.19181821	bird-sec
No. of transits through rotors	357.5705336	per season
Estimated collisions	23.58738444	per season
Estimated collisions after correction for operation	20.04927678	per season
Estimated collisions after avoidance factor	0.200492768	per season
Equivalent to 1 bird every	4.987711083	seasons

Non-breeding Season 2018-19 (north)

Table B-18 Golden eagle flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	602.3339419	8215.797533	8.10747E-06
2	184.5436399	7843.332668	2.48397E-06
3	47.55765022	895.9353805	6.4013E-07
4	524.5587777	3682.074931	7.06061E-06

Table B-19 Golden eagle collision rate estimates

Mean activity in wind farm at rotor height	0.014933912	hr^{-1}
Total Combined rotor swept volume	672391.2133	m^3
Bird occupancy	24.93659301	hrs/season
Bird occupancy of rotor swept volume	47.70038412	bird-sec
No. of transits through rotors	361.4239173	per season
Estimated collisions	23.84157553	per season
Estimated collisions after correction for operation	20.2653392	per season
Estimated collisions after avoidance factor	0.202653392	per season
Equivalent to 1 bird every	4.934533738	seasons

Non-breeding Season 2018-19 (south)

Table B-20 Golden eagle flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
2	40.79370619	210.865564	2.67434E-06
3	1653.195295	1605.293991	0.00010838
4	100.4978731	1510.435616	6.58842E-06
5	52.4032724	910.5497947	3.43544E-06

Table B-21 Golden eagle collision rate estimates

Mean activity in wind farm at rotor height	0.015492832	hr^{-1}
Total Combined rotor swept volume	261485.4718	m^3
Bird occupancy	25.86987546	hrs/season
Bird occupancy of rotor swept volume	44.18129846	bird-sec
No. of transits through rotors	334.759945	per season
Estimated collisions	22.08266839	per season
Estimated collisions after correction for operation	18.77026813	per season
Estimated collisions after avoidance factor	0.187702681	per season
Equivalent to 1 bird every	5.327574402	seasons

Golden Plover

Non-breeding Season 2017-18 (south)

Table B-22 Golden plover flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
2	0	583.9354081	0
3	0	5253.689425	0
4	91.11551499	4943.243835	2.06225E-06
5	0	1492.060004	0

Table B-23 Golden plover collision rate estimates

Mean activity in wind farm at rotor height	0.000733358	hr^{-1}
Total Combined rotor swept volume	190820.352	m^3
Bird occupancy	1.818155578	hrs/season
Bird occupancy of rotor swept volume	2.26596036	bird-sec
No. of transits through rotors	28.07578864	per season
Estimated collisions	1.233907149	per season
Estimated collisions after correction for operation	1.048821076	per season
Estimated collisions after avoidance factor	0.020976422	per season
Equivalent to 1 bird every	47.67257364	seasons

Hen Harrier

Non-breeding Season 2018-19 (north)

Table B-24 Hen harrier flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0	11666.4325	0
2	0	12260.51641	0
3	16.87185601	1290.146948	1.53563E-07
4	0	5302.187901	0

Table B-25 Hen harrier collision rate estimates

Mean activity in wind farm at rotor height	0.00012537	hr^{-1}
Total Combined rotor swept volume	558609.9923	m^3
Bird occupancy	0.224759574	hrs/season
Bird occupancy of rotor swept volume	0.357182054	bird-sec
No. of transits through rotors	2.606081293	per season
Estimated collisions	0.1504783	per season
Estimated collisions after correction for operation	0.127906555	per season
Estimated collisions after avoidance factor	0.001279066	per season
Equivalent to 1 bird every	781.8207613	seasons

Non-breeding Season 2018-19 (south)

Table B-26 Hen harrier flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
2	0	585.2871104	0
3	85.48132452	5253.689425	1.86563E-06
4	0	4943.243835	0
5	0	1945.26547	0

Table B-27 Hen harrier collision rate estimates

Mean activity in wind farm at rotor height	0.000663438	hr^{-1}
Total Combined rotor swept volume	217237.2192	m^3
Bird occupancy	1.189390469	hrs/season
Bird occupancy of rotor swept volume	1.687544609	bird-sec
No. of transits through rotors	12.3127083	per season
Estimated collisions	0.710950735	per season
Estimated collisions after correction for operation	0.604308125	per season
Estimated collisions after avoidance factor	0.006043081	per season
Equivalent to 1 bird every	165.4784967	seasons

Merlin

Non-breeding Season 2017-18 (north)

Table B-28 Merlin flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0	11830.74845	0
2	0	12232.20113	0
3	20.83001292	1290.146948	1.88748E-07
4	0	5302.187901	0

Table B-29 Merlin collision rate estimates

Mean activity in wind farm at rotor height	0.000154	hr^{-1}
Total Combined rotor swept volume	490680.9	m^3
Bird occupancy	0.276257	hrs/season
Bird occupancy of rotor swept volume	0.385634	bird-sec
No. of transits through rotors	3.47013	per season
Estimated collisions	0.163861	per season
Estimated collisions after correction for operation	0.139282	per season
Estimated collisions after avoidance factor	0.002786	per season
Equivalent to 1 bird every	358.9838	seasons

Breeding Season 2018 (north)

Table B-30 Merlin flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0	11830.75	0
2	24.18032	12232.2	2.19E-07
3	0	1293.133	0
4	0	5302.188	0

Table B-31 Merlin collision rate estimates

Mean activity in wind farm at rotor height	0.000179	hr^{-1}
Total Combined rotor swept volume	490680.9	m^3
Bird occupancy	0.485707	hrs/season
Bird occupancy of rotor swept volume	0.67801	bird-sec
No. of transits through rotors	6.101071	per season
Estimated collisions	0.288096	per season
Estimated collisions after correction for operation	0.244881	per season
Estimated collisions after avoidance factor	0.004898	per season
Equivalent to 1 bird every	204.1806	seasons

Non-breeding Season 2018-19 (north)

Table B-32 Merlin flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	29.07692	11666.43	2.65E-07
2	0	12260.52	0
3	0	1290.147	0
4	0	5302.188	0

Table B-33 Merlin collision rate estimates

Mean activity in wind farm at rotor height	0.000216	hr^{-1}
Total Combined rotor swept volume	490680.9	m^3
Bird occupancy	0.38735	hrs/season
Bird occupancy of rotor swept volume	0.540712	bird-sec
No. of transits through rotors	4.865592	per season
Estimated collisions	0.229756	per season
Estimated collisions after correction for operation	0.195292	per season
Estimated collisions after avoidance factor	0.003906	per season
Equivalent to 1 bird every	256.0265	seasons

Non-breeding Season 2018-19 (south)

Table B-34 Merlin flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
2	0	585.2871	0
3	0	5253.689	0
4	12.68689	4943.244	2.77E-07
5	0	1945.265	0

Table B-35 Merlin collision rate estimates

Mean activity in wind farm at rotor height	9.85E-05	hr^{-1}
Total Combined rotor swept volume	190820.4	m^3
Bird occupancy	0.176526	hrs/season
Bird occupancy of rotor swept volume	0.220004	bird-sec
No. of transits through rotors	1.979702	per season
Estimated collisions	0.093482	per season
Estimated collisions after correction for operation	0.07946	per season
Estimated collisions after avoidance factor	0.001589	per season
Equivalent to 1 bird every	629.2464	seasons

Red-throated Diver

Non-breeding Season 2017-18 (north)

Table B-36 Red-throated diver flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	81.70077	13802.54	6.15E-07
2	0	15290.25	0
3	0	1615.67	0
4	0	6185.886	0

Table B-37 Red-throated diver collision rate estimates

Mean activity in wind farm at rotor height	0.000502	hr^{-1}
Total Combined rotor swept volume	643521.4	m^3
Bird occupancy	1.10192	hrs/season
Bird occupancy of rotor swept volume	2.017325	bird-sec
No. of transits through rotors	18.10038	per season
Estimated collisions	1.03233	per season
Estimated collisions after correction for operation	0.87748	per season
Estimated collisions after avoidance factor	0.004387	per season
Equivalent to 1 bird every	227.9254	seasons

Breeding Season 2018 (north)

Table B-38 Red-throated diver flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	0	9858.957	0
2	19.29003	9174.151	2.19E-07
3	0	967.6102	0
4	77.12025	4418.49	8.77E-07

Table B-39 Red-throated diver collision rate estimates

Mean activity in wind farm at rotor height	0.000895	hr^{-1}
Total Combined rotor swept volume	643521.4	m^3
Bird occupancy	2.071938	hrs/season
Bird occupancy of rotor swept volume	3.793172	bird-sec
No. of transits through rotors	34.0341	per season
Estimated collisions	1.941087	per season
Estimated collisions after correction for operation	1.649924	per season
Estimated collisions after avoidance factor	0.00825	per season
Equivalent to 1 bird every	121.2177	seasons

Breeding Season 2018 (south)

Table B-40 Red-throated diver flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
2	0	437.9516	0
3	0	3940.267	0
4	0	4119.37	0
5	31.94288	1241.659	9.11E-07

Table B-41 Red-throated diver collision rate estimates

Mean activity in wind farm at rotor height	0.000324	hr^{-1}
Total Combined rotor swept volume	250258.3	m^3
Bird occupancy	0.749721	hrs/season
Bird occupancy of rotor swept volume	1.22542	bird-sec
No. of transits through rotors	10.99504	per season
Estimated collisions	0.627087	per season
Estimated collisions after correction for operation	0.533024	per season
Estimated collisions after avoidance factor	0.002665	per season
Equivalent to 1 bird every	375.2179	seasons

White-tailed Eagle

Non-breeding Season 2017-18 (north)

Table B-42 White-tailed eagle flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	914.9511784	8215.797533	1.19386E-05
2	161.7246903	8494.584117	2.11024E-06
3	85.87728559	895.9353805	1.12055E-06
4	52.02484838	3682.074931	6.78837E-07

Table B-43 White-tailed eagle collision rate estimates

Mean activity in wind farm at rotor height	0.012938625	hr^{-1}
Total Combined rotor swept volume	701261.0753	m^3
Bird occupancy	21.6048696	hrs/season
Bird occupancy of rotor swept volume	43.10167148	bird-sec
No. of transits through rotors	283.9089413	per season
Estimated collisions	20.56197731	per season
Estimated collisions after correction for operation	17.47768071	per season
Estimated collisions after avoidance factor	0.873884036	per season
Equivalent to 1 bird every	1.14431659	seasons

Non-breeding Season 2017-18 (south)

Table B-44 White-tailed eagle flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
2	0	405.5107001	0
3	0	3648.395434	0
4	161.6971921	3432.808219	5.26965E-06
5	23.98956522	1036.785107	7.81811E-07

Table B-45 White-tailed eagle collision rate estimates

Mean activity in wind farm at rotor height	0.002152	hr^{-1}
Total Combined rotor swept volume	272712.6	m^3
Bird occupancy	3.593339	hrs/season
Bird occupancy of rotor swept volume	6.400296	bird-sec
No. of transits through rotors	42.15849	per season
Estimated collisions	3.05331	per season
Estimated collisions after correction for operation	2.595313	per season
Estimated collisions after avoidance factor	0.129766	per season
Equivalent to 1 bird every	7.706199	seasons

Breeding Season 2018 (north)

Table B-46 White-tailed eagle flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	304.2817	15445.7	2.11E-06
2	914.1776	15969.82	6.34E-06
3	0	1687.345	0
4	0	6922.301	0

Table B-47 White-tailed eagle collision rate estimates

Mean activity in wind farm at rotor height	0.006904	hr^{-1}
Total Combined rotor swept volume	701261.1	m^3
Bird occupancy	19.59622	hrs/season
Bird occupancy of rotor swept volume	39.09442	bird-sec
No. of transits through rotors	257.5134	per season
Estimated collisions	18.65029	per season
Estimated collisions after correction for operation	15.85275	per season
Estimated collisions after avoidance factor	0.792637	per season
Equivalent to 1 bird every	1.261611	seasons

Breeding Season 2018 (south)

Table B-48 White-tailed eagle flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
2	0	762.3601	0
3	417.5895	6871.145	7.24E-06
4	209.6484	6453.679	3.63E-06
5	102.8462	1945.265	1.78E-06

Table B-49 White-tailed eagle collision rate estimates

Mean activity in wind farm at rotor height	0.004498	hr^{-1}
Total Combined rotor swept volume	272712.6	m^3
Bird occupancy	12.76832	hrs/season
Bird occupancy of rotor swept volume	22.74235	bird-sec
No. of transits through rotors	149.803	per season
Estimated collisions	10.84941	per season
Estimated collisions after correction for operation	9.222	per season
Estimated collisions after avoidance factor	0.4611	per season
Equivalent to 1 bird every	2.168727	seasons

Non-breeding Season 2018-19 (north)

Table B-50 White-tailed eagle flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
1	135.7763	8215.798	1.83E-06
2	754.6888	7843.333	1.02E-05
3	3.352621	895.9354	4.51E-08
4	0	3682.075	0

Table B-51 White-tailed eagle collision rate estimates

Mean activity in wind farm at rotor height	0.009822	hr^{-1}
Total Combined rotor swept volume	701261.1	m^3
Bird occupancy	16.40093	hrs/season
Bird occupancy of rotor swept volume	32.71983	bird-sec
No. of transits through rotors	215.5242	per season
Estimated collisions	15.60924	per season
Estimated collisions after correction for operation	13.26785	per season
Estimated collisions after avoidance factor	0.663393	per season
Equivalent to 1 bird every	1.507403	seasons

Non-breeding Season 2018-19 (south)

Table B-52 White-tailed eagle flight activity

VP	Seconds at risk height	Observation effort (HaHr)	Flying time at risk height (secsHahr^{-1})
2	53.33828	374.4215	1.75E-06
3	549.5905	3648.395	1.8E-05
4	227.3959	3432.808	7.44E-06
5	72.08126	1034.716	2.36E-06

Table B-53 White-tailed eagle collision rate estimates

Mean activity in wind farm at rotor height	0.010499	hr^{-1}
Total Combined rotor swept volume	272712.6	m^3
Bird occupancy	17.53122	hrs/season
Bird occupancy of rotor swept volume	31.22583	bird-sec
No. of transits through rotors	205.6832	per season
Estimated collisions	14.89652	per season
Estimated collisions after correction for operation	12.66204	per season
Estimated collisions after avoidance factor	0.633102	per season
Equivalent to 1 bird every	1.579525	seasons

ANNEX C. NRP FLIGHT ACTIVITY SURVEY EFFORT 2017-2019

Date	Season	Observer	VP	Start	Finish	Hours
05/09/2017	2017/2018 NBR	DJC	1	0925	1225	3
05/09/2017	2017/2018 NBR	BU	1	1400	1700	3
05/09/2017	2017/2018 NBR	BU	2	0920	1220	3
05/09/2017	2017/2018 NBR	DJC	2	1350	1650	3
06/09/2017	2017/2018 NBR	DJC	3	0955	1255	3
06/09/2017	2017/2018 NBR	BU	3	1410	1710	3
06/09/2017	2017/2018 NBR	BU	4	0925	1225	3
06/09/2017	2017/2018 NBR	DJC	4	1430	1730	3
07/09/2017	2017/2018 NBR	DJC	5	1005	1305	3
07/09/2017	2017/2018 NBR	BU	5	1310	1610	3
17/10/2017	2017/2018 NBR	DJC	1	1325	1625	3
17/10/2017	2017/2018 NBR	BU	4	1335	1635	3
18/10/2017	2017/2018 NBR	BU	2	1335	1635	3
18/10/2017	2017/2018 NBR	BU	3	0950	1250	3
18/10/2017	2017/2018 NBR	DJC	5	0930	1230	3
19/10/2017	2017/2018 NBR	DJC	2	0840	1140	3
19/10/2017	2017/2018 NBR	DJC	3	1230	1530	3
19/10/2017	2017/2018 NBR	BU	5	0935	1235	3
20/10/2017	2017/2018 NBR	BU	1	1040	1340	3
20/10/2017	2017/2018 NBR	DJC	4	1025	1325	3
14/11/2017	2017/2018 NBR	BU	2	1315	1545	2.5
14/11/2017	2017/2018 NBR	BU	3	1000	1230	2.5
14/11/2017	2017/2018 NBR	RAS	5	0945	1215	2.5
15/11/2017	2017/2018 NBR	RAS	2	0830	1100	2.5
15/11/2017	2017/2018 NBR	RAS	3	1140	1410	2.5
15/11/2017	2017/2018 NBR	BU	5	0900	1130	2.5
16/11/2017	2017/2018 NBR	BU	1	0935	1205	2.5
16/11/2017	2017/2018 NBR	RAS	1	1330	1600	2.5
16/11/2017	2017/2018 NBR	RAS	4	0945	1215	2.5
16/11/2017	2017/2018 NBR	BU	4	1340	1610	2.5
12/12/2017	2017/2018 NBR	RAS	2	1200	1400	2
12/12/2017	2017/2018 NBR	RAS	3	0930	1130	2
12/12/2017	2017/2018 NBR	DJC	5	1015	1215	2
13/12/2017	2017/2018 NBR	DJC	1	0915	1115	2
13/12/2017	2017/2018 NBR	RAS	1	1215	1415	2
13/12/2017	2017/2018 NBR	RAS	4	0905	1105	2
13/12/2017	2017/2018 NBR	DJC	4	1230	1430	2
14/12/2017	2017/2018 NBR	DJC	2	0900	1100	2
14/12/2017	2017/2018 NBR	DJC	3	1200	1400	2
14/12/2017	2017/2018 NBR	RAS	5	0945	1145	2
16/01/2018	2017/2018 NBR	DJC	1	1010	1210	2
16/01/2018	2017/2018 NBR	BU	1	1325	1525	2
16/01/2018	2017/2018 NBR	BU	4	1015	1215	2

Date	Season	Observer	VP	Start	Finish	Hours
16/01/2018	2017/2018 NBR	DJC	4	1310	1510	2
17/01/2018	2017/2018 NBR	DJC	2	0925	1125	2
17/01/2018	2017/2018 NBR	DJC	3	1215	1415	2
17/01/2018	2017/2018 NBR	BU	5	1030	1230	2
18/01/2018	2017/2018 NBR	BU	2	1300	1500	2
18/01/2018	2017/2018 NBR	BU	3	1015	1215	2
18/01/2018	2017/2018 NBR	DJC	5	1012	1215	2.05
12/02/2018	2017/2018 NBR	BU	2	1330	1600	2.5
12/02/2018	2017/2018 NBR	BU	3	1020	1250	2.5
12/02/2018	2017/2018 NBR	RAS	5	1030	1300	2.5
13/02/2018	2017/2018 NBR	RAS	2	1335	1605	2.5
13/02/2018	2017/2018 NBR	BU	5	1000	1230	2.5
15/02/2018	2017/2018 NBR	RAS	1	0930	1200	2.5
15/02/2018	2017/2018 NBR	RAS	1	1200	1400	2
15/02/2018	2017/2018 NBR	BU	4	0945	1245	3
15/02/2018	2017/2018 NBR	BU	4	1300	1400	1
07/03/2018	2017/2018 NBR	DJC	3	0955	1325	3.5
07/03/2018	2017/2018 NBR	DJC	3	1625	1725	1
07/03/2018	2017/2018 NBR	BU	4	1510	1640	1.5
07/03/2018	2017/2018 NBR	BU	5	1010	1310	3
08/03/2018	2017/2018 NBR	BU	3	1345	1645	3
08/03/2018	2017/2018 NBR	BU	4	0930	1200	2.5
08/03/2018	2017/2018 NBR	DJC	4	1450	1750	3
08/03/2018	2017/2018 NBR	DJC	5	0955	1255	3
09/03/2018	2017/2018 NBR	DJC	3	0955	1055	1
10/03/2018	2017/2018 NBR	BU	1	0940	1255	3.25
10/03/2018	2017/2018 NBR	DJC	1	1350	1705	3.25
10/03/2018	2017/2018 NBR	DJC	2	0925	1225	3
10/03/2018	2017/2018 NBR	BU	2	1400	1700	3
09/04/2018	2018 BR	DJC	2	1355	1655	3
09/04/2018	2018 BR	DJC	3	0950	1250	3
10/04/2018	2018 BR	DJC	4	1450	1750	3
10/04/2018	2018 BR	DJC	5	0955	1255	3
11/04/2018	2018 BR	DJC	1	0850	1150	3
12/04/2018	2018 BR	DJC	5	0950	1250	3
13/04/2018	2018 BR	DJC	1	1330	1630	3
13/04/2018	2018 BR	RAS	2	1315	1615	3
13/04/2018	2018 BR	DJC	3	0820	1125	3.083
14/04/2018	2018 BR	DJC	2	1345	1645	3
14/04/2018	2018 BR	RAS	3	1400	1700	3
14/04/2018	2018 BR	DJC	4	0755	1055	3
15/04/2018	2018 BR	DJC	1	1210	1510	3
15/04/2018	2018 BR	RAS	4	1230	1530	3
16/04/2018	2018 BR	DJC	5	1415	1715	3
15/05/2018	2018 BR	DJC	1	1615	1915	3

Date	Season	Observer	VP	Start	Finish	Hours
15/05/2018	2018 BR	DJC	2	1230	1530	3
15/05/2018	2018 BR	RAS	2	1630	1930	3
15/05/2018	2018 BR	RAS	3	1300	1600	3
16/05/2018	2018 BR	DJC	5	1330	1630	3
17/05/2018	2018 BR	DJC	5	0945	1245	3
18/05/2018	2018 BR	DJC	1	1215	1515	3
18/05/2018	2018 BR	RAS	4	1215	1515	3
19/05/2018	2018 BR	DJC	1	1140	1440	3
19/05/2018	2018 BR	RAS	4	1115	1415	3
21/05/2018	2018 BR	DJC	3	1630	1930	3
21/05/2018	2018 BR	RAS	4	1605	1905	3
22/05/2018	2018 BR	DJC	2	0830	1130	3
22/05/2018	2018 BR	RAS	3	0850	1150	3
24/05/2018	2018 BR	RAS	5	0950	1250	3
11/06/2018	2018 BR	DJC	1	1715	1915	2
11/06/2018	2018 BR	BU	2	1705	1905	2
12/06/2018	2018 BR	DJC	3	1400	1700	3
12/06/2018	2018 BR	BU	4	1415	1715	3
15/06/2018	2018 BR	DJC	2	1330	1630	3
16/06/2018	2018 BR	DJC	1	1305	1605	3
16/06/2018	2018 BR	DJC	2	1645	1745	1
17/06/2018	2018 BR	DJC	4	1325	1625	3
19/06/2018	2018 BR	DJC	3	1515	1815	3
19/06/2018	2018 BR	DJC	5	0950	1250	3
20/06/2018	2018 BR	DJC	5	1405	1705	3
21/06/2018	2018 BR	DJC	1	1500	1600	1
15/07/2018	2018 BR	AM	1	1535	1835	3
15/07/2018	2018 BR	DJC	2	1530	1830	3
16/07/2018	2018 BR	DJC	3	1545	1845	3
16/07/2018	2018 BR	AM	5	0740	1040	3
16/07/2018	2018 BR	DJC	5	1045	1345	3
17/07/2018	2018 BR	DJC	1	1335	1635	3
17/07/2018	2018 BR	AM	2	1250	1550	3
17/07/2018	2018 BR	AM	3	0825	1125	3
17/07/2018	2018 BR	DJC	4	0930	1230	3
19/07/2018	2018 BR	DJC	4	0955	1255	3
20/08/2018	2018 BR	BU	1	1330	1630	3
20/08/2018	2018 BR	RAS	2	0930	1230	3
20/08/2018	2018 BR	RAS	3	1310	1610	3
20/08/2018	2018 BR	BU	4	0940	1240	3
22/08/2018	2018 BR	BU	2	1255	1555	3
22/08/2018	2018 BR	BU	3	0925	1225	3
22/08/2018	2018 BR	RAS	5	0935	1235	3
23/08/2018	2018 BR	RAS	1	0910	1210	3

Date	Season	Observer	VP	Start	Finish	Hours
23/08/2018	2018 BR	RAS	4	1300	1600	3
23/08/2018	2018 BR	BU	5	0935	1235	3
03/09/2018	2018/2019 NBR	DJC	1	1335	1635	3
03/09/2018	2018/2019 NBR	RAS	2	1320	1620	3
03/09/2018	2018/2019 NBR	RAS	3	0945	1245	3
03/09/2018	2018/2019 NBR	DJC	4	0935	1235	3
04/09/2018	2018/2019 NBR	DJC	5	0950	1250	3
05/09/2018	2018/2019 NBR	RAS	5	1245	1545	3
06/09/2018	2018/2019 NBR	RAS	1	0930	1230	3
06/09/2018	2018/2019 NBR	DJC	2	0920	1225	3.083
06/09/2018	2018/2019 NBR	DJC	3	1305	1605	3
06/09/2018	2018/2019 NBR	RAS	4	1330	1630	3
01/10/2018	2018/2019 NBR	DJC	1	1115	1245	1.5
01/10/2018	2018/2019 NBR	RAS	2	1110	1240	1.5
01/10/2018	2018/2019 NBR	RAS	3	0740	1040	3
01/10/2018	2018/2019 NBR	DJC	4	0730	1030	3
02/10/2018	2018/2019 NBR	DJC	1	1500	1630	1.5
02/10/2018	2018/2019 NBR	DJC	5	1000	1300	3
03/10/2018	2018/2019 NBR	DJC	3	0850	1150	3
03/10/2018	2018/2019 NBR	RAS	4	1350	1650	3
03/10/2018	2018/2019 NBR	RAS	5	0930	1230	3
04/10/2018	2018/2019 NBR	RAS	1	1200	1500	3
04/10/2018	2018/2019 NBR	DJC	2	1140	1440	3
04/10/2018	2018/2019 NBR	RAS	2	1545	1715	1.5
06/11/2018	2018/2019 NBR	AA	1	0940	1210	2.5
06/11/2018	2018/2019 NBR	BU	2	1310	1540	2.5
06/11/2018	2018/2019 NBR	BU	3	0955	1225	2.5
06/11/2018	2018/2019 NBR	AA	4	1315	1545	2.5
07/11/2018	2018/2019 NBR	BU	5	1015	1245	2.5
08/11/2018	2018/2019 NBR	BU	4	0915	1115	2
08/11/2018	2018/2019 NBR	AA	5	1005	1235	2.5
09/11/2018	2018/2019 NBR	AA	2	1150	1420	2.5
09/11/2018	2018/2019 NBR	AA	3	0850	1120	2.5
04/12/2018	2018/2019 NBR	RAS	1	0925	1225	3
04/12/2018	2018/2019 NBR	AA	2	0930	1130	2
04/12/2018	2018/2019 NBR	AA	3	1240	1440	2
04/12/2018	2018/2019 NBR	RAS	4	1315	1515	2
05/12/2018	2018/2019 NBR	RAS	5	0945	1145	2
06/12/2018	2018/2019 NBR	AA	1	1300	1600	3
06/12/2018	2018/2019 NBR	RAS	2	1300	1500	2
06/12/2018	2018/2019 NBR	RAS	3	1030	1230	2
06/12/2018	2018/2019 NBR	AA	4	1010	1210	2
08/01/2019	2018/2019 NBR	DJC	1	1250	1520	2.5
08/01/2019	2018/2019 NBR	AA	2	1235	1435	2

Date	Season	Observer	VP	Start	Finish	Hours
09/01/2019	2018/2019 NBR	DJC	5	1005	1305	3
10/01/2019	2018/2019 NBR	AA	3	0925	1125	2
10/01/2019	2018/2019 NBR	AA	4	1230	1500	2.5
11/01/2019	2018/2019 NBR	DJC	3	0920	1120	2
11/01/2019	2018/2019 NBR	DJC	4	1235	1435	2
11/01/2019	2018/2019 NBR	AA	5	0910	1210	3
12/01/2019	2018/2019 NBR	DJC	1	0900	1100	2
05/02/2019	2018/2019 NBR	BU	2	1300	1600	3
05/02/2019	2018/2019 NBR	BU	3	0950	1220	2.5
05/02/2019	2018/2019 NBR	DJC	4	1410	1610	2
05/02/2019	2018/2019 NBR	DJC	5	0100	1230	11.5
06/02/2019	2018/2019 NBR	DJC	2	1300	1500	2
06/02/2019	2018/2019 NBR	DJC	3	0950	1220	2.5
06/02/2019	2018/2019 NBR	BU	4	1355	1425	0.5
06/02/2019	2018/2019 NBR	BU	5	0945	1215	2.5
07/02/2019	2018/2019 NBR	DJC	1	0915	1145	2.5
07/02/2019	2018/2019 NBR	BU	1	1215	1415	2
07/02/2019	2018/2019 NBR	BU	2	0910	1110	2
07/02/2019	2018/2019 NBR	DJC	4	1300	1530	2.5
06/03/2019	2018/2019 NBR	BU	1	0925	1225	3
06/03/2019	2018/2019 NBR	RAS	2	0900	1200	3
07/03/2019	2018/2019 NBR	RAS	3	0915	1215	3
08/03/2019	2018/2019 NBR	BU	4	1025	1325	3
09/03/2019	2018/2019 NBR	BU	3	1005	1305	3
09/03/2019	2018/2019 NBR	RAS	5	0945	1145	2
09/03/2019	2018/2019 NBR	RAS	5	1345	1545	2
11/03/2019	2018/2019 NBR	RAS	1	1400	1700	3
11/03/2019	2018/2019 NBR	RAS	4	0800	1100	3
11/03/2019	2018/2019 NBR	BU	5	1000	1200	2
11/03/2019	2018/2019 NBR	BU	5	1330	1530	2
12/03/2019	2018/2019 NBR	BU	2	0900	1200	3

ANNEX D. NRP FLIGHT ACTIVITY SURVEY RESULTS

Table D-1: Details of target species recorded during flight activity surveys (sorted by species) – north array CRAA seconds

Date	VP	Flight Start Time	Species	Number of Birds	Duration (sec)	Inside CRAA 0-20m	Inside CRAA 21-150m	Inside CRAA 151-200m	Inside CRAA 201-250m	Inside CRAA >250m	Outside CRAA 0-20m	Outside CRAA 21-150m	Outside CRAA 151-200m	Outside CRAA 201-250m	Outside CRAA >250m
19/5/2018	1	1217	Black-throated diver	2	89	0	29.02981822	0	0	0	0	59.97018178	0	0	0
22/8/2018	3	1004	Black-throated diver	3	44	0	0	0	0	0	0	0	44	0	0
5/9/2017	1	946	Golden eagle	1	331	0	0	0	0	0	7.522727273	323.4772727	0	0	0
5/9/2017	2	1008	Golden eagle	2	74	0	74	0	0	0	0	-3.45239E-10	0	0	0
5/9/2017	2	1010	Golden eagle	1	112	0	99.25670487	0	0	0	0	12.74329513	0	0	0
5/9/2017	1	1011	Golden eagle	1	185	0	173.2357585	0	0	0	0	11.76424149	0	0	0
5/9/2017	2	1036	Golden eagle	1	90	45	45	0	0	0	0	0	0	0	0
5/9/2017	2	1106	Golden eagle	1	42	0	0	0	0	0	21	21	0	0	0
5/9/2017	2	1120	Golden eagle	1	296	0	39.61111426	0	0	0	0	256.3888857	0	0	0
5/9/2017	2	1141	Golden eagle	1	255	0	0	0	0	0	0	255	0	0	0
5/9/2017	2	1146	Golden eagle	3	595	0	10.73862606	0	0	0	0	584.2613739	0	0	0
5/9/2017	2	1158	Golden eagle	2	157	0	157	0	0	0	0	-4.22801E-10	0	0	0
5/9/2017	2	1158	Golden eagle	3	386	0	386	0	0	0	0	-1.0395E-09	0	0	0
5/9/2017	1	1206	Golden eagle	1	152	0	0	0	0	0	0	152	0	0	0
5/9/2017	2	1209	Golden eagle	2	38	0	38	0	0	0	0	0	0	0	0
5/9/2017	2	1218	Golden eagle	3	112	0	112	0	0	0	0	2.53209E-10	0	0	0
5/9/2017	2	1414	Golden eagle	1	119	17	102	0	0	0	0	0	0	0	0
5/9/2017	2	1434	Golden eagle	1	191	0	0	0	0	0	0	191	0	0	0
5/9/2017	2	1501	Golden eagle	1	71	0	0	0	0	0	71	0	0	0	0
5/9/2017	2	1525	Golden eagle	1	95	0	0	0	0	0	0	95	0	0	0
6/9/2017	3	1218	Golden eagle	1	5	2.751104752	0	0	0	0	2.248895248	0	0	0	0
6/9/2017	4	1218	Golden eagle	1	276	0	0	0	0	0	0	276	0	0	0
6/9/2017	3	1220	Golden eagle	1	99	0	0	0	0	0	0	99	0	0	0
6/9/2017	4	1220	Golden eagle	2	186	0	0	0	0	0	0	186	0	0	0
6/9/2017	3	1246	Golden eagle	1	119	0	0	0	0	0	51	68	0	0	0
6/9/2017	4	1512	Golden eagle	2	450	0	0	0	0	0	0	300	150	0	0
6/9/2017	3	1602	Golden eagle	1	93	0	0	0	0	0	0	93	0	0	0
6/9/2017	3	1608	Golden eagle	1	29	0	0	0	0	0	0	29	0	0	0
7/9/2017	5	1331	Golden eagle	1	643	0	0	0	0	0	0	643	0	0	0
7/9/2017	5	1529	Golden eagle	1	381	0	0	0	0	0	0	381	0	0	0
17/10/2017	4	1508	Golden eagle	2	244	0.793545303	11.90317955	0	0	0	14.4564547	216.8468204	0	0	0
17/10/2017	4	1539	Golden eagle	1	314	0	0	0	0	0	15.7	188.4	109.9	0	0
18/10/2017	5	1137	Golden eagle	1	11	0	0	0	0	0	11	0	0	0	0
18/10/2017	3	1148	Golden eagle	2	130	0	0	0	0	0	0	130	0	0	0
18/10/2017	5	1213	Golden eagle	1	607	0	0	0	0	0	91.05	91.05	182.1	60.7	182.1
18/10/2017	5	1216	Golden eagle	1	464	0	0	0	0	0	61.86666667	61.86666667	61.86666667	108.2666667	170.1333333
18/10/2017	2	1542	Golden eagle	1	397	0	0.194919326	0.730947471	0.34110882	0	0	60.88200375	228.3075141	106.5435066	0
18/10/2017	2	1557	Golden eagle	1	108	0	0	0	0	0	15.42857143	92.57142857	0	0	0
18/10/2017	2	1614	Golden eagle	1	1015	40.20867148	593.0779043	40.20867148	0	0	20.38834345	300.7280659	20.38834345	0	0

Date	VP	Flight Start Time	Species	Number of Birds	Duration (sec)	Inside CRAA 0-20m	Inside CRAA 21-150m	Inside CRAA 151-200m	Inside CRAA 201-250m	Inside CRAA >250m	Outside CRAA 0-20m	Outside CRAA 21-150m	Outside CRAA 151-200m	Outside CRAA 201-250m	Outside CRAA >250m
18/10/2017	2	1620	Golden eagle	1	211	72.87193811	131.1694886	0	0	0	2.48520475	4.473368549	0	0	0
18/10/2017	2	1620	Golden eagle	1	691	27.46633832	604.259443	0	0	0	2.577139944	56.69707878	0	0	0
19/10/2017	2	924	Golden eagle	1	192	160	32	0	0	0	8.21558E-10	1.64309E-10	0	0	0
19/10/2017	2	926	Golden eagle	1	18	18	0	0	0	0	9.24238E-11	0	0	0	0
19/10/2017	5	942	Golden eagle	1	876	0	0	0	0	0	60.4137931	664.5517241	151.0344828	0	0
19/10/2017	5	1002	Golden eagle	1	307	0	0	0	0	0	0	138.15	76.75	92.1	0
19/10/2017	5	1005	Golden eagle	1	176	0	0	0	0	0	0	48	128	0	0
19/10/2017	2	1050	Golden eagle	1	253	31.625	221.375	0	0	0	0	0	0	0	0
19/10/2017	5	1119	Golden eagle	2	421	0	0	0	0	0	0	421	0	0	0
19/10/2017	5	1126	Golden eagle	1	153	0	0	0	0	0	45.9	107.1	0	0	0
19/10/2017	2	1138	Golden eagle	1	18	0	0	0	0	0	18	0	0	0	0
19/10/2017	5	1138	Golden eagle	1	801	0	0	0	0	0	0	801	0	0	0
19/10/2017	5	1154	Golden eagle	2	60	0	0	0	0	0	0	60	0	0	0
19/10/2017	5	1158	Golden eagle	2	248	0	0	0	0	0	15.5	232.5	0	0	0
19/10/2017	3	1319	Golden eagle	1	4	0	0	0	0	0	4	0	0	0	0
19/10/2017	3	1406	Golden eagle	1	156	0	0	0	0	0	78	78	0	0	0
19/10/2017	3	1437	Golden eagle	1	374	0	0	0	0	0	62.33333333	171.4166667	0	109.0833333	31.16666667
19/10/2017	3	1506	Golden eagle	1	194	0	0	0	0	0	129.3333333	64.66666667	0	0	0
20/10/2017	1	1214	Golden eagle	2	43	0	0	0	0	0	0	43	0	0	0
20/10/2017	1	1215	Golden eagle	1	44	0	0	0	0	0	0	44	0	0	0
20/10/2017	4	1240	Golden eagle	1	386	0	0	0	0	0	0	231.6	30.88	30.88	92.64
14/11/2017	5	1011	Golden eagle	1	550	0	0	0	0	0	397.2222222	152.7777778	0	0	0
14/11/2017	3	1217	Golden eagle	2	151	0	0	0	0	0	0	151	0	0	0
14/11/2017	3	1224	Golden eagle	2	20	0	0	0	0	0	20	0	0	0	0
14/11/2017	2	1334	Golden eagle	1	90	0	0	0	0	0	90	0	0	0	0
14/11/2017	2	1336	Golden eagle	3	419	0	0	0	0	0	0	419	0	0	0
14/11/2017	2	1343	Golden eagle	2	424	0	194.3965201	32.39942002	0	0	0	169.0320513	28.17200855	0	0
15/11/2017	5	903	Golden eagle	1	190	0	0	0	0	0	0	0	15.83333333	174.1666667	0
15/11/2017	2	940	Golden eagle	1	175	0	75.84938642	0	0	0	0	99.15061358	0	0	0
15/11/2017	5	947	Golden eagle	1	306	0	0	0	0	0	0	244.8	61.2	0	0
15/11/2017	5	1014	Golden eagle	1	6	0	0	0	0	0	6	0	0	0	0
15/11/2017	5	1028	Golden eagle	1	384	0	0	0	0	0	0	384	0	0	0
15/11/2017	5	1059	Golden eagle	1	660	0	0	0	0	0	0	450	195	15	0
15/11/2017	5	1110	Golden eagle	2	213	0	0	0	0	0	0	152.1428571	0	60.85714286	0
15/11/2017	3	1202	Golden eagle	1	285	0	23.19786261	10.70670582	0	0	0	171.8021374	79.29329418	0	0
15/11/2017	3	1204	Golden eagle	1	30	0	0	3.56890194	0	0	0	0	26.43109806	0	0
15/11/2017	3	1210	Golden eagle	2	195	0	23.19786261	0	0	0	0	171.8021374	0	0	0
15/11/2017	3	1216	Golden eagle	2	134	0	15.94109533	0	0	0	0	118.0589047	0	0	0
15/11/2017	3	1231	Golden eagle	1	150	0	17.8445097	0	0	0	0	132.1554903	0	0	0
15/11/2017	3	1313	Golden eagle	2	201	0	23.911643	0	0	0	0	177.088357	0	0	0
15/11/2017	3	1332	Golden eagle	2	424	0	50.44048075	0	0	0	0	373.5595192	0	0	0
16/11/2017	4	1010	Golden eagle	1	5	0	0	0	0	0	0	5	0	0	0

Date	VP	Flight Start Time	Species	Number of Birds	Duration (sec)	Inside CRAA 0-20m	Inside CRAA 21-150m	Inside CRAA 151-200m	Inside CRAA 201-250m	Inside CRAA >250m	Outside CRAA 0-20m	Outside CRAA 21-150m	Outside CRAA 151-200m	Outside CRAA 201-250m	Outside CRAA >250m
16/11/2017	1	1045	Golden eagle	1	501	35.38694396	353.8694396	0	0	0	10.15851058	101.5851058	0	0	0
16/11/2017	4	1045	Golden eagle	1	5	0	0	0	0	0	0	5	0	0	0
16/11/2017	4	1100	Golden eagle	1	16	0	0	0	0	0	0	16	0	0	0
16/11/2017	1	1111	Golden eagle	1	11	0	1.789539797	0	0	0	0	9.210460203	0	0	0
16/11/2017	4	1420	Golden eagle	1	3	0	0	0	0	0	3	0	0	0	0
16/11/2017	4	1515	Golden eagle	1	2	0	0	0	0	0	2	0	0	0	0
13/12/2017	4	1031	Golden eagle	1	421	0	0	0	0	0	0	421	0	0	0
13/12/2017	4	1032	Golden eagle	1	428	0	0	0	0	0	0	428	0	0	0
13/12/2017	1	1038	Golden eagle	1	496	0	0	0	0	0	0	496	0	0	0
13/12/2017	1	1045	Golden eagle	1	767	5.490759513	16.04991242	0	0	0	190.0190444	555.4402837	0	0	0
13/12/2017	1	1049	Golden eagle	1	607	0	0	0	0	0	0	607	0	0	0
13/12/2017	4	1050	Golden eagle	1	62	0	0	0	0	0	0	62	0	0	0
13/12/2017	1	1113	Golden eagle	1	8	8	0	0	0	0	0	0	0	0	0
13/12/2017	1	1231	Golden eagle	1	605	0	0	0	0	0	0	605	0	0	0
13/12/2017	1	1231	Golden eagle	1	1074	0	0	0	0	0	0	1074	0	0	0
13/12/2017	1	1236	Golden eagle	1	639	0	0	0	0	0	0	639	0	0	0
13/12/2017	1	1247	Golden eagle	1	307	47.80524597	143.4157379	0	0	0	28.94475403	86.8342621	0	0	0
13/12/2017	1	1311	Golden eagle	1	157	0	0	0	0	0	94.2	62.8	0	0	0
13/12/2017	1	1345	Golden eagle	1	485	0	0	0	0	0	45.46875	439.53125	0	0	0
13/12/2017	1	1348	Golden eagle	1	285	0	0	0	0	0	0	285	0	0	0
13/12/2017	4	1356	Golden eagle	1	44	0	0	0	0	0	0	44	0	0	0
13/12/2017	4	1417	Golden eagle	1	107	0	0	0	0	0	45.85714286	61.14285714	0	0	0
14/12/2017	3	1309	Golden eagle	1	15	0	0	0	0	0	0	15	0	0	0
14/12/2017	3	1329	Golden eagle	2	110	0	0	0	0	0	0	110	0	0	0
14/12/2017	3	1342	Golden eagle	1	564	0	0	0	0	0	0	564	0	0	0
14/12/2017	3	1345	Golden eagle	1	299	0	0	0	0	0	0	299	0	0	0
16/1/2018	4	1018	Golden eagle	2	83	0	0	0	0	0	0	83	0	0	0
16/1/2018	1	1021	Golden eagle	1	102	0	0	0	0	0	0	102	0	0	0
16/1/2018	1	1024	Golden eagle	1	1111	0	0	0	0	0	0	240.2162162	615.5540541	255.2297297	0
16/1/2018	1	1052	Golden eagle	1	76	0	75.1250585	0	0	0	0	0.8749415	0	0	0
16/1/2018	4	1059	Golden eagle	1	269	0	0	0	0	0	0	269	0	0	0
16/1/2018	4	1115	Golden eagle	1	14	0	0	0	0	0	0	14	0	0	0
16/1/2018	1	1159	Golden eagle	1	347	97.65146949	62.77594467	0	0	0	113.5659218	73.00666402	0	0	0
16/1/2018	4	1329	Golden eagle	1	3	0	0	0	0	0	3	0	0	0	0
16/1/2018	1	1333	Golden eagle	1	139	0	64.36891641	0	0	0	0	74.63108359	0	0	0
16/1/2018	1	1335	Golden eagle	3	779	0	0	0	0	0	0	717.9019608	61.09803922	0	0
16/1/2018	4	1347	Golden eagle	1	102	0	0	0	0	0	34	68	0	0	0
16/1/2018	4	1348	Golden eagle	1	16	0	0	0	0	0	16	0	0	0	0
16/1/2018	1	1435	Golden eagle	1	154	0	0	0	0	0	0	154	0	0	0
16/1/2018	1	1507	Golden eagle	3	472	0	0	0	0	0	30.4516129	197.9354839	182.7096774	60.90322581	0
17/1/2018	5	1044	Golden eagle	1	8	0	0	0	0	0	8	0	0	0	0
17/1/2018	5	1200	Golden eagle	1	31	0	0	0	0	0	0	31	0	0	0

Date	VP	Flight Start Time	Species	Number of Birds	Duration (sec)	Inside CRAA 0-20m	Inside CRAA 21-150m	Inside CRAA 151-200m	Inside CRAA 201-250m	Inside CRAA >250m	Outside CRAA 0-20m	Outside CRAA 21-150m	Outside CRAA 151-200m	Outside CRAA 201-250m	Outside CRAA >250m
17/1/2018	3	1229	Golden eagle	2	81	0	0	0	0	0	0	81	0	0	0
17/1/2018	3	1320	Golden eagle	5	632	0	0	0	0	0	0	632	0	0	0
17/1/2018	3	1351	Golden eagle	1	133	0	0	0	0	0	33.25	99.75	0	0	0
18/1/2018	5	1116	Golden eagle	1	439	0	0	0	0	0	60.55172414	378.4482759	0	0	0
18/1/2018	5	1130	Golden eagle	1	74	0	0	0	0	0	37	37	0	0	0
18/1/2018	2	1351	Golden eagle	2	543	0	54.39286835	85.47450741	0	0	0	156.7737983	246.3588259	0	0
18/1/2018	2	1424	Golden eagle	2	64	0	64	0	0	0	0	0	0	0	0
18/1/2018	2	1431	Golden eagle	1	20	14.68895982	0	0	0	0	5.311040181	0	0	0	0
18/1/2018	2	1431	Golden eagle	1	437	0	114.1309339	0	0	0	0	322.8690661	0	0	0
18/1/2018	2	1454	Golden eagle	1	12	0	0	0	0	0	0	12	0	0	0
12/2/2018	3	1239	Golden eagle	1	16	0	0	0	0	0	0	16	0	0	0
12/2/2018	2	1501	Golden eagle	1	44	0	0	0	0	0	0	44	0	0	0
12/2/2018	2	1512	Golden eagle	1	329	0	0	0	0	0	0	329	0	0	0
12/2/2018	2	1527	Golden eagle	2	565	0	0	0	0	0	0	488.6486486	76.35135135	0	0
12/2/2018	2	1537	Golden eagle	1	237	0	168.1905902	0	0	0	0	68.80940979	0	0	0
12/2/2018	2	1555	Golden eagle	2	184	0	0	0	0	0	0	184	0	0	0
13/2/2018	5	1057	Golden eagle	1	8	0	0	0	0	0	0	8	0	0	0
13/2/2018	5	1057	Golden eagle	1	3	0	0	0	0	0	0	3	0	0	0
13/2/2018	5	1100	Golden eagle	1	32	0	0	0	0	0	32	0	0	0	0
13/2/2018	5	1124	Golden eagle	1	282	0	0	0	0	0	0	15.66666667	62.66666667	203.6666667	0
13/2/2018	5	1142	Golden eagle	1	268	0	0	0	0	0	63.05882353	204.9411765	0	0	0
13/2/2018	5	1151	Golden eagle	1	380	0	0	0	0	0	0	380	0	0	0
13/2/2018	5	1158	Golden eagle	1	194	0	0	0	0	0	0	194	0	0	0
13/2/2018	5	1203	Golden eagle	1	322	0	0	0	0	0	0	322	0	0	0
13/2/2018	5	1203	Golden eagle	1	322	0	0	0	0	0	0	322	0	0	0
13/2/2018	5	1218	Golden eagle	2	409	0	0	0	0	0	0	75.74074074	212.0740741	121.1851852	0
13/2/2018	2	1341	Golden eagle	2	155	0	155	0	0	0	0	0	0	0	0
13/2/2018	2	1428	Golden eagle	2	100	0	37.29108543	0	0	0	0	62.70891457	0	0	0
15/2/2018	5	1045	Golden eagle	1	753	0	0	0	0	0	301.2	451.8	0	0	0
15/2/2018	5	1050	Golden eagle	1	123	0	0	0	0	0	0	123	0	0	0
15/2/2018	1	1052	Golden eagle	1	221	0	0	0	0	0	0	221	0	0	0
15/2/2018	1	1058	Golden eagle	2	157	0	0	0	0	0	0	157	0	0	0
15/2/2018	5	1235	Golden eagle	1	450	0	0	0	0	0	0	360	90	0	0
15/2/2018	1	1326	Golden eagle	1	123	0	0	0	0	0	15.375	107.625	0	0	0
7/3/2018	3	1051	Golden eagle	1	10	0	0	0	0	0	10	0	0	0	0
7/3/2018	3	1141	Golden eagle	1	467	0	98.32669075	0	0	0	0	368.6733092	0	0	0
7/3/2018	3	1235	Golden eagle	2	501	154.2840531	21.28055905	0	0	0	285.9886742	39.44671368	0	0	0
7/3/2018	3	1247	Golden eagle	2	925	0	142.9408521	42.57812615	0	0	0	569.764066	169.7169558	0	0
8/3/2018	5	1011	Golden eagle	1	22	0	0	0	0	0	0	22	0	0	0
8/3/2018	5	1019	Golden eagle	1	135	0	0	0	0	0	15	120	0	0	0
8/3/2018	5	1031	Golden eagle	1	99	0	0	0	0	0	16.5	82.5	0	0	0
8/3/2018	4	1108	Golden eagle	1	174	0	0	0	0	0	0	174	0	0	0

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8/3/2018	4	1122	Golden eagle	1	169	0	0	0	0	0	0	169	0	0	0
8/3/2018	4	1131	Golden eagle	1	312	0	0	0	0	0	0	312	0	0	0
8/3/2018	5	1132	Golden eagle	1	19	0	0	0	0	0	0	19	0	0	0
8/3/2018	5	1234	Golden eagle	1	41	0	0	0	0	0	20.5	20.5	0	0	0
8/3/2018	5	1239	Golden eagle	1	89	0	0	0	0	0	0	89	0	0	0
8/3/2018	5	1252	Golden eagle	1	264	0	0	0	0	0	264	0	0	0	0
8/3/2018	5	1252	Golden eagle	1	287	0	0	0	0	0	30.21052632	75.52631579	181.2631579	0	0
8/3/2018	3	1506	Golden eagle	1	335	0	0	0	0	0	0	258.8636364	76.13636364	0	0
8/3/2018	4	1616	Golden eagle	1	47	0	0	0	0	0	0	47	0	0	0
8/3/2018	3	1619	Golden eagle	1	227	0	0	0	0	0	0	227	0	0	0
8/3/2018	4	1640	Golden eagle	1	227	0	0	0	0	0	0	45.4	181.6	0	0
9/3/2018	3	1035	Golden eagle	1	145	0	0	0	0	0	0	145	0	0	0
9/3/2018	3	1038	Golden eagle	1	69	0	61.73091466	0	0	0	0	7.269085343	0	0	0
9/3/2018	3	1042	Golden eagle	1	244	0	15.97997097	0	0	0	0	228.020029	0	0	0
9/3/2018	3	1042	Golden eagle	1	244	0	0	15.97997097	0	0	0	0	228.020029	0	0
9/3/2018	3	1054	Golden eagle	1	180	0	86.50462778	0	0	0	0	93.49537222	0	0	0
9/3/2018	3	1054	Golden eagle	1	439	0	174.6001453	36.37503026	0	0	0	188.7101996	39.31462491	0	0
10/3/2018	2	946	Golden eagle	1	225	0	0	0	0	0	0	210	15	0	0
10/3/2018	1	1008	Golden eagle	1	184	0	0	0	0	0	0	107.3333333	76.66666667	0	0
10/3/2018	2	1120	Golden eagle	2	289	0	34.09117299	14.61050271	19.48067028	24.35083785	0	72.38251122	31.02107624	41.36143498	51.70179373
10/3/2018	2	1201	Golden eagle	1	29	0	0	0	0	0	0	29	0	0	0
10/3/2018	2	1222	Golden eagle	1	141	47	94	0	0	0	0	0	0	0	0
10/3/2018	2	1418	Golden eagle	1	135	0	0	0	0	0	0	135	0	0	0
10/3/2018	1	1422	Golden eagle	1	273	0	0	9.936919484	12.42114935	0	0	0	111.3964138	139.2455173	0
10/3/2018	2	1424	Golden eagle	1	72	0	0	0	0	0	0	72	0	0	0
10/3/2018	1	1427	Golden eagle	1	15	0	15	0	0	0	0	0	0	0	0
10/3/2018	2	1441	Golden eagle	2	461	0	13.58269315	20.37403972	0	67.91346574	0	47.88397352	71.82596028	0	239.4198676
10/3/2018	2	1448	Golden eagle	1	511	0	505.6927294	0	0	0	0	5.307270551	0	0	0
10/3/2018	2	1507	Golden eagle	2	379	0	7.847723329	0	0	0	0	371.1522767	0	0	0
10/3/2018	1	1521	Golden eagle	1	246	9.010387378	135.1558107	0	0	0	6.364612622	95.46918933	0	0	0
10/3/2018	2	1541	Golden eagle	1	82	0	0	0	0	0	0	82	0	0	0
10/3/2018	2	1546	Golden eagle	1	430	0	0	0	0	0	15.35714286	414.6428571	0	0	0
10/3/2018	2	1613	Golden eagle	1	65	0	0	0	0	0	32.5	32.5	0	0	0
10/3/2018	2	1618	Golden eagle	2	138	0	0	0	0	0	0	138	0	0	0
10/3/2018	2	1641	Golden eagle	1	86	0	0	0	0	0	0	86	0	0	0
9/4/2018	3	1037	Golden eagle	1	43	0	0	0	0	0	0	43	0	0	0
9/4/2018	3	1126	Golden eagle	1	18	0	0	0	0	0	18	0	0	0	0
9/4/2018	3	1138	Golden eagle	1	214	0	0	0	0	0	0	214	0	0	0
9/4/2018	3	1138	Golden eagle	1	164	0	0	0	0	0	0	164	0	0	0
9/4/2018	3	1158	Golden eagle	2	152	0	0	0	0	0	0	106.4	45.6	0	0
9/4/2018	3	1204	Golden eagle	1	632	0	0	0	0	0	0	376.1904762	30.0952381	30.0952381	195.6190476
9/4/2018	3	1221	Golden eagle	1	621	0	11.60430195	2.443010937	2.443010937	8.550538278	0	276.1761859	58.14235492	58.14235492	203.4982422

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9/4/2018	3	1221	Golden eagle	1	570	0.659134324	9.887014854	2.636537295	2.636537295	9.227880531	14.34086568	215.1129851	57.36346271	57.36346271	200.7721195
9/4/2018	2	1525	Golden eagle	1	722	0	0	0	0	0	30.08333333	210.5833333	45.125	361	75.20833333
9/4/2018	2	1547	Golden eagle	1	102	0	102	0	0	0	0	2.87699E-10	0	0	0
10/4/2018	5	1008	Golden eagle	1	35	0	0	0	0	0	35	0	0	0	0
10/4/2018	5	1015	Golden eagle	2	190	0	0	0	0	0	0	190	0	0	0
10/4/2018	5	1034	Golden eagle	1	475	0	0	0	0	0	260.483871	168.5483871	45.96774194	0	0
10/4/2018	5	1041	Golden eagle	1	46	0	0	0	0	0	46	0	0	0	0
10/4/2018	5	1217	Golden eagle	1	148	0	0	0	0	0	16.44444444	131.5555556	0	0	0
10/4/2018	4	1659	Golden eagle	1	91	0	0	0	0	0	0	0	91	0	0
10/4/2018	4	1715	Golden eagle	2	52	0	0	0	0	0	0	52	0	0	0
10/4/2018	4	1723	Golden eagle	2	81	0	0	0	0	0	0	81	0	0	0
12/4/2018	5	1137	Golden eagle	1	554	0	0	0	0	0	76.94444444	277	92.33333333	107.7222222	0
12/4/2018	5	1238	Golden eagle	1	108	0	0	0	0	0	0	108	0	0	0
13/4/2018	3	935	Golden eagle	1	94	0	0	0	0	0	0	94	0	0	0
13/4/2018	3	937	Golden eagle	2	168	0	0	0	0	0	0	106.9090909	61.09090909	0	0
13/4/2018	3	949	Golden eagle	1	190	0	0	0	0	0	0	190	0	0	0
14/4/2018	4	1036	Golden eagle	1	382	0	0	0	0	0	0	305.6	76.4	0	0
14/4/2018	4	1036	Golden eagle	1	382	0	0	0	0	0	0	259.76	91.68	30.56	0
14/4/2018	2	1634	Golden eagle	1	185	0	185	0	0	0	0	0	0	0	0
15/4/2018	1	1347	Golden eagle	1	160	0	0	0	0	0	0	0	160	0	0
15/4/2018	1	1408	Golden eagle	1	64	0	0	0	0	0	0	64	0	0	0
15/4/2018	1	1504	Golden eagle	2	401	0	130.5864478	39.17593433	0	0	0	177.8750907	53.36252721	0	0
16/4/2018	5	1443	Golden eagle	1	157	0	0	0	0	0	0	157	0	0	0
16/4/2018	5	1605	Golden eagle	1	186	0	0	0	0	0	0	93	93	0	0
16/4/2018	5	1605	Golden eagle	1	193	0	0	0	0	0	0	128.6666667	64.33333333	0	0
15/5/2018	3	1353	Golden eagle	1	5	0	0	0	0	0	5	0	0	0	0
15/5/2018	3	1410	Golden eagle	1	274	0	0	0	0	0	0	274	0	0	0
15/5/2018	2	1518	Golden eagle	1	299	0	91.5538159	0	0	0	0	207.4461841	0	0	0
15/5/2018	1	1710	Golden eagle	1	674	0	0	0	0	0	0	382.9545455	291.0454545	0	0
15/5/2018	1	1710	Golden eagle	1	346	0	0	0	0	0	0	210.6086957	45.13043478	90.26086957	0
15/5/2018	1	1853	Golden eagle	1	72	0	0	0	0	0	0	72	0	0	0
15/5/2018	1	1858	Golden eagle	1	7	7	0	0	0	0	0	0	0	0	0
16/5/2018	5	1447	Golden eagle	1	138	0	0	0	0	0	61.33333333	76.66666667	0	0	0
16/5/2018	5	1545	Golden eagle	2	122	0	0	0	0	0	0	61	45.75	15.25	0
17/5/2018	5	1017	Golden eagle	1	8	0	0	0	0	0	0	8	0	0	0
17/5/2018	5	1042	Golden eagle	1	345	0	0	0	0	0	45	255	30	15	0
17/5/2018	5	1042	Golden eagle	1	299	0	0	0	0	0	15.73684211	267.5263158	15.73684211	0	0
17/5/2018	5	1102	Golden eagle	1	732	0	0	0	0	0	0	137.25	350.75	244	0
17/5/2018	5	1141	Golden eagle	1	300	0	0	0	0	0	150	150	0	0	0
17/5/2018	5	1141	Golden eagle	1	709	0	0	0	0	0	271.5319149	377.1276596	60.34042553	0	0
18/5/2018	4	1310	Golden eagle	1	587	0	0	0	0	0	0	451.5384615	135.4615385	0	0
18/5/2018	4	1328	Golden eagle	1	186	0	0	0	0	0	0	15.5	170.5	0	0

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18/5/2018	1	1418	Golden eagle	1	45	45	0	0	0	0	-3.28647E-10	0	0	0	0
18/5/2018	4	1419	Golden eagle	1	49	0	0	0	0	0	49	0	0	0	0
18/5/2018	1	1427	Golden eagle	1	157	31.4	125.6	0	0	0	0	0	0	0	0
18/5/2018	1	1434	Golden eagle	1	78	78	0	0	0	0	0	0	0	0	0
19/5/2018	4	1146	Golden eagle	1	273	0	0	0	0	0	0	273	0	0	0
19/5/2018	4	1146	Golden eagle	1	243	0	0	0	0	0	0	0	243	0	0
19/5/2018	1	1352	Golden eagle	2	102	51	51	0	0	0	0	0	0	0	0
19/5/2018	1	1401	Golden eagle	2	165	120	45	0	0	0	-4.54492E-10	-1.70431E-10	0	0	0
19/5/2018	1	1407	Golden eagle	1	520	184.4038757	207.4543602	0	0	0	60.30200662	67.83975745	0	0	0
19/5/2018	1	1407	Golden eagle	1	520	184.9210497	208.0361809	0	0	0	59.78483264	67.25793672	0	0	0
21/5/2018	3	1627	Golden eagle	1	47	0	0	0	0	0	0	47	0	0	0
21/5/2018	3	1631	Golden eagle	1	444	0	0	0	0	0	214.3448276	229.6551724	0	0	0
21/5/2018	3	1631	Golden eagle	1	489	0	0	0	0	0	244.5	244.5	0	0	0
21/5/2018	3	1646	Golden eagle	1	290	0	0	0	0	0	61.05263158	228.9473684	0	0	0
22/5/2018	2	934	Golden eagle	1	11	0	0	0	0	0	0	11	0	0	0
22/5/2018	2	957	Golden eagle	1	76	0	0	0	0	0	15.2	60.8	0	0	0
22/5/2018	2	1046	Golden eagle	1	188	11.3877927	125.2657197	0	0	0	4.278873971	47.06761368	0	0	0
22/5/2018	2	1059	Golden eagle	1	306	153	153	0	0	0	0	0	0	0	0
22/5/2018	3	1103	Golden eagle	1	21	0	0	0	0	0	0	21	0	0	0
22/5/2018	2	1108	Golden eagle	1	438	30.16163835	331.7780219	75.40409588	0	0	0.045258198	0.497840181	0.113145496	0	0
22/5/2018	2	1128	Golden eagle	1	34	0	34	0	0	0	0	0	0	0	0
24/5/2018	5	1144	Golden eagle	1	62	0	0	0	0	0	0	62	0	0	0
16/6/2018	1	1418	Golden eagle	1	47	0	0	0	0	0	0	47	0	0	0
16/6/2018	2	1656	Golden eagle	1	207	0	0	0	0	0	15.92307692	191.0769231	0	0	0
16/6/2018	2	1657	Golden eagle	1	117	0	0	0	0	0	0	117	0	0	0
19/6/2018	5	1011	Golden eagle	1	146	0	0	0	0	0	0	146	0	0	0
19/6/2018	5	1210	Golden eagle	1	166	0	0	0	0	0	0	45.27272727	75.45454545	45.27272727	0
19/6/2018	3	1620	Golden eagle	1	324	84.73241033	52.14302174	0	0	0	115.8390182	71.28554968	0	0	0
20/6/2018	5	1619	Golden eagle	1	224	0	0	0	0	0	0	224	0	0	0
15/7/2018	1	1701	Golden eagle	1	5	0	0	0	0	0	5	0	0	0	0
16/7/2018	5	948	Golden eagle	1	143	0	0	0	0	0	15.88888889	127.1111111	0	0	0
16/7/2018	5	1020	Golden eagle	1	825	0	0	0	0	0	0	420	255	150	0
16/7/2018	5	1143	Golden eagle	1	400	0	0	0	0	0	0	261.5384615	138.4615385	0	0
16/7/2018	5	1246	Golden eagle	1	3	0	0	0	0	0	0	3	0	0	0
16/7/2018	5	1251	Golden eagle	1	127	0	0	0	0	0	0	63.5	63.5	0	0
16/7/2018	5	1255	Golden eagle	1	85	0	0	0	0	0	0	17	68	0	0
17/7/2018	3	853	Golden eagle	2	163	0	0	0	0	0	0	114.1	32.6	16.3	0
17/7/2018	2	1411	Golden eagle	1	132	0	72.68596469	0	0	0	0	59.31403531	0	0	0
17/7/2018	2	1411	Golden eagle	1	210	0	187.022786	0	0	0	0	22.97721404	0	0	0
17/7/2018	1	1414	Golden eagle	1	65	0	0	0	0	0	0	65	0	0	0
17/7/2018	2	1420	Golden eagle	2	102	0	102	0	0	0	0	0	0	0	0
17/7/2018	1	1606	Golden eagle	2	93	0	0	0	0	0	0	93	0	0	0

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17/7/2018	1	1613	Golden eagle	2	253	0	0	0	0	0	31.625	221.375	0	0	0
19/7/2018	4	1043	Golden eagle	1	14	0	0	0	0	0	0	14	0	0	0
19/7/2018	4	1050	Golden eagle	1	16	0	0	0	0	0	16	0	0	0	0
19/7/2018	4	1058	Golden eagle	1	121	0	0	0	0	0	0	121	0	0	0
20/8/2018	3	1451	Golden eagle	1	139	0	0	0	0	0	0	139	0	0	0
20/8/2018	3	1451	Golden eagle	1	162	0	0	0	0	0	0	162	0	0	0
22/8/2018	2	1259	Golden eagle	1	904	0	0	0	0	0	0	904	0	0	0
22/8/2018	2	1314	Golden eagle	3	372	0	0	0	0	0	15.5	356.5	0	0	0
22/8/2018	2	1331	Golden eagle	1	133	0	0	0	0	0	0	133	0	0	0
22/8/2018	2	1339	Golden eagle	1	150	0	0	0	0	0	0	150	0	0	0
22/8/2018	2	1341	Golden eagle	2	47	0	0	0	0	0	0	47	0	0	0
22/8/2018	2	1406	Golden eagle	1	707	0	0	0	0	0	0	406.1489362	150.4255319	150.4255319	0
22/8/2018	2	1409	Golden eagle	1	155	0	0	0	0	0	0	155	0	0	0
22/8/2018	2	1515	Golden eagle	1	314	0	55.9062151	11.18124302	11.18124302	33.54372906	0	101.0937849	20.21875698	20.21875698	60.65627094
22/8/2018	2	1535	Golden eagle	3	415	0	57.59493537	28.79746768	28.79746768	273.575943	0	3.886546114	1.943273057	1.943273057	18.46109404
23/8/2018	1	1008	Golden eagle	1	98	0	0	0	0	0	0	98	0	0	0
23/8/2018	1	1013	Golden eagle	1	814	0	327.3079991	83.72995325	0	0	0	320.8771861	82.08486156	0	0
23/8/2018	1	1017	Golden eagle	1	31	0	0	0	0	0	0	31	0	0	0
23/8/2018	1	1019	Golden eagle	1	425	0	60.55097393	20.18365798	0	0	0	258.1990261	86.06634202	0	0
23/8/2018	1	1049	Golden eagle	1	422	0	70.99390065	0	0	0	0	351.0060994	0	0	0
23/8/2018	1	1049	Golden eagle	1	143	0	0	0	0	0	0	143	0	0	0
23/8/2018	1	1052	Golden eagle	1	530	0	130.9245319	0	0	0	0	399.0754681	0	0	0
23/8/2018	5	1058	Golden eagle	1	308	0	0	0	0	0	0	184.8	123.2	0	0
23/8/2018	5	1111	Golden eagle	1	22	0	0	0	0	0	0	22	0	0	0
23/8/2018	1	1132	Golden eagle	1	813	0.58387756	23.35510241	7.590408285	0	0	14.471678	578.8671198	188.1318139	0	0
23/8/2018	3	1335	Golden eagle	1	445	0	0	0	0	0	107.4137931	337.5862069	0	0	0
3/9/2018	4	1021	Golden eagle	1	298	0	0	0	0	0	0	298	0	0	0
3/9/2018	4	1052	Golden eagle	1	75	0	0	0	0	0	0	75	0	0	0
3/9/2018	4	1106	Golden eagle	1	20	0	0	0	0	0	0	20	0	0	0
3/9/2018	4	1126	Golden eagle	1	73	0	23.11057754	0	0	0	0	49.88942246	0	0	0
3/9/2018	4	1129	Golden eagle	1	918	0	0	0	0	0	15.04918033	827.704918	75.24590164	0	0
3/9/2018	3	1132	Golden eagle	1	655	0	0	0	0	0	0	655	0	0	0
3/9/2018	3	1136	Golden eagle	1	195	0	0	0	0	0	15	180	0	0	0
3/9/2018	3	1217	Golden eagle	1	10	0	0	0	0	0	10	0	0	0	0
3/9/2018	2	1433	Golden eagle	1	68	11.05426752	0	0	0	0	56.94573248	0	0	0	0
3/9/2018	1	1537	Golden eagle	1	15	0	0	0	0	0	15	0	0	0	0
3/9/2018	2	1543	Golden eagle	1	58	0	0	0	0	0	58	0	0	0	0
4/9/2018	5	1021	Golden eagle	1	820	0	0	0	0	0	485.9259259	227.7777778	106.2962963	0	0
4/9/2018	5	1142	Golden eagle	1	254	0	0	0	0	0	0	190.5	47.625	15.875	0
4/9/2018	5	1142	Golden eagle	1	265	0	0	0	0	0	0	249.4117647	15.58823529	0	0
4/9/2018	5	1241	Golden eagle	1	346	0	0	0	0	0	105.3043478	120.3478261	120.3478261	0	0
4/9/2018	5	1241	Golden eagle	1	476	0	0	0	0	0	153.5483871	168.9032258	153.5483871	0	0

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4/9/2018	5	1241	Golden eagle	1	309	0	0	0	0	0	92.7	108.15	108.15	0	0
5/9/2018	5	1452	Golden eagle	2	34	0	0	0	0	0	34	0	0	0	0
5/9/2018	5	1517	Golden eagle	2	2	0	0	0	0	0	2	0	0	0	0
6/9/2018	2	1013	Golden eagle	1	76	0	0	0	0	0	15.2	60.8	0	0	0
6/9/2018	2	1053	Golden eagle	2	151	0	0	0	0	0	0	151	0	0	0
6/9/2018	1	1206	Golden eagle	1	1236	68.22466013	537.2691985	93.80890768	0	0	52.36070572	412.3405576	71.99597037	0	0
6/9/2018	2	1218	Golden eagle	1	295	0	0	0	0	0	0	93.15789474	77.63157895	77.63157895	46.57894737
6/9/2018	3	1533	Golden eagle	1	162	0	0	0	0	0	162	0	0	0	0
6/9/2018	3	1543	Golden eagle	1	283	0	0	0	0	0	0	172.9444444	110.0555556	0	0
6/9/2018	4	1547	Golden eagle	1	94	0	0	0	0	0	0	15.66666667	78.33333333	0	0
6/9/2018	4	1559	Golden eagle	1	137	0	0	0	0	0	0	137	0	0	0
6/9/2018	4	1607	Golden eagle	2	184	0	0	0	0	0	0	184	0	0	0
1/10/2018	3	1004	Golden eagle	1	17	0	0	0	0	0	17	0	0	0	0
1/10/2018	4	1019	Golden eagle	1	24	0	0	0	0	0	24	0	0	0	0
1/10/2018	3	1020	Golden eagle	1	2	0	0	0	0	0	2	0	0	0	0
1/10/2018	4	1020	Golden eagle	1	37	0	0	0	0	0	0	37	0	0	0
1/10/2018	4	1025	Golden eagle	1	92	0	0	0	0	0	0	92	0	0	0
1/10/2018	1	1202	Golden eagle	1	79	0	0	0	0	0	79	0	0	0	0
1/10/2018	1	1212	Golden eagle	1	58	0	0	0	0	0	58	0	0	0	0
2/10/2018	5	1006	Golden eagle	2	63	0	0	0	0	0	0	63	0	0	0
2/10/2018	5	1036	Golden eagle	1	112	0	0	0	0	0	48	64	0	0	0
2/10/2018	1	1534	Golden eagle	1	80	14.78251492	59.1300597	0	0	0	1.217485076	4.869940303	0	0	0
3/10/2018	4	1535	Golden eagle	1	335	64.09696933	217.9296957	0	0	0	12.0393943	40.93394063	0	0	0
3/10/2018	4	1607	Golden eagle	1	109	0	0	0	0	0	31.14285714	77.85714286	0	0	0
4/10/2018	2	1324	Golden eagle	2	235	83.71357752	30.44130092	0	0	0	88.61975581	32.22536575	0	0	0
4/10/2018	1	1327	Golden eagle	1	44	0	0	0	0	0	0	44	0	0	0
4/10/2018	1	1327	Golden eagle	1	46	0	0	0	0	0	15.33333333	30.66666667	0	0	0
4/10/2018	2	1338	Golden eagle	2	83	33.2	49.8	0	0	0	0	0	0	0	0
4/10/2018	2	1348	Golden eagle	2	34	0	34	0	0	0	0	0	0	0	0
4/10/2018	1	1353	Golden eagle	1	63	35.01684779	11.6722826	0	0	0	12.23315221	4.077717402	0	0	0
4/10/2018	1	1452	Golden eagle	1	229	18.83952221	21.53088253	0	0	0	88.02714445	100.6024508	0	0	0
6/11/2018	3	1013	Golden eagle	2	109	0	0	0	0	0	31.14285714	77.85714286	0	0	0
6/11/2018	3	1126	Golden eagle	2	164	0	0	0	0	0	0	164	0	0	0
6/11/2018	3	1150	Golden eagle	1	152	23.92496791	5.981241977	0	0	0	97.67503209	24.41875802	0	0	0
6/11/2018	3	1205	Golden eagle	1	354	17.0034616	28.33910266	19.83737186	0	0	75.34436449	125.5739408	87.90175857	0	0
6/11/2018	4	1354	Golden eagle	1	78	0	0	0	0	0	0	78	0	0	0
6/11/2018	1	1400	Golden eagle	1	129	0	0	0	0	0	0	96.75	32.25	0	0
6/11/2018	4	1404	Golden eagle	1	253	0	0	0	0	0	126.5	126.5	0	0	0
6/11/2018	4	1404	Golden eagle	1	251	0	0	0	0	0	125.5	125.5	0	0	0
6/11/2018	4	1415	Golden eagle	1	256	0	0	0	0	0	0	256	0	0	0
6/11/2018	1	1424	Golden eagle	1	448	0	0	0	0	0	15.44827586	432.5517241	0	0	0
6/11/2018	1	1442	Golden eagle	1	282	0	0	0	0	0	0	78.33333333	203.6666667	0	0

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6/11/2018	1	1450	Golden eagle	1	141	0	0	0	0	0	0	141	0	0	0
6/11/2018	1	1457	Golden eagle	1	124	0	0	0	0	0	15.5	77.5	31	0	0
7/11/2018	5	1128	Golden eagle	1	52	0	0	0	0	0	0	52	0	0	0
7/11/2018	5	1147	Golden eagle	1	137	0	0	0	0	0	76.1111111	60.88888889	0	0	0
7/11/2018	5	1153	Golden eagle	1	166	0	0	0	0	0	60.36363636	75.45454545	30.18181818	0	0
8/11/2018	4	1045	Golden eagle	1	59	11.29886074	0	0	0	0	47.70113926	0	0	0	0
8/11/2018	4	1051	Golden eagle	1	101	0	38.20157873	0	0	0	0	62.79842127	0	0	0
8/11/2018	5	1056	Golden eagle	1	9	0	0	0	0	0	0	9	0	0	0
8/11/2018	5	1103	Golden eagle	1	96	0	0	0	0	0	0	96	0	0	0
8/11/2018	4	1104	Golden eagle	2	217	0	185.1059364	0	0	0	0	31.89406364	0	0	0
9/11/2018	3	1048	Golden eagle	1	428	0	0	0	0	0	0	428	0	0	0
9/11/2018	3	1051	Golden eagle	1	322	0	0	0	0	0	0	322	0	0	0
4/12/2018	1	1109	Golden eagle	1	3	0	0	0	0	0	3	0	0	0	0
4/12/2018	1	1201	Golden eagle	1	211	0	0	0	0	0	211	0	0	0	0
4/12/2018	1	1201	Golden eagle	1	219	0	0	0	0	0	219	0	0	0	0
5/12/2018	5	1119	Golden eagle	1	293	0	0	0	0	0	0	293	0	0	0
5/12/2018	5	1126	Golden eagle	1	150	0	0	0	0	0	30	120	0	0	0
5/12/2018	5	1126	Golden eagle	1	223	0	0	0	0	0	31.85714286	191.1428571	0	0	0
5/12/2018	5	1140	Golden eagle	1	177	0	0	0	0	0	32.18181818	144.8181818	0	0	0
6/12/2018	1	1453	Golden eagle	1	56	50.59987886	0	0	0	0	5.400121138	0	0	0	0
8/1/2019	2	1302	Golden eagle	2	657	0	0	0	0	0	0	15.27906977	76.39534884	565.3255814	0
8/1/2019	2	1334	Golden eagle	1	227	0	0	0	0	0	0	0	227	0	0
8/1/2019	2	1334	Golden eagle	1	465	0	0	0	0	0	0	150	315	0	0
8/1/2019	1	1432	Golden eagle	1	41	12.56588534	0	0	0	0	28.43411466	0	0	0	0
8/1/2019	1	2237	Golden eagle	1	37	31.50432822	0	0	0	0	5.495671777	0	0	0	0
9/1/2019	5	1008	Golden eagle	2	93	0	0	0	0	0	93	0	0	0	0
9/1/2019	5	1011	Golden eagle	1	555	0	0	0	0	0	0	465	90	0	0
9/1/2019	5	1021	Golden eagle	1	171	0	0	0	0	0	0	171	0	0	0
9/1/2019	5	1109	Golden eagle	1	391	0	0	0	0	0	150.3846154	165.4230769	75.19230769	0	0
9/1/2019	5	1244	Golden eagle	1	66	0	0	0	0	0	66	0	0	0	0
9/1/2019	5	1303	Golden eagle	3	92	0	0	0	0	0	46	46	0	0	0
10/1/2019	3	949	Golden eagle	1	389	0	0	0	0	0	15.56	373.44	0	0	0
10/1/2019	3	1029	Golden eagle	1	116	0	0	0	0	0	16.57142857	99.42857143	0	0	0
11/1/2019	5	1016	Golden eagle	1	18	0	0	0	0	0	18	0	0	0	0
11/1/2019	5	1021	Golden eagle	1	141	0	0	0	0	0	31.33333333	109.6666667	0	0	0
11/1/2019	5	1026	Golden eagle	1	559	0	0	0	0	0	0	559	0	0	0
11/1/2019	5	1028	Golden eagle	1	61	0	0	0	0	0	15.25	45.75	0	0	0
11/1/2019	5	1028	Golden eagle	1	360	0	0	0	0	0	60	300	0	0	0
11/1/2019	5	1057	Golden eagle	1	312	0	0	0	0	0	187.2	124.8	0	0	0
11/1/2019	5	1059	Golden eagle	1	249	0	0	0	0	0	0	249	0	0	0
11/1/2019	3	1413	Golden eagle	1	58	0	0	0	0	0	0	58	0	0	0
11/1/2019	3	1419	Golden eagle	1	369	0	0	0	0	0	15.375	353.625	0	0	0

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5/2/2019	5	1031	Golden eagle	2	227	0	0	0	0	0	60.53333333	166.4666667	0	0	0
5/2/2019	5	1101	Golden eagle	1	324	0	0	0	0	0	46.28571429	277.7142857	0	0	0
5/2/2019	5	1146	Golden eagle	1	69	0	0	0	0	0	69	0	0	0	0
5/2/2019	5	1151	Golden eagle	1	261	0	0	0	0	0	76.76470588	184.2352941	0	0	0
5/2/2019	5	1202	Golden eagle	1	129	0	0	0	0	0	0	129	0	0	0
5/2/2019	2	1327	Golden eagle	1	294	9.831324351	31.95180414	4.915662176	0	0	52.06341249	169.2060906	26.03170625	0	0
5/2/2019	2	1335	Golden eagle	1	482	152.9336423	291.9642262	0	0	0	12.75385773	24.34827384	0	0	0
6/2/2019	5	953	Golden eagle	1	87	0	0	0	0	0	0	69.6	17.4	0	0
6/2/2019	5	1020	Golden eagle	2	36	0	0	0	0	0	0	36	0	0	0
6/2/2019	3	1029	Golden eagle	1	127	0	57.53346129	0	0	0	0	69.46653871	0	0	0
6/2/2019	5	1057	Golden eagle	1	259	0	0	0	0	0	0	259	0	0	0
6/2/2019	3	1200	Golden eagle	1	39	0	0	0	0	0	0	39	0	0	0
6/2/2019	5	1203	Golden eagle	1	18	0	0	0	0	0	0	0	0	18	0
6/2/2019	3	1210	Golden eagle	1	245	4.807626011	33.65338207	0	0	0	25.81737399	180.7216179	0	0	0
6/2/2019	3	1210	Golden eagle	1	268	3.379606963	25.34705223	0	0	0	28.1498048	211.123536	0	0	0
7/2/2019	2	1108	Golden eagle	2	120	0	0	0	0	0	0	120	0	0	0
7/2/2019	1	1129	Golden eagle	1	108	0	0	0	0	0	108	0	0	0	0
7/2/2019	4	1351	Golden eagle	2	62	0	0	0	0	0	62	0	0	0	0
7/2/2019	4	1402	Golden eagle	1	185	0	0	0	0	0	0	30.83333333	154.1666667	0	0
7/2/2019	4	1413	Golden eagle	1	241	0	0	0	0	0	0	180.75	60.25	0	0
7/2/2019	4	1440	Golden eagle	1	219	0	0	0	0	0	0	219	0	0	0
7/2/2019	4	1452	Golden eagle	1	11	0	0	0	0	0	0	11	0	0	0
6/3/2019	2	924	Golden eagle	1	786	0	115.5191985	133.2913829	213.2662126	0	0	80.98080151	93.43938636	149.5030182	0
6/3/2019	2	944	Golden eagle	1	92	0	0	0	0	0	92	0	0	0	0
6/3/2019	2	954	Golden eagle	1	146	0	0	0	0	0	0	146	0	0	0
6/3/2019	2	955	Golden eagle	1	1120	0	63.74759795	460.3993186	0	0	0	72.46861826	523.3844652	0	0
6/3/2019	1	1008	Golden eagle	1	102	0	0	30.44992961	0	0	0	0	71.55007039	0	0
6/3/2019	1	1038	Golden eagle	1	674	0	56.00993506	128.0227087	168.0298052	0	0	51.21733766	117.0682004	153.652013	0
6/3/2019	2	1052	Golden eagle	1	481	0	272.5820624	0	0	0	0	208.4179376	0	0	0
6/3/2019	1	1057	Golden eagle	1	16	0	0	0	0	0	16	0	0	0	0
6/3/2019	2	1102	Golden eagle	1	92	76.63332871	0	0	0	0	15.36667129	0	0	0	0
6/3/2019	2	1107	Golden eagle	1	768	0	229.7134571	174.2653813	0	0	0	206.9924252	157.0287364	0	0
6/3/2019	1	1214	Golden eagle	1	5	0	0	0	0	0	0	5	0	0	0
7/3/2019	3	1045	Golden eagle	1	196	0	0	0	0	0	0	196	0	0	0
7/3/2019	3	1047	Golden eagle	1	62	0	0	0	0	0	15.5	46.5	0	0	0
7/3/2019	3	1109	Golden eagle	1	70	0	0	0	0	0	0	70	0	0	0
7/3/2019	3	1133	Golden eagle	1	197	0	0	0	0	0	15.15384615	181.8461538	0	0	0
7/3/2019	3	1137	Golden eagle	1	775	0	0	0	0	0	0	775	0	0	0
7/3/2019	3	1144	Golden eagle	1	64	0	0	0	0	0	0	64	0	0	0
9/3/2019	3	1201	Golden eagle	3	347	0	0	0	0	0	0	316.826087	30.17391304	0	0
9/3/2019	3	1208	Golden eagle	1	66	0	0	0	0	0	0	66	0	0	0
9/3/2019	3	1215	Golden eagle	1	430	0	0	0	0	0	76.78571429	353.2142857	0	0	0

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9/3/2019	3	1228	Golden eagle	1	43	0	0	0	0	0	0	43	0	0	0
11/3/2019	4	929	Golden eagle	1	108	0	0	0	0	0	15.42857143	92.57142857	0	0	0
11/3/2019	4	938	Golden eagle	1	125	0	0	0	0	0	15.625	109.375	0	0	0
11/3/2019	4	947	Golden eagle	1	546	0	0	0	0	0	0	546	0	0	0
11/3/2019	5	1009	Golden eagle	1	69	0	0	0	0	0	0	69	0	0	0
11/3/2019	4	1016	Golden eagle	2	600	0	0	0	0	0	0	600	0	0	0
11/3/2019	5	1123	Golden eagle	1	64	0	0	0	0	0	0	64	0	0	0
11/3/2019	5	1342	Golden eagle	1	17	0	0	0	0	0	0	17	0	0	0
11/3/2019	5	1437	Golden eagle	1	127	0	0	0	0	0	0	127	0	0	0
11/3/2019	5	1449	Golden eagle	1	323	0	0	0	0	0	0	215.3333333	61.52380952	46.14285714	0
11/3/2019	5	1451	Golden eagle	1	223	0	0	0	0	0	0	143.3571429	63.71428571	15.92857143	0
11/3/2019	5	1508	Golden eagle	2	270	0	0	0	0	0	0	270	0	0	0
12/3/2019	2	921	Golden eagle	1	2	0	0	0	0	0	0	2	0	0	0
12/3/2019	2	923	Golden eagle	1	7	0	0	0	0	0	0	7	0	0	0
15/2/2018	4	1043	Golden plover	1	191	0	0	0	0	0	0	191	0	0	0
9/11/2018	3	918	Hen harrier	1	195	31.9031459	15.95157295	3.987893238	0	0	88.0968541	44.04842705	11.01210676	0	0
9/11/2018	3	1051	Hen harrier	1	101	0	0	0	0	0	0	101	0	0	0
6/9/2017	3	1412	Merlin	1	36	0	0	0	0	0	36	0	0	0	0
6/9/2017	3	1458	Merlin	1	54	12.8947699	25.7895398	0	0	0	5.105230098	10.2104602	0	0	0
12/4/2018	5	1131	Merlin	1	12	0	0	0	0	0	12	0	0	0	0
13/4/2018	2	1435	Merlin	1	78	44.90629953	29.93753302	0	0	0	1.893700471	1.26246698	0	0	0
14/4/2018	3	1651	Merlin	1	50	0	0	0	0	0	33.33333333	16.66666667	0	0	0
19/6/2018	5	1210	Merlin	1	177	0	0	0	0	0	0	48.27272727	80.45454545	48.27272727	0
16/7/2018	5	907	Merlin	2	10	0	0	0	0	0	10	0	0	0	0
23/8/2018	5	1139	Merlin	1	18	0	0	0	0	0	18	0	0	0	0
6/9/2018	1	953	Merlin	1	36	0	36	0	0	0	0	0	0	0	0
8/11/2018	4	927	Merlin	1	66	0	0	0	0	0	0	66	0	0	0
10/3/2018	1	959	Red-throated diver	1	151	0	0	81.70076837	0	0	0	0	69.29923163	0	0
12/6/2018	4	1712	Red-throated diver	1	175	0	95.48221708	0	0	0	0	79.51778292	0	0	0
15/7/2018	2	1811	Red-throated diver	2	104	5.970723987	11.94144797	0	0	0	28.69594268	57.39188536	0	0	0
15/7/2018	2	1816	Red-throated diver	2	163	0	0	0	0	0	0	163	0	0	0
20/8/2018	2	1228	Red-throated diver	2	94	0	0	0	0	0	0	94	0	0	0
22/8/2018	5	1019	Red-throated diver	2	124	0	0	0	0	0	0	124	0	0	0
5/9/2017	2	1010	White-tailed eagle	1	112	0	100.0929035	0	0	0	0	11.90709654	0	0	0
5/9/2017	1	1011	White-tailed eagle	1	222	27.39285385	126.0071277	0	0	0	12.2500033	56.35001516	0	0	0
5/9/2017	1	1013	White-tailed eagle	1	110	15.6355962	57.33051941	0	0	0	7.935832368	29.09805201	0	0	0
5/9/2017	1	1453	White-tailed eagle	1	517	3.971418617	266.0850473	0	0	0	3.631522559	243.3120115	0	0	0
5/9/2017	1	1502	White-tailed eagle	1	198	0	159.4166181	0	0	0	0	38.58338189	0	0	0
5/9/2017	1	1505	White-tailed eagle	2	256	0	134.9033802	0	0	0	0	121.0966198	0	0	0
5/9/2017	1	1516	White-tailed eagle	2	20	0	0	0	0	0	10	10	0	0	0
6/9/2017	4	1141	White-tailed eagle	1	251	0	0	0	0	0	0	251	0	0	0
6/9/2017	3	1142	White-tailed eagle	1	446	0	0	0	0	0	0	446	0	0	0

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6/9/2017	4	1146	White-tailed eagle	1	208	0	0	0	0	0	0	208	0	0	0
6/9/2017	4	1516	White-tailed eagle	2	360	0	0	0	0	0	0	240	120	0	0
7/9/2017	5	1522	White-tailed eagle	1	179	0	0	0	0	0	0	179	0	0	0
17/10/2017	4	1340	White-tailed eagle	1	228	0	7.948141132	7.948141132	13.90924698	0	0	52.85185887	52.85185887	92.49075302	0
17/10/2017	1	1532	White-tailed eagle	1	80	0	0	0	0	0	0	80	0	0	0
18/10/2017	5	1129	White-tailed eagle	1	69	0	0	0	0	0	69	0	0	0	0
18/10/2017	2	1417	White-tailed eagle	2	1	1	0	0	0	0	0	0	0	0	0
18/10/2017	2	1438	White-tailed eagle	1	38	0	20.81678045	0	0	0	0	17.18321955	0	0	0
18/10/2017	2	1443	White-tailed eagle	1	12	0	0	0	0	0	12	0	0	0	0
18/10/2017	2	1456	White-tailed eagle	2	23	23	0	0	0	0	0	0	0	0	0
18/10/2017	2	1500	White-tailed eagle	1	244	0	0	0	0	0	0	244	0	0	0
19/10/2017	3	1502	White-tailed eagle	1	84	0	0	0	0	0	16.8	67.2	0	0	0
20/10/2017	1	1334	White-tailed eagle	1	34	0	0	0	0	0	34	0	0	0	0
20/10/2017	1	1336	White-tailed eagle	1	49	0	0	0	0	0	49	0	0	0	0
14/11/2017	3	1003	White-tailed eagle	1	206	8.860354863	106.3242584	0	0	0	6.985798983	83.8295878	0	0	0
14/11/2017	2	1459	White-tailed eagle	1	43	0	22.05191669	0	0	0	0	20.94808331	0	0	0
15/11/2017	5	919	White-tailed eagle	1	50	0	0	0	0	0	0	50	0	0	0
15/11/2017	5	923	White-tailed eagle	1	24	0	0	0	0	0	0	24	0	0	0
15/11/2017	5	934	White-tailed eagle	1	188	0	0	0	0	0	0	188	0	0	0
15/11/2017	5	1128	White-tailed eagle	1	193	0	0	0	0	0	0	193	0	0	0
16/11/2017	4	1010	White-tailed eagle	1	5	0	0	0	0	0	0	5	0	0	0
16/11/2017	4	1045	White-tailed eagle	1	5	0	0	0	0	0	0	5	0	0	0
16/11/2017	4	1108	White-tailed eagle	1	131	0	46.58857828	0	0	0	0	84.41142172	0	0	0
16/11/2017	1	1109	White-tailed eagle	1	126	0	117.849067	0	0	0	0	8.150932984	0	0	0
16/11/2017	4	1138	White-tailed eagle	1	115	0	0	0	0	0	0	115	0	0	0
16/1/2018	1	1102	White-tailed eagle	1	290	51.54038992	70.86803613	0	0	0	70.56487324	97.02670071	0	0	0
16/1/2018	1	1103	White-tailed eagle	1	200	11.89700383	65.43352109	0	0	0	18.87222693	103.7972481	0	0	0
16/1/2018	4	1158	White-tailed eagle	1	152	0	0	0	0	0	0	106.4	45.6	0	0
16/1/2018	4	1347	White-tailed eagle	1	14	0	0	0	0	0	14	0	0	0	0
17/1/2018	2	945	White-tailed eagle	1	128	0	57.26896836	0	0	0	0	70.73103164	0	0	0
17/1/2018	3	1320	White-tailed eagle	5	632	0	0	0	0	0	0	632	0	0	0
17/1/2018	3	1400	White-tailed eagle	2	39	0	0	0	0	0	0	39	0	0	0
12/2/2018	3	1111	White-tailed eagle	1	149	0	0	0	0	0	0	149	0	0	0
12/2/2018	3	1111	White-tailed eagle	1	322	0	0	0	0	0	0	260.6666667	61.33333333	0	0
13/2/2018	5	1051	White-tailed eagle	1	111	0	0	0	0	0	0	111	0	0	0
15/2/2018	5	1123	White-tailed eagle	1	542	0	0	0	0	0	0	542	0	0	0
15/2/2018	1	1130	White-tailed eagle	1	66	0	17.50276059	0	0	0	0	48.49723941	0	0	0
15/2/2018	5	1147	White-tailed eagle	1	605	0	0	0	0	0	0	605	0	0	0
15/2/2018	5	1238	White-tailed eagle	1	255	0	0	0	0	0	0	165	45	45	0
7/3/2018	3	1224	White-tailed eagle	1	769	0	0	0	0	0	120.627451	467.4313725	180.9411765	0	0
7/3/2018	4	1547	White-tailed eagle	1	143	0	0	0	0	0	0	143	0	0	0
8/3/2018	5	1155	White-tailed eagle	1	54	0	0	0	0	0	0	54	0	0	0

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8/3/2018	3	1537	White-tailed eagle	2	233	0	0	0	0	0	0	233	0	0	0
8/3/2018	3	1544	White-tailed eagle	2	604	0	0	0	0	0	15.1	226.5	241.6	120.8	0
9/3/2018	3	1013	White-tailed eagle	1	651	0	0	0	0	0	0	211.9534884	75.69767442	75.69767442	287.6511628
9/3/2018	3	1034	White-tailed eagle	1	224	0	0	0	0	0	48	144	32	0	0
10/3/2018	2	1055	White-tailed eagle	1	168	0	0	0	0	0	0	137.4545455	30.54545455	0	0
10/3/2018	2	1119	White-tailed eagle	1	1189	4.244502093	110.3570544	12.73350628	42.44502093	165.5355816	10.80613082	280.9594013	32.41839246	108.0613082	421.4391019
10/3/2018	1	1129	White-tailed eagle	1	179	0	0	0	0	0	0	179	0	0	0
10/3/2018	2	1428	White-tailed eagle	1	529	0	31.00069217	0	0	0	0	497.9993078	0	0	0
10/3/2018	2	1437	White-tailed eagle	2	227	0	0	62.53706404	9.621086775	0	0	0	134.1962693	20.64557989	0
10/3/2018	2	1441	White-tailed eagle	2	461	0	13.58269315	20.37403972	0	67.91346574	0	47.88397352	71.82596028	0	239.4198676
10/3/2018	2	1448	White-tailed eagle	1	511	0	511	0	0	0	0	0	0	0	0
10/3/2018	2	1507	White-tailed eagle	1	379	0	7.847723329	0	0	0	0	371.1522767	0	0	0
10/3/2018	2	1618	White-tailed eagle	1	138	0	0	0	0	0	0	138	0	0	0
10/3/2018	2	1628	White-tailed eagle	1	60	0	0	0	0	0	0	60	0	0	0
10/4/2018	5	1114	White-tailed eagle	1	451	0	0	0	0	0	0	255.5666667	60.13333333	60.13333333	75.16666667
10/4/2018	5	1231	White-tailed eagle	1	225	0	0	0	0	0	0	105	75	45	0
10/4/2018	4	1548	White-tailed eagle	1	43	0	0	0	0	0	0	43	0	0	0
10/4/2018	4	1643	White-tailed eagle	1	116	0	0	0	0	0	0	49.71428571	49.71428571	16.57142857	0
10/4/2018	4	1659	White-tailed eagle	2	91	0	0	0	0	0	0	0	91	0	0
11/4/2018	1	1010	White-tailed eagle	1	9	0	0	0	0	0	9	0	0	0	0
12/4/2018	5	1137	White-tailed eagle	1	75	0	0	0	0	0	0	75	0	0	0
12/4/2018	5	1242	White-tailed eagle	1	93	0	0	0	0	0	93	0	0	0	0
13/4/2018	3	1100	White-tailed eagle	1	1290	0	0	0	0	0	0	1260	30	0	0
13/4/2018	3	1105	White-tailed eagle	1	614	0	0	0	0	0	0	614	0	0	0
13/4/2018	3	1112	White-tailed eagle	1	523	0	0	0	0	0	0	523	0	0	0
13/4/2018	3	1114	White-tailed eagle	1	80	0	0	0	0	0	0	80	0	0	0
13/4/2018	1	1554	White-tailed eagle	1	117	0	0	0	0	0	0	117	0	0	0
14/4/2018	4	842	White-tailed eagle	1	35	0	0	0	0	0	0	35	0	0	0
14/4/2018	3	1546	White-tailed eagle	1	181	0	0	0	0	0	15.08333333	165.9166667	0	0	0
14/4/2018	3	1558	White-tailed eagle	1	332	0	0	0	0	0	0	332	0	0	0
14/4/2018	3	1617	White-tailed eagle	1	485	0	0	0	0	0	45.46875	439.53125	0	0	0
14/4/2018	2	1618	White-tailed eagle	1	54	18	36	0	0	0	0	0	0	0	0
14/4/2018	2	1634	White-tailed eagle	1	185	0	185	0	0	0	0	0	0	0	0
15/4/2018	1	1343	White-tailed eagle	1	315	0	0	0	0	0	0	0	30	60	225
15/4/2018	1	1347	White-tailed eagle	1	160	0	0	0	0	0	0	0	160	0	0
15/4/2018	1	1419	White-tailed eagle	1	1001	0	170.3327789	97.94134785	12.77495842	0	0	436.3338878	250.8919855	32.72504158	0
15/4/2018	4	1435	White-tailed eagle	1	753	0	0	0	0	0	0	753	0	0	0
15/4/2018	4	1435	White-tailed eagle	1	1356	0	0	0	0	0	0	904	452	0	0
15/4/2018	4	1435	White-tailed eagle	1	1356	0	0	0	0	0	0	904	452	0	0
15/4/2018	4	1528	White-tailed eagle	1	71	0	0	0	0	0	0	71	0	0	0
15/5/2018	3	1457	White-tailed eagle	1	221	0	0	0	0	0	0	221	0	0	0
15/5/2018	2	1501	White-tailed eagle	1	102	0	2.246370651	0	0	0	0	99.75362935	0	0	0

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16/5/2018	5	1507	White-tailed eagle	1	278	0	0	0	0	0	0	185.3333333	61.77777778	30.88888889	0
17/5/2018	5	1102	White-tailed eagle	1	345	0	0	0	0	0	0	165	180	0	0
18/5/2018	1	1255	White-tailed eagle	1	134	0	67.60179034	0	0	0	0	66.39820966	0	0	0
18/5/2018	4	1330	White-tailed eagle	1	45	0	0	0	0	0	0	45	0	0	0
24/5/2018	5	1143	White-tailed eagle	1	156	0	0	0	0	0	0	78	15.6	62.4	0
24/5/2018	5	1215	White-tailed eagle	1	647	0	0	0	0	0	90.27906977	391.2093023	165.5116279	0	0
17/6/2018	4	106	White-tailed eagle	1	161	0	0	0	0	0	0	96.6	64.4	0	0
17/6/2018	4	1437	White-tailed eagle	1	88	0	0	0	0	0	52.8	35.2	0	0	0
16/7/2018	5	1008	White-tailed eagle	1	289	0	0	0	0	0	0	243.3684211	45.63157895	0	0
20/8/2018	1	1358	White-tailed eagle	1	966	0	0	0	0	0	0	347.15625	75.46875	105.65625	437.71875
22/8/2018	5	1159	White-tailed eagle	1	5	0	0	0	0	0	5	0	0	0	0
23/8/2018	3	1335	White-tailed eagle	1	511	0	0	0	0	0	105.2058824	405.7941176	0	0	0
23/8/2018	3	1335	White-tailed eagle	1	524	0	0	0	0	0	107.8823529	416.1176471	0	0	0
3/9/2018	4	1022	White-tailed eagle	1	668	0	0	0	0	0	0	425.0909091	242.9090909	0	0
3/9/2018	1	1543	White-tailed eagle	1	371	2.48075603	27.28831633	0	0	0	28.43591064	312.795017	0	0	0
3/9/2018	2	1545	White-tailed eagle	1	1204	0	472.330701	372.8926587	149.1570635	0	0	99.56929901	78.60734132	31.44293653	0
4/9/2018	5	1021	White-tailed eagle	1	69	0	0	0	0	0	0	69	0	0	0
4/9/2018	5	1047	White-tailed eagle	1	710	0	0	0	0	0	0	634.4680851	60.42553191	15.10638298	0
4/9/2018	5	1153	White-tailed eagle	1	41	0	0	0	0	0	41	0	0	0	0
5/9/2018	5	1543	White-tailed eagle	1	153	0	0	0	0	0	30.6	122.4	0	0	0
1/10/2018	1	1202	White-tailed eagle	1	62	0	0	0	0	0	62	0	0	0	0
2/10/2018	5	1006	White-tailed eagle	1	63	0	0	0	0	0	0	63	0	0	0
3/10/2018	4	1415	White-tailed eagle	1	144	0	0	0	0	0	16	128	0	0	0
3/10/2018	4	1415	White-tailed eagle	1	144	0	0	0	0	0	16	128	0	0	0
4/10/2018	1	1457	White-tailed eagle	1	251	0	0	0	0	0	0	251	0	0	0
6/11/2018	3	959	White-tailed eagle	1	25	0	4.150864136	0	0	0	0	20.84913586	0	0	0
6/11/2018	1	1002	White-tailed eagle	1	169	0	96.37977288	0	0	0	0	72.62022712	0	0	0
8/11/2018	5	1041	White-tailed eagle	1	425	0	0	0	0	0	0	0	136.6071429	121.4285714	166.9642857
8/11/2018	5	1205	White-tailed eagle	1	116	0	0	0	0	0	0	33.14285714	82.85714286	0	0
9/11/2018	3	905	White-tailed eagle	1	256	0	0	0	0	0	0	0	165.6470588	90.35294118	0
9/11/2018	3	935	White-tailed eagle	1	227	0	0	0	0	0	0	105.9333333	90.8	30.26666667	0
9/11/2018	3	1012	White-tailed eagle	1	216	0	0	0	0	0	0	92.57142857	15.42857143	30.85714286	77.14285714
9/11/2018	3	1038	White-tailed eagle	1	189	0	0	0	0	0	0	0	189	0	0
9/11/2018	3	1038	White-tailed eagle	1	120	0	0	0	0	0	0	0	120	0	0
4/12/2018	4	1448	White-tailed eagle	1	53	0	0	0	0	0	0	53	0	0	0
5/12/2018	5	1020	White-tailed eagle	1	152	0	0	0	0	0	0	152	0	0	0
6/12/2018	3	1229	White-tailed eagle	1	22	0	0	0	0	0	22	0	0	0	0
6/12/2018	1	1548	White-tailed eagle	1	129	0	44.43587393	0	0	0	0	84.56412607	0	0	0
9/1/2019	5	1116	White-tailed eagle	1	272	0	0	0	0	0	0	166.2222222	105.7777778	0	0
11/1/2019	3	951	White-tailed eagle	1	74	39.46520938	0	0	0	0	34.53479062	0	0	0	0
11/1/2019	5	1114	White-tailed eagle	1	197	0	0	0	0	0	0	90.92307692	45.46153846	60.61538462	0
11/1/2019	5	1200	White-tailed eagle	1	351	0	0	0	0	0	228.9130435	122.0869565	0	0	0

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11/1/2019	3	1430	White-tailed eagle	1	38	0	0	0	0	0	0	38	0	0	0
5/2/2019	5	1016	White-tailed eagle	1	413	0	0	0	0	0	0	367.1111111	45.88888889	0	0
6/2/2019	5	1206	White-tailed eagle	1	60	0	0	0	0	0	15	45	0	0	0
6/2/2019	5	1208	White-tailed eagle	1	387	0	0	0	0	0	30.96	356.04	0	0	0
7/2/2019	2	944	White-tailed eagle	1	68	0	0	0	0	0	0	68	0	0	0
7/2/2019	1	1013	White-tailed eagle	1	131	0	0	0	0	0	0	114.625	16.375	0	0
7/2/2019	1	1039	White-tailed eagle	1	3	0	0	0	0	0	3	0	0	0	0
7/2/2019	1	1045	White-tailed eagle	1	150	0	0	0	0	0	105	45	0	0	0
7/2/2019	1	1052	White-tailed eagle	1	61	1.992555372	1.992555372	0	0	0	28.50744463	28.50744463	0	0	0
7/2/2019	1	1103	White-tailed eagle	1	301	6.693750432	127.1812582	0	0	0	8.356249568	158.7687418	0	0	0
7/2/2019	1	1105	White-tailed eagle	1	3	0	0	0	0	0	3	0	0	0	0
7/2/2019	1	1115	White-tailed eagle	1	150	0	19.02980823	0	0	0	0	130.9701918	0	0	0
7/2/2019	4	1413	White-tailed eagle	1	19	0	0	0	0	0	19	0	0	0	0
7/2/2019	1	1430	White-tailed eagle	1	35	0	0	0	0	0	0	35	0	0	0
7/2/2019	4	1525	White-tailed eagle	1	76	0	0	0	0	0	0	76	0	0	0
11/3/2019	4	913	White-tailed eagle	1	115	0	0	0	0	0	16.42857143	98.57142857	0	0	0
11/3/2019	4	1016	White-tailed eagle	2	600	0	0	0	0	0	0	600	0	0	0
11/3/2019	5	1429	White-tailed eagle	1	209	0	0	0	0	0	0	80.38461538	128.6153846	0	0
11/3/2019	5	1433	White-tailed eagle	1	558	0	0	0	0	0	15.08108108	497.6756757	45.24324324	0	0
11/3/2019	1	1441	White-tailed eagle	1	378	0	210.4336244	0	0	0	0	167.5663756	0	0	0
11/3/2019	1	1444	White-tailed eagle	1	201	0	0	0	0	0	0	201	0	0	0
11/3/2019	5	1448	White-tailed eagle	1	418	0	0	0	0	0	15.48148148	263.1851852	92.88888889	46.44444444	0
11/3/2019	5	1508	White-tailed eagle	1	12	0	0	0	0	0	0	12	0	0	0
11/3/2019	1	1619	White-tailed eagle	1	458	8.321286782	116.4980149	0	0	0	22.21204655	310.9686517	0	0	0
12/3/2019	2	1029	White-tailed eagle	1	157	37.64898981	87.84764289	0	0	0	9.451010188	22.05235711	0	0	0
7/3/2018	3	1719	Whooper swan	11	19	0	0	0	0	0	19	0	0	0	0
9/4/2018	3	1108	Whooper swan	12	83	0	0	0	0	0	0	66.4	16.6	0	0
4/12/2018	2	1021	Whooper swan	2	44	0	0	0	0	0	0	44	0	0	0
4/12/2018	1	1023	Whooper swan	2	300	0	0	0	0	0	0	300	0	0	0

Table D-2: Details of target species recorded during flight activity surveys (sorted by species) – south array CRAA seconds

Date	VP	Flight Start Time	Species	Number of Birds	Duration (sec)	Inside CRAA 0-20m	Inside CRAA 21-150m	Inside CRAA 151-200m	Inside CRAA 201-250m	Inside CRAA >250m	Outside CRAA 0-20m	Outside CRAA 21-150m	Outside CRAA 151-200m	Outside CRAA 201-250m	Outside CRAA >250m
19/5/2018	1	1217	Black-throated diver	2	89	0	0	0	0	0	0	89	0	0	0
22/8/2018	3	1004	Black-throated diver	3	44	0	0	14.36335	0	0	0	0	29.63665	0	0
5/9/2017	1	946	Golden eagle	1	331	0	0	0	0	0	7.522727	323.4773	0	0	0
5/9/2017	1	1011	Golden eagle	1	185	0	0	0	0	0	0	185	0	0	0
5/9/2017	1	1206	Golden eagle	1	152	0	0	0	0	0	0	152	0	0	0
5/9/2017	2	1008	Golden eagle	2	74	0	0	0	0	0	0	74	0	0	0
5/9/2017	2	1010	Golden eagle	1	112	0	0	0	0	0	0	112	0	0	0
5/9/2017	2	1036	Golden eagle	1	90	0	0	0	0	0	45	45	0	0	0
5/9/2017	2	1106	Golden eagle	1	42	0	0	0	0	0	21	21	0	0	0
5/9/2017	2	1120	Golden eagle	1	296	0	0	0	0	0	0	296	0	0	0
5/9/2017	2	1141	Golden eagle	1	255	0	0	0	0	0	0	255	0	0	0
5/9/2017	2	1146	Golden eagle	3	595	0	0	0	0	0	0	595	0	0	0
5/9/2017	2	1158	Golden eagle	2	157	0	0	0	0	0	0	157	0	0	0
5/9/2017	2	1158	Golden eagle	3	386	0	0	0	0	0	0	386	0	0	0
5/9/2017	2	1209	Golden eagle	2	38	0	0	0	0	0	0	38	0	0	0
5/9/2017	2	1218	Golden eagle	3	112	0	0	0	0	0	0	112	0	0	0
5/9/2017	2	1414	Golden eagle	1	119	0	0	0	0	0	17	102	0	0	0
5/9/2017	2	1434	Golden eagle	1	191	0	0	0	0	0	0	191	0	0	0
5/9/2017	2	1501	Golden eagle	1	71	0	0	0	0	0	71	0	0	0	0
5/9/2017	2	1525	Golden eagle	1	95	0	0	0	0	0	0	95	0	0	0
6/9/2017	3	1218	Golden eagle	1	5	0	0	0	0	0	5	0	0	0	0
6/9/2017	3	1220	Golden eagle	1	99	0	0	0	0	0	0	99	0	0	0
6/9/2017	3	1246	Golden eagle	1	119	0	0	0	0	0	51	68	0	0	0
6/9/2017	3	1602	Golden eagle	1	93	0	0	0	0	0	0	93	0	0	0
6/9/2017	3	1608	Golden eagle	1	29	0	0	0	0	0	0	29	0	0	0
6/9/2017	4	1218	Golden eagle	1	276	0	0	0	0	0	0	276	0	0	0
6/9/2017	4	1220	Golden eagle	2	186	0	0	0	0	0	0	186	0	0	0
6/9/2017	4	1512	Golden eagle	2	450	0	0	0	0	0	0	300	150	0	0
7/9/2017	5	1331	Golden eagle	1	643	0	0	0	0	0	0	643	0	0	0
7/9/2017	5	1529	Golden eagle	1	381	0	0	0	0	0	0	381	0	0	0
17/10/2017	4	1508	Golden eagle	2	244	0	0	0	0	0	15.25	228.75	0	0	0
17/10/2017	4	1539	Golden eagle	1	314	11.17596	134.1116	78.23175	0	0	4.524036	54.28843	31.66825	0	0
18/10/2017	2	1542	Golden eagle	1	397	0	0	0	0	0	0	61.07692	229.0385	106.8846	0
18/10/2017	2	1557	Golden eagle	1	108	0	0	0	0	0	15.42857	92.57143	0	0	0
18/10/2017	2	1614	Golden eagle	1	1015	0	0	0	0	0	60.59701	893.806	60.59701	0	0
18/10/2017	2	1620	Golden eagle	1	211	0	0	0	0	0	75.35714	135.6429	0	0	0
18/10/2017	2	1620	Golden eagle	1	691	0	0	0	0	0	30.04348	660.9565	0	0	0
18/10/2017	3	1148	Golden eagle	2	130	0	0	0	0	0	0	130	0	0	0
18/10/2017	5	1137	Golden eagle	1	11	0	0	0	0	0	11	0	0	0	0
18/10/2017	5	1213	Golden eagle	1	607	0	0	0	0	0	91.05	91.05	182.1	60.7	182.1
18/10/2017	5	1216	Golden eagle	1	464	0	0	0	0	0	61.86667	61.86667	61.86667	108.2667	170.1333

Date	VP	Flight Start Time	Species	Number of Birds	Duration (sec)	Inside CRAA 0-20m	Inside CRAA 21-150m	Inside CRAA 151-200m	Inside CRAA 201-250m	Inside CRAA >250m	Outside CRAA 0-20m	Outside CRAA 21-150m	Outside CRAA 151-200m	Outside CRAA 201-250m	Outside CRAA >250m
19/10/2017	2	924	Golden eagle	1	192	0	0	0	0	0	160	32	0	0	0
19/10/2017	2	926	Golden eagle	1	18	0	0	0	0	0	18	0	0	0	0
19/10/2017	2	1050	Golden eagle	1	253	0	0	0	0	0	31.625	221.375	0	0	0
19/10/2017	2	1138	Golden eagle	1	18	0	0	0	0	0	18	0	0	0	0
19/10/2017	3	1319	Golden eagle	1	4	0	0	0	0	0	4	0	0	0	0
19/10/2017	3	1406	Golden eagle	1	156	0	0	0	0	0	78	78	0	0	0
19/10/2017	3	1437	Golden eagle	1	374	0	0	0	0	0	62.33333	171.4167	0	109.0833	31.16667
19/10/2017	3	1506	Golden eagle	1	194	0	0	0	0	0	129.3333	64.66667	0	0	0
19/10/2017	5	942	Golden eagle	1	876	0	0	0	0	0	60.41379	664.5517	151.0345	0	0
19/10/2017	5	1002	Golden eagle	1	307	0	0	0	0	0	0	138.15	76.75	92.1	0
19/10/2017	5	1005	Golden eagle	1	176	0	0	0	0	0	0	48	128	0	0
19/10/2017	5	1119	Golden eagle	2	421	0	84.70047	0	0	0	0	336.2995	0	0	0
19/10/2017	5	1126	Golden eagle	1	153	29.92364	69.82182	0	0	0	15.97636	37.27818	0	0	0
19/10/2017	5	1138	Golden eagle	1	801	0	12.7038	0	0	0	0	788.2962	0	0	0
19/10/2017	5	1154	Golden eagle	2	60	0	0	0	0	0	0	60	0	0	0
19/10/2017	5	1158	Golden eagle	2	248	0	0	0	0	0	15.5	232.5	0	0	0
20/10/2017	1	1214	Golden eagle	2	43	0	0	0	0	0	0	43	0	0	0
20/10/2017	1	1215	Golden eagle	1	44	0	0	0	0	0	0	44	0	0	0
20/10/2017	4	1240	Golden eagle	1	386	0	0	0	0	0	0	231.6	30.88	30.88	92.64
14/11/2017	2	1334	Golden eagle	1	90	0	0	0	0	0	90	0	0	0	0
14/11/2017	2	1336	Golden eagle	3	419	0	0	0	0	0	0	419	0	0	0
14/11/2017	2	1343	Golden eagle	2	424	0	0	0	0	0	0	363.4286	60.57143	0	0
14/11/2017	3	1217	Golden eagle	2	151	0	0	0	0	0	0	151	0	0	0
14/11/2017	3	1224	Golden eagle	2	20	0	0	0	0	0	20	0	0	0	0
14/11/2017	5	1011	Golden eagle	1	550	0	0	0	0	0	397.2222	152.7778	0	0	0
15/11/2017	2	940	Golden eagle	1	175	0	0	0	0	0	0	175	0	0	0
15/11/2017	3	1202	Golden eagle	1	285	0	0	0	0	0	0	195	90	0	0
15/11/2017	3	1204	Golden eagle	1	30	0	0	0	0	0	0	0	30	0	0
15/11/2017	3	1210	Golden eagle	2	195	0	0	0	0	0	0	195	0	0	0
15/11/2017	3	1216	Golden eagle	2	134	0	0	0	0	0	0	134	0	0	0
15/11/2017	3	1231	Golden eagle	1	150	0	0	0	0	0	0	150	0	0	0
15/11/2017	3	1313	Golden eagle	2	201	0	0	0	0	0	0	201	0	0	0
15/11/2017	3	1332	Golden eagle	2	424	0	0	0	0	0	0	424	0	0	0
15/11/2017	5	903	Golden eagle	1	190	0	0	0	0	0	0	0	15.83333	174.1667	0
15/11/2017	5	947	Golden eagle	1	306	0	0	0	0	0	0	244.8	61.2	0	0
15/11/2017	5	1014	Golden eagle	1	6	0	0	0	0	0	6	0	0	0	0
15/11/2017	5	1028	Golden eagle	1	384	0	0	0	0	0	0	384	0	0	0
15/11/2017	5	1059	Golden eagle	1	660	0	0	0	0	0	0	450	195	15	0
15/11/2017	5	1110	Golden eagle	2	213	0	0	0	0	0	0	152.1429	0	60.85714	0
16/11/2017	1	1045	Golden eagle	1	501	0	0	0	0	0	45.54545	455.4545	0	0	0
16/11/2017	1	1111	Golden eagle	1	11	0	0	0	0	0	0	11	0	0	0
16/11/2017	4	1010	Golden eagle	1	5	0	5	0	0	0	0	0	0	0	0

Date	VP	Flight Start Time	Species	Number of Birds	Duration (sec)	Inside CRAA 0-20m	Inside CRAA 21-150m	Inside CRAA 151-200m	Inside CRAA 201-250m	Inside CRAA >250m	Outside CRAA 0-20m	Outside CRAA 21-150m	Outside CRAA 151-200m	Outside CRAA 201-250m	Outside CRAA >250m
16/11/2017	4	1045	Golden eagle	1	5	0	0	0	0	0	0	5	0	0	0
16/11/2017	4	1100	Golden eagle	1	16	0	0	0	0	0	0	16	0	0	0
16/11/2017	4	1420	Golden eagle	1	3	3	0	0	0	0	0	0	0	0	0
16/11/2017	4	1515	Golden eagle	1	2	2	0	0	0	0	0	0	0	0	0
13/12/2017	1	1038	Golden eagle	1	496	0	0	0	0	0	0	496	0	0	0
13/12/2017	1	1045	Golden eagle	1	767	0	0	0	0	0	195.5098	571.4902	0	0	0
13/12/2017	1	1049	Golden eagle	1	607	0	0	0	0	0	0	607	0	0	0
13/12/2017	1	1113	Golden eagle	1	8	0	0	0	0	0	8	0	0	0	0
13/12/2017	1	1231	Golden eagle	1	605	0	0	0	0	0	0	605	0	0	0
13/12/2017	1	1231	Golden eagle	1	1074	0	0	0	0	0	0	1074	0	0	0
13/12/2017	1	1236	Golden eagle	1	639	0	0	0	0	0	0	639	0	0	0
13/12/2017	1	1247	Golden eagle	1	307	0	0	0	0	0	76.75	230.25	0	0	0
13/12/2017	1	1311	Golden eagle	1	157	0	0	0	0	0	94.2	62.8	0	0	0
13/12/2017	1	1345	Golden eagle	1	485	0	0	0	0	0	45.46875	439.5313	0	0	0
13/12/2017	1	1348	Golden eagle	1	285	0	0	0	0	0	0	285	0	0	0
13/12/2017	4	1031	Golden eagle	1	421	0	0	0	0	0	0	421	0	0	0
13/12/2017	4	1032	Golden eagle	1	428	0	0	0	0	0	0	428	0	0	0
13/12/2017	4	1050	Golden eagle	1	62	0	49.6294	0	0	0	0	12.3706	0	0	0
13/12/2017	4	1356	Golden eagle	1	44	0	15.65253	0	0	0	0	28.34747	0	0	0
13/12/2017	4	1417	Golden eagle	1	107	25.83708	34.44944	0	0	0	20.02006	26.69342	0	0	0
14/12/2017	3	1309	Golden eagle	1	15	0	0	0	0	0	0	15	0	0	0
14/12/2017	3	1329	Golden eagle	2	110	0	56.93625	0	0	0	0	53.06375	0	0	0
14/12/2017	3	1342	Golden eagle	1	564	0	491.1161	0	0	0	0	72.88388	0	0	0
14/12/2017	3	1345	Golden eagle	1	299	0	291.5622	0	0	0	0	7.43781	0	0	0
16/1/2018	1	1021	Golden eagle	1	102	0	0	0	0	0	0	102	0	0	0
16/1/2018	1	1024	Golden eagle	1	1111	0	0	0	0	0	0	240.2162	615.5541	255.2297	0
16/1/2018	1	1052	Golden eagle	1	76	0	0	0	0	0	0	76	0	0	0
16/1/2018	1	1159	Golden eagle	1	347	0	0	0	0	0	211.2174	135.7826	0	0	0
16/1/2018	1	1333	Golden eagle	1	139	0	0	0	0	0	0	139	0	0	0
16/1/2018	1	1335	Golden eagle	3	779	0	0	0	0	0	0	717.902	61.09804	0	0
16/1/2018	1	1435	Golden eagle	1	154	0	0	0	0	0	0	154	0	0	0
16/1/2018	1	1507	Golden eagle	3	472	0	0	0	0	0	30.45161	197.9355	182.7097	60.90323	0
16/1/2018	4	1018	Golden eagle	2	83	0	83	0	0	0	0	5.79E-10	0	0	0
16/1/2018	4	1059	Golden eagle	1	269	0	147.1798	0	0	0	0	121.8202	0	0	0
16/1/2018	4	1115	Golden eagle	1	14	0	0	0	0	0	0	14	0	0	0
16/1/2018	4	1329	Golden eagle	1	3	3	0	0	0	0	0	0	0	0	0
16/1/2018	4	1347	Golden eagle	1	102	0	0	0	0	0	34	68	0	0	0
16/1/2018	4	1348	Golden eagle	1	16	0	0	0	0	0	16	0	0	0	0
17/1/2018	3	1229	Golden eagle	2	81	0	0	0	0	0	0	81	0	0	0
17/1/2018	3	1320	Golden eagle	5	632	0	0	0	0	0	0	632	0	0	0
17/1/2018	3	1351	Golden eagle	1	133	0	0	0	0	0	33.25	99.75	0	0	0
17/1/2018	5	1044	Golden eagle	1	8	0	0	0	0	0	8	0	0	0	0

Date	VP	Flight Start Time	Species	Number of Birds	Duration (sec)	Inside CRAA 0-20m	Inside CRAA 21-150m	Inside CRAA 151-200m	Inside CRAA 201-250m	Inside CRAA >250m	Outside CRAA 0-20m	Outside CRAA 21-150m	Outside CRAA 151-200m	Outside CRAA 201-250m	Outside CRAA >250m
17/1/2018	5	1200	Golden eagle	1	31	0	0	0	0	0	0	31	0	0	0
18/1/2018	2	1351	Golden eagle	2	543	0	0	0	0	0	0	211.1667	331.8333	0	0
18/1/2018	2	1424	Golden eagle	2	64	0	0	0	0	0	0	64	0	0	0
18/1/2018	2	1431	Golden eagle	1	20	0	0	0	0	0	20	0	0	0	0
18/1/2018	2	1431	Golden eagle	1	437	0	0	0	0	0	0	437	0	0	0
18/1/2018	2	1454	Golden eagle	1	12	0	0	0	0	0	0	12	0	0	0
18/1/2018	5	1116	Golden eagle	1	439	0	0	0	0	0	60.55172	378.4483	0	0	0
18/1/2018	5	1130	Golden eagle	1	74	0	0	0	0	0	37	37	0	0	0
12/2/2018	2	1501	Golden eagle	1	44	0	0	0	0	0	0	44	0	0	0
12/2/2018	2	1512	Golden eagle	1	329	0	0	0	0	0	0	329	0	0	0
12/2/2018	2	1527	Golden eagle	2	565	0	0	0	0	0	0	488.6486	76.35135	0	0
12/2/2018	2	1537	Golden eagle	1	237	0	0	0	0	0	0	237	0	0	0
12/2/2018	2	1555	Golden eagle	2	184	0	0	0	0	0	0	184	0	0	0
12/2/2018	3	1239	Golden eagle	1	16	0	11.82693	0	0	0	0	4.173071	0	0	0
13/2/2018	2	1341	Golden eagle	2	155	0	0	0	0	0	0	155	0	0	0
13/2/2018	2	1428	Golden eagle	2	100	0	0	0	0	0	0	100	0	0	0
13/2/2018	5	1057	Golden eagle	1	8	0	0	0	0	0	0	8	0	0	0
13/2/2018	5	1057	Golden eagle	1	3	0	0	0	0	0	0	3	0	0	0
13/2/2018	5	1100	Golden eagle	1	32	0	0	0	0	0	32	0	0	0	0
13/2/2018	5	1124	Golden eagle	1	282	0	0	0	0	0	0	15.66667	62.66667	203.6667	0
13/2/2018	5	1142	Golden eagle	1	268	0	0	0	0	0	63.05882	204.9412	0	0	0
13/2/2018	5	1151	Golden eagle	1	380	0	33.97209	0	0	0	0	346.0279	0	0	0
13/2/2018	5	1158	Golden eagle	1	194	0	0	0	0	0	0	194	0	0	0
13/2/2018	5	1203	Golden eagle	1	322	0	13.19705	0	0	0	0	308.8029	0	0	0
13/2/2018	5	1203	Golden eagle	1	322	0	22.60976	0	0	0	0	299.3902	0	0	0
13/2/2018	5	1218	Golden eagle	2	409	0	0	0	0	0	0	75.74074	212.0741	121.1852	0
15/2/2018	1	1052	Golden eagle	1	221	0	0	0	0	0	0	221	0	0	0
15/2/2018	1	1058	Golden eagle	2	157	0	0	0	0	0	0	157	0	0	0
15/2/2018	1	1326	Golden eagle	1	123	0	0	0	0	0	15.375	107.625	0	0	0
15/2/2018	5	1045	Golden eagle	1	753	0	0	0	0	0	301.2	451.8	0	0	0
15/2/2018	5	1050	Golden eagle	1	123	0	0	0	0	0	0	123	0	0	0
15/2/2018	5	1235	Golden eagle	1	450	0	0	0	0	0	0	360	90	0	0
7/3/2018	3	1051	Golden eagle	1	10	0	0	0	0	0	10	0	0	0	0
7/3/2018	3	1141	Golden eagle	1	467	0	0	0	0	0	0	467	0	0	0
7/3/2018	3	1235	Golden eagle	2	501	0	0	0	0	0	440.2727	60.72727	0	0	0
7/3/2018	3	1247	Golden eagle	2	925	0	0	0	0	0	0	712.7049	212.2951	0	0
8/3/2018	3	1506	Golden eagle	1	335	0	0	0	0	0	0	258.8636	76.13636	0	0
8/3/2018	3	1619	Golden eagle	1	227	0	0	0	0	0	0	227	0	0	0
8/3/2018	4	1108	Golden eagle	1	174	0	64.12555	0	0	0	0	109.8745	0	0	0
8/3/2018	4	1122	Golden eagle	1	169	0	133.7548	0	0	0	0	35.24524	0	0	0
8/3/2018	4	1131	Golden eagle	1	312	0	65.41315	0	0	0	0	246.5868	0	0	0
8/3/2018	4	1616	Golden eagle	1	47	0	0	0	0	0	0	47	0	0	0

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8/3/2018	4	1640	Golden eagle	1	227	0	0	0	0	0	0	45.4	181.6	0	0
8/3/2018	5	1011	Golden eagle	1	22	0	0	0	0	0	0	22	0	0	0
8/3/2018	5	1019	Golden eagle	1	135	0	0	0	0	0	15	120	0	0	0
8/3/2018	5	1031	Golden eagle	1	99	0	0	0	0	0	16.5	82.5	0	0	0
8/3/2018	5	1132	Golden eagle	1	19	0	17.67309	0	0	0	0	1.326912	0	0	0
8/3/2018	5	1234	Golden eagle	1	41	0	0	0	0	0	20.5	20.5	0	0	0
8/3/2018	5	1239	Golden eagle	1	89	0	0	0	0	0	0	89	0	0	0
8/3/2018	5	1252	Golden eagle	1	264	0	0	0	0	0	264	0	0	0	0
8/3/2018	5	1252	Golden eagle	1	287	0	0	0	0	0	30.21053	75.52632	181.2632	0	0
9/3/2018	3	1035	Golden eagle	1	145	0	0	0	0	0	0	145	0	0	0
9/3/2018	3	1038	Golden eagle	1	69	0	0	0	0	0	0	69	0	0	0
9/3/2018	3	1042	Golden eagle	1	244	0	0	0	0	0	0	244	0	0	0
9/3/2018	3	1042	Golden eagle	1	244	0	0	0	0	0	0	0	244	0	0
9/3/2018	3	1054	Golden eagle	1	180	0	0	0	0	0	0	180	0	0	0
9/3/2018	3	1054	Golden eagle	1	439	0	0	0	0	0	0	363.3103	75.68966	0	0
10/3/2018	1	1008	Golden eagle	1	184	0	0	0	0	0	0	107.3333	76.66667	0	0
10/3/2018	1	1422	Golden eagle	1	273	0	0	0	0	0	0	0	121.3333	151.6667	0
10/3/2018	1	1427	Golden eagle	1	15	0	0	0	0	0	0	15	0	0	0
10/3/2018	1	1521	Golden eagle	1	246	0	0	0	0	0	15.375	230.625	0	0	0
10/3/2018	2	946	Golden eagle	1	225	0	0	0	0	0	0	210	15	0	0
10/3/2018	2	1120	Golden eagle	2	289	0	0	0	0	0	0	106.4737	45.63158	60.84211	76.05263
10/3/2018	2	1201	Golden eagle	1	29	0	0	0	0	0	0	29	0	0	0
10/3/2018	2	1222	Golden eagle	1	141	0	0	0	0	0	47	94	0	0	0
10/3/2018	2	1418	Golden eagle	1	135	0	0	0	0	0	0	135	0	0	0
10/3/2018	2	1424	Golden eagle	1	72	0	0	0	0	0	0	72	0	0	0
10/3/2018	2	1441	Golden eagle	2	461	0	0	0	0	0	0	61.46667	92.2	0	307.3333
10/3/2018	2	1448	Golden eagle	1	511	0	0	0	0	0	0	511	0	0	0
10/3/2018	2	1507	Golden eagle	2	379	0	0	0	0	0	0	379	0	0	0
10/3/2018	2	1541	Golden eagle	1	82	0	0	0	0	0	0	82	0	0	0
10/3/2018	2	1546	Golden eagle	1	430	0	0	0	0	0	15.35714	414.6429	0	0	0
10/3/2018	2	1613	Golden eagle	1	65	0	0	0	0	0	32.5	32.5	0	0	0
10/3/2018	2	1618	Golden eagle	2	138	0	0	0	0	0	0	138	0	0	0
10/3/2018	2	1641	Golden eagle	1	86	0	0	0	0	0	0	86	0	0	0
9/4/2018	2	1525	Golden eagle	1	722	0	0	0	0	0	30.08333	210.5833	45.125	361	75.20833
9/4/2018	2	1547	Golden eagle	1	102	0	0	0	0	0	0	102	0	0	0
9/4/2018	3	1037	Golden eagle	1	43	0	43	0	0	0	0	3.84E-10	0	0	0
9/4/2018	3	1126	Golden eagle	1	18	18	0	0	0	0	0	0	0	0	0
9/4/2018	3	1138	Golden eagle	1	214	0	64.64916	0	0	0	0	149.3508	0	0	0
9/4/2018	3	1138	Golden eagle	1	164	0	49.54421	0	0	0	0	114.4558	0	0	0
9/4/2018	3	1158	Golden eagle	2	152	0	0	0	0	0	0	106.4	45.6	0	0
9/4/2018	3	1204	Golden eagle	1	632	0	0	0	0	0	0	376.1905	30.09524	30.09524	195.619
9/4/2018	3	1221	Golden eagle	1	621	0	0	0	0	0	0	287.7805	60.58537	60.58537	212.0488

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9/4/2018	3	1221	Golden eagle	1	570	0	0	0	0	0	15	225	60	60	210
10/4/2018	4	1659	Golden eagle	1	91	0	0	0	0	0	0	0	91	0	0
10/4/2018	4	1715	Golden eagle	2	52	0	0	0	0	0	0	52	0	0	0
10/4/2018	4	1723	Golden eagle	2	81	0	0	0	0	0	0	81	0	0	0
10/4/2018	5	1008	Golden eagle	1	35	0	0	0	0	0	35	0	0	0	0
10/4/2018	5	1015	Golden eagle	2	190	0	0	0	0	0	0	190	0	0	0
10/4/2018	5	1034	Golden eagle	1	475	0	0	0	0	0	260.4839	168.5484	45.96774	0	0
10/4/2018	5	1041	Golden eagle	1	46	0	0	0	0	0	46	0	0	0	0
10/4/2018	5	1217	Golden eagle	1	148	0	0	0	0	0	16.44444	131.5556	0	0	0
12/4/2018	5	1137	Golden eagle	1	554	5.991958	21.57105	7.190349	8.388741	0	70.95249	255.429	85.14298	99.33348	0
12/4/2018	5	1238	Golden eagle	1	108	0	0	0	0	0	0	108	0	0	0
13/4/2018	3	935	Golden eagle	1	94	0	0	0	0	0	0	94	0	0	0
13/4/2018	3	937	Golden eagle	2	168	0	0	0	0	0	0	106.9091	61.09091	0	0
13/4/2018	3	949	Golden eagle	1	190	0	0	0	0	0	0	190	0	0	0
14/4/2018	2	1634	Golden eagle	1	185	0	0	0	0	0	0	185	0	0	0
14/4/2018	4	1036	Golden eagle	1	382	0	193.1205	48.28013	0	0	0	112.4795	28.11987	0	0
14/4/2018	4	1036	Golden eagle	1	382	0	71.62463	25.27928	8.426427	0	0	188.1354	66.40072	22.13357	0
15/4/2018	1	1347	Golden eagle	1	160	0	0	0	0	0	0	0	160	0	0
15/4/2018	1	1408	Golden eagle	1	64	0	0	0	0	0	0	64	0	0	0
15/4/2018	1	1504	Golden eagle	2	401	0	0	0	0	0	0	308.4615	92.53846	0	0
16/4/2018	5	1443	Golden eagle	1	157	0	0	0	0	0	0	157	0	0	0
16/4/2018	5	1605	Golden eagle	1	186	0	0	0	0	0	0	93	93	0	0
16/4/2018	5	1605	Golden eagle	1	193	0	0	0	0	0	0	128.6667	64.33333	0	0
15/5/2018	1	1710	Golden eagle	1	674	0	0	0	0	0	0	382.9545	291.0455	0	0
15/5/2018	1	1710	Golden eagle	1	346	0	0	0	0	0	0	210.6087	45.13043	90.26087	0
15/5/2018	1	1853	Golden eagle	1	72	0	0	0	0	0	0	72	0	0	0
15/5/2018	1	1858	Golden eagle	1	7	0	0	0	0	0	7	0	0	0	0
15/5/2018	2	1518	Golden eagle	1	299	0	0	0	0	0	0	299	0	0	0
15/5/2018	3	1353	Golden eagle	1	5	0	0	0	0	0	5	0	0	0	0
15/5/2018	3	1410	Golden eagle	1	274	0	0	0	0	0	0	274	0	0	0
16/5/2018	5	1447	Golden eagle	1	138	0	0	0	0	0	61.33333	76.66667	0	0	0
16/5/2018	5	1545	Golden eagle	2	122	0	0	0	0	0	0	61	45.75	15.25	0
17/5/2018	5	1017	Golden eagle	1	8	0	1.657423	0	0	0	0	6.342577	0	0	0
17/5/2018	5	1042	Golden eagle	1	345	0	0	0	0	0	45	255	30	15	0
17/5/2018	5	1042	Golden eagle	1	299	0	0	0	0	0	15.73684	267.5263	15.73684	0	0
17/5/2018	5	1102	Golden eagle	1	732	0	0	0	0	0	0	137.25	350.75	244	0
17/5/2018	5	1141	Golden eagle	1	300	0	0	0	0	0	150	150	0	0	0
17/5/2018	5	1141	Golden eagle	1	709	0	0	0	0	0	271.5319	377.1277	60.34043	0	0
18/5/2018	1	1418	Golden eagle	1	45	0	0	0	0	0	45	0	0	0	0
18/5/2018	1	1427	Golden eagle	1	157	0	0	0	0	0	31.4	125.6	0	0	0
18/5/2018	1	1434	Golden eagle	1	78	0	0	0	0	0	78	0	0	0	0
18/5/2018	4	1310	Golden eagle	1	587	0	170.2285	51.06855	0	0	0	281.31	84.39299	0	0

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18/5/2018	4	1328	Golden eagle	1	186	0	0	0	0	0	0	15.5	170.5	0	0
18/5/2018	4	1419	Golden eagle	1	49	0	0	0	0	0	49	0	0	0	0
19/5/2018	1	1352	Golden eagle	2	102	0	0	0	0	0	51	51	0	0	0
19/5/2018	1	1401	Golden eagle	2	165	0	0	0	0	0	120	45	0	0	0
19/5/2018	1	1407	Golden eagle	1	520	0	0	0	0	0	244.7059	275.2941	0	0	0
19/5/2018	1	1407	Golden eagle	1	520	0	0	0	0	0	244.7059	275.2941	0	0	0
19/5/2018	4	1146	Golden eagle	1	273	0	232.7729	0	0	0	0	40.22709	0	0	0
19/5/2018	4	1146	Golden eagle	1	243	0	0	92.37187	0	0	0	0	150.6281	0	0
21/5/2018	3	1627	Golden eagle	1	47	0	0	0	0	0	0	47	0	0	0
21/5/2018	3	1631	Golden eagle	1	444	0	0	0	0	0	214.3448	229.6552	0	0	0
21/5/2018	3	1631	Golden eagle	1	489	0	0	0	0	0	244.5	244.5	0	0	0
21/5/2018	3	1646	Golden eagle	1	290	21.78898	81.70868	0	0	0	39.26365	147.2387	0	0	0
22/5/2018	2	934	Golden eagle	1	11	0	0	0	0	0	0	11	0	0	0
22/5/2018	2	957	Golden eagle	1	76	0	0	0	0	0	15.2	60.8	0	0	0
22/5/2018	2	1046	Golden eagle	1	188	0	0	0	0	0	15.66667	172.3333	0	0	0
22/5/2018	2	1059	Golden eagle	1	306	0	0	0	0	0	153	153	0	0	0
22/5/2018	2	1108	Golden eagle	1	438	0	0	0	0	0	30.2069	332.2759	75.51724	0	0
22/5/2018	2	1128	Golden eagle	1	34	0	0	0	0	0	0	34	0	0	0
22/5/2018	3	1103	Golden eagle	1	21	0	0	0	0	0	0	21	0	0	0
24/5/2018	5	1144	Golden eagle	1	62	0	0	0	0	0	0	62	0	0	0
16/6/2018	1	1418	Golden eagle	1	47	0	0	0	0	0	0	47	0	0	0
16/6/2018	2	1656	Golden eagle	1	207	0	0	0	0	0	15.92308	191.0769	0	0	0
16/6/2018	2	1657	Golden eagle	1	117	0	0	0	0	0	0	117	0	0	0
19/6/2018	3	1620	Golden eagle	1	324	0	0	0	0	0	200.5714	123.4286	0	0	0
19/6/2018	5	1011	Golden eagle	1	146	0	0	0	0	0	0	146	0	0	0
19/6/2018	5	1210	Golden eagle	1	166	0	0	0	0	0	0	45.27273	75.45455	45.27273	0
20/6/2018	5	1619	Golden eagle	1	224	0	44.08135	0	0	0	0	179.9187	0	0	0
15/7/2018	1	1701	Golden eagle	1	5	0	0	0	0	0	5	0	0	0	0
16/7/2018	5	948	Golden eagle	1	143	0	0	0	0	0	15.88889	127.1111	0	0	0
16/7/2018	5	1020	Golden eagle	1	825	0	0	0	0	0	0	420	255	150	0
16/7/2018	5	1143	Golden eagle	1	400	0	0	0	0	0	0	261.5385	138.4615	0	0
16/7/2018	5	1246	Golden eagle	1	3	0	0	0	0	0	0	3	0	0	0
16/7/2018	5	1251	Golden eagle	1	127	0	62.23117	62.23117	0	0	0	1.268827	1.268827	0	0
16/7/2018	5	1255	Golden eagle	1	85	0	10.33114	41.32457	0	0	0	6.668859	26.67543	0	0
17/7/2018	1	1414	Golden eagle	1	65	0	0	0	0	0	0	65	0	0	0
17/7/2018	1	1606	Golden eagle	2	93	0	0	0	0	0	0	93	0	0	0
17/7/2018	1	1613	Golden eagle	2	253	0	0	0	0	0	31.625	221.375	0	0	0
17/7/2018	2	1411	Golden eagle	1	132	0	10.01616	0	0	0	0	121.9838	0	0	0
17/7/2018	2	1411	Golden eagle	1	210	0	13.11951	0	0	0	0	196.8805	0	0	0
17/7/2018	2	1420	Golden eagle	2	102	0	0	0	0	0	0	102	0	0	0
17/7/2018	3	853	Golden eagle	2	163	0	0	0	0	0	0	114.1	32.6	16.3	0
19/7/2018	4	1043	Golden eagle	1	14	0	9.217528	0	0	0	0	4.782472	0	0	0

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19/7/2018	4	1050	Golden eagle	1	16	0	0	0	0	0	16	0	0	0	0
19/7/2018	4	1058	Golden eagle	1	121	0	0	0	0	0	0	121	0	0	0
20/8/2018	3	1451	Golden eagle	1	139	0	0	0	0	0	0	139	0	0	0
20/8/2018	3	1451	Golden eagle	1	162	0	0	0	0	0	0	162	0	0	0
22/8/2018	2	1259	Golden eagle	1	904	0	0	0	0	0	0	904	0	0	0
22/8/2018	2	1314	Golden eagle	3	372	0	0	0	0	0	15.5	356.5	0	0	0
22/8/2018	2	1331	Golden eagle	1	133	0	0	0	0	0	0	133	0	0	0
22/8/2018	2	1339	Golden eagle	1	150	0	0	0	0	0	0	150	0	0	0
22/8/2018	2	1341	Golden eagle	2	47	0	0	0	0	0	0	47	0	0	0
22/8/2018	2	1406	Golden eagle	1	707	0	0	0	0	0	0	406.1489	150.4255	150.4255	0
22/8/2018	2	1409	Golden eagle	1	155	0	0	0	0	0	0	155	0	0	0
22/8/2018	2	1515	Golden eagle	1	314	0	13.87017	2.774034	2.774034	8.322101	0	143.1298	28.62597	28.62597	85.8779
22/8/2018	2	1535	Golden eagle	3	415	0	0	0	0	0	0	61.48148	30.74074	30.74074	292.037
23/8/2018	1	1008	Golden eagle	1	98	0	0	0	0	0	0	98	0	0	0
23/8/2018	1	1013	Golden eagle	1	814	0	0	0	0	0	0	648.1852	165.8148	0	0
23/8/2018	1	1017	Golden eagle	1	31	0	0	0	0	0	0	31	0	0	0
23/8/2018	1	1019	Golden eagle	1	425	0	0	0	0	0	0	318.75	106.25	0	0
23/8/2018	1	1049	Golden eagle	1	422	0	0	0	0	0	0	422	0	0	0
23/8/2018	1	1049	Golden eagle	1	143	0	0	0	0	0	0	143	0	0	0
23/8/2018	1	1052	Golden eagle	1	530	0	0	0	0	0	0	530	0	0	0
23/8/2018	1	1132	Golden eagle	1	813	0	0	0	0	0	15.05556	602.2222	195.7222	0	0
23/8/2018	3	1335	Golden eagle	1	445	29.15556	91.63176	0	0	0	78.25823	245.9544	0	0	0
23/8/2018	5	1058	Golden eagle	1	308	0	0	0	0	0	0	184.8	123.2	0	0
23/8/2018	5	1111	Golden eagle	1	22	0	0	0	0	0	0	22	0	0	0
3/9/2018	1	1537	Golden eagle	1	15	0	0	0	0	0	15	0	0	0	0
3/9/2018	2	1433	Golden eagle	1	68	0	0	0	0	0	68	0	0	0	0
3/9/2018	2	1543	Golden eagle	1	58	0	0	0	0	0	58	0	0	0	0
3/9/2018	3	1132	Golden eagle	1	655	0	0	0	0	0	0	655	0	0	0
3/9/2018	3	1136	Golden eagle	1	195	0	0	0	0	0	15	180	0	0	0
3/9/2018	3	1217	Golden eagle	1	10	0	0	0	0	0	10	0	0	0	0
3/9/2018	4	1021	Golden eagle	1	298	0	33.87404	0	0	0	0	264.126	0	0	0
3/9/2018	4	1052	Golden eagle	1	75	0	0	0	0	0	0	75	0	0	0
3/9/2018	4	1106	Golden eagle	1	20	0	0	0	0	0	0	20	0	0	0
3/9/2018	4	1126	Golden eagle	1	73	0	0	0	0	0	0	73	0	0	0
3/9/2018	4	1129	Golden eagle	1	918	1.431562	78.73593	7.157812	0	0	13.61762	748.969	68.08809	0	0
4/9/2018	5	1021	Golden eagle	1	820	0	0	0	0	0	485.9259	227.7778	106.2963	0	0
4/9/2018	5	1142	Golden eagle	1	254	0	0	0	0	0	0	190.5	47.625	15.875	0
4/9/2018	5	1142	Golden eagle	1	265	0	0	0	0	0	0	249.4118	15.58824	0	0
4/9/2018	5	1241	Golden eagle	1	346	0	0	0	0	0	105.3043	120.3478	120.3478	0	0
4/9/2018	5	1241	Golden eagle	1	476	0	0	0	0	0	153.5484	168.9032	153.5484	0	0
4/9/2018	5	1241	Golden eagle	1	309	0	0	0	0	0	92.7	108.15	108.15	0	0
5/9/2018	5	1452	Golden eagle	2	34	0	0	0	0	0	34	0	0	0	0

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5/9/2018	5	1517	Golden eagle	2	2	0	0	0	0	0	2	0	0	0	0
6/9/2018	1	1206	Golden eagle	1	1236	0	0	0	0	0	120.5854	949.6098	165.8049	0	0
6/9/2018	2	1013	Golden eagle	1	76	0	0	0	0	0	15.2	60.8	0	0	0
6/9/2018	2	1053	Golden eagle	2	151	0	0	0	0	0	0	151	0	0	0
6/9/2018	2	1218	Golden eagle	1	295	0	0	0	0	0	0	93.15789	77.63158	77.63158	46.57895
6/9/2018	3	1533	Golden eagle	1	162	154.4639	0	0	0	0	7.536069	0	0	0	0
6/9/2018	3	1543	Golden eagle	1	283	0	116.1913	73.9399	0	0	0	56.75317	36.11566	0	0
6/9/2018	4	1547	Golden eagle	1	94	0	0	0	0	0	0	15.66667	78.33333	0	0
6/9/2018	4	1559	Golden eagle	1	137	0	0	0	0	0	0	137	0	0	0
6/9/2018	4	1607	Golden eagle	2	184	0	0	0	0	0	0	184	0	0	0
1/10/2018	1	1202	Golden eagle	1	79	0	0	0	0	0	79	0	0	0	0
1/10/2018	1	1212	Golden eagle	1	58	0	0	0	0	0	58	0	0	0	0
1/10/2018	3	1004	Golden eagle	1	17	0	0	0	0	0	17	0	0	0	0
1/10/2018	3	1020	Golden eagle	1	2	0	0	0	0	0	2	0	0	0	0
1/10/2018	4	1019	Golden eagle	1	24	0	0	0	0	0	24	0	0	0	0
1/10/2018	4	1020	Golden eagle	1	37	0	0	0	0	0	0	37	0	0	0
1/10/2018	4	1025	Golden eagle	1	92	0	0	0	0	0	0	92	0	0	0
2/10/2018	1	1534	Golden eagle	1	80	0	0	0	0	0	16	64	0	0	0
2/10/2018	5	1006	Golden eagle	2	63	0	0	0	0	0	0	63	0	0	0
2/10/2018	5	1036	Golden eagle	1	112	0	0	0	0	0	48	64	0	0	0
3/10/2018	4	1535	Golden eagle	1	335	0	0	0	0	0	76.13636	258.8636	0	0	0
3/10/2018	4	1607	Golden eagle	1	109	17.22987	43.07467	0	0	0	13.91299	34.78247	0	0	0
4/10/2018	1	1327	Golden eagle	1	44	0	0	0	0	0	0	44	0	0	0
4/10/2018	1	1327	Golden eagle	1	46	0	0	0	0	0	15.33333	30.66667	0	0	0
4/10/2018	1	1353	Golden eagle	1	63	0	0	0	0	0	47.25	15.75	0	0	0
4/10/2018	1	1452	Golden eagle	1	229	0	0	0	0	0	106.8667	122.1333	0	0	0
4/10/2018	2	1324	Golden eagle	2	235	0	0	0	0	0	172.3333	62.66667	0	0	0
4/10/2018	2	1338	Golden eagle	2	83	0	0	0	0	0	33.2	49.8	0	0	0
4/10/2018	2	1348	Golden eagle	2	34	0	0	0	0	0	0	34	0	0	0
6/11/2018	1	1400	Golden eagle	1	129	0	0	0	0	0	0	96.75	32.25	0	0
6/11/2018	1	1424	Golden eagle	1	448	0	0	0	0	0	15.44828	432.5517	0	0	0
6/11/2018	1	1442	Golden eagle	1	282	0	0	0	0	0	0	78.33333	203.6667	0	0
6/11/2018	1	1450	Golden eagle	1	141	0	0	0	0	0	0	141	0	0	0
6/11/2018	1	1457	Golden eagle	1	124	0	0	0	0	0	15.5	77.5	31	0	0
6/11/2018	3	1013	Golden eagle	2	109	0	0	0	0	0	31.14286	77.85714	0	0	0
6/11/2018	3	1126	Golden eagle	2	164	0	0	0	0	0	0	164	0	0	0
6/11/2018	3	1150	Golden eagle	1	152	0	0	0	0	0	121.6	30.4	0	0	0
6/11/2018	3	1205	Golden eagle	1	354	0	0	0	0	0	92.34783	153.913	107.7391	0	0
6/11/2018	4	1354	Golden eagle	1	78	0	0	0	0	0	0	78	0	0	0
6/11/2018	4	1404	Golden eagle	1	253	58.63224	58.63224	0	0	0	67.86776	67.86776	0	0	0
6/11/2018	4	1404	Golden eagle	1	251	54.77345	54.77345	0	0	0	70.72655	70.72655	0	0	0
6/11/2018	4	1415	Golden eagle	1	256	0	98.03345	0	0	0	0	157.9665	0	0	0

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7/11/2018	5	1128	Golden eagle	1	52	0	0	0	0	0	0	52	0	0	0
7/11/2018	5	1147	Golden eagle	1	137	0	0	0	0	0	76.11111	60.88889	0	0	0
7/11/2018	5	1153	Golden eagle	1	166	0	0	0	0	0	60.36364	75.45455	30.18182	0	0
8/11/2018	4	1045	Golden eagle	1	59	0	0	0	0	0	59	0	0	0	0
8/11/2018	4	1051	Golden eagle	1	101	0	0	0	0	0	0	101	0	0	0
8/11/2018	4	1104	Golden eagle	2	217	0	0	0	0	0	0	217	0	0	0
8/11/2018	5	1056	Golden eagle	1	9	0	0	0	0	0	0	9	0	0	0
8/11/2018	5	1103	Golden eagle	1	96	0	0	0	0	0	0	96	0	0	0
9/11/2018	3	1048	Golden eagle	1	428	0	367.969	0	0	0	0	60.03097	0	0	0
9/11/2018	3	1051	Golden eagle	1	322	0	322	0	0	0	0	0	0	0	0
4/12/2018	1	1109	Golden eagle	1	3	0	0	0	0	0	3	0	0	0	0
4/12/2018	1	1201	Golden eagle	1	211	0	0	0	0	0	211	0	0	0	0
4/12/2018	1	1201	Golden eagle	1	219	0	0	0	0	0	219	0	0	0	0
5/12/2018	5	1119	Golden eagle	1	293	0	1.556426	0	0	0	0	291.4436	0	0	0
5/12/2018	5	1126	Golden eagle	1	150	0	0	0	0	0	30	120	0	0	0
5/12/2018	5	1126	Golden eagle	1	223	0	0	0	0	0	31.85714	191.1429	0	0	0
5/12/2018	5	1140	Golden eagle	1	177	0	0	0	0	0	32.18182	144.8182	0	0	0
6/12/2018	1	1453	Golden eagle	1	56	0	0	0	0	0	56	0	0	0	0
8/1/2019	1	1432	Golden eagle	1	41	0	0	0	0	0	41	0	0	0	0
8/1/2019	1	2237	Golden eagle	1	37	0	0	0	0	0	37	0	0	0	0
8/1/2019	2	1302	Golden eagle	2	657	0	0	0	0	0	0	15.27907	76.39535	565.3256	0
8/1/2019	2	1334	Golden eagle	1	227	0	0	0	0	0	0	0	227	0	0
8/1/2019	2	1334	Golden eagle	1	465	0	0	0	0	0	0	150	315	0	0
9/1/2019	5	1008	Golden eagle	2	93	0	0	0	0	0	93	0	0	0	0
9/1/2019	5	1011	Golden eagle	1	555	0	0	0	0	0	0	465	90	0	0
9/1/2019	5	1021	Golden eagle	1	171	0	0	0	0	0	0	171	0	0	0
9/1/2019	5	1109	Golden eagle	1	391	0	0	0	0	0	150.3846	165.4231	75.19231	0	0
9/1/2019	5	1244	Golden eagle	1	66	0	0	0	0	0	66	0	0	0	0
9/1/2019	5	1303	Golden eagle	3	92	0	0	0	0	0	46	46	0	0	0
10/1/2019	3	949	Golden eagle	1	389	15.56	373.44	0	0	0	0	0	0	0	0
10/1/2019	3	1029	Golden eagle	1	116	0	0	0	0	0	16.57143	99.42857	0	0	0
11/1/2019	3	1413	Golden eagle	1	58	0	0	0	0	0	0	58	0	0	0
11/1/2019	3	1419	Golden eagle	1	369	0	0	0	0	0	15.375	353.625	0	0	0
11/1/2019	5	1016	Golden eagle	1	18	0	0	0	0	0	18	0	0	0	0
11/1/2019	5	1021	Golden eagle	1	141	0	0	0	0	0	31.33333	109.6667	0	0	0
11/1/2019	5	1026	Golden eagle	1	559	0	0	0	0	0	0	559	0	0	0
11/1/2019	5	1028	Golden eagle	1	61	0	0	0	0	0	15.25	45.75	0	0	0
11/1/2019	5	1028	Golden eagle	1	360	0	0	0	0	0	60	300	0	0	0
11/1/2019	5	1057	Golden eagle	1	312	0	0	0	0	0	187.2	124.8	0	0	0
11/1/2019	5	1059	Golden eagle	1	249	0	0	0	0	0	0	249	0	0	0
5/2/2019	2	1327	Golden eagle	1	294	0	0	0	0	0	61.89474	201.1579	30.94737	0	0
5/2/2019	2	1335	Golden eagle	1	482	0	0	0	0	0	165.6875	316.3125	0	0	0

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5/2/2019	5	1031	Golden eagle	2	227	0	0	0	0	0	60.53333	166.4667	0	0	0
5/2/2019	5	1101	Golden eagle	1	324	0	0	0	0	0	46.28571	277.7143	0	0	0
5/2/2019	5	1146	Golden eagle	1	69	0	0	0	0	0	69	0	0	0	0
5/2/2019	5	1151	Golden eagle	1	261	0	0	0	0	0	76.76471	184.2353	0	0	0
5/2/2019	5	1202	Golden eagle	1	129	0	0	0	0	0	0	129	0	0	0
6/2/2019	3	1029	Golden eagle	1	127	0	0	0	0	0	0	127	0	0	0
6/2/2019	3	1200	Golden eagle	1	39	0	0	0	0	0	0	39	0	0	0
6/2/2019	3	1210	Golden eagle	1	245	0	0	0	0	0	30.625	214.375	0	0	0
6/2/2019	3	1210	Golden eagle	1	268	0	0	0	0	0	31.52941	236.4706	0	0	0
6/2/2019	5	953	Golden eagle	1	87	0	0	0	0	0	0	69.6	17.4	0	0
6/2/2019	5	1020	Golden eagle	2	36	0	0	0	0	0	0	36	0	0	0
6/2/2019	5	1057	Golden eagle	1	259	0	64.88024	0	0	0	0	194.1198	0	0	0
6/2/2019	5	1203	Golden eagle	1	18	0	0	0	0	0	0	0	0	18	0
7/2/2019	1	1129	Golden eagle	1	108	0	0	0	0	0	108	0	0	0	0
7/2/2019	2	1108	Golden eagle	2	120	0	0	0	0	0	0	120	0	0	0
7/2/2019	4	1351	Golden eagle	2	62	62	0	0	0	0	-4.3E-10	0	0	0	0
7/2/2019	4	1402	Golden eagle	1	185	0	0	0	0	0	0	30.83333	154.1667	0	0
7/2/2019	4	1413	Golden eagle	1	241	0	13.10857	4.369524	0	0	0	167.6414	55.88048	0	0
7/2/2019	4	1440	Golden eagle	1	219	0	74.04151	0	0	0	0	144.9585	0	0	0
7/2/2019	4	1452	Golden eagle	1	11	0	0	0	0	0	0	11	0	0	0
6/3/2019	1	1008	Golden eagle	1	102	0	0	0	0	0	0	0	102	0	0
6/3/2019	1	1038	Golden eagle	1	674	0	0	0	0	0	0	107.2273	245.0909	321.6818	0
6/3/2019	1	1057	Golden eagle	1	16	0	0	0	0	0	16	0	0	0	0
6/3/2019	1	1214	Golden eagle	1	5	0	0	0	0	0	0	5	0	0	0
6/3/2019	2	924	Golden eagle	1	786	0	0	0	0	0	0	196.5	226.7308	362.7692	0
6/3/2019	2	944	Golden eagle	1	92	0	0	0	0	0	92	0	0	0	0
6/3/2019	2	954	Golden eagle	1	146	0	0	0	0	0	0	146	0	0	0
6/3/2019	2	955	Golden eagle	1	1120	0	0	0	0	0	0	136.2162	983.7838	0	0
6/3/2019	2	1052	Golden eagle	1	481	0	50.50649	0	0	0	0	430.4935	0	0	0
6/3/2019	2	1102	Golden eagle	1	92	0	0	0	0	0	92	0	0	0	0
6/3/2019	2	1107	Golden eagle	1	768	0	0	0	0	0	0	436.7059	331.2941	0	0
7/3/2019	3	1045	Golden eagle	1	196	0	51.11445	0	0	0	0	144.8856	0	0	0
7/3/2019	3	1047	Golden eagle	1	62	0	0	0	0	0	15.5	46.5	0	0	0
7/3/2019	3	1109	Golden eagle	1	70	0	0	0	0	0	0	70	0	0	0
7/3/2019	3	1133	Golden eagle	1	197	0	0	0	0	0	15.15385	181.8462	0	0	0
7/3/2019	3	1137	Golden eagle	1	775	0	512.7859	0	0	0	0	262.2141	0	0	0
7/3/2019	3	1144	Golden eagle	1	64	0	0	0	0	0	0	64	0	0	0
9/3/2019	3	1201	Golden eagle	3	347	0	316.8261	30.17391	0	0	0	0	0	0	0
9/3/2019	3	1208	Golden eagle	1	66	0	66	0	0	0	0	0	0	0	0
9/3/2019	3	1215	Golden eagle	1	430	67.68698	311.3601	0	0	0	9.098734	41.85418	0	0	0
9/3/2019	3	1228	Golden eagle	1	43	0	43	0	0	0	0	0	0	0	0
11/3/2019	4	929	Golden eagle	1	108	3.102919	18.61752	0	0	0	12.32565	73.95391	0	0	0

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11/3/2019	4	938	Golden eagle	1	125	1.892637	13.24846	0	0	0	13.73236	96.12654	0	0	0
11/3/2019	4	947	Golden eagle	1	546	0	0	0	0	0	0	546	0	0	0
11/3/2019	4	1016	Golden eagle	2	600	0	0	0	0	0	0	600	0	0	0
11/3/2019	5	1009	Golden eagle	1	69	0	0	0	0	0	0	69	0	0	0
11/3/2019	5	1123	Golden eagle	1	64	0	0	0	0	0	0	64	0	0	0
11/3/2019	5	1342	Golden eagle	1	17	0	0	0	0	0	0	17	0	0	0
11/3/2019	5	1437	Golden eagle	1	127	0	0	0	0	0	0	127	0	0	0
11/3/2019	5	1449	Golden eagle	1	323	0	0	0	0	0	0	215.3333	61.52381	46.14286	0
11/3/2019	5	1451	Golden eagle	1	223	0	0	0	0	0	0	143.3571	63.71429	15.92857	0
11/3/2019	5	1508	Golden eagle	2	270	0	0	0	0	0	0	270	0	0	0
12/3/2019	2	921	Golden eagle	1	2	0	0	0	0	0	0	2	0	0	0
12/3/2019	2	923	Golden eagle	1	7	0	0	0	0	0	0	7	0	0	0
15/2/2018	4	1043	Golden plover	1	191	0	112.8097	0	0	0	0	78.19031	0	0	0
9/11/2018	3	918	Hen harrier	1	195	55.68195	27.84098	6.960244	0	0	64.31805	32.15902	8.039756	0	0
9/11/2018	3	1051	Hen harrier	1	101	0	69.3756	0	0	0	0	31.6244	0	0	0
6/9/2017	3	1412	Merlin	1	36	0	0	0	0	0	36	0	0	0	0
6/9/2017	3	1458	Merlin	1	54	0	0	0	0	0	18	36	0	0	0
12/4/2018	5	1131	Merlin	1	12	0	0	0	0	0	12	0	0	0	0
13/4/2018	2	1435	Merlin	1	78	0	0	0	0	0	46.8	31.2	0	0	0
14/4/2018	3	1651	Merlin	1	50	0	0	0	0	0	33.33333	16.66667	0	0	0
19/6/2018	5	1210	Merlin	1	177	0	0	0	0	0	0	48.27273	80.45455	48.27273	0
16/7/2018	5	907	Merlin	2	10	0	0	0	0	0	10	0	0	0	0
23/8/2018	5	1139	Merlin	1	18	0	0	0	0	0	18	0	0	0	0
6/9/2018	1	953	Merlin	1	36	0	0	0	0	0	0	36	0	0	0
8/11/2018	4	927	Merlin	1	66	0	15.70758	0	0	0	0	50.29242	0	0	0
10/3/2018	1	959	Red-throated diver	1	151	0	0	0	0	0	0	0	151	0	0
12/6/2018	4	1712	Red-throated diver	1	175	0	0	0	0	0	0	175	0	0	0
15/7/2018	2	1811	Red-throated diver	2	104	0	0	0	0	0	34.66667	69.33333	0	0	0
15/7/2018	2	1816	Red-throated diver	2	163	0	0	0	0	0	0	163	0	0	0
20/8/2018	2	1228	Red-throated diver	2	94	0	0	0	0	0	0	94	0	0	0
22/8/2018	5	1019	Red-throated diver	2	124	0	19.77417	0	0	0	0	104.2258	0	0	0
5/9/2017	1	1011	White-tailed eagle	1	222	0	0	0	0	0	39.64286	182.3571	0	0	0
5/9/2017	1	1013	White-tailed eagle	1	110	0	0	0	0	0	23.57143	86.42857	0	0	0
5/9/2017	1	1453	White-tailed eagle	1	517	0	0	0	0	0	7.602941	509.3971	0	0	0
5/9/2017	1	1502	White-tailed eagle	1	198	0	0	0	0	0	0	198	0	0	0
5/9/2017	1	1505	White-tailed eagle	2	256	0	0	0	0	0	0	256	0	0	0
5/9/2017	1	1516	White-tailed eagle	2	20	0	0	0	0	0	10	10	0	0	0
5/9/2017	2	1010	White-tailed eagle	1	112	0	0	0	0	0	0	112	0	0	0
6/9/2017	3	1142	White-tailed eagle	1	446	0	0	0	0	0	0	446	0	0	0
6/9/2017	4	1141	White-tailed eagle	1	251	0	32.00815	0	0	0	0	218.9919	0	0	0
6/9/2017	4	1146	White-tailed eagle	1	208	0	46.93913	0	0	0	0	161.0609	0	0	0
6/9/2017	4	1516	White-tailed eagle	2	360	0	0	0	0	0	0	240	120	0	0

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7/9/2017	5	1522	White-tailed eagle	1	179	0	0	0	0	0	0	179	0	0	0
17/10/2017	1	1532	White-tailed eagle	1	80	0	0	0	0	0	0	80	0	0	0
17/10/2017	4	1340	White-tailed eagle	1	228	0	0.557092	0.557092	0.974911	0	0	60.24291	60.24291	105.4251	0
18/10/2017	2	1417	White-tailed eagle	2	1	0	0	0	0	0	1	0	0	0	0
18/10/2017	2	1438	White-tailed eagle	1	38	0	0	0	0	0	0	38	0	0	0
18/10/2017	2	1443	White-tailed eagle	1	12	0	0	0	0	0	12	0	0	0	0
18/10/2017	2	1456	White-tailed eagle	2	23	0	0	0	0	0	23	0	0	0	0
18/10/2017	2	1500	White-tailed eagle	1	244	0	0	0	0	0	0	244	0	0	0
18/10/2017	5	1129	White-tailed eagle	1	69	0	0	0	0	0	69	0	0	0	0
19/10/2017	3	1502	White-tailed eagle	1	84	0	0	0	0	0	16.8	67.2	0	0	0
20/10/2017	1	1334	White-tailed eagle	1	34	0	0	0	0	0	34	0	0	0	0
20/10/2017	1	1336	White-tailed eagle	1	49	0	0	0	0	0	49	0	0	0	0
14/11/2017	2	1459	White-tailed eagle	1	43	0	0	0	0	0	0	43	0	0	0
14/11/2017	3	1003	White-tailed eagle	1	206	0	0	0	0	0	15.84615	190.1538	0	0	0
15/11/2017	5	919	White-tailed eagle	1	50	0	0	0	0	0	0	50	0	0	0
15/11/2017	5	923	White-tailed eagle	1	24	0	0	0	0	0	0	24	0	0	0
15/11/2017	5	934	White-tailed eagle	1	188	0	9.826945	0	0	0	0	178.1731	0	0	0
15/11/2017	5	1128	White-tailed eagle	1	193	0	19.87442	0	0	0	0	173.1256	0	0	0
16/11/2017	1	1109	White-tailed eagle	1	126	0	0	0	0	0	0	126	0	0	0
16/11/2017	4	1010	White-tailed eagle	1	5	0	5	0	0	0	0	0	0	0	0
16/11/2017	4	1045	White-tailed eagle	1	5	0	0	0	0	0	0	5	0	0	0
16/11/2017	4	1108	White-tailed eagle	1	131	0	0	0	0	0	0	131	0	0	0
16/11/2017	4	1138	White-tailed eagle	1	115	0	115	0	0	0	0	0	0	0	0
16/1/2018	1	1102	White-tailed eagle	1	290	0	0	0	0	0	122.1053	167.8947	0	0	0
16/1/2018	1	1103	White-tailed eagle	1	200	0	0	0	0	0	30.76923	169.2308	0	0	0
16/1/2018	4	1158	White-tailed eagle	1	152	0	0	0	0	0	0	106.4	45.6	0	0
16/1/2018	4	1347	White-tailed eagle	1	14	0	0	0	0	0	14	0	0	0	0
17/1/2018	2	945	White-tailed eagle	1	128	0	0	0	0	0	0	128	0	0	0
17/1/2018	3	1320	White-tailed eagle	5	632	0	0	0	0	0	0	632	0	0	0
17/1/2018	3	1400	White-tailed eagle	2	39	0	0	0	0	0	0	39	0	0	0
12/2/2018	3	1111	White-tailed eagle	1	149	0	0	0	0	0	0	149	0	0	0
12/2/2018	3	1111	White-tailed eagle	1	322	0	0	0	0	0	0	260.6667	61.33333	0	0
13/2/2018	5	1051	White-tailed eagle	1	111	0	0	0	0	0	0	111	0	0	0
15/2/2018	1	1130	White-tailed eagle	1	66	0	0	0	0	0	0	66	0	0	0
15/2/2018	5	1123	White-tailed eagle	1	542	0	0	0	0	0	0	542	0	0	0
15/2/2018	5	1147	White-tailed eagle	1	605	0	29.73189	0	0	0	0	575.2681	0	0	0
15/2/2018	5	1238	White-tailed eagle	1	255	0	0	0	0	0	0	165	45	45	0
7/3/2018	3	1224	White-tailed eagle	1	769	0	0	0	0	0	120.6275	467.4314	180.9412	0	0
7/3/2018	4	1547	White-tailed eagle	1	143	0	51.81354	0	0	0	0	91.18646	0	0	0
8/3/2018	3	1537	White-tailed eagle	2	233	0	2.10793	0	0	0	0	230.8921	0	0	0
8/3/2018	3	1544	White-tailed eagle	2	604	4.75557	71.33356	76.08913	38.04456	0	10.34443	155.1664	165.5109	82.75544	0
8/3/2018	5	1155	White-tailed eagle	1	54	0	0	0	0	0	0	54	0	0	0

Date	VP	Flight Start Time	Species	Number of Birds	Duration (sec)	Inside CRAA 0-20m	Inside CRAA 21-150m	Inside CRAA 151-200m	Inside CRAA 201-250m	Inside CRAA >250m	Outside CRAA 0-20m	Outside CRAA 21-150m	Outside CRAA 151-200m	Outside CRAA 201-250m	Outside CRAA >250m
9/3/2018	3	1013	White-tailed eagle	1	651	0	0	0	0	0	0	211.9535	75.69767	75.69767	287.6512
9/3/2018	3	1034	White-tailed eagle	1	224	0	0	0	0	0	48	144	32	0	0
10/3/2018	1	1129	White-tailed eagle	1	179	0	0	0	0	0	0	179	0	0	0
10/3/2018	2	1055	White-tailed eagle	1	168	0	0	0	0	0	0	137.4545	30.54545	0	0
10/3/2018	2	1119	White-tailed eagle	1	1189	0	0	0	0	0	15.05063	391.3165	45.1519	150.5063	586.9747
10/3/2018	2	1428	White-tailed eagle	1	529	0	0	0	0	0	0	529	0	0	0
10/3/2018	2	1437	White-tailed eagle	2	227	0	0	0	0	0	0	0	196.7333	30.26667	0
10/3/2018	2	1441	White-tailed eagle	2	461	0	0	0	0	0	0	61.46667	92.2	0	307.3333
10/3/2018	2	1448	White-tailed eagle	1	511	0	0	0	0	0	0	511	0	0	0
10/3/2018	2	1507	White-tailed eagle	1	379	0	0	0	0	0	0	379	0	0	0
10/3/2018	2	1618	White-tailed eagle	1	138	0	0	0	0	0	0	138	0	0	0
10/3/2018	2	1628	White-tailed eagle	1	60	0	0	0	0	0	0	60	0	0	0
10/4/2018	4	1548	White-tailed eagle	1	43	0	0	0	0	0	0	43	0	0	0
10/4/2018	4	1643	White-tailed eagle	1	116	0	0	0	0	0	0	49.71429	49.71429	16.57143	0
10/4/2018	4	1659	White-tailed eagle	2	91	0	0	0	0	0	0	0	91	0	0
10/4/2018	5	1114	White-tailed eagle	1	451	0	0	0	0	0	0	255.5667	60.13333	60.13333	75.16667
10/4/2018	5	1231	White-tailed eagle	1	225	0	0	0	0	0	0	105	75	45	0
11/4/2018	1	1010	White-tailed eagle	1	9	0	0	0	0	0	9	0	0	0	0
12/4/2018	5	1137	White-tailed eagle	1	75	0	25.49701	0	0	0	0	49.50299	0	0	0
12/4/2018	5	1242	White-tailed eagle	1	93	0	0	0	0	0	93	0	0	0	0
13/4/2018	1	1554	White-tailed eagle	1	117	0	0	0	0	0	0	117	0	0	0
13/4/2018	3	1100	White-tailed eagle	1	1290	0	0	0	0	0	0	1260	30	0	0
13/4/2018	3	1105	White-tailed eagle	1	614	0	0	0	0	0	0	614	0	0	0
13/4/2018	3	1112	White-tailed eagle	1	523	0	0	0	0	0	0	523	0	0	0
13/4/2018	3	1114	White-tailed eagle	1	80	0	0	0	0	0	0	80	0	0	0
14/4/2018	2	1618	White-tailed eagle	1	54	0	0	0	0	0	18	36	0	0	0
14/4/2018	2	1634	White-tailed eagle	1	185	0	0	0	0	0	0	185	0	0	0
14/4/2018	3	1546	White-tailed eagle	1	181	0	0	0	0	0	15.08333	165.9167	0	0	0
14/4/2018	3	1558	White-tailed eagle	1	332	0	0	0	0	0	0	332	0	0	0
14/4/2018	3	1617	White-tailed eagle	1	485	0	0	0	0	0	45.46875	439.5313	0	0	0
14/4/2018	4	842	White-tailed eagle	1	35	0	19.21306	0	0	0	0	15.78694	0	0	0
15/4/2018	1	1343	White-tailed eagle	1	315	0	0	0	0	0	0	0	30	60	225
15/4/2018	1	1347	White-tailed eagle	1	160	0	0	0	0	0	0	0	160	0	0
15/4/2018	1	1419	White-tailed eagle	1	1001	0	0	0	0	0	0	606.6667	348.8333	45.5	0
15/4/2018	4	1435	White-tailed eagle	1	753	0	0	0	0	0	0	753	0	0	0
15/4/2018	4	1435	White-tailed eagle	1	1356	0	0	0	0	0	0	904	452	0	0
15/4/2018	4	1435	White-tailed eagle	1	1356	0	0	0	0	0	0	904	452	0	0
15/4/2018	4	1528	White-tailed eagle	1	71	0	0	0	0	0	0	71	0	0	0
15/5/2018	2	1501	White-tailed eagle	1	102	0	0	0	0	0	0	102	0	0	0
15/5/2018	3	1457	White-tailed eagle	1	221	0	57.81074	0	0	0	0	163.1893	0	0	0
16/5/2018	5	1507	White-tailed eagle	1	278	0	0	0	0	0	0	185.3333	61.77778	30.88889	0
17/5/2018	5	1102	White-tailed eagle	1	345	0	0	0	0	0	0	165	180	0	0

Date	VP	Flight Start Time	Species	Number of Birds	Duration (sec)	Inside CRAA 0-20m	Inside CRAA 21-150m	Inside CRAA 151-200m	Inside CRAA 201-250m	Inside CRAA >250m	Outside CRAA 0-20m	Outside CRAA 21-150m	Outside CRAA 151-200m	Outside CRAA 201-250m	Outside CRAA >250m
18/5/2018	1	1255	White-tailed eagle	1	134	0	0	0	0	0	0	134	0	0	0
18/5/2018	4	1330	White-tailed eagle	1	45	0	12.68361	0	0	0	0	32.31639	0	0	0
24/5/2018	5	1143	White-tailed eagle	1	156	0	0	0	0	0	0	78	15.6	62.4	0
24/5/2018	5	1215	White-tailed eagle	1	647	0	0	0	0	0	90.27907	391.2093	165.5116	0	0
17/6/2018	4	106	White-tailed eagle	1	161	0	80.81456	53.87637	0	0	0	15.78544	10.52363	0	0
17/6/2018	4	1437	White-tailed eagle	1	88	42.50368	28.33579	0	0	0	10.29632	6.86421	0	0	0
16/7/2018	5	1008	White-tailed eagle	1	289	0	58.51959	10.97242	0	0	0	184.8488	34.65916	0	0
20/8/2018	1	1358	White-tailed eagle	1	966	0	0	0	0	0	0	347.1563	75.46875	105.6563	437.7188
22/8/2018	5	1159	White-tailed eagle	1	5	0	0	0	0	0	5	0	0	0	0
23/8/2018	3	1335	White-tailed eagle	1	511	18.9921	73.25523	0	0	0	86.21379	332.5389	0	0	0
23/8/2018	3	1335	White-tailed eagle	1	524	13.08405	50.46705	0	0	0	94.7983	365.6506	0	0	0
3/9/2018	1	1543	White-tailed eagle	1	371	0	0	0	0	0	30.91667	340.0833	0	0	0
3/9/2018	2	1545	White-tailed eagle	1	1204	0	33.38238	26.35451	10.5418	0	0	538.5176	425.1455	170.0582	0
3/9/2018	4	1022	White-tailed eagle	1	668	0	0	0	0	0	0	425.0909	242.9091	0	0
4/9/2018	5	1021	White-tailed eagle	1	69	0	0	0	0	0	0	69	0	0	0
4/9/2018	5	1047	White-tailed eagle	1	710	0	0	0	0	0	0	634.4681	60.42553	15.10638	0
4/9/2018	5	1153	White-tailed eagle	1	41	0	0	0	0	0	41	0	0	0	0
5/9/2018	5	1543	White-tailed eagle	1	153	0	0	0	0	0	30.6	122.4	0	0	0
1/10/2018	1	1202	White-tailed eagle	1	62	0	0	0	0	0	62	0	0	0	0
2/10/2018	5	1006	White-tailed eagle	1	63	0	0	0	0	0	0	63	0	0	0
3/10/2018	4	1415	White-tailed eagle	1	144	16	128	0	0	0	0	0	0	0	0
3/10/2018	4	1415	White-tailed eagle	1	144	16	128	0	0	0	0	0	0	0	0
4/10/2018	1	1457	White-tailed eagle	1	251	0	0	0	0	0	0	251	0	0	0
6/11/2018	1	1002	White-tailed eagle	1	169	0	0	0	0	0	0	169	0	0	0
6/11/2018	3	959	White-tailed eagle	1	25	0	0	0	0	0	0	25	0	0	0
8/11/2018	5	1041	White-tailed eagle	1	425	0	0	0	0	0	0	0	136.6071	121.4286	166.9643
8/11/2018	5	1205	White-tailed eagle	1	116	0	0	0	0	0	0	33.14286	82.85714	0	0
9/11/2018	3	905	White-tailed eagle	1	256	0	0	103.6394	56.53056	0	0	0	62.00771	33.82239	0
9/11/2018	3	935	White-tailed eagle	1	227	0	81.12536	69.53602	23.17867	0	0	24.80798	21.26398	7.087994	0
9/11/2018	3	1012	White-tailed eagle	1	216	0	77.04783	12.84131	25.68261	64.20653	0	15.5236	2.587266	5.174533	12.93633
9/11/2018	3	1038	White-tailed eagle	1	189	0	0	137.5543	0	0	0	0	51.44572	0	0
9/11/2018	3	1038	White-tailed eagle	1	120	0	0	96.86233	0	0	0	0	23.13767	0	0
4/12/2018	4	1448	White-tailed eagle	1	53	0	25.53781	0	0	0	0	27.46219	0	0	0
5/12/2018	5	1020	White-tailed eagle	1	152	0	57.9893	0	0	0	0	94.0107	0	0	0
6/12/2018	1	1548	White-tailed eagle	1	129	0	0	0	0	0	0	129	0	0	0
6/12/2018	3	1229	White-tailed eagle	1	22	22	0	0	0	0	0	0	0	0	0
9/1/2019	5	1116	White-tailed eagle	1	272	0	0	0	0	0	0	166.2222	105.7778	0	0
11/1/2019	3	951	White-tailed eagle	1	74	0	0	0	0	0	74	0	0	0	0
11/1/2019	3	1430	White-tailed eagle	1	38	0	1.474763	0	0	0	0	36.52524	0	0	0
11/1/2019	5	1114	White-tailed eagle	1	197	0	19.28438	9.642188	12.85625	0	0	71.6387	35.81935	47.75913	0
11/1/2019	5	1200	White-tailed eagle	1	351	0	0	0	0	0	228.913	122.087	0	0	0
5/2/2019	5	1016	White-tailed eagle	1	413	0	0	0	0	0	0	367.1111	45.88889	0	0

Date	VP	Flight Start Time	Species	Number of Birds	Duration (sec)	Inside CRAA 0-20m	Inside CRAA 21-150m	Inside CRAA 151-200m	Inside CRAA 201-250m	Inside CRAA >250m	Outside CRAA 0-20m	Outside CRAA 21-150m	Outside CRAA 151-200m	Outside CRAA 201-250m	Outside CRAA >250m
6/2/2019	5	1206	White-tailed eagle	1	60	15	45	0	0	0	0	0	0	0	0
6/2/2019	5	1208	White-tailed eagle	1	387	10.40175	119.6201	0	0	0	20.55825	236.4199	0	0	0
7/2/2019	1	1013	White-tailed eagle	1	131	0	0	0	0	0	0	114.625	16.375	0	0
7/2/2019	1	1039	White-tailed eagle	1	3	0	0	0	0	0	3	0	0	0	0
7/2/2019	1	1045	White-tailed eagle	1	150	0	0	0	0	0	105	45	0	0	0
7/2/2019	1	1052	White-tailed eagle	1	61	0	0	0	0	0	30.5	30.5	0	0	0
7/2/2019	1	1103	White-tailed eagle	1	301	0	0	0	0	0	15.05	285.95	0	0	0
7/2/2019	1	1105	White-tailed eagle	1	3	0	0	0	0	0	3	0	0	0	0
7/2/2019	1	1115	White-tailed eagle	1	150	0	0	0	0	0	0	150	0	0	0
7/2/2019	1	1430	White-tailed eagle	1	35	0	0	0	0	0	0	35	0	0	0
7/2/2019	2	944	White-tailed eagle	1	68	0	0	0	0	0	0	68	0	0	0
7/2/2019	4	1413	White-tailed eagle	1	19	19	0	0	0	0	0	0	0	0	0
7/2/2019	4	1525	White-tailed eagle	1	76	0	0	0	0	0	0	76	0	0	0
11/3/2019	1	1441	White-tailed eagle	1	378	0	0	0	0	0	0	378	0	0	0
11/3/2019	1	1444	White-tailed eagle	1	201	0	0	0	0	0	0	201	0	0	0
11/3/2019	1	1619	White-tailed eagle	1	458	0	0	0	0	0	30.53333	427.4667	0	0	0
11/3/2019	4	913	White-tailed eagle	1	115	10.49597	62.97581	0	0	0	5.932604	35.59562	0	0	0
11/3/2019	4	1016	White-tailed eagle	2	600	0	0	0	0	0	0	600	0	0	0
11/3/2019	5	1429	White-tailed eagle	1	209	0	12.63165	20.21065	0	0	0	67.75296	108.4047	0	0
11/3/2019	5	1433	White-tailed eagle	1	558	2.466024	81.3788	7.398073	0	0	12.61506	416.2969	37.84517	0	0
11/3/2019	5	1448	White-tailed eagle	1	418	0	0	0	0	0	15.48148	263.1852	92.88889	46.44444	0
11/3/2019	5	1508	White-tailed eagle	1	12	0	0	0	0	0	0	12	0	0	0
12/3/2019	2	1029	White-tailed eagle	1	157	0	0	0	0	0	47.1	109.9	0	0	0
7/3/2018	3	1719	Whooper swan	11	19	0	0	0	0	0	19	0	0	0	0
9/4/2018	3	1108	Whooper swan	12	83	0	0	0	0	0	0	66.4	16.6	0	0
4/12/2018	1	1023	Whooper swan	2	300	0	0	0	0	0	0	300	0	0	0
4/12/2018	2	1021	Whooper swan	2	44	0	0	0	0	0	0	44	0	0	0

ANNEX E. FOCAL (DIVER) VANTAGE POINT EFFORT 2018

Date	Start Time	End Time	Duration	Observer	Comments	PLA_ID	Easting	Northing
24/04/2018	1020	1320	3.00	AR	No flights but BV pair on loch	FVP1	31279	15953
24/04/2018	1410	1710	3.00	AR		FVP2	32880	14934
28/04/2018	1310	1610	3.00	AR		FVP3	32322	13668
28/04/2018	1650	1950	3.00	AR		FVP4	34191	13690
29/05/2018	1008	1308	3.00	AR		FVP1	31279	15953
29/05/2018	0639	0939	3.00	AR		FVP2	32880	14934
12/05/2018	1015	1315	3.00	AR		FVP2	32880	14934
12/05/2018	1332	1632	3.00	AR		FVP3	32322	13668
01/05/2018	0750	1050	3.00	AR		FVP1	31279	15953
02/05/2018	0810	1110	3.00	AR		FVP2	32880	14934
21/06/2018	0600	0900	3.00	AR		FVP2	32880	14934
28/06/2018	0625	0925	3.00	AR		FVP2	32880	14934
28/06/2018	0930	1230	3.00	AR		FVP2	32880	14934
30/06/2018	1755	2055	3.00	AR		FVP2	32880	14934
30/06/2018	1427	1727	3.00	AR	No Divers seen. Checked scrape Broken eggshell present	FVP3	32322	13668
21/06/2018	0927	1227	3.00	AR	No Divers seen.	FVP3	32322	13668
02/07/2018	0830	1130	3.00	AR		FVP2	32880	14934
05/07/2018	1830	2130	3.00	AR		FVP2	32880	14934

ANNEX F. MOORLAND BIRD SURVEY EFFORT 2018

Survey conditions = a subjective assessment of the survey conditions. E - excellent, G - good, M - moderate, P - poor.

Date	Start Time	End Time	Duration	Observer	Cloud 10ths	Cloud base (m)	Wind Direction	Wind Force	Precipitation	Visibility (km)	Survey Conditions	Comments
13/04/2018	0715	1315	6.00	RAS	9	500	SE	3	nil	5	G	Visit 1
14/04/2018	0730	1400	6.50	RAS	8	500	S	4	nil	5	G	Visit 1
15/04/2018	0730	1200	4.50	RAS	4	600	SE	1	nil	5	E	Visit 1
15/04/2018	0730	1210	4.67	DJC	4	600	SE	1	nil	6	E	Visit 1
16/04/2018	0915	1345	4.50	DJC	10	400	S	6	ILR	5	M	Visit 1
16/04/2018	1730	1845	1.25	DJC	9	600	S	6	nil	6	M	Visit 1
16/04/2018	0915	1815	9.00	RAS	10	300	S	4	CLR	2	P	Visit 1
14/05/2018	0700	1345	6.75	DJC	9	400	S	5	ILR	3	M	Visit 2
14/05/2018	0700	1345	6.75	RAS	9	300	S	5	ILR	3	M	Visit 2
16/05/2018	0915	1315	4.00	DJC	6	700	WNW	4	nil	6	G	Visit 2
16/05/2018	1655	1740	0.75	DJC	8	600	WNW	3	nil	6	G	Visit 2
16/05/2018	0915	1400	4.75	RAS	5	600	WNW	3	nil	5	G	Visit 2
16/05/2018	1545	1645	1.00	RAS	6	600	WNW	3	nil	5	G	Visit 2
17/05/2018	0700	1200	5.00	RAS	8	700	SE	2	nil	5	E	Visit 2
17/05/2018	0700	0815	1.25	DJC	0	9999	nil	0	nil	6	E	Visit 2
19/05/2018	0745	1115	3.50	RAS	6	600	S	5	nil	5	M	Visit 2
19/05/2018	0730	1140	4.17	DJC	10	700	S	5	nil	6	M	Visit 2
12/06/2018	0745	1400	6.25	DJC	10	600	WNW	4	nil	6	G	Visit 3
12/06/2018	0800	1415	6.25	BU	10	800	NW	1	nil	15	E	Visit 3
13/06/2018	0740	1045	3.08	DJC	10	700	S	4	ILR	6	M	Visit 3
13/06/2018	0750	1050	3.00	BU	10	800	S	3	ILR	10	G	Visit 3
15/06/2018	0720	1226	5.10	DJC	5	600	W	4	ILR	6	M	Visit 3
17/06/2018	0750	1245	4.92	DJC	10	500	S	5	ILR	3	M	Visit 3
18/06/2018	0740	1403	6.38	DJC	8	500	SW	7	IHR	3	P	Visit 3
20/06/2018	0900	1400	5.00	DJC	5	700	W	4	ILR	6	M	Visit 3

ANNEX G. SCARCE BREEDING BIRD SURVEY EFFORT 2018

Survey conditions = a subjective assessment of the survey conditions. E - excellent, G - good, M - moderate, P - poor.

Species: EA = golden eagle, WE = white-tailed eagle, BV = black-throated diver, RH = red-throated diver, ML = merlin, PE = peregrine

Date	Start Time	End Time	Duration	Observer	Cloud 10ths	Cloud base (m)	Wind Direction	Wind Force	Precipitation	Visibility (km)	Survey Conditions	Targ_Spp
11/02/2018	0845	1645	8.00	RAS	8	500	W	3	IHS	3	M	EA WE
11/02/2018	0900	1700	8.00	BU	7	800	SW	3	ILS	10	G	EA WE
14/02/2018	1350	1700	3.17	BU	10	600	SW	4	IHR	10	G	EA WE
15/02/2018	1450	1700	2.17	RAS	10	800	SW	4	ILR	15	M	EA WE
06/03/2018	0915	1300	3.75	DJC	10	600	NE	4	nil	6	G	EA WE
06/03/2018	1300	1715	4.25	BU	10	600	NE	5	ILS	2	P	EA WE
06/03/2018	0915	1300	3.75	BU	10	600	ENE	4	ILS	15	G	EA WE
07/03/2018	1325	1625	3.00	DJC	4	700	NE	3	nil	6	G	EA WE
07/03/2018	1640	1810	1.50	BU	8	1000	S	1	nil	20	E	EA WE
08/03/2018	1200	1345	1.75	BU	7	1000	S	2	nil	20	E	EA WE
09/03/2018	0815	1630	8.25	BU	0	9999	S	1	nil	20	E	EA WE
09/03/2018	0815	0955	1.67	DJC	0	9999	S	1	nil	10	E	EA WE
09/03/2018	1055	1645	5.83	DJC	3	700	S	3	ILR	10	E	EA WE
11/03/2018	0900	1715	8.25	DJC	10	300	S	2	ILR	6	M	EA WE BV RH
09/04/2018	0830	0950	1.33	DJC	10	500	S	3	nil	6	G	EA WE
09/04/2018	1250	1355	1.08	DJC	6	600	S	4	nil	6	G	EA WE
09/04/2018	1655	1750	0.92	DJC	10	700	NE	4	nil	6	M	EA WE
10/04/2018	0835	0955	1.33	DJC	4	500	SE	2	nil	6	G	WE EA RH BV
11/04/2018	1225	1653	4.47	DJC	10	500	ENE	3	nil	6	G	EA WE
12/04/2018	1250	1735	4.75	DJC								EA WE
13/04/2018	1615	1715	1.00	RAS	9	600	S	3	nil	5	G	EA WE ML
14/04/2018	1055	1310	2.25	DJC	4	600	S	4	nil	4	G	RH WE ML EA BV
14/04/2018	1715	1740	0.42	DJC								RH WE ML EA BV
18/04/2018	0730	1530	8.00	RAS	6	500	S	7	nil	5	M	EA WE ML HH
18/04/2018	0730	1615	8.75	DJC	9	500	SSE	7	nil	6	M	ML EA WE RH BV PE
19/04/2018	0730	1800	10.50	RAS	6	500	SSW	4	nil	5	G	EA WE ML HH RH BV

Date	Start Time	End Time	Duration	Observer	Cloud 10ths	Cloud base (m)	Wind Direction	Wind Force	Precipitation	Visibility (km)	Survey Conditions	Targ_Spp
19/04/2018	0725	1720	9.92	DJC	5	700	SSW	5	nil	6	G	EA WE ML BV RH PE
15/04/2018	1055	1745	6.83	AR	7	800	SE	1	nil	7	G	BV RH
15/04/2018	1800	1830	0.50	AR	5	800	SE	2	nil	10	G	BV RH
21/04/2018	0902	1501	5.98	AR	10	300	SW	5	nil	4	M	BV RH
21/04/2018	1511	1621	1.17	AR	8	900	SW	5	nil	10	M	BV RH
16/05/2018	1400	1545	1.75	RAS	6	600	WNW	3	nil	5	G	ML
16/05/2018	1700	1800	1.00	RAS	5	600	WNW	3	nil	5	G	ML
17/05/2018	1200	1700	5.00	RAS	5	700	S	3	nil	5	E	EA ML
17/05/2018	1245	1700	4.25	DJC	8	700	SW	3	nil	6	G	ML EA RH BV WE
18/05/2018	1545	1730	1.75	DJC	10	300	S	6	nil	2	M	WE ES RH BV
19/05/2018	1515	1630	1.25	RAS	10	700	S	8	nil	6	M	WE EA BV
22/05/2018	1150	1705	5.25	RAS	7	600	NE	4	nil	5	G	WE EA ML
22/05/2018	1200	1700	5.00	DJC	4	700	NE	4	nil	6	G	WE EA ML
23/05/2018	0830	2000	11.50	DJC	4	700	S	2	nil	6	E	WE EA ML
24/05/2018	0915	1600	6.75	DJC	0	9999	S	3	nil	6	G	WE EA ML
24/05/2018	0622	1250	6.47	AR	0	9999	SW	2	nil	20	E	BV RH
24/05/2018	1301	1457	1.93	AR	0	9999	SW	4	nil	10	E	BV RH
28/05/2018	0832	1543	7.18	AR	1	1000	ENE	1	nil	20	E	BV RH
19/06/2018	1250	1515	2.42	DJC	9	700	SW	6	nil	6	M	ML EA WE
21/06/2018	0830	1415	5.75	DJC	3	700	NW	6	nil	6	M	ML EA WE
16/07/2018	0630	0730	1.00	AM	5	3000	SW	3	IHR	15	VG	ML
16/07/2018	1050	1750	7.00	AM								EA
16/07/2018	0930	1045	1.25	DJC	6	600	WSW	4	nil	6	G	ML
18/07/2018	0800	1555	7.92	DJC	9	600	SW	2	nil	6	G	EA RH BV WE
19/07/2018	1255	1645	3.83	DJC	10	600	SSW	6	ILR	4	M	RH BV
20/07/2018	0930	1330	4.00	DJC	10	200	N	2	CLR	1	P	WE EA BV RH
10/02/2019	0830	1530	7.00	BU	10	800	W	3	ILR	15	G	WE EA
08/02/2019	0900	1645	7.75	DJC	10	300	SE	7	nil	1	P	EA WE
09/02/2019	0845	1530	6.75	DJC	10	600	W	9	IHR	3	P	EA WE
09/02/2019	0845	1530	6.75	BU	10	600	W	9	IHR	3	P	EA WE
06/03/2019	1225	1625	4.00	BU	10	800	NE	5	ILR	15	G	EA WE
06/03/2019	1215	1515	3.00	RAS	10	500	ENE	5	ILR	5	G	WE EA

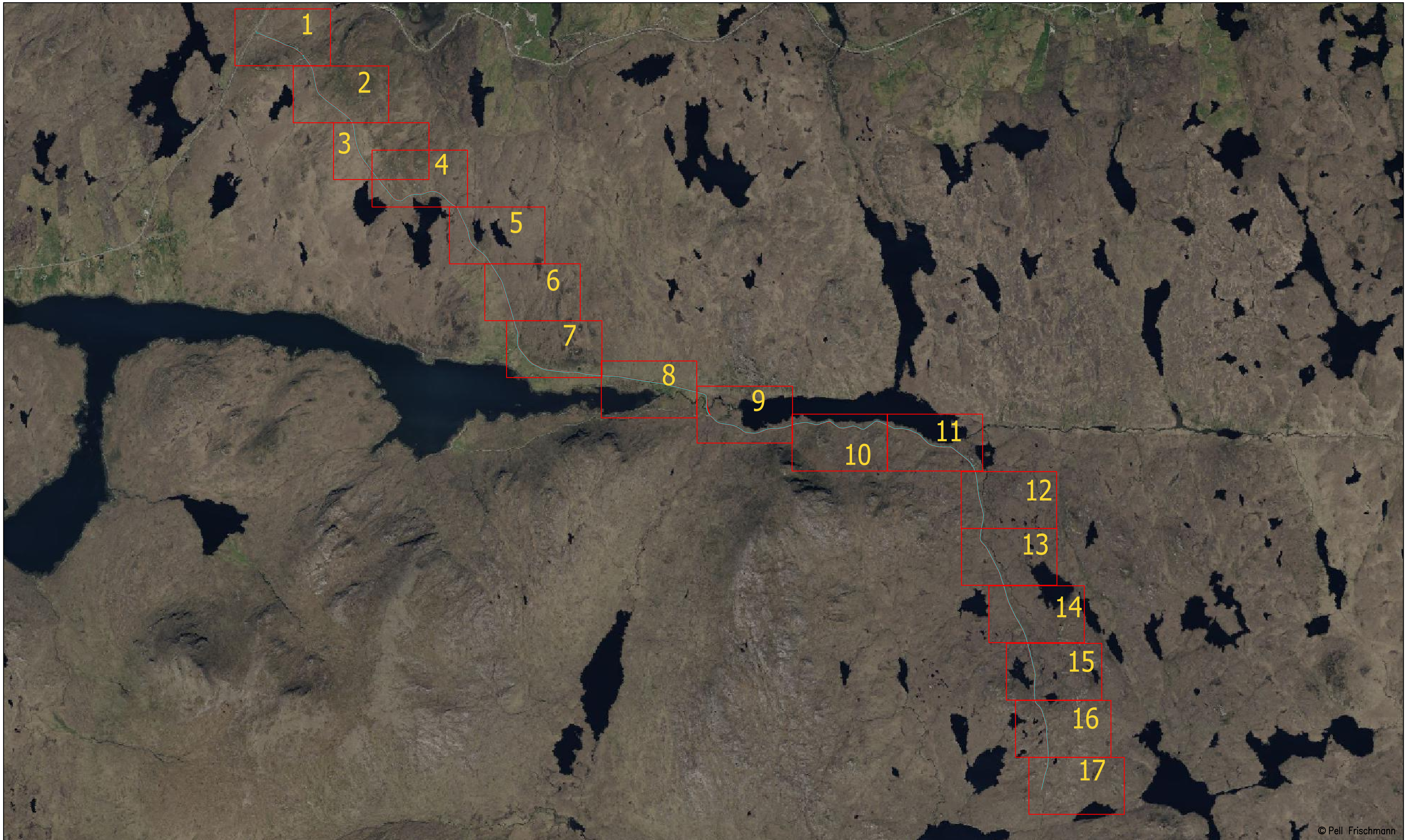
Date	Start Time	End Time	Duration	Observer	Cloud 10ths	Cloud base (m)	Wind Direction	Wind Force	Precipitation	Visibility (km)	Survey Conditions	Targ_Spp
07/03/2019	1215	1715	5.00	RAS	5	600	N	5	IHR	5	G	EA WE
08/03/2019	0900	1000	1.00	BU	10	500	NE	2	CHR	5	P	EA WE
08/03/2019	1325	1625	3.00	BU	10	600	NE	4	CHR	5	P	EA WE
09/03/2019	1145	1345	2.00	RAS	5	700	W	6	nil	5	G	EA WE
09/03/2019	1545	1745	2.00	RAS	7	600	W	6	IHH	4	M	EA WE
09/03/2019	1305	1715	4.17	BU	8	800	W	6	IHS	15	G	EA WE
11/03/2019	1200	1300	1.00	BU	6	1000	SW	5	nil	20	E	EA WE
11/03/2019	1530	1730	2.00	BU	7	1000	SW	5	ILR	20	E	EA WE
11/03/2019	1100	1400	3.00	RAS	7	600	WSW	5	nil	5	G	EA WE
12/03/2019	0800	1300	5.00	RAS	5	600	S	8	IHR	4	P	EA WE

ANNEX H. WINTER WALKED TRANSECT SURVEY EFFORT 2017-18 AND 2018-19

Date	Start Time	End Time	Duration	Observer	Cloud 10ths	Cloud base (m)	Wind Direction	Wind Force	Precipitation	Visibility (km)	Survey Conditions
05/09/2017	0845	0925	0.67	DJC	7	600	SSW	5	IHR	6	M
05/09/2017	1225	1300	0.58	DJC	7	600	SSW	5	IHR	6	M
05/09/2017	1330	1350	0.33	DJC	7	600	SSW	5	IHR	6	M
05/09/2017	1650	1735	0.75	DJC	7	600	SSW	5	IHR	6	M
05/09/2017	0840	0915	0.58	BU	5	800	SW	2	nil	15	E
05/09/2017	1220	1245	0.42	BU	7	800	SW	3	ILR	15	G
05/09/2017	1320	1400	0.67	BU	7	800	SW	4	nil	15	E
06/09/2017	0835	0955	1.33	DJC	10	500	W	3	ILR	3	G
06/09/2017	1255	1430	1.58	DJC	9	500	SW	5	IHR	4	G
06/09/2017	1250	1400	1.17	BU	9	800	SW	3	nil	15	G
06/09/2017	1710	1805	0.92	BU	7	800	SW	4	ILR	15	G
07/09/2017	0905	1300	3.92	BU	10	800	SSW	2	ILR	20	G
07/09/2017	1610	1800	1.83	BU	7	800	W	3	nil	15	G
07/09/2017	0905	1005	1.00	DJC	10	500	WSW	3	ILR	4	G
07/09/2017	1305	1800	4.92	DJC	10	400	SW	5	CHR	2	P
08/09/2017	0910	1145	2.58	DJC	10	500	W	3	IHR	4	G
18/10/2017	0835	0930	0.92	DJC	1	1000	ENE	3	nil	6	E
18/10/2017	1245	1705	4.33	DJC	9	1000	ENE	4	nil	6	G
18/10/2017	1250	1330	0.67	BU	10	800	SSE	3	nil	20	E
19/10/2017	0820	0840	0.33	DJC	10	1000	E	3	nil	6	G
19/10/2017	1140	1230	0.83	DJC	10	800	E	4	nil	6	G
19/10/2017	1530	1655	1.42	DJC	10	800	SE	4	nil	6	M
19/10/2017	0850	0930	0.67	BU	10	800	SE	2	nil	15	E
19/10/2017	1235	1535	3.00	BU	10	1000	SE	2	nil	20	E
20/10/2017	1010	1035	0.42	BU	10	400	NE	3	nil	10	G
14/11/2017	0900	1000	1.00	BU	8	1000	W	4	nil	20	E
14/11/2017	1215	1615	4.00	RAS	9	500	WSW	5	IHR	5	G
15/11/2017	1410	1510	1.00	RAS	10	300	S	5	CHR	2	M
15/11/2017	1130	1415	2.75	BU	10	1000	S	1	nil	20	E
16/11/2017	0900	0930	0.50	BU	6	800	W	5	nil	15	G

Date	Start Time	End Time	Duration	Observer	Cloud 10ths	Cloud base (m)	Wind Direction	Wind Force	Precipitation	Visibility (km)	Survey Conditions
16/11/2017	1215	1230	0.25	RAS	4	700	W	6	nil	5	G
16/11/2017	1300	1330	0.50	RAS	6	600	W	6	IHR	5	G
16/11/2017	1610	1620	0.17	RAS	6	500	W	6	ILR	4	G
12/12/2017	1215	1330	1.25	DJC	7	600	SSW	3	nil	3	M
14/12/2017	1140	1150	0.17	DJC	8	600	NW	4	ILR	3	G
14/12/2017	1505	1610	1.08	DJC	10	600	NW	5	nil	3	M
14/12/2017	1145	1430	2.75	RAS	10	500	N	4	IHS	5	G
16/01/2018	0945	1015	0.50	BU	8	600	W	4	ILS	15	G
16/01/2018	1215	1245	0.50	BU	8	600	W	5	IHS	10	G
16/01/2018	1255	1325	0.50	BU	7	600	W	5	nil	20	G
16/01/2018	1525	1555	0.50	BU	7	600	W	5	IHS	10	G
17/01/2018	0930	1030	1.00	BU	7	600	W	4	ILS	15	G
17/01/2018	1230	1430	2.00	BU	9	600	W	4	ILS	15	G
18/01/2018	0915	1015	1.00	BU	3	800	WNW	3	nil	20	E
18/01/2018	0925	1015	0.83	DJC	6	700	W	3	nil	6	G
18/01/2018	1215	1520	3.08	DJC	4	500	W	5	ILS	6	G
12/02/2018	0910	1020	1.17	BU	8	600	SSW	4	nil	15	G
12/02/2018	1250	1330	0.67	BU							
12/02/2018	0945	1030	0.75	RAS	9	500	W	4	CLS	4	M
12/02/2018	1300	1600	3.00	RAS	7	500	SSW	4	ILS	5	G
13/02/2018	1230	1530	3.00	BU							
15/02/2018	0920	0945	0.42	BU	10	600	SW	4	IHR	6	P
07/03/2018	0858	0955	0.95	DJC	10	700	NE	3	nil	6	G
07/03/2018	1310	1510	2.00	BU	6	1000	SE	2	nil	20	E
08/03/2018	0900	0930	0.50	BU	10	800	S	1	CLF	8	M
08/03/2018	1255	1450	1.92	DJC	6	500	SE	3	nil	6	G
10/03/2018	0910	0940	0.50	BU	5	1000	ENE	3	nil	20	E
10/03/2018	1700	1730	0.50	BU	10	600	ENE	5	CLR	15	M
04/09/2018	1500	1725	2.42	DJC	10	300	SW	5	ILR	1	G
05/09/2018	1000	1245	2.75	RAS	10	300	SW	5	ILR	3	P
05/09/2018	1545	1830	2.75	RAS	8	600	W	5	nil	5	G
02/10/2018	0815	0915	1.00	DJC	8	600	W	7	nil	3	M

Date	Start Time	End Time	Duration	Observer	Cloud 10ths	Cloud base (m)	Wind Direction	Wind Force	Precipitation	Visibility (km)	Survey Conditions
02/10/2018	1315	1715	4.00	RAS	8	600	WNW	6	ILR	5	G
03/10/2018	1715	1815	1.00	RAS	10	200	SW	6	CLR	1	M
04/10/2018	1520	1720	2.00	DJC	5	600	W	5	nil	6	G
06/11/2018	0845	0955	1.17	BU	10	800	SE	4	nil	10	G
06/11/2018	0910	0935	0.42	AA	10	700	SE	4	nil	10	G
06/11/2018	1120	1145	0.42	AA	10	700	SE	4	nil	10	G
08/11/2018	0940	1005	0.42	AA	9	700	S	4	nil	10	G
08/11/2018	1235	1330	0.92	AA	9	700	S	4	nil	10	G
09/11/2018	0810	0850	0.67	AA	10	600	SE	5	nil	10	G
09/11/2018	1120	1145	0.42	AA	10	600	SE	6	CLR	5	G
07/11/2018	1245	1530	2.75	BU	10	600	ESE	3	IHR	10	G
08/11/2018	0830	0915	0.75	BU	8	800	S	3	nil	15	G
04/12/2018	0850	0920	0.50	RAS	3	600	nil	0	nil	5	E
04/12/2018	1225	1255	0.50	RAS	7	500	NW	3	ILR	4	G
04/12/2018	1135	1235	1.00	AA	3	800	N	3	nil	10	E
04/12/2018	1445	1545	1.00	AA	6	800	N	3	nil	10	E
05/12/2018	1200	1400	2.00	RAS	7	900	ESE	3	nil	5	E
11/01/2019	1455	1525	0.50	DJC	8	600	SW	4	nil	4	G
12/01/2019	1130	1500	3.50	DJC	10	300	W	7	ILR	2	M
07/02/2019	0845	0910	0.42	BU	2	800	SW	1	nil	20	E
07/02/2019	1110	1215	1.08	BU	8	800	SW	3	nil	15	G
07/02/2019	1145	1300	1.25	DJC	8	500	SSE	4	ILR	3	M
06/03/2019	0855	0925	0.50	BU	10	800	NE	5	nil	15	G
07/03/2019	0830	0915	0.75	RAS	10	500	NNE	5	ILR	3	M
07/03/2019	1715	1800	0.75	RAS	4	600	N	3	nil	5	G
09/03/2019	0900	1000	1.00	BU	6	800	W	4	ILS	20	E
11/03/2019	0900	1000	1.00	BU	5	1000	SW	5	nil	20	E



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Client: Eurowind

Key: Wheel SPA, Body SPA, Load SPA, Indicative, Over-run, Over-sail

Project: Uisenis Wind Farm

Drawing Title: Proposed Road Widening

SPA Location: Eisgean Road – Section Plan

	Name	Date
Drawn	GB	09/02/2024
Designed	CN	09/02/2024
Checked	SMcG	09/02/2024
Point of Interest		1

Scale: 1:2000 @ A3

File No.: Uisenis widening.dwg

Drawing Status: Draft

Drawing No.: SK01

Notes:
1. All mitigation is subject to confirmation through a test run.
2. This is not a construction drawing and is intended for illustration purposes only.

Revision: 00