

7.0 SOILS AND GEOLOGY

7.1 INTRODUCTION

This chapter of the EIS consists of an assessment of the potential impacts of the proposed development on soils and geology. Provided in this chapter is a description of the existing soils and geology environment and a statement of the likely significant soils and geology impacts associated with both the construction and operational phases of the proposed development. Measures to mitigate the likely significant impacts of the proposed development are proposed, and residual impacts described.

7.2 METHODOLOGY

7.2.1 Baseline

The chapter has been prepared in accordance with the following guidelines:

- Environmental Protection Agency (EPA) Guidelines on the Information to be Contained in Environmental Impact Statements (2002);
- Environmental Protection Agency, (EPA) Advice Notes on Current Practice in the Preparation of Environmental Impact Statements (EPA, 2003);
- Institute of Geologists of Ireland (IGI) Geology in Environmental Impact Statements – A Guide (2002).

Consultees contacted for the purposes of the soils and geology study were:

- Geological Survey of Ireland (GSI);
- Department of Environment, Heritage & Local Government (DoEHLG);
- Environmental Protection Agency (EPA);
- Offaly County Council.

Consultation was also undertaken with other specialists in order to assess the impact of the interaction with other environmental factors. This included consultation with the hydrogeology and hydrology specialist in relation to the risk to water quality, and the human beings specialist in relation to the risk to human health from contaminated land.

7.2.1.1 Study Area and Baseline Data Collection

A desk study was undertaken of the proposed development site and its surroundings, within a radius of approximately 5km. Information on the regional geology for the desk study was sourced primarily from the GSI bedrock and subsoil datasets.

The brownfield nature of the site required that a preliminary contamination assessment was undertaken. This comprised a site walkover survey and review of previous contamination assessment reports.

The following is a list of the sources of information used for the soil and geology assessment.

- GSI bedrock (Geology of Galway – Offaly Sheet No. 15) and Teagasc subsoil mapping;
- Environmental Protection Agency (EPA) – National Groundwater Monitoring Programme;
- Offaly County Council – Water Services Section;
- ESB Exit Audit Reports: Phase 1 (July 2003) and Phase 2 (May 2005);
- URS Ireland Site Assessment (June 2005) and Exit Audit Summary Reports (June 2005 & April 2008) Letter Report (April 2008);
- Feedback from consultations with statutory consultees, interested organisations and affected third parties.

This information was used to describe and evaluate the soils and geology environment at the proposed development site and in its vicinity and to identify and categorise the likely significant impacts of the proposed development on this environment.

7.2.2 Impact Assessment

The potential impacts of the proposed development on soils and geology were assessed as per the criteria for impact assessment provided in "*Guidelines on the Information to be Contained in Environmental Impact Statements*" (EPA 2002). The impacts are described by identifying three key aspects as follows:

- Beneficial, adverse or neutral – The impacts were assessed as being beneficial, adverse or neutral.
- Impact Magnitude – The magnitude of each impact was considered as being Negligible, Slight, Moderate or Significant in the case of negative impacts. The magnitude was considered as being minor, moderate or major in the case of

beneficial impacts. The criteria for determining the magnitude of the impacts is summarised in Table 7.1 below.

Table 7.1 Criteria for Assessing Impact Magnitude

Impact Magnitude	Criteria
Significant Adverse	Results in loss of attribute
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute
Slight Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity
Minor Beneficial	Results in minor improvement of attribute quality
Moderate Beneficial	Results in moderate improvement of attribute quality
Major Beneficial	Results in major improvement of attribute quality

- Duration – The duration of each impact was considered to be either temporary, short-term, medium term, long-term or a permanent impact. Temporary impacts are considered to be those which are construction related and last less than one year. Short term impacts were seen as impacts lasting one to seven years. Medium-term impacts are impacts lasting seven to fifteen years. Long-term impacts are impacts lasting fifteen to sixty years and permanent impacts are impacts lasting over sixty years.

Where a significant impact is anticipated, mitigation measures are proposed to minimise the effect of the impact.

7.3 RECEIVING ENVIRONMENT

The following section provides an overview of the regional geological environment. Further detail is provided for the proposed development site. Bedrock geology, subsoils and geological features of importance such as karst features and geological heritage areas are documented.

7.3.1 Bedrock & Structural Geology

7.3.1.1 Regional Bedrock Geology

The area is dominated by northeast-southwest trending anticlines with a core of Old Red Sandstone facies succeeded by Courceyan limestone and shale, with synclines comprising younger sequences of Waulsortian and Visean basinal limestones. The Ferbane inlier, a large anticlinal fold orientated NE-SW is located to the north of the proposed development site with Old Red Sandstone at its core while the Slieve Bloom inlier lies to the south.

The Ferbane fault, a major northeast–southwest trending fault defines the northern margin of the Ferbane inlier. During the Variscan Orogeny horizontal northwest compression caused reverse movement of this fault and produced dextral transpression. The Knockshigowna Fault, also major northeast–southwest trending fault lies north of the Slieve Bloom inlier.

A map of regional bedrock and structural geology is shown in Figure 7.1.

7.3.1.2 Local Bedrock Geology

The proposed development site is underlain by Waulsortian Limestones (WA). These are described as pale grey, sparry, fossiliferous (bryozoan), poly-mud micritic limestones, often massive knoll forms, with crinoidal or pale cherty shaly interbeds and frequently dolomitised.

Information from borehole logs compiled during site investigations describe bedrock at the proposed development site as grey to brown thickly bedded, fine to medium grained, fractured limestone.

7.3.2 Karstification

The Waulsortian limestone is prone to karstification due to the calcium carbonate content of the limestone. Karstification results from dissolution of limestone by percolating rainwater that finds its ways down through cracks, joints or discontinuities in the bedrock.

There are no recorded karst features at the site of the proposed development and the immediate surroundings. The nearest mapped karst features are two springs at Kilcormac, approximately 6.2km and 6.9km to the south respectively. A further spring is located 7.2km to the southwest of the proposed development site and south of Cloghan village. No karst features were observed at the proposed development site or within a 1km radius of it during site visits in 2009.

7.3.3 Subsoils

7.3.3.1 Regional Subsoils

Regionally the area is dominated by cutover peat bogs with areas of till derived chiefly from limestone and areas of alluvium associated with the Silver River which lies to the east of the site. Glaciofluvial sands and gravels are found approximately 4.5km north of the site at Ferbane and 6.0km south of the site at Fivealley. Teagasc subsoil maps indicate the proposed development site is underlain by made ground.

A map of the subsoil geology for the area (as mapped by Teagasc) is shown in Figure 7.2.

7.3.3.2 Local Subsoils

Site specific information for subsoils was obtained from site investigations undertaken in 1997 and 2004 at the site of the former ESB plant works. The proposed development area comprises only 11 acres of the former ESB site which comprised 48 acres in total. Therefore, the following information refers not only to the proposed development site but also to adjacent lands to the south and southeast.

The logs for borehole drilled as part of the 1997 site investigations indicate that subsoils at the site comprise glacial deposits ranging in thickness from 4.0m to 7.4m, with an average thickness of 5.3m. The glacial deposits consist of moderately permeable till overlying moderately to highly permeable gravels. A thin layer of black sandy clay perhaps representing peat ash was encountered in boreholes to the central and east areas of the proposed development site. Limestone bedrock was encountered beneath the glacial and comprised grey and brown fractured thickly bedded fine grained limestone with occasional calcite filled vugs.

Made ground was encountered in all trial pits excavated as part of the 2004 site investigation and comprised hardcore, peat ash and clay or gravel fill.

7.3.4 Contamination Assessment

Environmental exit audits were undertaken by ESB and URS (on behalf of ESB) between 2003 and 2008 for the former ESB owned peat powered station at Lumcloon, Ferbane, Co. Offaly. The report assessments were undertaken on all lands within the boundary of the former ESB owned power site. Lumcloon Energy Ltd. only acquired part (i.e. 11 acres) of the former ESB owned power site and proposes to develop the gas fired powered station on these lands.

A report on Phase 1 of the exit audit process reported that asbestos containing materials (ACM) had been detected in the station dump area (ash field) which is located 450m south east of the proposed development site. Remediation work was undertaken and the ACM removed. The Phase 1 report also indicated that the soils at the site had potentially been impacted by oil or chemical spills in the vicinity of the station site.

Phase 2 assessment works included a site investigation (SI) which was undertaken in 2004 across the full former site. The SI found frequent low-level contamination by a number of metals which was attributed to the presence of peat ash disposed in the ash field south east of the proposed development site. Localised low-level contamination by a number of other metals and phenol was also reported in the shallow soils. This was attributed to materials deposited during station activities or site demolition.

The Phase 2 investigations within the proposed development site found frequent low level contamination by arsenic and vanadium and less frequent low level contamination by cadmium, molybdenum and nickel. The source of the metals is thought to be a result of the presence or influence of peat ash. Localised low level lead, copper, zinc and phenol contamination was also reported which might relate to demolition waste or past station activities. Low level lead contamination was found in the vicinity of the former main station buildings in the north and central areas of the proposed development site. Low level copper and zinc contamination was found in the north and central areas of the site (former main station buildings) and in the southwest of the site (former transformer bays). Low level phenol contamination was found in the north and central areas of the site (former main station buildings) and in a few samples elsewhere on the site.

Low-level hydrocarbon contamination was found in near-surface soils in the location of the former transformer bays. These areas are located in the southwest of the proposed development site. An area of more elevated hydrocarbon contamination was identified in the electrical compound which borders the south west boundary of the proposed site. It was concluded that the hydrocarbon contamination encountered was unlikely to have an impact upon the local environment.

Asbestos-containing material (ACM) was not observed or detected in any of the trial pits or boreholes within the proposed development site or the surrounding areas investigated as part of the Phase 2 works.

A site inspection conducted by URS in February 2008 noted that no suspected ACM was observed during this inspection. Soil samples were taken from two mounded areas within the proposed development site. No asbestos fibres were detected in the samples.

To summarise, contamination of soils at the site comprises low-level metal and phenol contamination. This was assessed to have a low environmental and human health impact. There are limited areas of low level and elevated levels of hydrocarbon contamination in the south west of the proposed development site (former ESB electrical compound). This was assessed to have a low environmental impact. The proposed development site was also determined to be '*asbestos safe*'.

The proposed industrial development of the site will not be affected or restricted by the low-level soil contamination at the site. It was determined as part of the contamination assessment that no remedial action will be required for the proposed development.

7.3.5 Sites of Geological Interest

There are no geological heritage sites at the site of the proposed development. The nearest geological heritage site, Lough Boora, lies approximately 2.8km to the southeast of the proposed development site. This is a site of an early post-glacial lakeshore which has been exposed by drainage and excavation associated with turf cutting. It is listed under the IGH7 Quaternary Theme and IGH14 Fluvial Lacustrine Theme.

7.4 IMPACT ASSESSMENT

The impacts of the proposed development on the soils and geology environment were assessed as per the methodology described in Section 7.1.3 above. Potential impacts that the proposed development can have on the existing soil and geology environment are mainly the following: disturbance of contaminated ground during construction and indirect impacts on surface water and groundwater quality arising from this. These potential impacts are discussed below.

7.4.1 Construction Phase

7.4.1.1 Contaminated Ground

The principal potential impact on soils and geology arises from the disturbance of contaminated soil which will be required during the construction phase. Generally soil contamination across the site was assessed as being low-level and no impact on the environment is anticipated. The extent of the contamination comprised low level metal and phenol contamination and low level hydrocarbon contamination in limited areas. It is not anticipated that these areas will have any impact on the proposed development.

The 2008 Summary Environmental Exit Audit Report (URS 2008) states no evidence of chemical contamination in soil that would limit redevelopment of the subject area for commercial or industrial use. Based on the limited area of deposits and low level nature of the contamination, it is anticipated that there will be a negligible impact to soil quality from disturbance of soils during construction. No soil remediation will be required prior to construction.

Significant excavation is not required for the site development works. However, should soil need to be removed off site for localised works then this will be carried out in accordance with Irish waste legislative requirements.

7.4.1.2 Soil Erosion

The nature of the development will require the disturbance and exposure of soils during construction. This has the potential to cause soil erosion and sediment loss while soils are exposed.

7.4.1.3 Fuel Storage

There is a potential impact on soils and geology from accidental spillages or leaks from vehicles on site during the construction phase.

7.4.1.4 Sites of Geological Heritage

Given the distance of Lough Boora from the proposed development site (2.8km), it is anticipated that there will be no impact on this site.

7.4.1.5 Geotechnical Issues

There are no deep excavations planned as part of the proposed development. There are no areas of soft ground on site and issues with regard to slope stability have been identified at the site.

7.4.2 Operational Phase

The potential impacts of the proposed development during the operational phase were assessed as per the methodology describe in Section 7.1.3 above. A summary of the assessment is provided in Table 7.2 below.

7.4.2.1 Contaminated Ground

It is not anticipated that there will be any impact from the proposed development on the contaminated ground during the operational phase.

7.4.2.2 Fuel & Chemical Storage

A number of chemicals will be stored on the site during regular operation including chemicals for water treatment and boiler dosing. An assortment of lubricants, oils and greases will also required storage on site.

In addition diesel will be stored on site to be used as a back up fuel in the event of interruption to the natural gas supply in order comply with the Commission for Energy Regulation (CER) Regulations. Five days running capacity (approximately 5,200m³) of diesel will be stored on the site.

As a result of the above materials the site will be classified as lower tier COMAH in accordance with European Communities (Control of Major Accident Hazards Involving Dangerous Substances) Regulations 2006 (S.I. No. 74 of 2006).

There is potential for contamination of soils in the event of an accidental spillage or leak of any of the above materials.

7.4.2.3 Sites of Geological Heritage

Given the distance of Lough Boora from the proposed development site (2.8km), it is anticipated that there will be no impact on this site.

7.5 MITIGATION MEASURES

7.5.1 Construction Phase

7.5.1.1 Fuel & Chemical Storage

An environmental operating plan will be implemented during construction which will minimise the potential for accidental spills/ contamination. This plan will include detailed measures to minimise environmental impact including the following:

Chemicals and other construction materials will be safely stored to ensure the risk of oil or chemical contamination of soil is minimised.

Appropriate measures will be put in place to minimise the risk of soil contamination from re-fuelling of vehicles, e.g., re-fuelling to be undertaken in designated areas with drained hard standing, and spill kits in place.

Good housekeeping (daily site clean-ups, use of disposal bins, etc.) on the project site, and the proper use, storage and disposal of many substances used on construction sites, such as lubricants, fuels and oils and their containers can prevent soil contamination.

A contingency plan for pollution emergencies will also be developed by the appointed contractor prior to work and regularly updated, which would identify the actions to be taken in the event of a pollution incident. The CIRIA document (2001) recommends that a contingency plan for pollution emergencies should address the following:

- Containment measures;
- Emergency discharge routes;
- List of appropriate equipment and clean-up materials;
- Maintenance schedule for equipment;
- Details of trained staff, location, and provision for 24-hour cover;
- Details of staff responsibilities;
- Notification procedures to inform the relevant environmental protection authority;
- Audit and review schedule;
- Telephone numbers of statutory water undertakers and local water company;
- List of specialist pollution clean-up companies and their telephone numbers.

7.5.1.2 Soil Erosion

The disturbance/exposure of soils from the site will be carried out during suitable weather conditions in order to minimise the production of sediment and to reduce nutrient loss. Exposed soils will be seeded as soon as possible to reduce the likelihood of erosion. Earth berms will be erected around the site to prevent sediment loss from the site during the construction process.

7.5.2 Operational Phase

7.5.2.1 Fuel & Chemical Storage

A back up supply of diesel (5,200m³) is required at the site in the event of an interruption of the gas supply. All appropriate measures will be taken to minimise the risk of accidental spillages or leaks. The fuel will be stored in a cylindrical steel tank within a 110% capacity

bund to comply with bunding requirements. The bund will be constructed in accordance with CIRIA Report 163 "*Construction of Bunds for Oil Storage Tanks*" and BS8007:1987 "*Code of Practice for Design of Concrete Structures for Retaining Aqueous Liquids*". The diesel oil will be limited to 0.1% sulphur as per the requirements of EU Directive 1999/32/EC (relating to a reduction in the sulphur content of certain liquid fuels)

The site will be classified as lower tier COMAH in accordance with European Communities (Control of Major Accident Hazards Involving Dangerous Substances) Regulations 2006 (S.I. No. 74 of 2006). In accordance with legislative requirements, a major accident hazard (MAH) report was prepared for the proposed development. This report details risk and consequence assessments for the site in accordance with the Health and Safety Authority (HSA) guidance document entitled 'Setting the Specified Area – The Approach of the HSA'.

7.6 RESIDUAL IMPACTS

There will be a temporary negligible adverse impact on soils and geology from the proposed development due to the low level of soil contamination.

There will be temporary negligible potential adverse impact from accidental spillages or leaks from chemicals or fuels stored on the site during the construction or operational phases following appropriate mitigation measures.

There will be a temporary negligible adverse impact relating to soil erosion or sediment loss during the construction phase following mitigation measures.

There will be no impact relating to geotechnical issues from the proposed development.

There will be no impact on the Lough Boora from the proposed development during either the construction or operational phases.

Table 7.2 Summary of Residual Impacts on Soil & Geology

Magnitude of Impact	Criteria	Residual Impact
Significant Adverse	Results in loss of attribute	None
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute	None
Slight Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute	None
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	Disturbance of low level contaminated soils during construction Contamination of soils from accidental spills/leaks of fuel/chemicals during construction and operation Soil erosion & sediment loss during construction
Minor Beneficial	Results in minor improvement of attribute quality	None
Moderate Beneficial	Results in moderate improvement of attribute quality	None
Major Beneficial	Results in major improvement of attribute quality	None

7.7 REFERENCES

- Environmental Protection Agency, 2003. *Advice Notes on Current Practice in the Preparation of Environmental Impact Statements.*
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- Environmental Protection Agency Ireland (EPA) website - www.epa.ie
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- ESB International, July 2003. *Ferbane Generating Station – Environmental Exit Audit Phase 1 Report.*
- ESB International, May 2005. *Environmental Ground Investigation - Former Ferbane Generating Station Co. Offaly.*

- Geological Survey of Ireland, June 2005. *Geology of Galway – Offaly Sheet No. 15.* (1:100,000 scale maps).
- Institute of Geologists of Ireland (IGI), 2002. *Geology in Environmental Impact Statements: A Guide.*
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