4 Description of the Existing and Proposed Development

The existing operations at the WOP Station and ADF sites are set out in detail in this chapter of the EIAR. This Chapter also sets out the proposed development, including the construction requirements which is subject of this application.

4.1 Description of the Existing Development

4.1.1 Existing Development - WOP

4.1.1.1 Existing Station Site

WOP Station is located adjacent to the town of Shannonbridge in Co. Offaly on the River Shannon, just downstream of its confluence with the River Suck. It is adjacent to the village of Shannonbridge, which is approximately 850 m to the north, while the River Shannon borders the site to the west. The site covers an area of approximately 35.5 hectares (ha). See WOP Station location in **Figure 1-1.**

WOP Station is fired on milled peat supplied by Bord na Móna Energy Limited with a start-up and combustion support facility for firing fuel oil. Bord na Móna supply the peat from existing bogs as licensed by the EPA.

In 2017 WOP Station exported 928,876 MWhrs of electricity to the national grid equivalent to the needs of approximately 220,000[1] households.

4.1.1.2 WOP Station Facilities and Operations

The existing WOP Station site is owned by the ESB and is separated into two areas with separate entrances, the power station and associated buildings and infrastructure which is operated by ESB, and the fuel handling area which is operated by Bord na Móna. The site is accessed via two routes – leading east and west respectively along the R357.

WOP Station comprises a single boiler/turbine unit with an electrical output of 150 MWe and its main features are as follows:

- Main building housing fluidised-bed boiler and 150 MWe rated turbo-alternator unit.
- Fuel handling system comprising peat wagon tipplers, screens, conveyors and an intermediate peat storage (IPS) facility.

[1] Based on CRU average of 4,200kWhrs/year per household, 2017, https://www.cru.ie/document_group/review-of-typical-consumption-figures-decision-paper

- Water treatment plant (WTP) for processing of water prior to its storage and use in the boiler.
- Cooling water system, comprising a pumphouse, inlet and outlet culverts and outfall, for condenser cooling.
- Flue gas system comprising cyclone separators and bag filters for removal of peat ash from exhaust gases.
- Chimney for discharge of exhaust gases to the atmosphere.
- Ash handling system comprising conveying systems and storage silos.
- Oil tank for storage of auxiliary fuel.
- Storage facilities for limestone, lime and sand.
- Generator transformers, high voltage switchgear, and unit and house transformers.
- Supporting facilities including the following:
    - Administration offices
    - fire protection system
    - auxiliary cooling water system
    - fuel oil pumphouse
    - diesel generator
    - chemicals storage tanks
    - chemical laboratory
    - sewage treatment plant
    - workshop and stores

The structural form of the station buildings is conventional structural steel supported on reinforced concrete foundations. Gantries and walkways for access to plant and equipment are constructed of stainless/galvanised steel open grating type flooring. These are supported on steel beams and columns. External walls comprise profiled metal cladding and roofs are constructed of profiled metal decking on purlins spanning between rafters.

Peat fuel is supplied to WOP Station by Bord na Móna, principally by rail but also by road. WOP Station is equipped to unload up to six rail deliveries of peat each hour and the EIS submitted as part of the planning application for the existing station (Offaly Co Co. Reg. Ref. 01/187; An Bord Pleanála Ref. PL19.125575) envisaged that there would be 74 road deliveries of peat per day.

4.1.2 Existing Development - The ADF

4.1.2.1 The Existing ADF Site

The station's off-site ADF is located on remote Bord na Móna cutaway bogland approximately 5.5 km from WOP Station. The ADF site area extends to approximately 59.2 ha. See ADF location in **Figure 1.1**. This development site

extends onto lands located within four townlands - Clonfinlough, Clondelara, Leitra, and Derrylahan. The facility is operated by Bord na Móna on the behalf of ESB.

Access to the ADF is from the R357 Shannonbridge – Cloghan Regional Road, via a minor road that passes Bord na Móna's Blackwater works. The ADF is located approximately 3 km from the junction with the public road. The area is sparsely vegetated and is surrounded by tracts of production bogland.

The EPA's IE Licence P0611-02 requires the ADF to be fully in compliance with the EU Landfill Directive (Directive 1999/31/EC on the landfill of waste). The IE Licence in turn requires all relevant requirements of the Directive regarding the design, construction, operation and aftercare management of the landfills to be implemented.

There are two discrete waste streams disposed of at the ADF.

- **Fly ash** is removed from the flue gases by bag filters and conveyed to an ash silo. The ash is transported from WOP Station to the ADF by rail in an ash rake. Each rake comprises a locomotive pulling 10 to 12 wagons each of which carries two ash buckets. Before being loaded into the wagons the ash has 15 to 30% of moisture added; and each wagon has a hydraulically controlled lid to prevent dust during the journey from WOP Station to the ADF.
- The combustion of peat gives rise to the production of a relatively small volume of **bottom ash**. It is removed from the combustion chamber and conveyed to a small bottom ash silo on the WOP Station site. It is transferred from the silo by a sealed vacuum system to a skip mounted on a rail bogey and transported to the ADF, also by means of the dedicated rail line. Of the total ash arising, approximately 5% is bottom ash.

Ash is transported to the ADF on Bord na Móna's narrow gauge rail system in specially designed saddleback wagons. Typical movements of ash between WOP Station and the ADF site will comprise two to three locomotive runs per day. Each train (rake) contains up to 12 wagons and is used daily Monday – Saturday. Each wagon comprises two ash buckets with combined capacity of approximately 7-9 m^3 of ash. The ash is tipped from the wagons and is placed in the cells using low bearing pressure tracked earthmoving plant. The ash is placed semi-dry and is wetted to control potential dust emissions. It is graded to falls during the filling of the cells to ensure that ponding, resulting in leachate generation, does not occur. A tractor drawn spray tanker or fixed spray system is used in wetting the ash to aid compaction and further prevent dust nuisance. Leachate that is generated is re-circulated over the active cell to dampen the ash.

On-site, the location of the off-loading area within the ADF is dependent on which cell is operational and access is arranged by the relocation of the temporary rail tracks on the site. Tracks will be aligned so the ash can be tipped from the rake into each cell where it will be spread, compacted and levelled by a front-end loader to prevent any ponding of water on the surface.

Three cells (Cells 1, 2 and 3) are already closed and capped as per the requirements of the IE licence. Cells 4 and 5 are currently active and are accepting ash with capping being completed on an ongoing basis. It is anticipated that Cell 6 will be used from late 2019 / early 2020 and will be actively in-use when WOP Station enters its co-firing phase.

Each cell is separated from the adjoining cells by inter-cell embankments and by external embankments. Leachate is drained from each cell and recirculated or pumped to the existing leachate storage lagoon.

Cover and capping that is already in place for completed cells comprises a 1 m layer of peat / subsoil, which was added in a concave mound design. Capped cells are naturally revegetated to blend with the natural landscape. Cells 1-5 have a basal and capping liner (permanent low permeability Geosynthetic Clay Liner). The material used for the restoration layer comprises a mixture of peat and soil sourced on site from existing uprisings stockpiles and cutaway bog within the site boundary.

4.1.3 Characteristics of the Existing Development

The quantities of fuel used, energy generated and ash disposed of to the ADF for 2017 is provided in Table 4-1 Error! Reference source not found. Data is derived from the Annual Environmental Report (AER)[2].

Table 4-1: Annual energy generation, fuel use and ash disposal at WOP

Energy Generation, Fuel use, and ash disposal	2017
Total Energy Generated (MWHrs)	1,032,084
Electricity Consumption (MWHrs)	103,208
Nett Export of energy (MWhrs)	928,876
Light Fuel Oil (m^3)	353.5
Peat (metric tonnes)	1,243,220
Peat Ash to Landfill (metric tonnes)	46,566

4.1.4 Industrial Emission Licence P0611-02

The existing WOP Station and ADF are specified industrial activities listed in the First Schedule to the Environmental Protection Agency (EPA) Act 1992 as amended and operates under an Industrial Emission (IE) licence[3] granted and

[2] Note this AER has been resubmitted to the EPA in November 2018
[3] http://www.epa.ie/terminalfour/ippc/ippc-view.jsp?regno=P0611-02

enforced by the Environmental Protection Agency. The existing licence covers the following activities:

a) the production of energy in combustion plant the rated thermal input of which is equal to or greater than 50MW, and
b) the recovery or disposal of waste in a facility, within the meaning of the Waste Management Act, 1996, which facility is connected or associated with another activity specified in this Schedule in respect of which a licence or revised licence under Part IV is in force or in respect of which a licence under the said Part is or will be required.

By means of the Licence the EPA sets controls, monitoring and reporting requirements on emissions to the environment arising from the operation of the station and ADF and also sets requirements related to the final closure and decommissioning of the facility. Emission limits are set to ensure no adverse impact on the environment including human health and ecology. As part of the licence monitoring and reporting requirement Annual Environmental Reports (AER) are provided to the EPA, detailing its emissions and operations for the previous year. These AER reports are available on the EPA website.

Changes to IE Licence conditions can be requested by the operator of the facility or can result from changes to legislative requirements and initiated by the EPA. Such changes can be made by way of a clerical amendment, technical amendment or through a full licence review process. Currently a IE Licence Review application is being made to the EPA by WOP Station which relates to the thermal cooling water emission condition in the current licence.

4.2 Description of the Proposed Development

As noted above, it is proposed to modify and continue to operate, the existing peat-fuelled WOP Station and ADF permitted under Offaly Co. Co. Reg. Ref. 01/187; Bord Pleanála Reg. Ref. PL19.125575, to facilitate the continued operation of those facilities and the phased transition of the station towards exclusive firing with biomass.

The proposed development comprises four distinct elements:

i. the continued and on-going operation of the existing generating station and the associated ADF beyond the previously permitted date of 31st December 2020, including the continued use of all structures, plant, hard-surfaced areas, boundary treatments and access ways on the existing sites - comprising structures with a combined gross floor area of c.27,073 sq.m. and other existing development on the 35.5 Ha WOP Station site; and existing development (including c.43 sq.m. of buildings, a c. 84 sq.m. wash slab, a c.1,491 sq.m. leachate lagoon (4,200 cubic metre capacity)) and other infrastructure associated with the existing operational landfill (c.128,780 sq.m. in area) located on the 59.2 Ha ADF site;

ii. the phased transition of the WOP Station from peat-firing to firing exclusively on renewable biomass – the term 'biomass' describing a range of non-waste materials such as non-pelleted woody biomass; products, co-products, by-products and residues from energy crops and agricultural industries; and manufactured wood pellets. It is anticipated that from early 2020 [4] (subject to planning being granted by that date) WOP Station will be fuelled by reducing volumes of peat and increasing volumes of biomass, with an associated reduction in carbon dioxide emissions. By the end of 2027, the station will be fuelled exclusively by biomass;

iii. the development of fuel management and handling facilities on the WOP Station site to facilitate the change in fuel type – including the development of two biomass storage slabs (c. 3,924 sq.m. and c. 6,331 sq.m.) flanked by boundaries up to 5 m and 3.6 m high respectively; a 61 sq.m. pellet intake building (overall height 17.2m); a pellet storage silo (c. 28 sq.m. in area, 260 cubic metre capacity, maximum height 14.7m); and the re-organisation of surface storage, circulation and car parking areas – including new internal fencing and access gates, within the WOP Station site;

iv. the development of additional landfill capacity (c. 929,200 cubic metres over an area of c. 173,130 sq.m.) at the existing dedicated ADF, to facilitate the disposal of an additional c. 880,000 tonnes of ash from the WOP Station, and associated ancillary development on that site including a new leachate lagoon (surface area c. 1,400 sq.m, storage capacity 4,500 cubic metres) and associated boundary treatment.

In terms of the existing IE Licence, the proposed changes to the WOP Station and operation resulting from the planning application to transition to biomass will also trigger a review of the IE Licence. The proposed development will facilitate the continuation of use of the WOP Station, transitioning of the fuel type from peat to biomass and extending the landfill capacity as described herein. A full IE Licence Review will be required to licence the proposed activity. An application for a revised IE Licence to operate WOP Station and ADF will be made separately to the EPA subsequent to the planning application lodgement, in accordance with the requirements of the Agency.

4.2.1 Continued Operation of Existing Development Post 2020

As outlined in the attached Planning Report (**Document Ref QS-000206-01-R460-005**), the existing development is permitted subject to the condition (Condition 2 of

[4] Note: throughout this EIAR it is stated that the transition to biomass is envisaged as starting from early 2020. As clearly stated in the public notices, the transition date is subject to receipt of the appropriate consents.

OCC 01/087; ABP Ref. PL19.125575) that activity on both sites – WOP Station and the ADF, ceases on 31st December 2020.

Permission is being sought to extend the operational life of both the WOP Station and the ADF beyond that originally permitted. At the WOP Station permission is being sought for electricity generation to continue on this site in perpetuity, in-line with the phased transition of fuel outlined below (see **Section 4.3**). At the ADF permission is being sought for increased capacity to facilitate the disposal of an additional 880,000 tonnes of ash from WOP Station. Based purely on the traditional peat combustion, the combustion of 1,250,000 energy tonnes of peat per annum would give rise to a maximum disposal requirement of c.52,000 tonnes of ash. However the combustion of biomass gives rise to less ash than peat. Therefore the volume of ash arising each year will likely reduce as the proportion of biomass increases. Based on indicative calculations for the co-firing and exclusively biomass stages, it is estimated that the extended footprint can meet disposal requirements for at least 25 years, depending on the actual ash arising which in itself is a function of the fuel type and annual plant load factor. For clarity, permission is being sought to maintain *in situ* all physical development on the WOP and ADF sites associated with existing activities on those sites. These activities are those described above as the existing facilities and operations on both the WOP Station and ADF sites (**Section 4.1.1** above). On the WOP Station site, the existing structures have a combined gross floor area of c.27,073 sq.m. within the 35.5 ha site, and these will be maintained as currently developed unless specifically altered by this proposal. On the c. 59.2 ha ADF site, there is an existing landfill area of c. 128,780 sq.m. As noted above, five of the existing cells will be filled and Cell 6 will be in-use when the anticipated change to co-firing occurs. Associated with the operation of this site there are a small number of buildings (c. 43 sq.m. in area) with associated service areas including an 84 sq.m. wash slab and a c. 1,491 sq.m. leachate lagoon (with an approximate storage capacity of 4,200 m^3) which will be maintained as existing. A detailed description of each site and the relevant quanta of development is set out in the Planning Report (see **Section 3** of that report).

These aspects of the development will be unchanged unless specifically indicated on the planning drawings that accompany this application.

4.3 Transition to Biomass

The burning of fuel in WOP Station generates thermal energy, a portion of which is converted into electrical energy through a steam cycle. Excess thermal energy is emitted through the boiler emission stack to the atmosphere and as thermal cooling water to the River Shannon. WOP Station operates to an overall efficiency of approximately 36% in terms of converting energy stored in fuel to electrical energy.

WOP Station is currently fired on commercial peat fuel with a peat utilisation rate of approximately 1.2 Million energy tonnes (ETs) per year. An energy tonne is that quantity of fuel with equivalent energy content of a standard tonne of peat at 55% moisture content, i.e. 7.7 Gigajoules (GJ).

It is proposed to reduce peat burn in WOP Station from early 2020 by at least 40% on current burn rate, with a maximum (capped) consumption of 60% of current peat volume of 1,250 kET/year (i.e. maximum volume of 750kET per year). This will be followed by a further reduction in capped volume to 40% (of current peat volumes) in 2025 (i.e. maximum volume of 500kET per year). Peat burn will cease at the end of 2027.

It is noted that the actual peat consumption in any year could be lower than the capped maximum for that year depending on prevailing market trends. After 2019, peat fired generation will not be subsidised and it will have to compete openly on a daily basis with other generation sources. Therefore the actual volume of peat-fired generation in each year will depend on both the wholesale market price of electricity and the cost of carbon allowances . In any year, where the actual peat consumption is lower than the maximum for that particular year, there will be no carry-over and this reduced consumption will not affect the maxima which have been set for the subsequent years.

The boiler at WOP Station is a circulating fluidised bed-type boiler capable of firing different fuel types. It can readily combust a range of biomass fuel types without any significant technical modification. It can technically operate at 100% output capacity (150MWe) firing on biomass, which in any one year operating continuously would equate to approximately 1.2 million energy tonnes of biomass. This is the maximum biomass energy tonnes that could be used in the WOP Station annually as shown in **Figure 4-1**. However, the quantity of biomass which is likely to be used in the early years will be constrained for commercial, transport and supply-chain reasons. The indicative biomass use profile is also shown in **Figure 4-1**.

Biomass volumes will ramp up immediately in early 2020 with volumes of biomass burned annually driven primarily by the availability of sufficient volumes of biomass that is both sustainable and can be sourced commercially.

At current and expected biomass prices, biomass for electricity production requires subsidised support. Since 2017 WOP Station has been approved for biomass support under REFiT3, which allows for biomass support for an output of up to 394.2 GWhrs of electricity per year. The Department of Communication, Climate Action and Environment (DCCAE) have announced details of a follow on Renewable Electricity Support Scheme (RESS) within which WOP Station is eligible to compete for increased biomass support.

With the proposed auctions of 1000 GWhrs in 2019, and 3000 GWhrs in 2020, in theory WOP could receive sufficient biomass subsidised support to allow it to generate from biomass on full-load all year round, thereby producing up to 1,000 GWhrs annually from renewable biomass from the start.

All different biomass types have different energy content per physical tonne and per cubic metre, so biomass for energy is traded and quantified on an energy content basis, normally either Gigajoule (GJ) or else based on the equivalent energy content of one tonne of oil (toe). The energy content of one tonne of oil is equivalent to approximately 42 GJ or 5.5 standard tonnes of peat (energy tonnes).

WOP's current approved subsidised level of biomass support under REFiT3 would require approximately 513,000 energy tonnes/year (95 ktoe/year) of biomass. In order to operate on biomass all year round at full load would require approximately 1.2 million energy tonnes/year (220 ktoe/year).

The proposed fuel transition is shown on **Figure 4-1** and in **Table 4-2**. The biomass profile is indicative as it is dependent on the level of approved biomass support, availability of biomass at a commercially viable price and sustainable supply chain development.

Due to the variation in energy content of different biomass materials and of the level of moisture in that material, there can be significant variations in the amount of biomass energy contained in one truckload - ranging from approximately 20 ETs per truckload for a very high moisture content chipped wood product up to approximately 60 ETs per truck for a dry wood pellet product.

ESB projects that, in the maximum biomass scenario with a spread of different biomass deliveries as outlined above, the station would require a daily average of 100 deliveries per day over a year. Allowing for daily variations in deliveries statistical modelling indicates a 95 percentile of 129 trucks per day i.e. on 95% of days the number of deliveries is expected to be below 129 deliveries. The maximum quantity of biomass that could be delivered to the plant annually based on these delivery rates is 1.2 Million energy tonnes depending on a mix of fuel types.

Throughout the operational life of WOP Station, it will continue to require an ongoing start-up and combustion support facility for firing low volumes of fuel oil (approximately 600 m^3 per year).

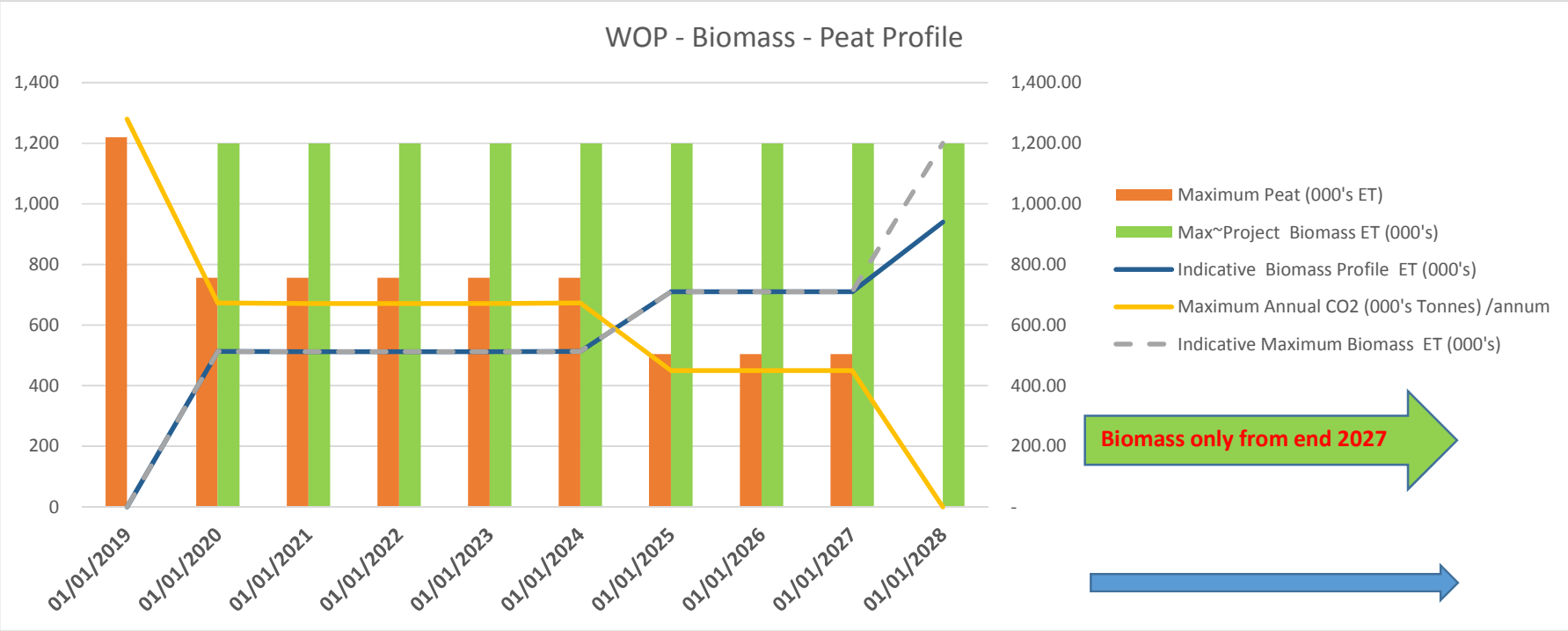


Figure 4-1: Biomass, Maximum Peat and Maximum CO_2 Profile

Table 4-2: Maximum Peat and resulting CO_2 output and Indicative Biomass

Year	Maximum Annual Peat (000's ET)	Maximum Annual CO2 (000's Tonnes) /annum	Indicative Biomass (000's ET)*
2019	1,250	1,279	0
2020	750	673	512
2021	750	671	512
2022	750	671	512
2023	750	671	512
2024	750	673	512
2025	500	450	710
2026	500	450	710
2027	500	450	710
2028 on	0	0	Up to 1,200 annually

*Indicative biomass may be higher with higher subsidies.

From the initial stage, in early 2020, biomass will be introduced as outlined in **Table 4-2** above and there will an immediate 40% reduction in the current usage of peat.

From 2020 to 2024 biomass annual usage is expected to be about 512,000 energy tonnes, equating to approximately 17,000 HGV deliveries per annum. During this period the maximum quantity of peat that will be used on an annual basis will be 750,000 energy tonnes generating a maximum amount of 676,000 tonnes of CO_2 annually.

From the beginning of 2025 to the end of 2027 biomass use will increase and peat usage will reduce to an annual maximum amount of 500,000 energy tonnes generating a maximum of 450,000 tonnes of CO_2 annually.

Post 2027 peat usage will be zero and the plant will be exclusively fuelled by sustainable biomass. At this point WOP Station will be a low-carbon dispatchable energy generation station. Energy production from WOP Station will be accounted for by the EU as “zero-carbon” under the EU Emission Trading Scheme whereby biomass is considered carbon neutral. The Greenhouse Gas (GHG) certificates that the station will receive will show zero carbon from the fuel used. The dispatchable renewable biomass energy will contribute significantly to achieving Ireland’s GHG emission targets to 2030 and also to achieving Ireland’s binding target for renewable energy generation.

The above profile of biomass and peat burn represents the worst case scenario in terms of CO_2 emissions from WOP Station. As the biomass supply chain is developed, increasing quantities of this fuel can be utilised by the WOP Station and it is possible that even in the period 2020 to 2024, with sufficient support from upcoming renewable support in place, the maximum amount of biomass, - c.1.2 million energy tonnes, could be used on an annual basis should it be commercially viable to do so.

During the co-firing stage, peat will principally continue to be delivered to the station by rail and handled using existing plant facilities although deliveries of peat by road will also take place but this will be within the overall number of fuel deliveries to the station.

Biomass will be transported by road. It will be fed directly into the existing conveyor belt system or deposited on large concrete aprons before being mechanically shovelled to the existing conveyor belt system and fed into the stations existing fuel feed system. Depending on the nature of the biomass being used, dedicated storage is included in the form of a silo which may be required to store wood pellets.

The station will continue to produce ash which will be deposited in the ADF in accordance with the IE licence requirements. Ash will be transported by rail to the existing ash disposal facility.

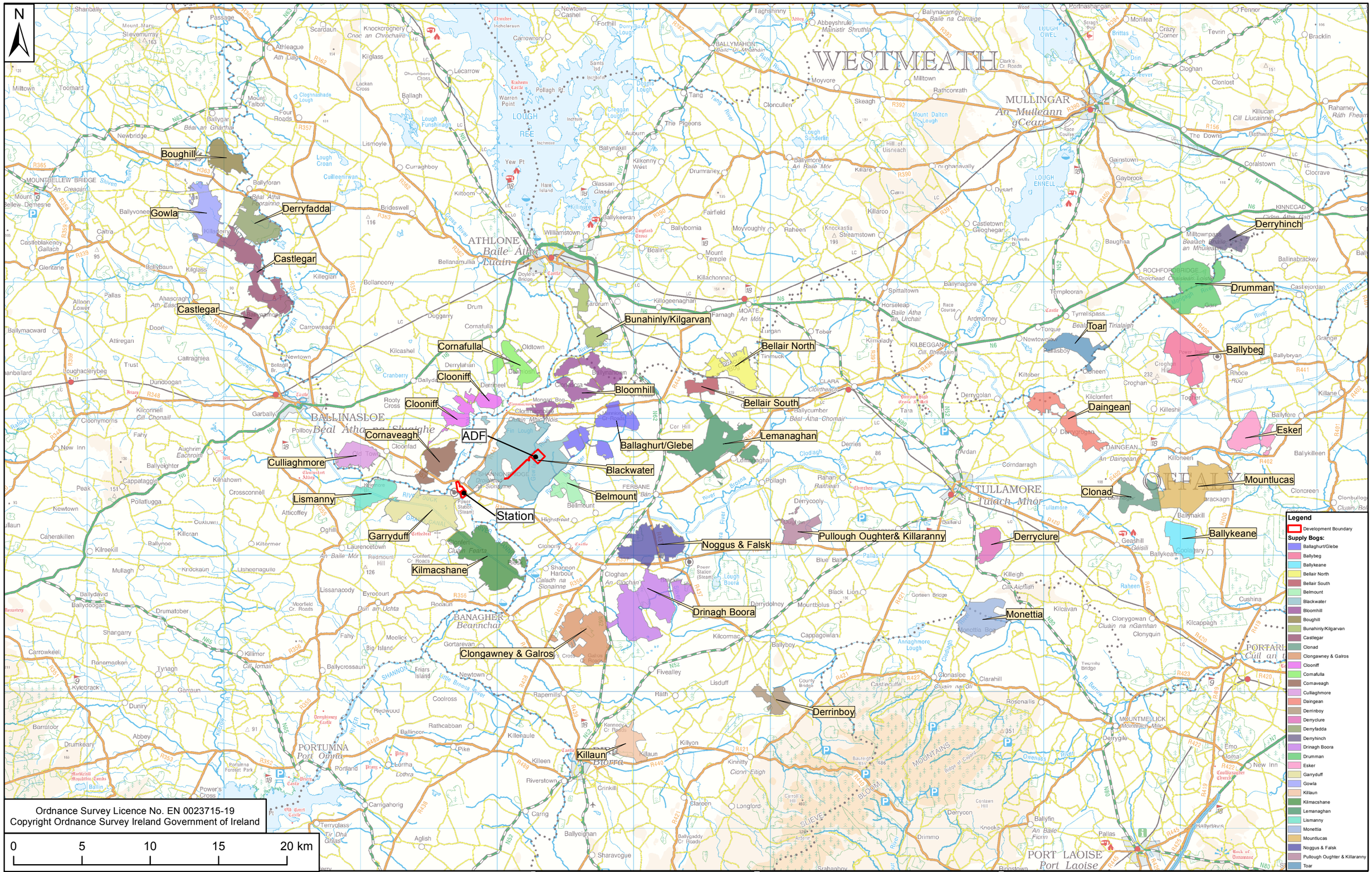
4.3.1 Peat

As indicated in **Table 4-2** above, peat will continue to be used as a fuel at WOP Station, with a reducing volume over time to the end of 2027. The combustion of peat will phased out entirely by the end of 2027.

There will be no subsidy for peat burning post 2019. REFiT 3 provides a subsidy for a portion (30%) of the biomass element when that Station is co-fired (i.e fuelled by biomass and peat). This support is in line with National and EU plans and the achievement and maintenance of EU Renewable Energy targets.

Peat will continue to be delivered to the station by rail transport and also by road.

The peat that fuels the WOP Station is harvested by Bord na Móna at a number of supply bogs. These activities are regulated by the EPA under Industrial Pollution Control (IPC) Licence Registration Numbers P0500-01 (Boora Group), P0501-01 (Derrygreenagh Group), P0502-01 （Blackwater Group), and P0503-01 (Allen Group). It is noted that many private operators also operate within the same area as Bord na Móna, however, their peat harvesting activities are generally not licensed by the EPA. The locations of the bogs that will continue to supply milled peat to WOP Station up to the end of 2027 are presented Figure 4-2**.**



REV	DATE	REVISION DESCRIPTION	DRN	PROD	VER	APP

PURPOSE OF ISSUE - PRELIMINARY UNLESS INDICATED

CLIENT APPROVAL ☐ PLANNING ☐ TENDER ☐ CONSTRUCTION ☐ AS-BUILT ☐

ESB INTERNATIONAL

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ESB International is a trading name of ESBI Engineering & Facility Management Ltd.

Registered Office: as above
Registered in Ireland No. 155249

CLIENT: **ESB**

PROJECT: **West Offaly Power, Transition to Biomass**

CONTRACT

PRODUCTION UNIT: **Civil & Environmental Engineering**

DRAWING TITLE: **Figure 4.2- Bord Na Mona Supply Bogs**

DRAWN	PRODUCED	VERIFIED	APPROVED	APPROVAL DATE
E.O'Shea	E.O'Shea	E.Delaney	P.Kavanagh	14/11/2018

CLIENT REF.	NO. OF SHEETS	SIZE	SCALE
00-00	1/1	A3	1:250,000

DRAWING NUMBER: **QS-000206-01-D460-129**

The bog areas are listed in **Table 4-3** together with the maximum percentage (%) of peat supplying WOP Station for each bog.

Table 4-3: Proposed Peat Supply Bogs to Supply WOP Station 2019 – 2027 (Source: Bord na Móna)

	BnM Ownership Boundary Area (ha)	Max % of peat to WOP Station
Boora Bog Group		
Monettia	711	15%
Killaun	391	10%
Derrinboy	308	10%
Derryclure	332	10%
Bellair	570	50%
Bellair	229	50%
Lemonaghan	1127	80%
Drinagh Boora	1385	0%
Clongawney & Galros	1214	0%
Noggus & Falsk	924	0%
Pullough Oughter& Killaranny	911	0%
Derrygreenagh Bog Group		
Kinnegad (also known as Rossan)	353	0%
Derryhinch	336	15%
Drumman	1120	20%
Toar	445	10%
Ballybeg	836	10%
Ballivor	654	0%
Carranstown	306	0%
Bracklin	755	0%
Daingean	646	10%
Allen Bog Group		
Esker	571	10%
Clonad	447	10%
Ballykeane	453	10%
Mountlucas	1229	10%
Blackwater Bog Group		
Cornaveagh	500	100%
Kilmacshane (also known as Clonfert)	1298	100%
Garryduff	973	100%
Lismanny	451	100%
Cuilliaghmore (also known as Culliagh)	446	100%
Blackwater	2336	100%
Cornafulla (also known as Drumlosh)	465	100%
Belmont	319	100%
Clooniff	531	100%

	BnM Ownership Boundary Area (ha)	Max % of peat to WOP Station
Bloomhill	890	100%
Ballaghurt/ Glebe	736	100%
Bunahinly/ Kilgarvin	393	100%
Boughill	426	50%
Castlegar (includes Killaderry Bog)	1021	50%
Derryfadda	611	50%
Gowla	664	50%

Peat supplied to the WOP Station is currently, and will continue to be, sourced from those bogs listed under the aforementioned IPC Licence Registration Numbers P0500-01, P0501-01, P0502-01 and P0503-01. There is sufficient peat remaining in the peat bogs listed above to supply peat to WOP Station up to the end of 2027.

Although consent for the peat harvesting activity will not be included in a planning application submitted by ESB, the environmental impacts associated with that activity have been considered in this planning application and supporting documentation including this EIAR as required under the European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018, S.I.296, 2018 which enacts Directive 2014/EU/52 of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment and Assessment under the EU Habitats Directive (See **EIAR Chapter 6** and the **AA Report** accompanying the planning application).

No new peat supply bogs are been developed as a consequence of this project Therefore, the consideration of induced indirect effects associated with the supply of milled peat destined to WOP Station, as detailed in this EIAR, is restricted to activities within the catotelm layer of the bogs, which contains dead plant material (as distinct from the acrotelm, which comprises the active growing plant layer on the surface of the bog).

4.3.2 Biomass

4.3.2.1 Definition and Type

Biomass is derived from organic material such as trees, plants, and agricultural residues.

The recast Renewable Energy Directive[5] sets out a definition of biomass as follows:

> *"biomass' means the biodegradable fraction of products, waste and residues from biological origin from agriculture, (including vegetal and animal substances), forestry and related industries including fisheries and aquaculture, as well as the biodegradable fraction of waste, including industrial and municipal waste of biological origin"*

Biomass as a fuel source for renewable electricity generation is utilised by EU Member States in increasing quantities since 2005 as reported in the European Environment Agency Report, Renewable Energy in Europe 2017[6]. With respect to biomass this states that:

> *"Electricity generation from solid biomass grew from 4.8 Mtoe in 2005 to 9.6 Mtoe in 2015, driven by, inter alia, the expansion of biomass cogeneration and the conversion of coal-fired power plants to biomass installations (11). The growth rate over the period 2005-2015 was 7 % (Figure 2.6). In 2015, the United Kingdom surpassed Germany in total electricity generated from solid biomass, with growth from 1.4 Mtoe in 2014 to 1.9 Mtoe in 2015. In 2015, the United Kingdom accounted for 20 % of total electricity generated from solid biomass and Germany accounted for 15 %. Finland and Sweden each had shares of 10 %. In 2016, electricity generation from solid biomass increased by 0.7 Mtoe, compared with 2015, to 10.3 Mtoe, a 7.6 % growth rate. The highest increase occurred in the United Kingdom with 0.2 Mtoe growth, further widening the gap between it and the other Member States of the EU. In comparison, Germany, the second largest generator of electricity from solid biomass increased its output by 0.1 mtoe".*

Biomass used for energy generation purposes is therefore seen to be widespread in Europe, including in Ireland where Edenderry Power Limited (EPL) is co-fired with peat and biomass.

The agreed recast of the Renewable Energy Directive, REDII includes for this use and includes updated sustainability criteria which must be complied with in order for this activity to be classified as renewable energy generation.

The type of biomass that will be used for electricity generation at WOP Station will comprise both indigenous (native) sources and imported biomass. These will meet the criteria set out under REDII and will be clean biomass as defined in the EU Waste Framework Directive, the European Communities (Waste Directive)

[5] Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on the promotion of the use of energy from renewable sources (recast),

[6] European Environment Agency, Recent growth and knock-on effects, EEA Report No. 23/2017

Regulations, 2011 and the EPA Guidance document on the regulation and management of wood waste. Solid municipal waste or treated post-consumer wood waste will not be used for electricity generation purposes at WOP Station.

Biomass - which will be sourced sustainably, that will be utilised at WOP Station will comprise materials such as:

- non-pelleted woody biomass, e.g.
  - products, co-products, by-products and residues of the forestry sector such as brash, thinning and other residues from the forestry sector where those materials are produced from the active management and felling of commercial forests;
  - products, co-products, by-products and residues - such as saw dust, sourced from timber mills, manufacturing processes and the forestry sector; and
  - wood chips produced by the timber industry – whether from commercial products or chipped wood arising from other commercial activities such as rubber tree plantations;
- products, co-products, by-products and residues from energy crops
- products, co-products, by-products and residues from agricultural industries, e.g. plant derived
  - husks,
  - shells, and
  - pulp; and
- manufactured wood pellets.

Irish Legislation, (the European Communities (Waste Directive) Regulations, 2011), excludes biomass produced for energy purposes from natural non-hazardous forestry and agriculture materials from the application of the Waste Management Act 1996(as amended), The 2011 Regulations also adopt the EU Waste Framework Directive defining requirements for by-products as follows;

- *"A substance or object, resulting from a production process, the primary aim of which is not the production of that item, may be regarded as not being waste but as being a by-product only if the following conditions are met:*
  - *further use of the substance or object is certain;*
  - *the substance or object can be used directly without any further processing other than normal industrial practice;*
  - *the substance or object is produced as an integral part of a production process; and*

further use is lawful in that the substance or object fulfils all relevant product, environmental and health protection requirements for the specific use and will not lead to overall adverse environmental or human health impacts."

As the biomass used for energy generation purposes at WOP Station will be derived solely from non-hazardous forestry and agriculture materials or by-products

meeting the requirements of the 2011 Regulations, it will therefore not be regarded as a waste material.

Activities associated with forest management produces forestry products that are of different quality, composition and value (e.g. saw-logs, pulpwood for use in panel board mills and paper mills, stakewood). Wood suitable for use as a biomass fuel includes:

- Small roundwood, which is removed from the forest to thin plantations, and allow larger diametre trees to flourish (i.e. thinnings);
- Smaller size material, which is produced when the forest is finally harvested and is unsuitable for use as sawlogs;
- Residues from final harvest operations (excluding those that must remain in the forest for environmental reasons);
- Harvested wood unsuitable for use as sawlogs due to its shape or form.

Forest by-products and residues will usually be left to dry for a period to reduce moisture content for fuel use, and may be processed into chips or pellets. Chipping of wood may occur at the forest roadside using mobile chippers or at a processing plant. Pelletising wood involves further drying and processing, but has the advantage that pellets are a more energy dense form of fuel, and are easier to handle and transport.

Sawmill residues arise when harvested timber is processed - producing wood chips, sawdust and bark, in addition to the sawn timber. The quantity of residues produced depends on the throughput at the mill. Sawmill residues can also be processed into wood pellets. Bark and sawdust residues also arise from panel board mills – whereby small roundwood is debarked to produce wood chips for the manufacture of the boards. The quantity of board mill residues depends on the quantities of pulpwood debarked at the mill.

In terms of agricultural sources of biomass, perennial energy crops suitable for cultivation in Ireland are willow - grown using a short rotation coppice (SRC) technique; and miscanthus - a woody rhizomatous grass.

In terms of potential utilisation at WOP Station biomass trials have shown that the combustion of SRC crops at WOP Station is feasible. By contrast, trials with miscanthus have shown that it is unsuitable as a fuel due to technical constraints.

SRC crops can be grown on arable land or reasonable quality permanent pasture land. Establishment of such crops requires initial intensive effort and agrochemical input, but thereafter perennial crops require less input than annual crops. Once planted they take up to four years to reach initial maturity, after which they are

harvested at regular intervals – typically every two years for SRC willow. After about 20 to 25 years the crop is removed and replanted, and then the harvesting cycle begins again.

Based on forecasts of the land that could be available for perennial energy crops an estimated 203,000 ha on an all-Ireland basis could be available to grow SRC willow and miscanthus[7].

4.3.3 ESB Biomass Fuel Sustainability

ESB recognises the importance of ensuring that biomass utilised as its generating station is sourced sustainably and will ensure that the sustainability requirements of the agreed recast EU Renewable Energy Directive II (REDII), set out in Articles 26 (2 -7) will be adhered to. The requirements for verification of compliance with the sustainability and greenhouse gas emissions saving criteria are set out in Article 27 of the recast directive.

The EU Commission Staff Working Document "State of Play on the Sustainability of Solid and Gaseous Biomass Used for Electricity, Heating and Cooling in the EU [8]" clearly outlines the important role that biomass will play in achieving the 2030 Climate and Energy Framework as follows:

> *'Solid and gaseous biomass –particularly wood and wood waste– used for electricity, heating and cooling production is the biggest source of renewable energy in the EU and is expected to make a key contribution to the 20% EU renewable energy target by 2020. Sustainable biomass can play an important role in helping to address concerns about climate change and security of energy supply, while contributing to economic growth and employment, particularly in rural areas. According to the Impact Assessment to the 2030 Climate and Energy Framework, biomass use in the heat and power sectors is expected to further increase in the medium term, in the context of the EU effort to move to a low-carbon economy by the middle of the century.'*

Key to the use of biomass for energy generation is its sustainability. In order for the increased consumption of biomass to result in a genuine and significant CO_2 reduction, the biomass must be sustainable.

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[7] SEAI and Ricardo Energy & Environment, Bioenergy Supply in Ireland, 2015 – 2035, An update of potential resource quantities and costs, Ver 1.2, 10/17

[8] COMMISSION STAFF WORKING DOCUMENT, State of play on the sustainability of solid and gaseous biomass used for electricity, heating and cooling in the EU, Brussels, 28.7.2014, SWD(2014) 259 final

Currently there are no Irish standards for Biomass Sustainability and there is no global definition of sustainability for this type of material. However, the REDII, recently agreed at EU Commission and Parliament level, provides sustainability criteria to which ESB will adhere. ESB is committed to ensuring its sustainability programme is fully compliant with these REDII criteria, in as far they are relevant to this project.

ESB intends to operate a sustainability programme to best international practice standards in this area, as outlined in this document. ESB's Sustainability Criteria for Biomass Supply has being built on several other well-developed and adopted sustainable biomass requirements and practices governing biomass sustainability internationally including;

- Standard for Heat & Electricity: Woodfuel used under the renewable Heat incentive and Renewables Obligation under UK legislation[9],
- Forest Europe's criteria for sustainable forestry[10]
- Danish industry agreement on sustainable wooden biomass (wood chips and wood pellets) developed in adherence to the Danish Ministry of the Environment's Guidelines on Securing Sustainable Wood [11]
- UK Government Timber Procurement Policy [12]
- Orsted – Program for sustainable biomass sourcing [13].

In addition, ESB's Sustainability Criteria for Biomass Supply will comply with the principles of sustainability which are enshrined into the EU Timber Regulation (Regulation (EU) No. 995/2010) which prevents the circulation of illegally logged wood in the European Union. Under the EUTR, placing illegally harvested timber and products derived from such timber on the EU market is prohibited.

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[9] www.usewoodfuel.co.uk/media/451137/decc_ts_guidance_training_fc_scotland_april_2015.pdf

[10] http://foresteurope.org/sfm-criteria-indicators2/

[11] www.danskenergi.dk/sites/danskenergi.dk/files/media/dokumenter/2017-09/IndustryAgreement_Biomass-20160623.pdf

[12] https://www.gov.uk/guidance/timber-procurement-policy-tpp-prove-legality-and-sustainablity

[13] https://www.google.ie/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=2ahUKEwivtuK6h_fdAhVGVsAKHSZUCqEQFjAAegQICRAC&url=https%3A%2F%2Forsted.com%2F-%2Fmedia%2FWWW%2FDocs%2FCorp%2FCOM%2FSustainability%2FBiomass-Sourcing-UK-021117.ashx%3Fla%3Den%26hash%3D2F1C73A252EA155B9624E203FCDC0000BCD555C8&usg=AOvVaw1k4uB1y2kEJhwttRjpO0UI

Forestry in Ireland operates within a legal and regulatory framework. This is necessary in order to protect forests and also to ensure that forestry operations and activities are carried out in compliance with the principles of sustainable forest management. As part of the regulatory framework a Felling Licence granted by the Minister for Agriculture, Food and the Marine is required and provides authority under the Forestry Act 2014 to fell or otherwise remove a tree or trees and to thin a forest for silvicultural reasons. The provisions of the Act and the Forestry Regulations 2017 (SI No 191 of 2017) came into force from 24th May 2017. Under the regulations all applications for licences for afforestation, forest road construction projects, whether grant-aided or not, and for aerial fertilisation and tree felling operations, require the prior written approval from the Minister for Agriculture, Food and the Marine. The activities covered are as follows:

- **Tree felling** – the uprooting or cutting down of any tree (subject to certain exemptions);
- **Aerial fertilisation** – aircraft application of fertiliser to a forest;
- **Afforestation** – the establishment of a forest or stand of trees in an area where there was no previous tree cover where the area involved is greater than 0.10 ha (approximately 0.25 acres);
- **Forest road construction** –construction of a forest road.

Before the Minister can grant approval for any of the above activities, they must first determine if the project is likely to have a significant environmental effect.

In addition to the above licencing requirements the Department of Agriculture Food and the Marine have published a range of Forestry environmental guidelines to ensure that the environmental aspects of Sustainable Forest Management are implemented. Adherence to the guidelines is a condition of grant aid and the issuing of a felling licence[14].

4.3.3.1 ESB Sustainability Criteria for Biomass Supply

ESB will follow a sustainable biomass programme with core sustainability principles founded on the principles of legality, sustainability and independent auditing. These are detailed in Error! Reference source not found. and **Figure 4-3.**

[14] Department of Agriculture, Food and the Marine, https://www.agriculture.gov.ie/forestservice/publications/

No.	Sustainability Requirement	Description
1	Legal Compliance	ESB will ensure biomass related activities comply with all applicable laws & regulations of Ireland, of the country from which biomass is sourced and with all relevant international laws and agreements.
2	Environmental Compliance	ESB will ensure that appropriate measures are in place to minimise any impact of biomass related activities on air, water, soil, ecosystems and biodiversity and will comply with all applicable current and future legislation.
3	Chain of Custody	ESB will gather and maintain data on the full chain of custody ensuring that all biomass can be traced right back to point of origin.
4	Greenhouse Gas Emissions	ESB will ensure that its use of biomass for generation has a positive impact on Ireland's overall GHG emissions and will comply with all applicable current and future legislation in this regard. ESB will also ensure that management of biomass sources is carried out to ensure that global carbon sequestration is maintained.
5	Community	ESB will ensure its biomass related activities contribute positively to the socio-economic opportunity of stakeholders (including land owners, farm workers, suppliers, and the local community) and will comply with applicable labour and human rights laws. Biomass related activities will not endanger food supply or impact communities where the use of biomass is essential for subsistence

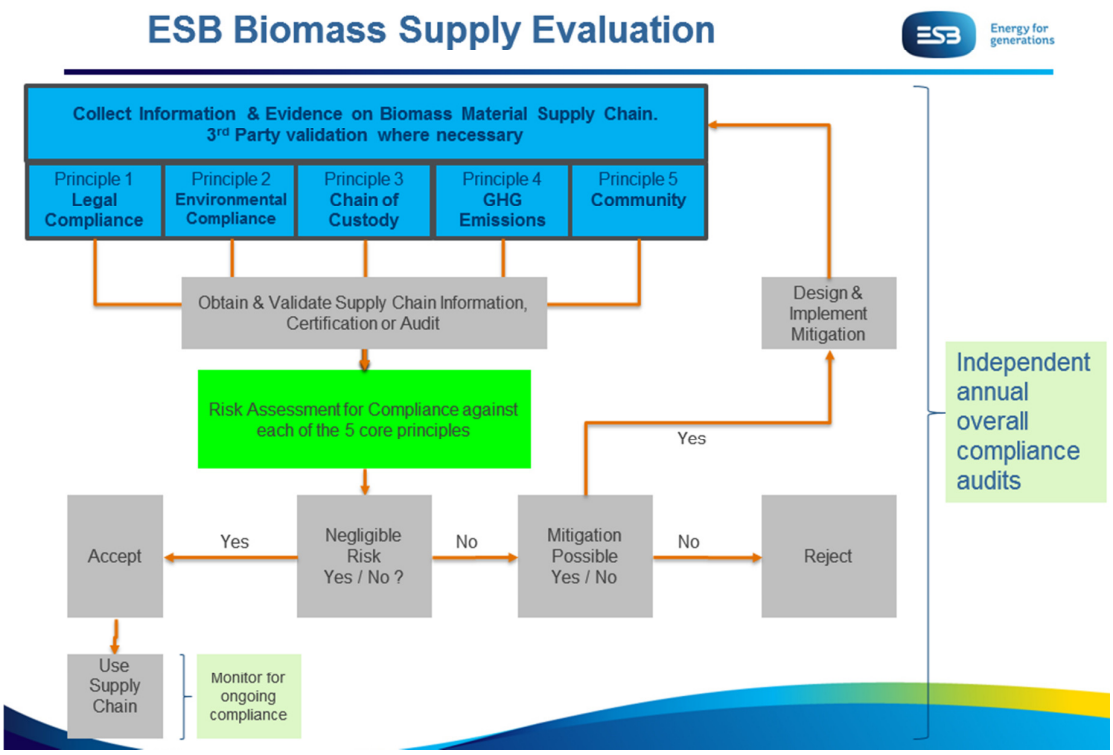

Figure 4-3: ESB Biomass Supply Evaluation

4.3.3.2 Biomass Sources

Biomass for WOP will be provided in accordance with ESB's sustainability requirements and will be sourced commercially from indigenous sources and from International sustainable sources.

Currently, there is insufficient indigenous biomass available to supply the projected biomass need of the Midland peat stations in the initial years of co-firing and imported biomass will be required. It is anticipated that in the early years indigenous biomass will provide between 20-40% of the required feedstock, with the balance coming from imported biomass. Indigenous biomass will mainly arise from commercial forestry operations and timber processing - which are both dependent on the market and the development of the national forests.

This estimation of the future availability of indigenous biomass volumes is supported by the COFORD Report – the **All Ireland Roundwood Production**

Forecast, 2016-2035[15] which identified that roundwood supply would increase significantly over the next two decades, with almost all of the increase coming from privately-owned forests in the State and primarily in the larger size assortments. As shown on **Figure 4-4**, the major increase in supply occurs from 2020 on with significant supply from private forestry occurring from 2024.

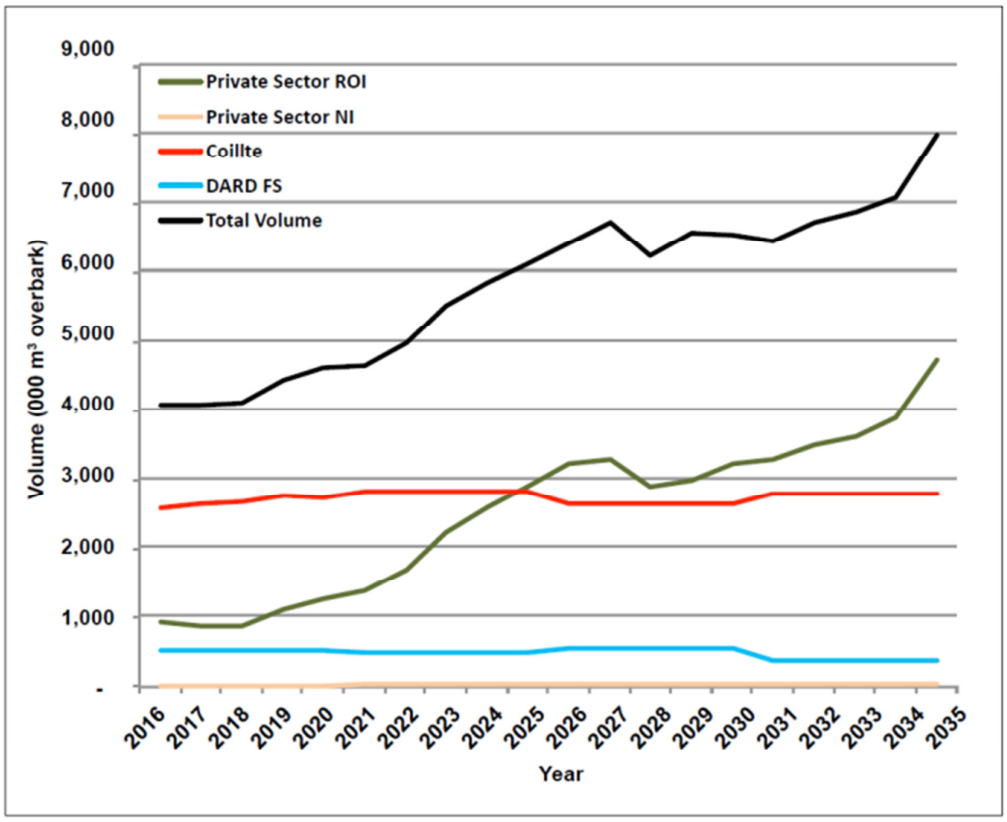

Figure 4-4: Forecast to total new realisable volume, All Ireland Roundwood Production Forecast 2016-2035, COFORD, 2016

From 2025 onwards there will be a marked increase in the availability of indigenous biomass from the forestry sector (public and private) as maturing forests reach thinning and harvestable age. Hence over time, with increasing indigenous biomass supply arising from increased forest activity in State and Private forestry and with

[15] Henry Phillips et al, (2016), All Ireland Roundwood Production Forecast 2016-2035, COFORD. Available at: http://www.coford.ie/media/coford/content/publications/2016/00663CofordRoundwoodProduction2016-2035WebVersion.pdf

the potential development of SRC crops, indigenous supply is expected to displace imported material.

Solid biomass demand for the bioenergy sector in Ireland is also expected to grow significantly out to 2035 and this demand will be fulfilled mainly from the forest and agricultural sectors of the economy but also through increases in imports.

The enhancement of use of bioenergy in Ireland is a target objective set out by the Irish Government in its Bioenergy Action Plan, 2015[16]. In support of this plan SEAI updated a previously prepared study[17] on bioenergy availability which originally detailed the quantity of bioenergy resources available and their prices out to 2030.

The updated study[18] increased the number of bioenergy resources examined and extended the timeframe for analysis to 2035. The 2015 Report had indicated that;

> *'The availability of biomass resources for energy production is influenced by interactions between physical availability, cost of production and demand for the resources in alternative non-energy applications',*

The report provided an analysis of biomass availability taking these factors into account to assess biomass resources.

The 2017 report - which updated the 2015 report, extended the range of biomass sources considered and examined fourteen market ready bioenergy resources including solid biomass sources - such as forest thinnings and residues, sawmill residues, straw, perennial energy crops (such as SRC willow and miscanthus), and other solid materials.

Estimates of biomass availability for by-products arising from other commercial activity such as forestry and wood processing were assessed based on future requirements or production for that activity. Estimates of dedicated energy crops grown for bioenergy production - such as SRC willow, were determined based on the availability of land after the projections for food production were incorporated. The report stated that data from which estimates for bioenergy availability were framed were obtained from discussions with key sector representatives and key plans and data such as the **Food Wise 2025 Plan**,[19] **COFORD's All Ireland**

[16] Department of Communications, Energy and Natural Resources, Draft Bioenergy Action plan, 2014
[17] Matthew Clancy et al, SEAI's Energy Modelling Group (EMG), Bioenergy Supply Curves for Ireland 2010-2030, October 2012
[18] SEAI and Ricardo Energy & Environment, Bioenergy Supply in Ireland, 2015 – 2035, An update of potential resource quantities and costs, Ver 1.2, 10/17
[19] Department of Agriculture Food and the Marine, (2015), Food Wise 2025 – Local roots Global reach – a 10 year vision for the Irish agri-food industry. Available at: https://www.agriculture.gov.ie/foodwise2025/

Roundwood Production Forecast , 2016 – 2035[15] and the **EPA's National Waste Report 2012**[20].

The significant potential to expand the bioenergy resource to 2035 is highlighted in the 2017 report indicating a potential seven-fold increase in bioenergy resource as follows:

> *'The bioenergy resource in Ireland has significant potential to expand between now and 2035. Realisation of this potential is dependent on higher market prices than currently prevail for most resource types for bioenergy as well as mitigation of the supply-side barriers to resource development. Under favourable conditions with high market prices for bioenergy resources and mitigation of supply-side barriers, the total amount of solid, liquid and gaseous bioenergy produced in Ireland could reach 3,290 (kilotonne of oil equivalent) ktoe (138 PJ) by 2035*[21]*. This compares to total primary energy demand of bioenergy, including imports, of 468 ktoe (19.6 PJ) in 2014.'*

In terms of forestry biomass, Ireland's forest resource is widely spread across the country and is split between Coillte-managed State forest resources and privately owned forest (see **Figure 4-4)**. The latter is increasing due to government policies, including grants to support afforestation[22].

The long-term target is to have 18% of land cover as forest by 2050, and to support a long-term sustainable roundwood supply of 7 – 8 million cubic metres per annum (m^3/a). Increasing forest resources will lead to increased supply of pulpwood, by-product and residues which can be utilised in the bioenergy sector.

The National forest estate continues to expand as reported in **Ireland's National Forest Inventory, 2017** comprising 11% of the total land area (770,020 ha in 2017)[23], with a wide variety of forest types present. Of this, 50.8% of forests are in public ownership and 49.2% are in private ownership. The forest estate is dominated by conifer species (71.2%) with broadleaved species accounting for 28.7% of the area and with 44.9% of the stocked forest estate less than 20 years of age. The total growing stock volume of Irish forests is estimated to be over 116 million m^3 with a gross mean annual volume of 8.4 million m^3 per year.

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[20] EPA (2012). National Waste Report. Available at: http://www.epa.ie/pubs/reports/waste/stats/EPA_NWR12_Complete_to_web_5Aug14.pdf

[21] A tonne of oil equivalent (toe) is the conventional standardised unit of energy and is defined on the basis of a tonne of oil having a net calorific value of 41,686kJ/kg. In terms of electricity production 1 toe is required to produced 11.63 Megawatt hours of electricity (see SEAI conversion factors http://www.seai.ie/resources/seai-statistics/conversion-factors/)

[22] DAFM (Department of Agriculture Food and the Marine) (2014). 'Forests, products and people. Ireland' forest policy - a renewed vision'.

[23] Department of Agriculture, Food and the Marine, National Forest Inventory 2017, Main Findings.

The level of forest thinning has increased since 2013 which is regarded as a positive trend for wood mobilisation. In addition the forest estate in Northern Ireland comprises 112,000 ha (NI), some 8% of the land area.

During the 2020 to 2027 timeframe, it is anticipated that the indigenous biomass industry will begin to yield additional volumes of fuel as WOP Station - in combination with LRP and EPL, will act as a catalyst for the industry.

It is expected that the agricultural sector will seek government support (in policy and fiscal terms) for the development of SRC e.g. willow. This will necessitate the preparation of position papers, the environmental assessment of same, and administration of a grant scheme. It is reasonable to expect that this will take c. 36 months before supports are available. This will be followed by the planting of crops and - noting that willow needs three to four years to initially develop with a greater yield occurring in the second rotation, significant volumes of these crops will likely only become commercially available in the mid-2020s.

Residues from forestry activities are therefore seen as a key resource with a large potential for biomass identified as also been potentially available from willow highlighting the importance of the agricultural sector in realising the bioenergy resource potential. This is reflected in Table 1.2 of the SEAI report with relevant figures extracted here in **Table 4-4**.

Table 4-4: Available solid biomass potential expressed in 'natural units'

Resource	Unit	2020	2025	2030	2035
Business as usual					
Forestry	'000 m3	491	1661	1621	2794
	ktoe	81	274	267	460
Biomass fibre for Electricity	ktoe	24 – 29	82 – 99	80 – 96	138 – 166
Sawmill Residue	'000 m3	862	974	1,098	1,237
	ktoe	142	160	181	204
Biomass fibre for Electricity	ktoe	42.6 - 51.1	48.1 - 57.8	54.3 - 65.2	61.2 - 73.4
Perennial energy crops	'000 m3	26	256	1,018	2,571
	ktoe	12	116	462	1,167
Biomass fibre for Electricity	ktoe	4—4	35-42	139-166	350-420
Enhanced Supply Scenario					
Forestry	'000 m3	541	1905	1811	2988
Forestry	ktoe	89	314	298	492

Resource	Unit	2020	2025	2030	2035
Biomass fibre for Electricity	ktoe	27-32	94-113	90-107	148-177
Perennial energy crops	'000 m3	32	372	1,283	2,571
	ktoe	15	169	582	1,167
Electricity only	ktoe	4—5	51-61	175-210	350-420

Note: - Oven dried tonnes. **-**1 ktoe is equivalent to 11,630 MWh[21]

The SEAI 2017 Report (Section 16.2) also provides estimates of potential availability of bioenergy for import in the future. It indicates that global trade in the biomass sector is likely to increase substantially in the future as countries increase their use of biomass.

It quotes a study - that completed for IEA Bioenergy Task 40 on Sustainable Bioenergy Trade [24], which found that trade in solid biomass could increase by a factor of about 80 by 2030 (from 2010 levels). This would give rise to trade of about 24,000 Picojoule (PJ) which is about 570 Mtoe of solid biomass. It also found that it would be likely that Europe would be a net importer drawing on exports from North and South America, Russia and the former USSR and parts of Africa.

The SEAI report goes on to state that:

> *'Ireland has deep water ports capable of receiving the large ships in which biomass is typically transported, but might need to develop the infrastructure necessary to deal with large quantities of imported biomass (e.g. bulk handling facilities at ports).'*

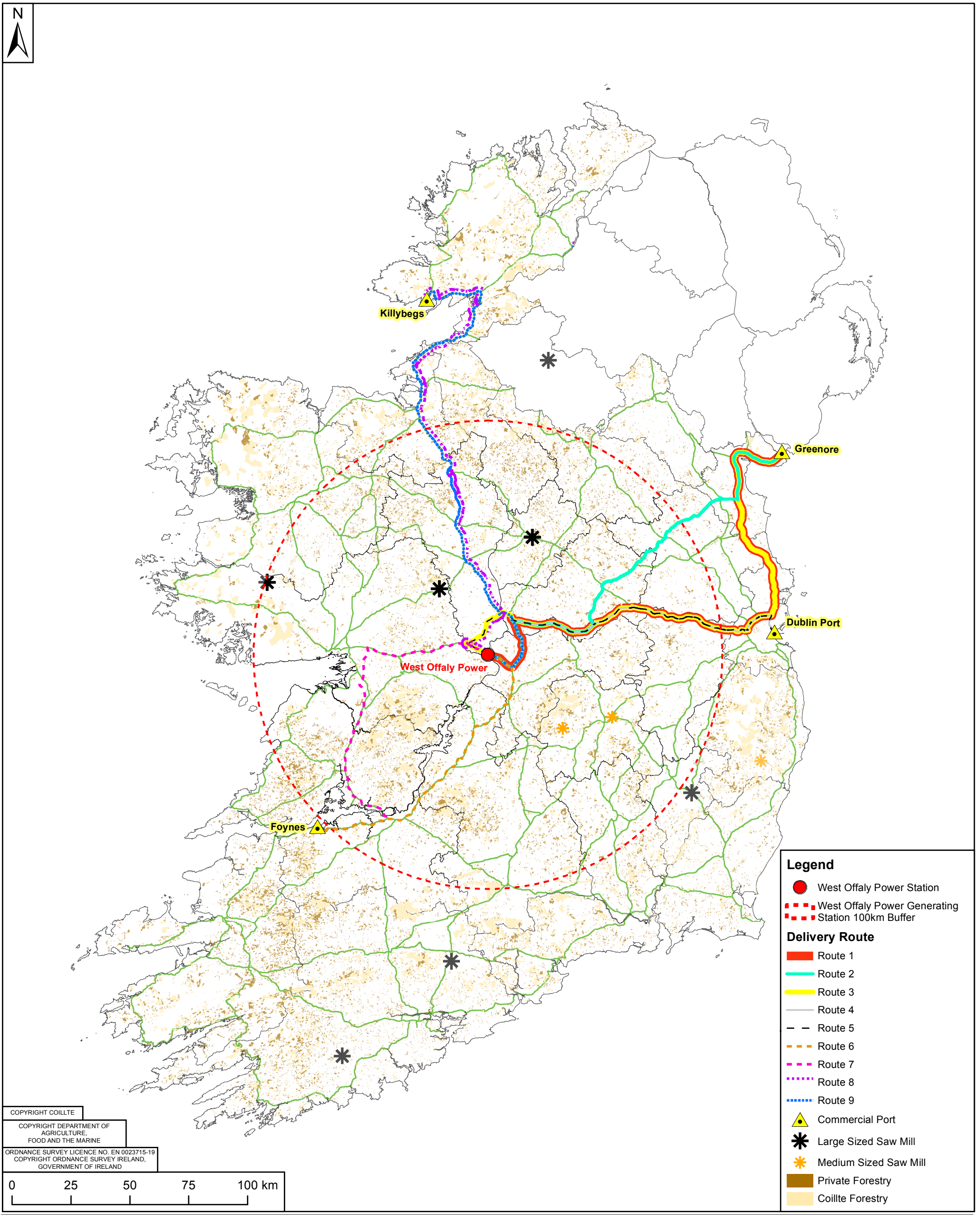
Biomass will be sourced Internationally on a commercial basis in accordance with the ESB sustainability criteria as set out in **Section 4.4.3.1** above and will come from Europe, Africa, Australia and North and South America but may also come from Asia.

4.3.3.3 Delivery of Biomass to the WOP Station

Biomass will be transported to the WOP Station site by road transport. The station will operate mainly on a just in time delivery basis for biomass with a 95%ile of 129 HGV biomass deliveries per day and average of 100 HGV biomass deliveries per day. Deliveries will be scheduled over a 16 hour day between (07.00 and 23.00 hours).

[24] Matzenberger, J., Daioglou, V., Junginger, M., Keramidas, K., Kranzl, L., Tromborg, E. (2013). 'Future perspectives of international bioenergy trade'. IEA Bioenergy Task 40.

As noted above, indigenous biomass - in the form of by-products and residues sourced from the forestry and timber processing industries and from indigenous crops and agriculture, will typically come from sources within a 100 kilometre radius of WOP Station but could also be sourced at greater distance depending on economic factors. Imported biomass will be landed by bulk transporters of approximately 30,000 tonne capacity at key ports with facilities to handle biomass – such as Dublin Port and Greenore, Co. Louth on the east coast or Foynes Port, Co. Limerick in the Shannon Estuary on the West coast. It will also be possible to utilise Killybegs Harbour, Co. Donegal on the north west coast. See **Figure 4-5** over.



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REV	DATE	REVISION DESCRIPTION	DRN	PROD	VER	APP

PURPOSE OF ISSUE - PRELIMINARY UNLESS INDICATED

CLIENT APPROVAL ☐ PLANNING ☐ TENDER ☐ CONSTRUCTION ☐ AS-BUILT ☐

DRAWING TITLE:

Figure 4.5-
Typical Indigenous Biomass Sources and Likely import Ports

CLIENT: **ESB**

PROJECT: **West Offaly Power, Transition to Biomass**

CONTRACT

PRODUCTION UNIT: **Civil & Environmental Engineering**

DRAWN	PRODUCED	VERIFIED	APPROVED	APPROVAL DATE
E.O'Shea	E.O'Shea	E. Delaney	P.Kavanagh	14/11/2018

CLIENT REF.	NO. OF SHEETS	SIZE	SCALE
00-00	00-00	A3	1:1,500,000

DRAWING NUMBER: **QS-000206-01-D460-130**

4.4 Proposed Fuel Management and Handling Facilities (Construction and Operation)

The proposed layout of development on the WOP Station is shown on **Figure 4-6**.

The proposed transition to biomass will not give rise to physical modifications to the power generation plant itself but require some modification of fuel storage and handling facilities.

4.4.1 Fuel Storage

There is no proposal to deviate from the established peat handling system on the WOP Station site – namely the existing peat wagon tipplers, screens, conveyors and storage in the intermediate peat storage (IPS), described in **Section 4.1**. As noted above, permission is being sought to maintain all of those elements and to continue to utilise them.

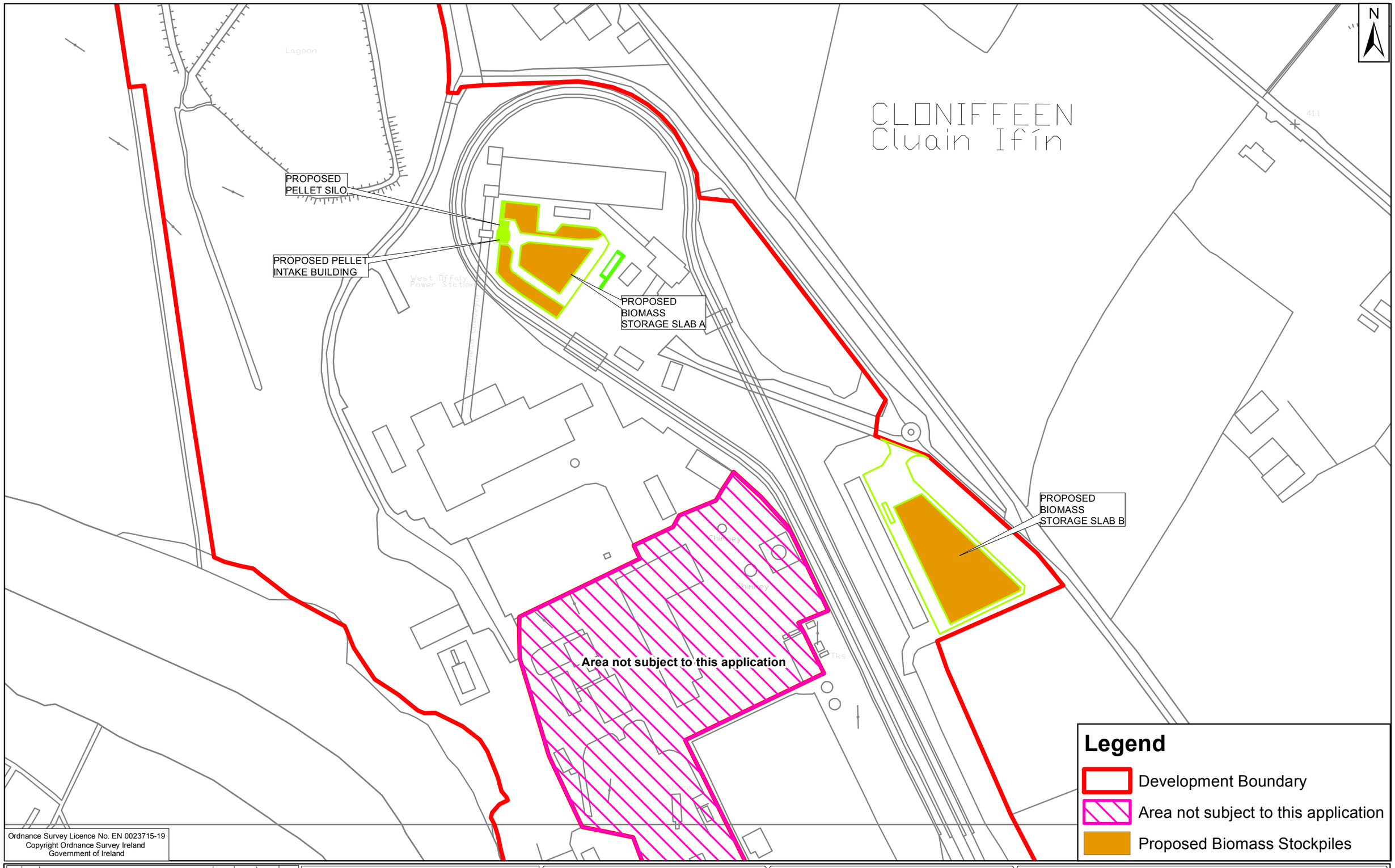
To facilitate the transition to biomass at WOP Station, it is proposed to provide two purpose built concrete slabs for the short-term storage of biomass described in **Section 4.3.2** above. One of the proposed concrete slabs is located immediately south of the existing Intermediate Peat Storage building and is referred to as Biomass Storage Slab A. The other slab is located adjacent to the eastern entrance to the station referred to as Biomass Storage Slab B. It is also proposed to provide a silo for the storage of pellets and this will be located adjacent to the Biomass Slab A.

The slab and pellet storage designs have been prepared jointly by ESB (Storage Slab A) and by Bord na Móna (Storage Slab B and the pellet storage system).

4.4.2 Proposed Biomass Storage Slab A

Storage Slab A is located adjacent to the existing IPS building, see **Figure 4-7.** Storage Slab A will have a surface area of c. 3,924 sq.m. and will accommodate approximately 2 No. days of biomass storage – indicatively c. 9,030 cubic metres of material. Deliveries to this slab will use the existing weighbridge.

Storage Slab A will be surrounded on three sides with a 5 m maximum height reinforced concrete retaining wall approximately 300 mm to 400 mm in thickness, subject to detailed design. This wall is intended to be supported by the reinforced concrete foundation slab where it would be locally thickened, if required, and be supported by the piles, if required. The reinforced concrete walls will be designed to support a dust (wind protection) screen positioned to the top of the wall should dust become an issue at a later stage and be required.



REV	DATE	REVISION DESCRIPTION	DRN	PROD	VER	APP

PURPOSE OF ISSUE - PRELIMINARY UNLESS INDICATED

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INTERNATIONAL
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ESB International is a trading name of
ESBI Engineering & Facility Management Ltd.
Registered Office: as above
Registered in Ireland No. 155249

CLIENT: ESB

PROJECT: West Offaly Power Transition to Biomass

CONTRACT

PRODUCTION UNIT: Civil & Environmental Engineering

DRAWING TITLE: Figure 4.6- WOP Station Proposed Layout Plan

DRAWN	PRODUCED	VERIFIED	APPROVED	APPROVAL DATE
E.O'Shea	E.O'Shea	E.Delaney	P.Kavanagh	14/11/2018

CLIENT REF.	NO. OF SHEETS	SIZE	SCALE
00-00	00-00	A3	1:2,500

DRAWING NUMBER: QS-000206-01-D460-131

Legend

Proposed Biomass Stockpiles

REV	DATE	REVISION DESCRIPTION	DRN	PROD	VER	APP

PURPOSE OF ISSUE - PRELIMINARY UNLESS INDICATED

CLIENT APPROVAL ☐ PLANNING ☐ TENDER ☐ CONSTRUCTION ☐ AS-BUILT ☐

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CLIENT: **ESB**

PROJECT: **West Offaly Power, Transition to Biomass**

CONTRACT

PRODUCTION UNIT: **Civil & Environmental Engineering**

DRAWING TITLE: **Figure 4.7- WOP Station - Biomass Storage Slab A**

DRAWN	PRODUCED	VERIFIED	APPROVED	APPROVAL DATE
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Additionally, a proprietary precast concrete wall, such as Alpha Bloc removable walls, is intended to be located in one area to the north west of the slab to allow for access for future maintenance works in that area. The precast A frame concrete wall will be 3.6 m in height.

Slab A will be located in the centre of an existing unused gravelled fuel handling area of the WOP Station site. This proposed location will not appreciably impact upon the existing road layout and flow of peat delivery trucks and importantly, will maintain access to the West side of the site for maintenance works and for emergencies

An overview of the general area and the approximate footprint of Storage Slab A in shown in **Figure 4-8Error! Reference source not found.** and **Figure 4-9**. Within this area the pellet storage silo will also be located as shown in **Figure 4-6**.

Figure 4-8: Ground view of Biomass Storage Slab A

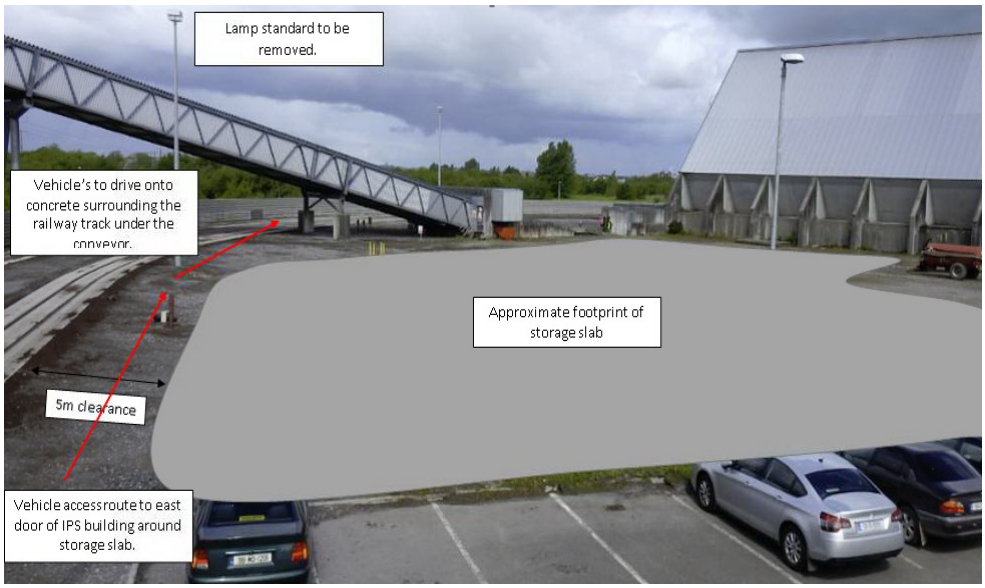

Figure 4-9: Approximate footprint of Biomass Storage Slab A

4.4.3 Proposed Biomass Storage Slab B

Biomass Storage Slab B will be located to the south-east of the existing roundabout at the entrance to the fuel handling section of the WOP Station site. It is located immediately west of a former storage building, see **Figure 4-10** below.

N

Existing Road

PROPOSED
BIOMASS
STORAGE SLAB B

Existing Building

Chimney

Area not subject to this application

TKS.

TKS.

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0 10 20 30 40 50 m

Legend

- Development Boundary
- Area not subject to this application
- Proposed Biomass Stockpiles

REV	DATE	REVISION DESCRIPTION	DRN	PROD	VER	APP

PURPOSE OF ISSUE - PRELIMINARY UNLESS INDICATED

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CONTRACT

PRODUCTION UNIT: **Civil & Environmental Engineering**

DRAWING TITLE: **Figure 4.10- WOP Station - Biomass Storage Slab B**

DRAWN	PRODUCED	VERIFIED	APPROVED	APPROVAL DATE
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CLIENT REF.	NO. OF SHEETS	SIZE	SCALE
00-00	00-00	A3	1:750

DRAWING NUMBER: **QS-000206-01-D460-133**

Biomass Storage Slab B will have a surface area of c. 6,331 sq.m. It will be located adjacent to the eastern entrance to the station and will also accommodate additional biomass storage, c. 25,750 cubic metres of material. As with Storage Slab A, moveable walls (Alpha Blocs and Octoblocs) will be used to separate material within, and around the edge of, the slab.

Access to the slab will be via the roundabout and the slab will be located between an existing building and existing overhead power lines. The area currently comprises made-ground, see **Figure 4-11** below.

Figure 4-11: Proposed location of Biomass Storage Slab B

The edge of the slab will be located 3m from the existing building and 8m from the overhead power lines. Vehicular access to the existing roller shutter door at both gable ends of the existing building shall be maintained, although access to the southern end of the building may be restricted during the construction period. Access to the overhead power lines shall be maintained outside the slab area with a ramp provided at the northern end of the slab.

Deliveries of biomass to the slab shall be weighed and sampled on arrival using either the existing weighbridge or alternatively the proposed weighbridge to be provided on the biomass slab. This weighbridge may be constructed at a later stage than the slab construction as it may not be required for the initial years of the stations operation.

Existing trees located to the south-east of the slab location (as shown on **Figure 4-12)** will be removed - in accordance with the requirements of any Felling Licence, prior to the commencement of construction.

In order to achieve the proposed site levels it will be necessary to excavate material to reduce the level of the existing ground. This material shall either be removed off

site for disposal, reused on site for landscaping purposes or reused offsite in accordance with the relevant Waste Regulations.

On completion of the Slab B construction, 3.6 m high precast concrete moveable wall units, Alfablocks or similar, and precast concrete blocks, Octablocks or similar, will be delivered to site and lifted into place on the slab using a mobile crane.

Figure 4-12: Existing tree stands at proposed location of Storage Slab B

4.4.4 Proposed Pellet Silo

Adjacent to Slab A, it is proposed to provide a biomass pellet silo and pellet intake building for the handling of pellets which will be delivered by lorry. This silo will have a diametre of 6 m and a maximum height of 14.7 m. It will be constructed in galvanised steel with a non-corrugated body and shall have a capacity of 260 cubic metres (m^3). The pellet intake building will be c. 61 sq.m. in area.

The pellets shall discharge from the silo to the adjacent existing conveyor via a screw conveyor and an additional screw conveyor shall be provided to the open ground west of the conveyor for emergency discharge of pellets. The proposed pellet intake building will be a steel framed building with a maximum height of 17.2 m. A bucket elevator, dust extraction plant and electrical controls will also be housed in the pellet intake building. See Planning Drawing No. **QS-000206-01-D460-068**.

The pellet intake building and pellet silo may be constructed in conjunction with the construction of Biomass Slab A.

4.4.5 Delivery of peat and biomass fuel

Peat fuel will be delivered by rail and by road to the WOP Station. Peat delivered by rail will be unloaded to the underground fuel handling system directly in the tippler building. Peat delivered by road will be unloaded directly to the three lorry unloader bays directly onto the underground fuel handling system. Biomass will be delivered by road and will be unloaded directly to the underground fuel handling system or directed to the biomass storage areas as required. It will then be subsequently transferred from these storage slabs to the underground conveyor system. Pelleted biomass will be delivered directly to the pellet storage system. **Appendix 4.1** sets out the activities which are associated with the delivery and handling of peat and/or biomass to WOP Station.

4.4.6 Drainage management

4.4.6.1 Drainage Biomass Slab A and Pellet Silo

The proposed drainage for the sites of Biomass Storage Slab A and the Pellet Storage Silo will include the rerouting of some existing services and the construction of a new surface water system to capture surface runoff from the slab. Further details are provided in **Appendix 4.2** and **Appendix 8.5**.

The proposed drainage system for the slab has been designed to route all flows through a combined Sustainable Urban Drainage System (SUDS). The proposed SUDS system will include a treatment train to ensure surface runoff from stored biomass and any potential oil spillages in are treated sufficiently before entry into the existing system.

4.4.6.2 Drainage Biomass Slab B

The proposed slab will be laid to a fall, and surface water shall discharge into a drainage channel that runs along the edge of the slab. Further details are provided in **Appendix 4.2** and **Appendix 8.5**.

Typical details such as those that relate to oil interceptors and attenuation tanks are provided. The final design of these will be subject to detailed design.

4.4.7 Existing and Ancillary Services

4.4.7.1 Existing services

Typical existing services at Storage Slab A include surface water drains, light poles, a fire hydrant main and an 11kV electrical cable. The location has very little existing underground services and those that are present will be exposed and protected, or be relocated around the perimetre of the slab for maintenance reasons prior to construction and recorded on as-built drawings. The area where the slab is proposed to be positioned is free from overhead lines and will be surrounded by existing buildings and infrastructure minimising its impact on its surroundings.

There is an existing surface water drain located in the vicinity of the proposed silo and intake building. This pipe will be diverted and incorporated into the proposed drainage network for the area.

There are no identified underground services located in the immediate area of Storage Slab B. Slab B has been located to maintain a distance of 8 m from the existing overhead lines. As there is a 3 m separation between the existing building and the slab, existing drainage should not be affected, however if required this can be diverted. Confirmatory investigations will be undertaken by Contractor prior to any excavation to confirm assumptions with respect to services including underground cables and in accordance with health and safety regulations.

4.4.7.2 Ancillary services

New Access Gate

At Storage Slab B a new gate and new fencing will be provided. The existing gate will remain in place during construction works and will be used to secure the site. The existing gate will be removed when the new gate and fencing has been erected.

The new gate will be set back from the road edge in order to provide a splayed entrance. Due to the length and height of the new gate a mobile crane will be required to lift it into place.

New Weighbridge

At Storage Slab B a new weighbridge will be provided. The proposed weighbridge can be constructed flush with the concrete slab when the slab is constructed, or alternatively, installed at a later date when it can be supported on the slab. A crane will also be required to lift the weighbridge into position.

Fire fighting

Provision for fire safety measures have been made. Fire cabinets are proposed to be located around Biomass Slab A as shown on the plan drawing **QS-00206-01-D460-033.** These cabinets are proposed to contain 60m rolled up hoses and combined together will service all areas of the proposed biomass slab. The firefighting plan including all associated firefighting provisions will require to be designed by a fire engineering specialist. The fire fighting plan and provisions will be submitted to the local county council fire department for acceptance.

A water ring main may be provided, located around the top of the biomass storage wall, to dose the biomass as a dust mitigation measure should it be required, to be determined during the detailed design stage.

Fire hydrants with fire hoses shall also be provided at three locations in the vicinity of Storage Slab B slab and a fire water ring main will be provided for firefighting purposes.

Lighting

It is proposed that Asymmetric lights (typically up to 12 m in height and fitted with LED 150w LED 4K), would be located on top of the biomass retaining walls in Biomass Slab A to illuminate the slab for night time operations.

At Storage Slab B, circa eighteen lighting poles (up to 12 m high) shall be erected around the slab, each with 240W LED 4K asymmetric lights. It may be possible to fit six of the proposed lights to the existing building instead of providing lamp posts and this will be determined at detailed design stage.

4.4.8 Site Access

There are currently two routes to the WOP Station – that from Shannonbridge village (via the R357) to the north of the site, and that via the existing Bord na Móna works access that links with the R357 to the east of the station, see **Figure 4-13**.

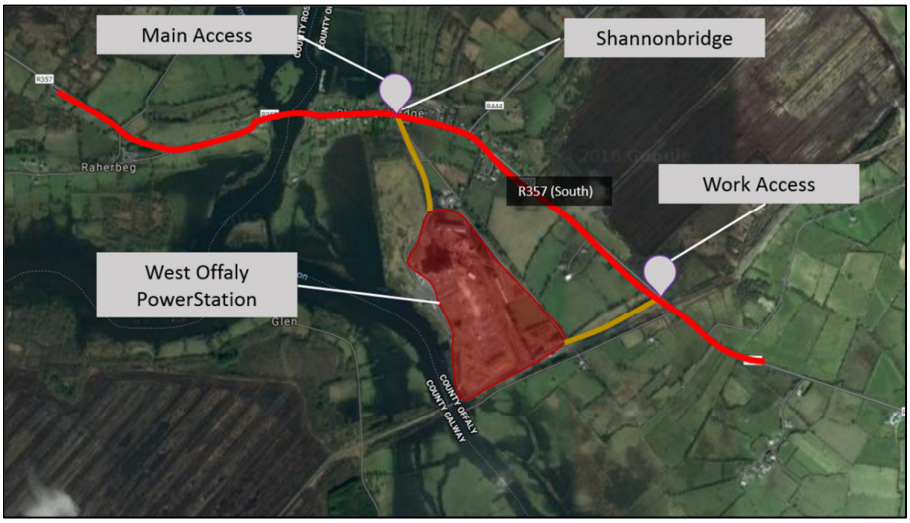


Figure 4-13: WOP site access

Notwithstanding the proposed new entrance gates, there are no proposed changes to these access arrangements to facilitate either the proposed construction or operational stages.

4.4.9 Biomass Storage Construction Approach

A detailed construction management plan has been prepared for the construction of the proposed development and is provided in **Appendix 4.2**. This is summarised in the following sections.

A Contractor Specific Method Statement and Safety Risk Assessment will be prepared by the construction contractors and coordinated and reviewed by ESB for this work.

The Conditions of the IE Licence P0611-02 will be adhered to at all times during the works. A Construction and Environmental Management Plan (CEMP) will be

prepared by the Contractor prior to commencement of works. This CEMP will set out the detail of the project construction and will include a Traffic Management Plan and a Waste Management Plan. This Plan must also include a Construction and Demolition Waste Management Plan in accordance with the "*Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects*" published by the Department of Environment, Heritage and Local Government in 2006, and ensure that all material is disposed of at an appropriately licensed landfill site.

4.4.9.1 Phasing of construction works

It is intended that the two biomass storage slabs will be constructed in two separate phases. The Pellet Storage Silo and Pellet Intake Building will be constructed with the Storage Slab A and it is anticipated that this will be constructed in Phase 1. The construction of the Storage Slab B and associated works will be constructed in Phase 2.

4.4.9.1 Condition Survey of Nearby Structures:

After the diversion of existing services has been carried out, a pre-condition survey of any sensitive structures within the vicinity of the works would be carried out. Any structures to be monitored would be identified in the detailed design stage of the works.

4.4.9.2 Additional site investigation works

Both a ground-bearing or piled option have been considered for the construction of the storage slabs. To inform detailed design additional site investigations will be undertaken to determine the bearing capacity of the soil and consolidation rates. The foundation design will be finally determined when detailed site investigations are carried out. The construction methodology has been developed for both of these foundation options.

4.4.9.3 Option 1 - Ground Bearing Foundations

Prior to the construction of the slabs the drainage network, manholes, silt traps and attenuation areas will be constructed. The slab construction is subject to detailed design following further confirmatory site investigation. Formwork shall be provided to form the proposed drainage channel at the edge of the slab. The detail design shall provide for water tight construction and expansion joints in the concrete.

Storage Slab A

The area will be excavated to the agreed formation level with spoil removed off site for stockpiling and possible reuse. It is estimated that a max depth of spoil to be removed in some areas will be in the order of 750 mm. Spoil is intended to be tested for reuse to ensure it meets the appropriate performance requirements. Where deemed unsuitable, soil will be tested and disposed of locally if possible and in accordance with the waste regulations.

A ground bearing slab and retaining wall would be constructed on granular material compacted in layers and likely incorporate a layer of geotextile and a layer of geogrid, in compliance with TII manual for "Specification of Highway

Works". The granular material should be compacted in layers with a vibrating roller or equivalent equipment, subject to detailed design. The reinforced concrete slab shall be designed based on the requirements of IS EN 1992 for vehicle wheel loads and the weight of the biomass as part of detailed design, and is envisaged to be approximately 300 mm in thickness. The steel reinforcing mats is envisaged to be constructed on top of a blinded formation level. The concrete slab and wall foundation is intended to be discharged by pump on site and the concrete will be vibrated before finishing.

Slab B

The existing made ground shall be excavated, tested for reuse and if unsuitable shall be removed off-site for disposal in accordance with waste regulations. Prior to the construction of the slab the drainage network, manholes, silt traps and attenuation area shall be constructed. The biomass slab shall be 300mm thick reinforced concrete laid to falls. The slab construction is subject to detailed design following further site investigation. Formwork shall be provided to form the proposed drainage channel at the edge of the slab. The detail design shall provide for water tight construction and expansion joints in the concrete.

Pellet Silo and Pellet Intake Building

The borehole information available in the vicinity of the pellet silo and pellet intake building indicates the depth of rock to be 3.7 m below existing ground level. Construction of a ground bearing foundation for the pellet silo and pellet intake building foundations entails the removal of ground to rock level and the build up to formation level in layers with compacted granular material such as 6F2 and Clause 804. The concrete floors shall be designed as ground bearing raft foundations.

4.4.9.4 Expected construction equipment – ground bearing foundations for Slab A, B and Pellet Silo

The expected construction plant needed to carry out the ground bearing foundation construction works for Storage Slabs A and B and the pellet silo is set out in **Table 4-5.**

Table 4-5: Expected Construction Plant- Ground Bearing Foundations

Slab A	Slab B	Pellet Silo and Intake Building
• 21 tonne Excavators x 2 • 6 tonne Dumper x 1 • 28 tonne Articulated Dumper x 1 • 5 tonne Vibration Mini Roller x 1 • Telehandler x 1 • Concrete pump x 1 • Concrete poker/vibrator x 4	• 21 tonne excavator x 2 • 9 tonne dumper x 1 • 5 tonne vibration mini roller x 1 28 tonne articulated dumper x 1 • Telehandler x 1 Concrete pump x 1 • Concrete poker/vibrator x 1	• 21 tonne excavator x 2 (with rock breaker attachment) • 9 tonne dumper x 1 • 5 tonne vibration mini roller x 1 • 28 tonne articulated dumper x 1 • Telehandler x 1 • Concrete pump x 1 • Concrete poker/vibrator x 2

4.4.9.5 Option 2 - Piled Foundations

Again, prior to the construction of the slabs the drainage network, manholes, silt traps and attenuation areas will be constructed. The piling and slab construction will be subject to detailed design following further confirmatory site investigation. Formwork shall be provided to form the proposed drainage channel at the edge of the slab. The detail design shall provide for water tight construction and expansion joints in the concrete.

Storage Slab A

If the assessment of the site investigations determine that excessive settlement of a ground bearing slab would likely occur, a piled foundation may need to be constructed to transmit the load to the limestone rock approximately 5m below existing ground level.

Preliminary design suggests that approximately 350 piles would be required with a diametre of approximately 375 mm and a length of 6m typically, subject to detailed design. The reinforced concrete slab thickness, steel reinforcement, and pile spacing and design is intended to be calculated based on the requirements of IS EN 1992 for anticipated vehicle wheel loads and the weight of the biomass and IS EN 1997.

The area is intended to be excavated to the agreed formation level with spoil removed off site for stockpiling and possible reuse. It is estimated that a max depth of spoil to be removed in some areas will be of the order of 850 mm, to be confirmed. Spoil is intended to be tested for reuse to ensure it meets the requirements where practicable. Where deemed unsuitable, soil will be tested and disposed of locally if possible and in accordance with the waste regulations.

A piling platform would be constructed of granular material compacted in layers and likely incorporate a layer of geotextile and a layer of geogrid, in compliance with TII manual for “Specification of Highway Works”.

Slab B

As part of the detailed design it may be determined that piling is the most suitable option for the slab construction. In this event, the ground level will be excavated to formation level and a base shall be provided for the piling rig using compacted granular material. Bored in-situ piles shall be provided to transfer loads to the rock and these piles shall be filled with reinforced concrete. The design based on preliminary site investigation indicates a concrete slab design of 300mm thickness designed to span between piles. It is estimated that 400 piles (450mm diametre) will be required. The drainage design may have to be amended to accommodate the pile locations.

Pellet Silo and Pellet Intake building

The type of piles to be used will be determined at detailed design stage having regard to the design of the adjacent biomass slab. Due to the proximity to existing buildings, plant and equipment, however, bored piles may be the most suitable option. The number and location of the piles shall be designed so as to accommodate the walls of the pellet storage pit in the vehicle intake building. Based on the borehole information the maximum length of pile required is estimated to be less than 5m and the bored piles shall be of reinforced concrete construction.

Excavation of existing made ground will be required to accommodate the pellet storage pit and some rock breaking may be required based on the borehole information in this area. This shall be carried out in accordance with planning permission requirements and noise conditions and in accordance with the requirements of the power station operations. All excavated material shall be removed off site and disposed of locally if possible in accordance with the waste regulations.

The floor of the vehicle intake building and the base and walls of pellet storage pit shall be constructed in reinforced concrete of 300mm thickness. The proposed silo shall be supported on a 300mm thick reinforced concrete slab designed to span between piles.

4.4.9.6 Expected construction equipment - piled foundations

The expected permanent construction plant needed to carry out the piled foundation are as set out in **Table 4-6.**

Table 4-6: Expected Construction Plant- Piled Foundations

Slab A	Slab B	Pellet Silo and Intake Building
• 21 Tonne Excavators x 2 • 6 Tonne Dumper x 1 • 28 Tonne Articulated Dumper x 1 • 5 Tonne Vibration Mini Roller x 2 • Telehandler • Piling Rig x 1 • Concrete Pump x 1 • Concrete poker/vibrator x 4	• 21 tonne excavator x 2 • 9 tonne dumper x 1 • 5 tonne vibration mini roller x 1 28 tonne articulated dumper x 1 • Telehandler x 1 Piling rig x 1 Concrete pump x 1 • Concrete poker/vibrator x 1	• 21 tonne excavator x 1 (with rock breaker attachment) • 9 tonne dumper x1 • 5 tonne vibration mini roller x 1 Telehandler x 1 • Piling rig x 1 Concrete pump x 1 • Concrete poker/vibrator x 2

4.4.9.7 Site Management

All construction works on site shall be managed and supervised by competent and qualified personnel and all works shall be carried out under appropriate supervision, best practice current health and safety measures and also best practice quality control. The works shall also be supervised by Engineers on behalf of the client.

4.4.9.8 Temporary site compound and laydown areas

The following four locations have been identified as areas that can be used during the construction stage for construction staff car parking, site offices and material laydown areas. Figure 4-14 below shows these locations. The contractor will determine in conjunction with ESB, which of these areas is the most suitable to carry out their works efficiently.

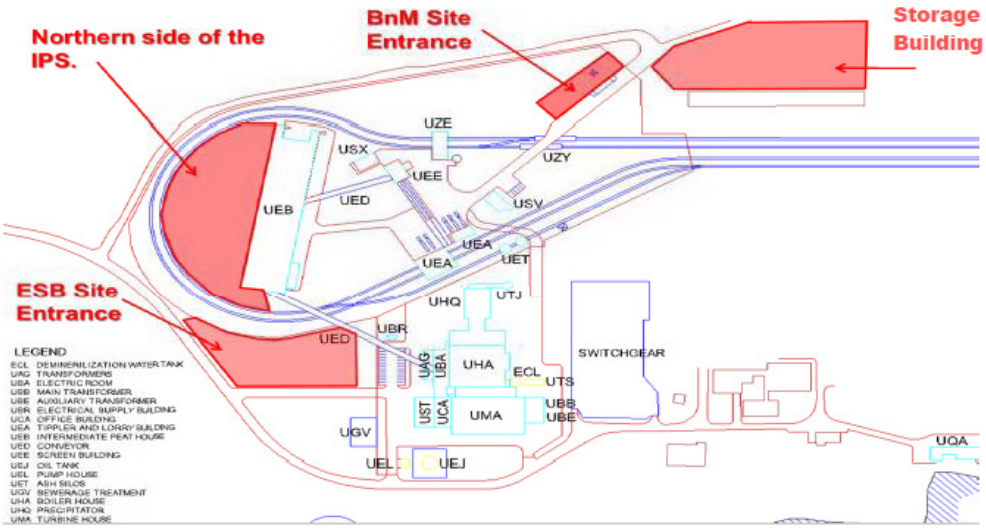


Figure 4-14: Potential Construction site laydown areas

Facilities for site employees and visitors shall be provided within the site compound. The facilities provided shall include office space, toilet facilities, drying room, site canteen with drinking water, hot water, seating and facilities to heat and refrigerate food, parking area and storage containers. All facilities shall have adequate heat and lighting and shall be maintained in a clean and tidy way. The site compound shall be fenced and secured to prevent unauthorised access. All temporary facilities shall be removed on completion of the works and the site compound area shall be reinstated.

Site and cycle parking shall be provided for construction personnel within a designated area within the site compound. A clearly marked pedestrian route shall be provided from the site compound area to the works area. All vehicles will be required to reverse park in the site compound area.

4.5 Proposed Development of Additional Landfill Capacity (Construction and Operation)

4.5.1 Future Requirements for Ash Disposal

Ash - both fly ash and bottom ash, will continue to arise from the generation activities at WOP. This will require the development of new ash disposal cells, as incorporated in the current proposal.

The proposed development will be carried out in accordance with the established and permitted operations at the ADF site. These operations take place in the context of the existing IE Licence for WOP Station and in accordance with any Licence Review and any subsequent new licence. The existing ADF will continue to exclusively accept ash from WOP Station and there will be no intensification of activity at the ADF. There will be no increase in the levels of rail or road traffic as a consequence of the proposed development. There will be no increase in the level of plant required on site or the noise currently generated.

Based purely on peat combustion, the combustion of 1,250,000 energy tonnes of peat per annum would give rise to a disposal requirement of c. 52,000 tonnes of ash. However the combustion of biomass typically gives rise to less ash than peat. Therefore the percentage of ash arising each year will reduce as the proportion of biomass increases. Based on indicative calculations for co-firing and exclusively biomass stages, it is estimated that the extended footprint can meet disposal requirements for 25 years, depending on the actual ash arisings.

There will also be no increase in the volume of leachate produced due to the increased volume of ash as cells are capped as they are filled.

4.5.2 Proposed Development at the ADF

Proposed operations at the ADF will be in-line with the established operations with ash transported to the site by covered rail wagon and placed in lined landfill cells as detailed in **Section 4.1.2.2** of this EIAR.

The current extent of the landfill footprint and the proposed new development (new landfill cells) are shown on **Figure 4-15**.

Three cells (Cells 1, 2 and 3) are already closed and capped as per the requirements of the IE licence. Cells 4 and 5 are currently active and are accepting ash with capping being completed on an ongoing basis in accordance with the approved Ash Landfill Operational Plan and the existing IE Licence, and as approved by the EPA. It is anticipated that Cell 6 will be used from late 2019 / early 2020 and will be actively in-use when WOP Station enters its co-firing phase. That cell will be required for acceptance of ash up until end of 2020.

It is proposed that a further five engineerd landfill cells will be developed (Cells 7, 8, 9, 10 and 11). This will extend the ADF footprint by c.173,130 sq.m. This will accommodate the disposal of an additional c. 929,200 cubic metres of ash (approximately equivalent to 880,000 tonnes). As noted above, this facility will have no defined date of closure but it is expected it can accommodate ash arisings for a period in the range of 25 years.

To facilitate the extended operation of the ADF, peat soil within the ADF site area and adjacent to the landfill footprint itself will also be excavated to a depth of circa one metre to provide material for the final landfill capping layer.

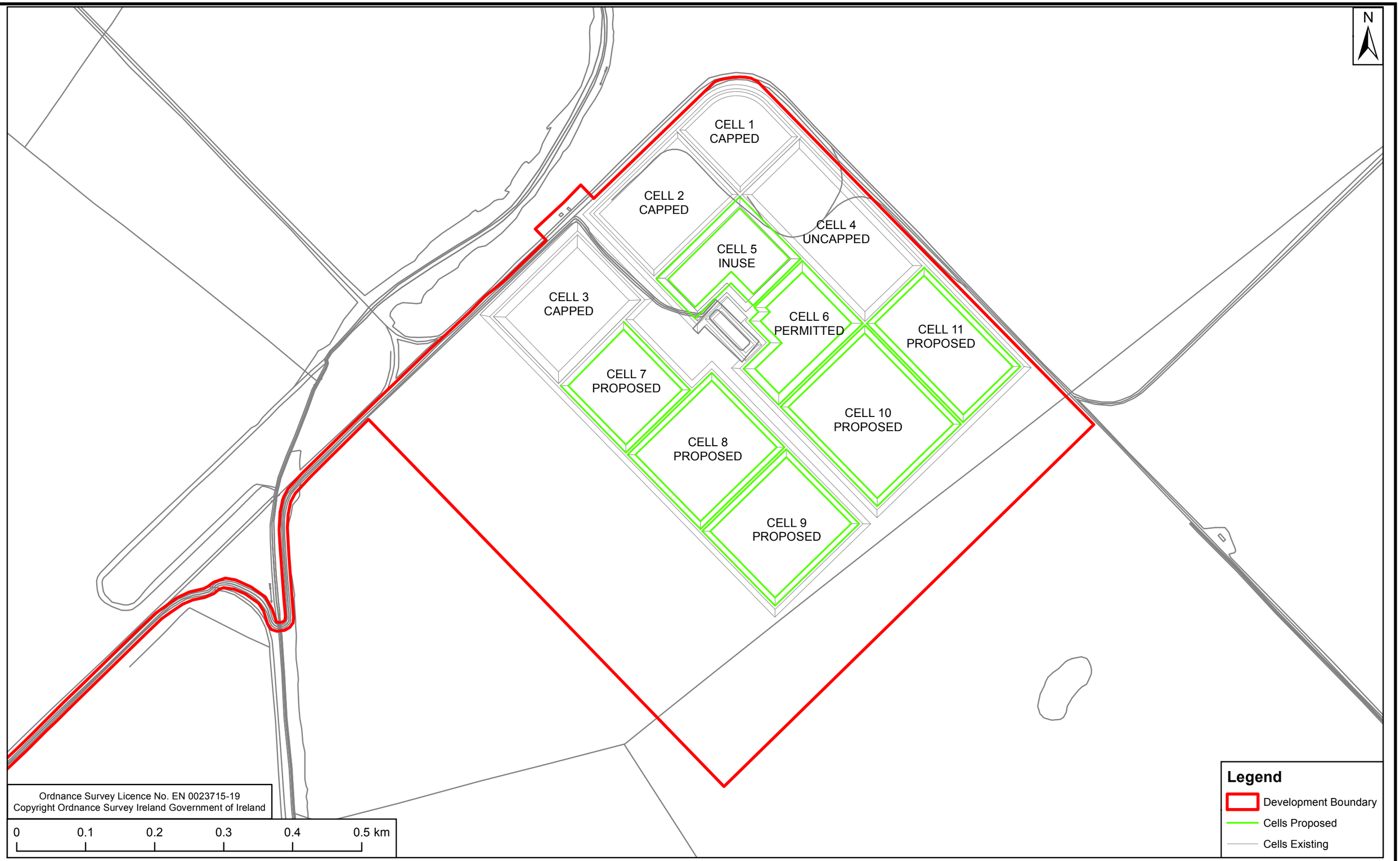
Cells will continue to be capped as they are filled.

The proposed cells will be constructed in accordance with the EPA guidance and the IE licence for the site as is currently and as detailed in **Section 4.1.2.2**. of this EIAR.

4.5.2.1 Site Services and Infrastructure

To facilitate on-going operations at the ADF, it is proposed that a new 4,500 cubic metres lagoon (surface area of 1,400 sq.m.) will be developed on the site. This will ensure all leachate will be managed on the site in-line with established practice and in accordance with the IE licence.

Existing site services and infrastructure – including the vehicular access way, surface water drains, leachate collection system and railway network will continue to be used and extended. Other than the proposed addition to the leachate collection and management system, no other works are required to facilitate the acceptance of the additional ash.



REV	DATE	REVISION DESCRIPTION	DRN	PROD	VER	APP

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CLIENT: **ESB**

PROJECT: **West Offaly Power, Transition to Biomass**

CONTRACT

PRODUCTION UNIT: **Civil & Environmental Engineering**

DRAWING TITLE: **Figure 4.15- WOP ADF Proposed Layout Plan**

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00-00	00-00	A3	1:5,000

DRAWING NUMBER **QS-000206-01-D460-134**

4.5.3 Operation & Maintenance

WOP Station operates an Environmental Management System (EMS) certified to ISO14001:2015. The management of the environmental aspects of the WOP Station site including the ADF complies with this EMS under ISO14001 and IE 611-02 as well as the stations environmental policy. The Station also operates under the ETS scheme with a GHG emission permit (Licence Reference IE_GHG077_10385_4) issued by the EPA

As part of the Environmental Management Programme, objectives and targets are set to deal with all potential emissions from WOP Station including the ADF. The guiding principle in the operation of the ADF is to deposit ash with due care to safety and the environment in compliance with all relevant regulations.

4.6 Construction Material Quantities and Associated Transport for the Proposed Development

This section considers the quantities of materials associated with the proposed development.

The foundation design will be finally determined when further detailed site investigations are carried out prior to construction. However a summary of the estimated construction material quantities and the associated activities during the construction period is provided in **Table 4-7** for ground bearing and in **Table 4-8** for pile bearing. Further detail is provided in **Appendix 4.2**.

Table 4-7: Estimated Construction Materials Ground Bearing

Ground Bearing Quantities and Materials					
Slab A		**Slab B**		**Pellet Silo & Pellet Intake Building**	
Description	**Quantities**	**Description**	**Quantities**	**Description**	**Quantities**
Additional SI		Excess excavation material	4300 m^3	Excess excavation material	520 m^3
Relocating Services		6F2 granular material	3000 m^3	6F2 granular material	455 m^3
Excavation Reduce Site levels	2990 m^3	Clause 804 granular material	330 m^3	Clause 804 granular material	30 m^3
Filling – Imported stone for base	1380 m^3	Clause 505 Pipe surround	150 m^3	Concrete deliveries	75 m^3
Slab - Blinding	230 m^3	Terram and geogrid	18990 m^2	Reinforcement	10 Tonnes
Slab – Concrete pour	1380 m^3	Concrete deliveries	1900 m^3	Structural steel	6 Tonnes
Retaining walls – Concrete pour	228 m^3	Reinforcement	247 Tonnes	Cladding and doors	565 m2
Steel – Reinforcing	187 Tonnes	Drainage materials pipes, manholes etc		Equipment (bucket elevator, conveyors etc)	
Alfaboc walling		Gates and fencing		Silo	
Drainage Works	1253 m	Biomass separation walls - Octablocs	60 nr		
Car Park Relocation – Exported materials and soil disposal	179 m^3	Biomass separation walls - Alfablocs	200 nr		
Car Park Relocation – Imported Stone / Bitumen	140 m^3	Lighting			
Lighting					

Table 4-8: Estimated Construction Material Pile Bearing Quantities

Pile Bearing Quantities					
Storage Slab A		Storage Slab B		Pellet Silo	
Description	Quantities	Description	Quantities	Description	Quantities
Additional SI Works		Excess excavation material	2900 m^3	Excess excavation material	250 m^3
Relocating of Services		6F2 granular material	1575 m^3	6F2 granular material	0
Excavation – Reduce Site levels to Formation	3450 m^3	Clause 804 granular material	330 m^3	Clause 804 granular material	25 m^3
Filling – Imported stone for base	1380 m^3	Clause 505 Pipe surround	150m^3	Concrete deliveries	93 m^3
Piling – 310 piles approx.	205 m^3	Terram and geogrid	0	Reinforcement	12 Tonnes
Slab - Blinding	230 m^3	Concrete deliveries	2340m^3	Structural steel	6 Tonnes
Slab – Concrete pour	2070 m^3	Reinforcement	304 Tonnes	Cladding and doors	565 m^2
Steel - Reinforcing	231 Tonnes	Drainage materials pipes, manholes etc		Equipment (bucket elevator, conveyors etc)	
Retaining walls – Concrete pour	228 m^3	Gates and fencing		Silo	
Drainage Works – SUDS pipe laying and drainage diversions	1253 m	Biomass separation walls - Alfablocs	200nr		
Car Park Relocation – Exported materials and soil disposal	179 m^3	Biomass separation walls - Octablocs	60nr		
Car Park Relocation – Imported stone / Bitumen	140 m^3	Lighting			
Alfabloc Walling					
Lighting					

A summary of the estimated associated HGV deliveries during the construction period is provided in **Table 4-9** below and is further detailed further in **Appendix 4.2**. Traffic volumes may vary during the construction stage depending on the type of construction method required.

Table 4-9 Estimated Construction Total HGV Traffic Volumes

Estimated Construction Total HGV Traffic Volumes			
	Slab A	**Slab B**	**Silo**
Ground bearing foundation design	824	1,171	143
Piled foundation design	996	914	64

4.6.1 Delivery Protocols during Construction

The contractor will inform and educate all regular suppliers and all sub-contractors and delivery drivers of the basic procedures. All deliveries will be controlled at the entrance to the fuel handling area. The designated storage areas shall be identified prior to taking delivery of the material and the driver shall be directed to the storage area. Further detail is provided in **Appendix 4.2**.

Materials shall be sourced locally in so far as possible and potential suppliers for concrete and stone are listed in **Table 4-10**.

Table 4-10: Potential Local Material Suppliers

Potential Local Suppliers	Name	Location	Approx. Distance
Concrete	Kildea Concrete	Bealnamulia, Athlone	20 km
Concrete	Whytes Concrete	Ballinasloe	15 km
Concrete	Spollen Concrete	Glassen, Athlone	34 km
Concrete	Banagher Concrete	Banagher, Co. Offaly	17 km
Quarry Material	Roadstone	Tullamore, Co. Offaly	41 km
Quarry Material	Roadstone	Cam, Co. Roscommon	27 km
Quarry Material	McKeons sand and Gravel	Culliagh Shannonbridge	8 km

4.6.2 Fuel Consumption

An estimate of the daily fuel consumption and estimated total fuel consumption of construction equipment is provided in **Table 4-11** and **Table 4-12.** The average daily fuel consumption will depend on the intensity of use of each item.

Table 4-11: Anticipated Daily Fuel Usage

Machine Type	Fuel usage (litres/day)
21 tonne excavator	110 - 140
6 tonne dumper	36 - 45
28 tonne dumper	130 - 160
5 tonne roller	15 - 20
Telehandler	24 - 30
Piling rig	90 - 110
Concrete Pump	34 - 36

Table 4-12: Estimated Total Fuel usage during construction

Estimated Total Fuel Usage (litres)		
	Ground Bearing	**Piled**
Biomass Slab A	46,934	56,064
Biomass Slab B	56,171	62,354
Silo	11,231	92,345
Total	114,336	127,652

4.7 General Environmental Controls (Construction)

4.7.1 Control of Surface Water Runoff

During construction works, surface water runoff shall be controlled so that no silt or other pollutants enter the surface water system. The contractor shall employ best practice settling systems to ensure maximum removal of suspended solids prior to discharge of any surface water or groundwater from excavations to surface water drains.

The contractor will have to comply with the IE Licence discharge/monitoring requirement during construction. The contractor will be required to comply with best practice such as the CIRIA standard “Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors’ (CIRIA, 2001). The contractor will be required to monitor the construction related discharges before a connection to the operational site drainage and ensure that suspended sediment levels are no more than 25mg/l prior to discharge to the onsite drainage system.

4.7.2 Waste Management

All waste arising shall be managed and disposed of in a way that ensures the provisions of the Waste Management Act, 1996 and associated amendments and Regulations, are applied.

A Construction and Demolition Waste Management Plan will be prepared to minimise waste and deal with recycling and reuse of construction waste where it is deemed suitable by testing in line with legislative requirements. All non-hazardous office and canteen waste will be collected by a licensed waste collector for disposal

in a licensed facility. Construction waste that cannot be reused or recycled shall be stored in a designed area for collection by a licensed waste contractor. Waste oil and fuel shall be stored in a bunded area for collection by a licensed oil recycling contractor. Electrical waste shall be stored in designated containers for collection by a recycling contractor. Scrap metal such as off cuts from reinforcement not suitable for use shall be collected and stored separately for removal off site by a licensed scrap metal merchant.

Excess excavated material shall be removed off site by a licensed haulier for re-use or disposed of in a licensed facility. Material such as excavated soils will be tested to determine their suitability for reuse in the construction of berms in the ADF. This will reduce the amount of imported and exported fill needed.

4.7.3 Fuels and Oils

Fuels and oils used for plant and equipment on the site be stored in a bunded area within the site compound. This area will be inspected regularly and the bund shall be adequate to contain a minimum of 110% of the volume of the largest container of oil and fuel stored. Spill protection equipment such as absorbent mats, shall be available on site at all times to contain any oil spill that may occur and procedures shall be in place to deal with any such spillage. All plant shall be provided with drip trays and spill kits.

Plant operators shall carry out a visual inspection of their vehicle on a daily basis and shall be trained in how to deal with any uncontrolled spillage of oil.

4.7.4 Invasive Species

No invasive species have been identified in the proposed location for the biomass storage slabs however the following precautionary measures will be employed. Invasive species can be introduced into a location by contaminated vehicles and equipment, in particular tracked vehicles, which were previously used in locations that contained invasive species. Good site organisation and hygiene shall be maintained at all times on site, particularly during construction activities. For any material entering the site, the supplier must provide an assurance that it is free of invasive species. Plant shall be inspected upon arrival and departure from site and cleaned when necessary. All site users shall be made aware of invasive species management plans and treatment methodologies.

4.7.5 Health and Safety

All works shall be carried out so as to comply with all the requirements of the Safety and Health at Work Act 2005 and any subsequent regulations or amendments and with the requirements of the Health and Welfare at Work (Construction) Regulations, (SI 291 of 2013), any subsequent amendments and any other relevant Health and Safety legislation. All construction staff on site shall have a current

Safepass card and relevant CSCS card (Construction Skills Certification Scheme). All works shall be carried out in a safe manner and in accordance with the above legislation and any other guidance notes issued by the Health and Safety Authority. In particular all excavation works shall be carried out in accordance with the HSA publication A Guide to Safety in Excavations.

Preliminary design risk assessments have been prepared for the design of the works and these will be updated during detailed design stage. This document shall be utilised to develop the Preliminary Safety and Health plan that will be provided to contractors at tender stage.

The necessary appointments shall be made for the construction works in accordance with the above legislation. The Contractor will provide a site specific construction stage safety and health plan and shall provide detailed risk assessments and method statements in advance of each element of work. The Contractor shall particularly address the interface between construction activities and the on-going power station operations in conjunction with the ESB and Bord na Móna. On completion of the works, a detailed safety file shall be prepared.

4.7.6 Traffic and Transportation

The site currently has a lot of moving plant with deliveries of peat coming in via train and trucks on a regular basis as well as station vehicles carrying out maintenance. A detailed site specific construction traffic management plan will be developed by the contractor and approved by the BnM fuel handling operations staff to ensure that the construction works and delivery of construction material does not interfere with the on-going peat deliveries and ensuring controlled and safe movement of all vehicles. A waiting area will be proposed for vehicles entering the site so that a build-up of vehicles is prevented onsite. The site construction traffic will be segregated from the pedestrian traffic for safety reasons.

4.8 Construction Programme

The construction programme is dependent on the sequencing of the works and the resources provided to complete the works. An estimated construction programme for the works is set out in **Table 4-13**. It is estimated that the overall construction period will be in the region of 6 – 9 months but will be dependent on the construction methods required which will be finalised following detailed design. It should be noted also that some of these activities could be constructed concurrently and the works could be completed in a shorted time period than that shown.

Table 4-13 Estimated Construction Programme

Estimated Construction Programme (Days)			
	Slab A	**Slab B**	**Silo**
Ground bearing foundation design	154	153	105
Piled foundation design	211	211	103

4.9 Operational Activities

Technical constraints of operating the WOP Station when firing on biomass, particularly indigenous materials such as brash from forestry operation and SRC willow, will likely require that an additive to the combustion process be utilised to prevent boiler damage from combustion gases. Where necessary additives such as lime or ash may be utilised to mitigate such effects.

4.10 Decommissioning and Reinstatement

4.10.1 WOP Station Decommissioning

The WOP Station will be decommissioned in accordance with the EPA approved Decommissioning Management Plan (DMP) as required by Condition 10.2 of the stations IE Licence.

In accordance with the DMP the site will be rendered environmentally safe and the following key activities will be undertaken during decommissioning:

- Cessation of all production.
- Cancellation of all incoming deliveries of materials to the station.
- Termination of all contracts other than those that are concerned with the DMP or related to safety of personnel or the environment.
- Return of materials to suppliers where possible, for resale or reuse.
- Isolation and purging of transfer lines from bulk storage to direct pipe contents back to bulk storage.
- Shutting and blanking of supply lines for oils and chemicals to intermediate storage and/or dilution tanks.
- Clearing of fuel stocks.
- Cleaning and decontamination of all plant and equipment.
- Removal of all laboratory chemicals.
- Cleaning and decontamination of all laboratory analytical instruments.
- Cleaning, decontamination and inspection of bunds, sumps and underground drains.

- Destocking of the workshops and stores.
- Isolation and disconnection of all electrical supplies to pumps and motors.
- Draining of oil from transformers that will not be reused elsewhere.
- Cleaning of residues from boilers and cleaning and blanking off of fuel lines.
- Draining and cleaning of lube oil systems.
- Draining of water systems such as raw feedwater tanks, condensate storage tanks and supplementary cooling systems.
- Transfer of ion exchange resins to drum storage.
- Maintenance of parts of the water supply system to provide wash-down and cleaning facilities during decommissioning and to meet the ongoing needs for fire protection and sanitary services.
- Maintenance of site drainage system and oil interceptors during decommissioning activities.
- Secure archiving of all relevant documentation including drawings, instrumentation diagrams, validation documentation, vendor manuals and data, project files, maintenance records, inspection records and other appropriate documentation.
- Maintenance of a security presence on site on a 24-hour basis, as necessary, for ongoing monitoring of the site from a safety, fire protection and environmental perspective.
- Maintenance of defined site access procedures.
- Removal off site of all materials for reuse, recycling of final waste disposal by appropriate licenced waste contractors.

It is anticipated that any necessary decontamination of plant and equipment will be carried out on site. It will primarily involve cleaning in place and power washing of internal and external surfaces with collection for final disposal by licenced waste contractors following characterisation and treatment as required.

4.10.1.1 Boiler Storage and Decommissioning

A decision on station closure would likely be preceded by a period where the station boiler is in storage, with dry storage being the preferred method. Decommissioning of the boiler will involve cleaning activities that already take place routinely at WOP Station and are managed successfully.

No non-routine environmental emissions will result from either boiler storage or boiler decommissioning at WOP Station.

4.10.1.2 Drainage Line Cleaning

Drainage systems within the power station involve seven licenced emission points combined to discharge to three separate discharge points to the River Shannon.

Protection by oil interceptors and existing surface water pond is provided as appropriate and there is no potential for impact upon the River Shannon if the drainage system is left in place after decommissioning. However, cleaning of station drains will be required to mitigate the potential for oil residues to be present within pipelines. This will involve water jetting using the existing oil interceptor system and vacuum tankers. Residues / washings from drainage line cleaning will be disposed of appropriately following testing to confirm that their suitability for discharge. No areas of heavy or free product oil residues that would require steam cleaning are expected. On completion of decommissioning the site drainage will be in a suitable condition for removal or more likely to be left in place to continue to provide surface water drainage for the site.

The station will continue to properly operate and maintain the site drainage system prior to and during implementation of the DMP.

4.10.1.3 Asbestos

Historically, a station waste repository was operated on lands at the former Shannonbridge Generating Station that partly correspond with lands at WOP Station. Whereas asbestos buried there was removed over the years, some Bord na Móna railway lines were built upon part of the station dump area in 1974. Since then, asbestos rope was unearthed in this area beneath the railway lines. Due to the depth of the material, several metres beneath the ground, and the length of time involved, it was not feasible to remove this prior to commissioning of WOP Station. This material will be removed as part of the DMP. It is not expected that other hazardous waste will be encountered in the excavation of the buried asbestos.

Following site decommissioning WOP Station may undergo demolition. This may also generate asbestos waste material such as asbestos rope in seals and gaskets. This will also be removed by specialist contractors as part of the DMP.

4.10.1.4 ADF Decommissioning Phase

The ongoing operation of the ADF is linked to the ongoing power generation activity at WOP Station. Upon the cessation of power generation and disposal activities, the closure requirements outlined in the prevailing planning and licensing consents, and as required by the EPA, will be adhered to. Specifically, the EPA approved Decommissioning Management Plan (DMP) and Closure, Restoration and Aftercare Management Plan (CRAMP) as required by Section 10.2 of the current IE Licence and any future licence requirements will be implemented to the satisfaction of the EPA. All open cells will be capped with an impermeable barrier, a drainage layer, and a final peat capping layer and subsequently revegetated.

4.10.2 Site Demolition and Reinstatement

Following site decommissioning WOP Station may undergo demolition in accordance with any planning requirements that may be imposed.

The WOP site will be reinstated in accordance with the conditions of any planning permission granted. This will generally require the demolition of all surface structures with maximisation of materials recycling.

The site will likely remain a brownfield site which may be subject to separate industrial related development under a separate planning permission.

4.11 References

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