KNOCKHARLEY LANDFILL LTD.

ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR) FOR THE PROPOSED DEVELOPMENT AT KNOCKHARLEY LANDFILL

VOLUME 2 – MAIN EIAR

CHAPTER 2 – DESCRIPTION OF THE PROPOSED DEVELOPMENT

NOVEMBER 2018

Knockharley Landfill Ltd.

Kentstown, Navan,Co.Meath

FEHILY TIMONEY & COMPANY

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2 DESCRIPTION OF THE DEVELOPMENT

2.1 Introduction

This section of the Environmental Impact Assessment Report (EIAR) details the proposed development at Knockharley Landfill. It includes a description of the existing facility and the proposed development elements comprising the intensification of waste acceptance, storage of incinerator bottom ash (IBA), biological processing of residual municipal solid waste 'fines' and the storage and treatment of leachate. The principal facility elements and processes are identified. Construction and operational phase management of the facility is described, as are waste types to be accepted and processed. The provision for decommissioning and aftercare management of the proposed development is also discussed. There is a glossary of terms in Appendix 2.1 of Volume 3 of this EIAR.

2.2 Existing Development

The existing facility comprises a landfill facility where waste disposal and recovery activities are undertaken. The landfill opened for waste acceptance in December 2004. The landfill accepts the residual fraction of, household, commercial and industrial wastes together with construction/demolition wastes and incinerator bottom ash (IBA) and is licensed by the EPA with an Industrial Emissions (IE) Licence W0146-02. The site is licensed to operate from 07:30 to 18:30 Monday to Saturday inclusive and is licensed to accept waste between 08:00 and 18:00 (excluding public holidays). The proposed planning boundary of the facility is shown in red on Drawing No. LW14-821-01-P-0002 Existing Site Layout in Volume 4 of this EIAR and the ownership boundary (of Knockharley Landfill Ltd.) is shown in blue. This figure identifies the existing planning boundary, ownership boundary, landfill footprint, both built and permitted, screening berms, and infrastructure.

The existing facility infrastructure is shown in Volume 4 of this EIAR on drawing LW14-821-01-P-050-0004 which comprises:

1. Administration building
2. Machinery/maintenance garage
3. Four portable cabins for storage
4. Weighbridge building
5. Two weighbridges
6. Inspection slab
7. Quarantine slab
8. Car parking
9. Landfill gas treatment compound
10. Leachate lagoon
11. Surface water attenuation lagoon and wetland

The facility is located on a 135.2 hectare (333-acre site). The existing landfill footprint is positioned near the centre of the landholding and the current planning permission permits the development of approximately 25 hectares of landfill cells. The landfill is being developed in seven phases. To date, Phases 1-4 (Cell 1 to Cell 16 inclusive) of the seven planned cell phases have been fully constructed. As of November 2018, Cells 13, 14, 15 and 16 are operational.

A permanent cap has been placed on all cells in Phase 1 and Phase 2 (Cells 1-8 inclusive). In relation to Phase 3, Cells 9 and 10 and half of Cells 11 and 12 are fully capped. The permanent lining of the final cap on Cells 11 and 12 is complete, the soil placement will take place in 2019. There is an intermediate cap on the remainder on Cells 13 and 14. The landfill development and waste placement is in a northerly direction. The leachate storage lagoon is located to the south of the administrative buildings and the surface water attenuation pond and wetland is situated to the south of the landfill.

The ownership boundary is shown on Drawing No. LW14-821-01-P0000-BDY in Volume 4 of this EIAR. There is a public road, CR384 to the east of the facility with several residential properties. The access road to the facility from the N2 passes under this public road. The applicant, Knockharley Landfill Ltd. owns land on either side of the public road and residential properties along the public road. The planning boundary excludes the public road and one residential property adjoining the public road as shown on Drawing No. LW14-821-01-P0000-003 Proposed Site Layout in Volume 4 of this EIAR – see red hatched areas.

Knockharley Landfill Facility comprises development, outlined below, that are described in the following sections of this chapter:

- Access road and internal road network
- Buildings, fencing and security
- Environmental monitoring infrastructure
- Existing Utilities
- An engineered lined landfill
- Groundwater management infrastructure
- Leachate management system (comprising collection and storage)
- Surface water management system (comprising collection, attenuation and wetland)
- Landfill gas management system (comprising collection pipework, wells and a landfill gas compound)
- Landfill capping system
- Landfill void
- Existing waste types
- Existing waste activities

2.2.1 Existing Road Network

The landfill is accessed via the N2 national primary route (see Drawing No, LW14-821-01-P-0000-002 Existing Site Layout in Volume 4 of this EIAR) which provides direct vehicular access to the national roads network, with access facilitated at a ghost island priority junction on the N2 at the facility entrance (see aerial overview of entrance in Plate 2-1). The ghost island provides sheltered access for right turning vehicles travelling from the north.

This is complimented with an auxiliary left turn deceleration lane to facilitate access for vehicles coming from the south. Both turning facilities aid in preserving the flow, speed and therefore the capacity of through traffic on the N2. The junction has been designed and constructed in accordance with the NRA: Design Manual for Roads and Bridges (DMRB) and has been the subject of Roads Safety Auditing (Stages 1, 2 and 3) in accordance with procedures set out in the relevant NRA guidelines.

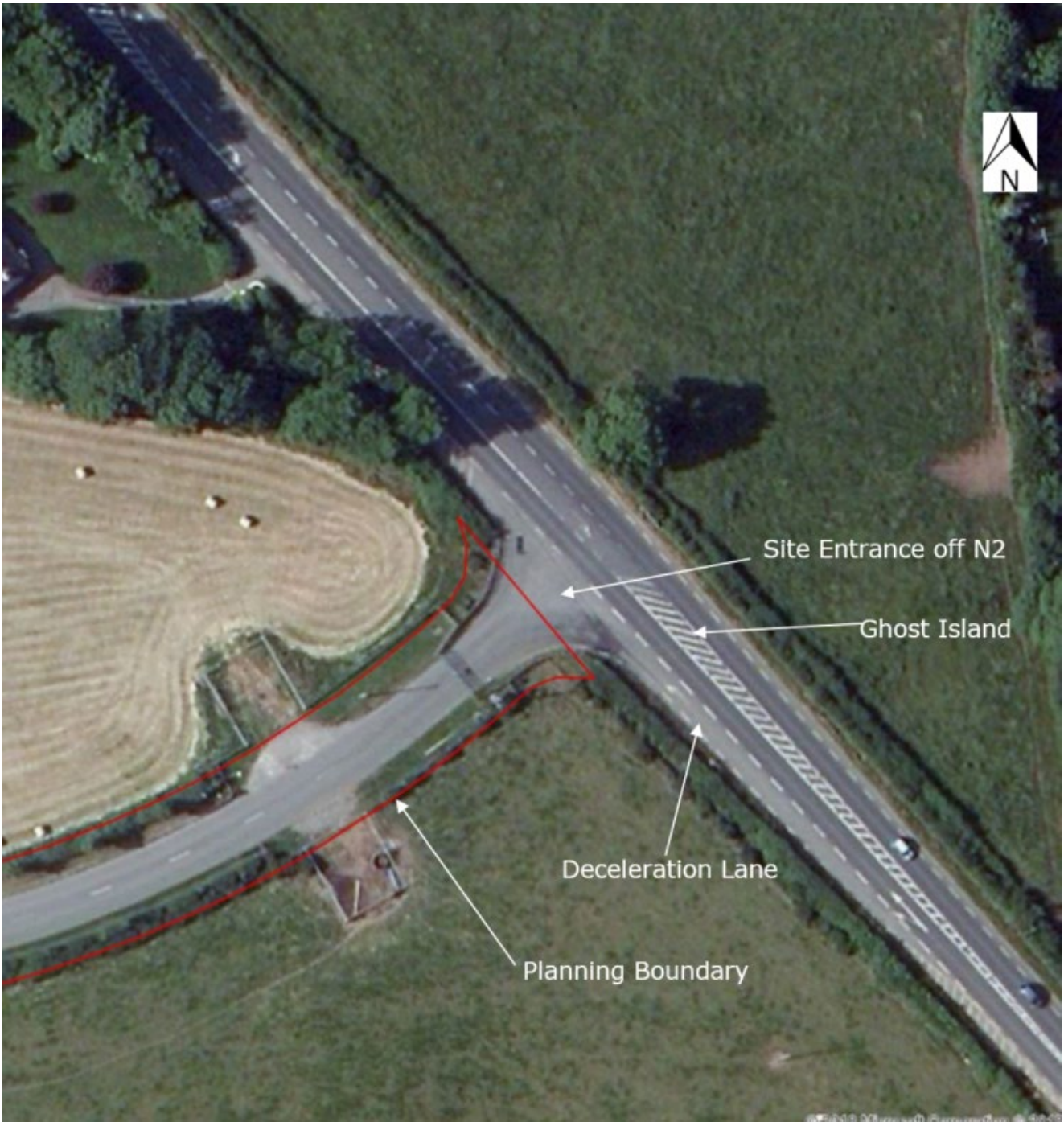


Plate 2-1: Knockharley Landfill Facility Access

The access road to the site runs due west through arable lands, thereafter running under the CR384 County Road. The entrance proper to the site is located approximately 80 to 100 metres west of the underpass of the CR384. The distance from the N2 to the onsite weighbridges is approximately 900 m. The dedicated access road is single carriage way and is the only road access to and from the site.

2.2.2 Existing Buildings, Fencing and Security

Plate 2-2 presents an aerial view of the existing administration building, car parking, weighbridges and weighbridge building, waste inspection and quarantine areas which includes the machinery/maintenance garage, portable storage cabins and bunded fuel storage.

Plate 2-2: Knockharley Landfill Administration Area

The facility is accessed off the national route N2 via a private gated entrance road. A security gate with closed circuit television is located on the access road. This aids site security staff in preventing unauthorised traffic from entering the site. This is the only road access to and from the facility. The perimeter of the site is fenced.

2.2.3 Existing Environmental Monitoring Infrastructure

The conditions and schedules of the current IE Licence (W0146-02) detail the requirements for environmental compliance. This includes monitoring requirements, trigger levels and emission limit values.

The current environmental infrastructure comprises:

- landfill gas perimeter monitoring wells
- in-waste landfill gas monitoring wells
- groundwater wells to monitor groundwater level and quality
- leachate side risers (to monitor leachate quality) and level sensors in cells and in the leachate lagoon
- continuous monitoring of pH, TOC and electrical conductivity at the outlet of the surface water pond
- meteorological monitoring station

Monitoring of the following is carried out on site at pre-defined locations but not requiring permanent monitoring infrastructure:

- surface water
- noise
- dust and PM10
- odour
- surface emissions (VOCs)
- stack emissions (flares and engines)

Existing monitoring locations are shown on Drawing No. LW14-821-01-P-050-001 in Volume 4 of this EIAR.

2.2.4 Existing Utilities

Existing overhead power lines (see Drawing No, LW14-821-01-P-0000-002 Existing Site Layout in Volume 4 of this EIAR), are present at the following locations:

- 220 KV running north south and adjacent to the western boundary of the landfill footprint
- 20 KV running north south on the eastern boundary parallel to the existing local road with spurs to:
    - An ESB substation exporting power from the landfill gas compound to a 20KV line
    - An ESB substation importing power to the administration building

An existing below ground high pressure natural gas main is located south of and off-set from the permitted landfill footprint traversing the site in an east west direction. There is no connection from the facility to this gas main.

The facility is connected to the water mains and has phone and broadband. All foul effluent generated from administration welfare facilities is collected on site and passed through a 'biocycle' treatment unit and is discharged thereafter to the leachate lagoon.

2.2.5 Existing Engineered Landfill

The facility was designed, constructed and is being operated in accordance with the EU Landfill Directive 1999/31/EC, the original Licence, licence review, the IE Amendment and Technical Amendment A, B, C and D, relevant EPA guidance manuals on landfill selection, design, operation and monitoring and the relevant planning permissions that pertain to the site. Of the 7 no. approved landfill phases, the first 4 phases (Cells 1-16) have been constructed. Waste is being placed in Cells 15 and 16 during 2018.

The landfill liner system is a 1 m thick composite barrier comprising HDPE membrane and clay basal layer with a permeability of $1X10^{-9}$ m/s or similar approved, complying with both EU regulation and the licence conditions. Plate 2-3 shows an empty cell as constructed at Knockharley.

Plate 2-3: Lined cells at Knockharley Landfill

The clay component of the basal lining system was won from material excavated during the construction of the cells. The clay was screened by mechanical means to eliminate stone sizes greater than 50 mm. The clay was placed and compacted in layers, to achieve the required degree of permeability, in compliance with the licence. The cells were then lined with a 2 mm thick high-density polyethylene (HDPE) geomembrane. The liner is textured on the side-slopes and smooth on the cell floors. The cell floor falls to low points equipped with leachate pumps. The composite barrier layer is protected against mechanical damage using a protective geotextile overlain by drainage stone on the floor and using a protective geotextile on the side slopes. The construction of the landfill liner system was subject to independent quality assurance testing and controls approved by the EPA.

Cell numbering is shown on Drawing No, LW14-821-01-P-0000-002 Existing Site Layout in Volume 4 of this EIAR.

2.2.6 Existing Groundwater Management Infrastructure

Groundwater drains are constructed below the engineered clay lining system, to maintain groundwater below cell formation. Groundwater flows observed during construction of cells 14 and 15 was approximately 3 m^3 per day. These flows are typically encountered during phased cell developments (plan area approximately 250 m x 70 m). The groundwater pipe drains consist of trenches of 1000 mm deep and 1000 mm wide below the bottom of the cells. 150 mm diameter open jointed concrete and/or slotted drainage pipes are surrounded by a stone filter and wrapped in geotextile, as shown in Figure 2.1. Gravity flows collected in this pipe terminate in sumps and electricity powered pumps discharge groundwater via a rising main to the surface water attenuation pond on site.

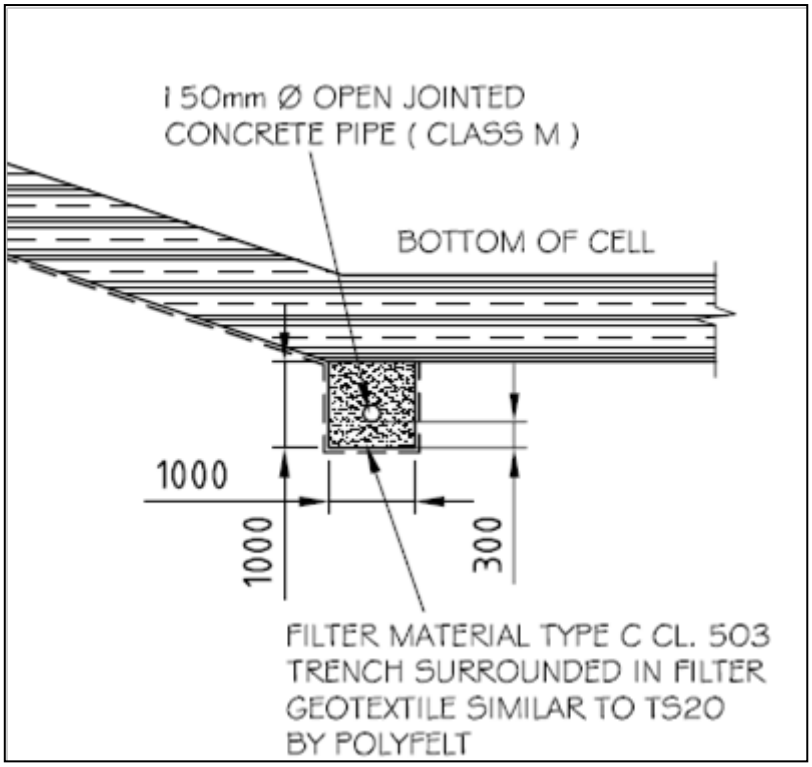


Figure 2-1: Typical Detail of Groundwater Drain

2.2.7 Existing Leachate Management Infrastructure

Leachate that gathers in the base of cells is collected in a leachate collection system comprising slotted drainage pipework, laid in a 'herringbone' fashion within a 500 mm thick leachate drainage layer of granular material laid on the cell floors. Electricity - powered leachate pumps are located in the low points of the cells, and leachate is pumped from side riser sumps to the perimeter leachate collection rising main. The leachate collection rising main, which will ultimately be laid around the entire perimeter of the landfill, discharges to the leachate lagoon.

The leachate lagoon (see Plate 2-4) has a floating cover to prevent rainfall ingress and to minimise odour nuisance. The lagoon is lined with 2 mm HDPE membrane on a 1 m clay layer. The capacity of the leachate lagoon is approximately 2,500 m^3, with an allowance for a 0.75 m freeboard. Leachate is tankered off-site for treatment at a wastewater treatment plant.

There is no foul sewer service near the site. Accordingly, all foul effluent generated from the onsite administration welfare facilities is collected on site and through a 'biocycle' treatment unit, the treated effluent is discharged thereafter to the leachate lagoon.

Plate 2-4: Covered Leachate Lagoon

2.2.8 Existing Surface Water Drainage Infrastructure

Surface water runoff from roads and hard standing areas discharge to a surface water trunk main collection pipe. This surface water trunk is located on the eastern side of the perimeter access road and runs between the administration building to the southern surface water attenuation lagoon. Refer to Drawing LW14-821-01-P-0000-002 in Volume 4 of this EIAR. This below ground pipe main varies from 225 mm diameter up to 750 mm diameter. There is also a 450 mm diameter spur from this pipe main to the north of the proposed building for the biological treatment of the organic fraction of Municipal Solid Waste (also referred to as MSW fines) which runs from east to west and turns north to receive runoff from the main site access road.

The pipe discharges to an existing attenuation pond and wetland serving the overall site, via a Class 1 bypass proprietary oil/water separator. This petrol interceptor prevents petroleum products from entering the storm water attenuation pond and wetland.

Surface water from the landfill footprint is drained via the main landfill perimeter swale to a purpose-built storm water attenuation pond and constructed wetland. Swales are vegetated channels over which flows are conveyed at low non-erosive velocities. The existing swales drain the surface water from the landfill footprint and embankments surrounding the landfill cells. These swales are of approximate depth 600 mm with a bottom width of 1000 mm and side slopes of 1 in 3. The swales were constructed in accordance with CIRIA C698, Site Handbook for the Construction of SUDS. As the landfill cells develop further, the surface water swales will continue to be constructed around the landfill footprint and embankments.

The attenuation pond and wetland (located on the southern boundary of the landfill footprint) were designed to manage the runoff from the development for up to a 1 in 100-year design return period storm event. The outflow from the constructed wetland discharges into the local drainage network at the south-eastern corner of the site.

The discharge from the surface water pond is controlled by a slam shut valve that prevents surface water discharging if continuous monitoring of TOC indicates potential contamination of the surface water. The live storage volume of the pond is 4,253 m^3, (theoretical requirement 3,758 m^3). The 1:20 discharge capacity from the existing attenuation pond to the receiving watercourse (via the wetland) is 0.188 m^3/s. The storm water attenuation pond also has a 1:100 emergency spill capacity of 0.28 m^3/s.

The storm water attenuation pond (see Plate 2-5 foreground) is lined with a composite barrier, comprising a HDPE membrane and a 1.0 m clay basal layer with a permeability of 1 x 10^{-9} m/s, which is the same specification as the landfill cell clay barrier. The constructed wetland comprises a shallow clay-lined pond both naturally colonised and planted with appropriate species.

Plate 2-5: Surface Water Attenuation Pond and Wetland

2.2.9 Existing Landfill Gas Management Infrastructure

Landfill gas (LFG) is extracted from all active and filled cells via vertical and horizontal gas wells. Gas wells are constructed from the cell floor upwards as waste is placed in each cell. Additional bored gas wells are constructed in each cell to aid gas extraction upon reaching a predetermined filling height. Gas extraction commences from each cell once sufficient waste has been placed above the leachate stone drainage layer to prevent air infiltration into the gas extraction system. In addition, short-term use of driven extraction pipes ('pin wells') are used as a temporary gas collection measure, close to the working face. A slotted horizontal gas collection pipe also is installed at the top of the cell side-slopes to intercept any gas travelling up the cell embankments.

Landfill gas is fed via both temporary over-ground and permanent below-ground HDPE pipes to a 355 mm HDPE gas ring main located outside the perimeter of the waste cells. The ring main transfers landfill gas from the cells to the landfill gas compound via two condensate knock-out pots located 'upstream' of the compound.

At present, Cells 1 to 10 and approximately half of Cells 11 & 12 are fully capped. As part of these works, there is a permanent gas collection system connected to the ring main.

Capping works for the other landfill phases will involve the installation of more condensate knock-out pots, permanent well heads and below ground pipes to enable management of the landfill gas field.

The landfill-gas compound is located east of the landfill footprint and north of the surface water lagoon.

The landfill gas treatment infrastructure consisting of enclosed flares and landfill gas utilisation engines are in the landfill gas compound. Currently, there are four engines on site. Two engines are run continuously as lead engines, these have a capacity of 1,000 m^3/hr.

Two back up engines of 800 m^3/hr capacity each are installed on site. There are 3 no. enclosed flares in the landfill gas compound, two duty and one back up. The two duty flares provide flaring capacity of 2,500 m^3/hr and 1,500 m^3/hr. The back-up flare is 1,500 m^3/hr.

The largest flare, is directly connected to the booster station that provides the primary back up to the two duty engines. A fourth open flare of 500 m^3/hr capacity is located within the compound. It is not currently operational and is only used for odour control measures if required.

There is an ESB substation in the compound to facilitate the transfer of energy generated by the plant to the national grid via an overhead 20 KV power line. The landfill gas plant was commissioned in 2010 and has been exporting power to the grid since then. The current energy generation from landfill gas generated on site is 2.1 MW.

Plate 2-6: Landfill Gas Compound

2.2.10 Existing Landfill Capping System

As part of ongoing operations at the site, the active area of the landfill is covered with daily cover. Near-horizontal areas of the working face are covered with soil and woodchip, the slope of the working face is covered with daily cover at the end of each working day.

Temporary low-permeability covers are installed as areas of the landfill reach full height. At the time of writing, a temporary cap has been installed on parts of Cells 13 and 14.

A fully engineered cap is in place over a Cells 1-10 and half of Cells 11 and 12. This cap comprises: a gas collection layer, 1 mm fully welded LLDPE liner, sub-surface drainage layer, subsoil layer and a topsoil layer. The overall thickness of the soil layers is 1 m in accordance with the requirements of the facility licence. Approximately 96,000 m² has been capped to date. The final capping of Cells 11 and 12 is underway, the welded LLDPE liner is in place and the soil layers will be placed in 2019.

Future permanent capping will continue on a phased basis.

2.2.11 Existing Landfill Void Capacity

The total quantity of waste and recovery materials landfilled at the site up to the end of 2017 within cells 1 through 16 is approximately 2,170,954 tonnes.

The existing design capacity of Knockharley landfill is approximately 3.137 x10^6 m³. The estimated remaining void in the current permitted development based on void assessments of Phases 4b, 5, 6 and 7 is 1,627,431 m^3.

The current planning permission permits the acceptance of waste at Knockharley until the 26 August 2021. Condition 3 of the permission granted by An Bord Pleanála in March 2007 (Ref: PL17.220331) restricted disposal at the facility to 132,000 tonnes per annum until December 2010, thereafter reducing to 88,000 tonnes per annum for disposal. Assuming a density of 1.0 t/m^3 It will not be possible to fill the remaining void by the 26 August 2021.

2.2.12 Existing Waste Types Accepted

The categories of waste accepted are as per Schedule A of the licence W0146-02 which includes for the disposal and recovery of household, commercial and industrial waste and construction and demolition waste is shown in Table 2-1. The current planning permission limits intake to 88,000 tonnes per annum.

Table 2-1: Schedule A – Wastes for Acceptance

Waste Type	Maximum Tonnes per Annum
Household	100,000
Commercial	45,000
Industrial	30,000
Sub Total for Disposal	175,000
Construction & Demolition for Recovery	25,000
Total	**200,000**

2.2.13 Existing Waste Activities

Waste Management Act 1996, as amended

The relevant classes of the Third Schedule (Disposal Activities) & Fourth Schedule (Recovery Activities) of the Waste Management Act 1996, on which the original facility licence was granted are shown in Tables 2.2 & 2.3. Note that since the grant of the facility licence, the Waste Management Act 1996 was amended in 2011 such that disposal and recovery activities identified in the Third and Fourth Schedules respectively were revised. The tables indicate in italics the respective revised activities that correspond to those originally licensed, while providing a description of the operational activities to which the classes relate.

Table 2-2: Third Schedule Waste Disposal Activities

Third Schedule Waste Disposal Activities	
Class 1	Deposit on, in or under land (including landfill)
Class D1	*Deposit into or on to land (e.g. landfill, etc.)*
Description of Activity	Deposit of non-hazardous wastes in lined cells that are on, in and under land
Class 4	Surface impoundment, including placement of liquid or sludge discards into pits, ponds or lagoons
Class D4	*Surface impoundment (e.g. placement of liquid or sludgy discard into pits, pond or lagoons, etc.)*
Description of Activity	Storage of leachate in a lagoon prior to disposal off-site at a suitable wastewater treatment plant and the use of a surface water pond to control the quality and quantity of the surface water run-off from the site
Class 5	Specially engineered landfill, including placement into discrete cells which are capped and isolated from one another and the environment
Class D5	*Specially engineered landfill (e.g. placement into lined discrete cells which are capped and isolated from one another and the environment, etc.)*
Description of Activity	The deposition of non-hazardous waste into lined landfill cells
Class 6	Biological treatment not referred to elsewhere in this Schedule; which results in final compounds or mixtures which are disposed of by means of any activity referred to in paragraphs to 10 of this Schedule.
Class D8	*Biological treatment not specified elsewhere in this Schedule which results in final compounds or mixtures which are discarded by means of any of the operations numbered D 1 to D 12.*
Description of Activity	The possible future biological pre-treatment of leachate subject to the agreement of the Agency.
Class 13	Storage prior to submission to any activity referred to in a preceding paragraph of this schedule other than temporary storage pending collection on the premises where the waste concerned is produced.
Class D15	*Storage pending any of the operations numbered D 1 to D 14 (excluding temporary storage (being preliminary storage according to the definition of 'collection' in section 5(1)), pending collection, on the site where the waste is produced).*
Description of Activity	The temporary storage on-site of unacceptable waste in the waste quarantine area prior to transport to another site.

Table 2-3: Fourth Schedule Waste Recovery Activities

Fourth Schedule Waste Recovery Activities	
Class 4	Recycling or reclamation of other inorganic materials
Class R5	*Recycling/reclamation of other inorganic materials, which includes soil cleaning resulting in recovery of the soil and recycling of inorganic construction materials*
Description of Activity	The use of recycled construction and demolition waste as cover and/or construction material at the site.
Class 9	Use of any waste principally as a fuel or other means to generate energy
Class R1	*Use principally as a fuel or other means to generate energy: This includes incineration facilities dedicated to the processing of municipal solid waste only where their energy efficiency is equal to or above –* *- 0.65 for installations permitted after 31 December 2008,* *using the following formula, applied in accordance with the reference document on Best Available Techniques for Waste Incineration:* *Energy efficiency = (Ep - (Ef + Ei)/ (0.97x(Ew+Ef)* *where -* *'Ep' means annual energy produced as heat or electricity calculated with energy in the form of electricity being multiplied by 2.6 and heat produced for commercial use multiplied by 1.1(GJ/year),* *'Ef' means annual energy input to the system from fuels contributing to the production of steam (GJ/year),* *'Ew' means annual energy contained in the treated waste calculated using the net calorific value of the waste (GJ/year),* *'Ei' means annual energy imported excluding Ew and Ef(GJ/year),* *'0.97' is a factor accounting for energy losses due to bottom ash and radiation*
Description of Activity	The utilisation of landfill gas
Class 11	Use of waste obtained from any activity referred to in a preceding paragraph of this Schedule
Class R11	*Use of waste obtained from any of the operations numbered R 1 to R 10*
Description of Activity	The use of construction and demolition waste on site
Class 13	Storage of waste intended for submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where such waste is produced
Class R13	*Storage pending any of the operations numbered D 1 to D 12 (excluding temporary storage (being preliminary storage according to the definition of 'collection' in section 5(1)), pending collection, on the site where the waste is produced)*
Description of Activity	The storage of construction and demolition waste on site prior to recovery.

Industrial Emissions Directive

The facility Waste Licence W0146-02 was amended by the EPA in December 2013 in compliance with the Industrial Emissions Directive (2010/75/EU), as implemented by the European Union (Industrial Emissions) Regulations (S.I. 138 of 2013), thus changing the licence from a Waste Licence to an Industrial Emissions (IE) Licence.

In accordance with the revised First Schedule of the EPA Act 1992 to 2013, the 'Schedule of Licensed Activities' of the facility licence at the site are:

11.1 The recovery or disposal of waste in a facility, within the meaning of the Act of 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. (is an industrial emissions directive activity, in so far as the process development or operation specified in 11.1 is carried on in an installation connected or associated with another activity that is an industrial emission directive activity)

11.5 Landfills, within the meaning of section 5 (amended by Regulation 11(1) of the Waste Management (Certification of Historic Unlicensed Waste Disposal and Recovery Activity) Regulations 2008 (S.I. No. 524 of 2008)) of the Act of 1996, receiving more than 10 tonnes of waste per day or with a total capacity exceeding 25,000 tonnes, other than landfills of inert waste.

Note that this revised Schedule identifies that the relevant activities in accordance with the Waste Management Act 1996 as amended, continue to apply at the facility, where the revised Schedule states:

> *"Notwithstanding the foregoing, any limitation on waste recovery and disposal activities in this Part in accordance with the Third Schedule and Fourth Schedule of the Waste Management Act 1996 as amended including, where applicable, any refused waste disposal and recovery activities form the Third Schedule and Fourth Schedule of the Waste Management Act as amended shall continue to apply."*

2.3 Proposed Development

2.3.1 Introduction

The proposed development comprises:

- The acceptance of up to 435,000 tonnes per annum of non-hazardous wastes, which will comprise up to 150,000 tonnes of incinerator bottom ash (IBA), as well as household, commercial and industrial wastes including residual fines, non-hazardous contaminated soils, construction and demolition (C&D) wastes and baled recyclables. In addition, the acceptance of up to 5,000 tonnes per annum of stable non-reactive hazardous waste is proposed. Permission is sought for the acceptance of waste until the landfill cells are full.
- The acceptance and placement within the existing permitted landfill footprint of incoming wastes for recovery or disposal as appropriate; the increase in height of the landfill body from the current permitted post settlement final contour height of 74 mOD to a post settlement contour height of 85 mOD – the proposed height increase will apply from the active landfill phase at the time of permission grant. Permission is sought for the acceptance of waste until the cells are full.
- The construction and operation of a dedicated IBA facility. Permission is sought to store IBA until recovery outlets are identified. Permission is sought for trials to prepare IBA for recovery and removal off site. The IBA facility will consist of 5 no. cells which will be constructed in accordance with the requirements of the Landfill Directive 99/31/EC for non-hazardous wastes. A final post settlement contour height of 85 mOD is proposed. Permission is sought for operation of the IBA facility until the cells are full and subsequent aftercare activities as may be required are complete. The development includes additional perimeter (haul) roads and screening berms.

  The IBA facility will comprise 1 no. portal frame building 76 m x76 m x 15.5 m to facilitate:
  - weathering
  - metals recovery trials
  - crushing and washing to facilitate recovery trials and processing

- The construction and operation of a building for:
  - The biological treatment of the organic fraction of MSW (otherwise known as MSW 'fines' material) and;
  - contingency storage of baled recyclables
  - contingency storage of baled MSW

  This facility shall comprise:
    - a processing building of 108 m in length, 50 m in width and up to 17 m in height, of portal frame construction with 13 no. vehicle roller shutter doors and 7 or more pedestrian access doors (subject to fire certification requirements)
    - internal storage bays as required
    - 12 no. concrete composting tunnels located within the processing building of c. 6 m in width, 25m in length and 5 m in height
    - a covered bio-filtration unit within the overall processing building footprint, with a stack of height of 20 m
    - access from the internal site road with a marshalling yard area with egress from the existing site road to the landfill gas compound
  - all other ancillary and associated works, including leachate storage in a below ground tank, bio-treatment system for sanitary wastewater drainage and fencing.
  Permission is sought for the continued use of this building post filling of the landfill cells onsite.

- The construction and operation of a leachate management facility comprising:
  - 3 no. additional floating cover leachate storage lagoons (L2, L3 and L4) of c. 3,000 m^2 each
  - 2 no. bunded above ground tanks for raw leachate from IBA cells (S1 and S2) approximately 25 m diameter 6.0 m high.
  - 3 no. bunded above ground tanks:
    - 1 no. tank (S3) for treated leachate from landfill leachate approximately 22m diameter 6.0m high.
    - 1 no, tank for treated leachate from IBA approximately 25 m diameter 6.0 m high (S4).
    - 1 no. tank for leachate concentrate 16 m diameter by 6.0 m high (S5).
  - Modular - typically containerised plant units (C1 through C6), on concrete slab of c. 1,000 m^2 and 1 no. elevated tank 5 m diameter 10 m high (T1) with provision for 2 no. additional low level (<5.0 m high) bunded storage tanks for dosing and other compounds (T2 and T3).
  - Extension of existing loading area for 2 no. 25 tonne articulated tankers and a new loading area for 2 no. 25 tonne articulated tankers.

  Permission is sought for the continued operation of this plant post filling of the landfill cells to facilitate continued leachate management.

- Construction of screening berms along the western boundary to a maximum of 10 m in height, on the eastern boundary to a maximum height of 10 m and on the northern boundary, to a maximum height of 6 m, with a total berm footprint of c. 11.3 ha. Haul roads for construction will be in or immediately adjacent to berm footprint.
- Construction of surface management infrastructure, with discharge to the adjacent Knockharley Stream to the northern end of the landfilling footprint and the proposed IBA cell development. Key elements will comprise:
  - holding pond for surface water runoff
  - storm water attenuation lagoon to maintain green field surface water discharges to Knockharley stream and to facilitate suspended solids management
  - wetland
  - flood compensation culvert to provide equivalent 1:1000-year flood plain storage
  - permitted stream diversion around permitted development

- Felling of c. 12.5 ha of the existing commercial broadleaf/conifer mix plantations to facilitate:
    - construction of the screening berms along the western boundary and to the north of the proposed IBA area, and
    - development of Phase 7 Cells 27 and 26 and the new northern surface water attenuation pond.

  Replanting and new planting totalling (c.16.8 ha) will off-set loss of commercial forestry in the proposed development footprint at the following locations:

    - replanting over screening berms
    - new planting on the cap over cells 25, 26, 27 and 28 in what is currently the permitted development

- Relocation of an existing 20 KV overhead ESB powerline that provides power to the existing landfill facility administration buildings, that will be impacted by the development of the screening berm to the east of the proposed IBA cell area.
- Construction of an additional ESB sub-station and new overhead ESB supply to the north-western corner of the currently permitted landfill footprint to facilitate power provision for pumps and other infrastructure.
- Construction of a new ESB sub-station adjacent to the proposed building for biological waste treatment and storage with ESB connection to adjacent 20 kV power lines.
- Extension of existing below ground infrastructure (permitted development) and provision of additional below ground infrastructure. (Power, water, telemetry, leachate rising mains, drainage). Extension of the existing car park for the administration area (760 m^2) to provide additional no. 40 parking spaces.

The proposed site layout is shown in Drawing No.'s LW14-821-01-P-0000-003 through 011 Proposed Site Layout Plan in Volume 4 of this EIAR[1]. To support the written description of the proposed works in this chapter, Drawing LW14-821-01-P-0050-0005 Proposed Site Layout Plan with Infrastructure Locations, in Volume 4 of this EIAR includes a numbering notation as below:

1. Proposed waste acceptance types, activities & quantities (see Section 2.3)
    a. Non-stabilised residual including biodegradable
    b. IBA
    c. Non-hazardous and non-biodegradable stabilised and inert
2. Proposed changes to current permitted cell development (see Section 2.4)
    a. Increased profile
    b. Revised cell layout and additional working faces
3. Proposed dedicated IBA facility (see Section 2.5)
    a. Cell layout
    b. IBA road access
    c. IBA wheel wash
    d. Suspended solids management at side risers
    e. Side risers and rising mains
    f. Suspended solids management
    g. Weathering area including weathering building
4. Proposed biological treatment facility (see Section 2.6)

[1] A separate drawing, No. LW14-821-01-P0000-013 contains the same details as the Proposed Site Layout series 1-8, but includes the proposed surface water management infrastructure, IBA facility, leachate management facility and biological treatment facility on one drawing for ease of reference.

5. Proposed leachate storage and treatment (see Section 2.7)
    a. Bunded storage
    b. Floating cover lagoons
    c. Tanker loading areas
    d. Leachate treatment / conditioning area
6. Proposed surface water/drainage infrastructure (see Section 2.8)
    a. Additional surface water attenuation lagoon
    b. Surface water outfall
    c. Flood compensation lands
    d. Surface water holding pond
7. Earth balance and proposed berms (see Section 2.9)
    a. Cell development
    b. Berm phasing
8. Proposed tree felling & replanting (see Section 2.10)
9. Relocation of ESB powerline (see Section 2.11)
10. Ancillary infrastructure (see Section 2.12)
    a. Additional ESB substation
    b. Additional ESB substation
    c. Additional drainage
    d. New overhead ESB line

An application will also be made to the EPA to facilitate the licensing of the proposed development as outlined herein. The existing facility is licensed to operate by the EPA by IE W0146-02.

2.3.2 Proposed Waste Types, Activities & Quantities

It is proposed to accept up to 440,000 tonnes per annum of waste at Knockharley in total. This waste shall be managed through disposal or recovery activities, dependent on the nature of the waste material.

It is necessary to consider the processes that will be applied to each waste type to be accepted in terms of the process being either a recovery or a disposal activity, as defined by the relevant activities outlined in Schedules 3 & 4 of the Waste Management Acts 1996 to 2011, as amended. The classification of the activities being applied to each waste type is discussed further in this section.

While the current permission pertaining to the facility limits the acceptance of waste for disposal to 88,000 tonnes per annum, for reasons discussed in Chapter 4 'Need for the Development & Alternatives Considered', it is considered that an increased acceptance rate at Knockharley Landfill would be appropriate, and sustainable to provide required national landfilling capacity including contingency capacity.

The proposed development will see the acceptance of a total of 440,000 tonnes 'through the gate' on an annual basis, that will either be recovered or disposed of, dependent on the nature and quantity of the material. The types of waste to be accepted at the proposed development and proposed quantities and related disposal or recovery activities are outlined in more detail in the following sections.

2.3.3 Waste Types to be Accepted

Broadly, the waste types to be accepted as part of the proposed development are the same as those currently accepted at the facility, with the addition of two new waste types; stable non-reactive hazardous waste (maximum 5,000 tonnes per annum) and baled recyclable waste.

The waste types to be accepted are:

- Non-hazardous residual municipal solid wastes of household, commercial and industrial origin, which will have undergone various degree of pre-treatment from separate 'black bin' collection to biological treatment in the form of stabilised residual fines, as well as residual MSW from other sources such as unauthorised landfill remediation and/or repatriated wastes; the issue of unauthorised landfill remediation and waste repatriation is discussed in more detail in Chapter 4 'Need for the Development & Alternatives Considered'.
- Non-hazardous incinerator bottom ash (which is currently accepted at the facility).
- Non-recyclable bulky wastes, where bulky wastes are broadly considered as larger wastes which do not fit in household/commercial bins e.g. mattresses, furniture etc.
- Non–hazardous soils and stones and other C&D wastes.
- Street sweepings and similar cleansing wastes.
- 'Individual' volumes of non-hazardous industrial wastes from various industries such as food preparation, chemical processes, thermal processes, metal treatments, health care (non-hazardous) and water/wastewater treatment industries, all of which are currently accepted at the facility.
- Stable non-reactive hazardous waste
- Baled recyclable waste (contingency storage)
- Baled MSW (contingency storage)

2.3.4 Proposed Waste Activities

The proposed activities to be undertaken at the facility are classified in accordance with relevant legislation and can broadly be described as:

- placement of waste within lined cells
- biological treatment of residual MSW fines
- management of leachate
- storage of surface water for attenuation prior to discharge
- storage of unsuitable waste in quarantine area prior to removal off-site
- contingency storage of baled recyclables
- contingency storage of baled MSW
- IBA recovery trials (screening and washing and recovery of metals)

Waste Activities under the Industrial Emissions Directive

The facility Licence W0146-02 was amended by the EPA in December 2013 in compliance with the Industrial Emissions Directive (2010/75/EU), as implemented by the European Union (Industrial Emissions) Regulations (S.I. 138 of 2013), thus changing the licence from a Licence to an Industrial Emissions (IE) Licence.

An application shall be made to the EPA in respect of the IE Licence following submission of the SID planning application which shall include for the proposed waste activities under the Industrial Emissions Directive. Table 2-4 over shows a list of the proposed activities that may apply to the proposed development.

Table 2-4: Proposed Activities in accordance with the Industrial Emissions Directive 2010/75/EU as per Revised First Schedule of EPA Act 1992 to 2013

Proposed Activity 11.1	The recovery or disposal of waste in a facility, within the meaning of the Act of 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. (is an industrial emissions directive activity, in so far as the process development or operation specified in 11.1 is carried on in an installation connected or associated with another activity that is an industrial emission directive activity).
Description of Activity	All waste related site activities as described in 11.4 (a), 11.4 (b) & 11.5 following
Proposed Activity 11.4 (a)	Disposal of non-hazardous waste with a capacity exceeding 50 tonnes per day involving one or more of the following activities (other than activities to which the Urban Waste Water Treatment Regulations 2001 (S.I. 254 of 2001) apply): (ii) physico-chemical treatment;
Description of Activity	Leachate management
Proposed Activity 11.4 (a)	Disposal of non-hazardous waste with a capacity exceeding 50 tonnes per day involving one or more of the following activities (other than activities to which the Urban Waste Water Treatment Regulations 2001 (S.I. 254 of 2001) apply): (iv) Treatment of slags and ashes
Description of Activity	IBA recovery trials
Proposed Activity 11.4 (b)	Recovery, or a mix of recovery and disposal, of non-hazardous waste with a capacity exceeding 75 tonnes per day involving one or more of the following activities, (other than activities to which the Urban Waste Water Treatment Regulations 2001 (S.I. No. 254 of 2001) apply): (iii) treatment of slags and ashes
Description of Activity	IBA recovery trials
Proposed Activity 11.4 (b)	Recovery, or a mix of recovery and disposal, of non-hazardous waste with a capacity exceeding 75 tonnes per day involving one or more of the following activities, (other than activities to which the Urban Waste Water Treatment Regulations 2001 (S.I. No. 254 of 2001) apply): (i) biological treatment;
Description of Activity	Leachate management Biological treatment of MSW fines
Proposed Activity 11.5	Landfills, within the meaning of section 5 (amended by Regulation 11(1) of the Waste Management (Certification of Historic Unlicensed Waste Disposal and Recovery Activity) Regulations 2008 (S.I. No. 524 of 2008)) of the Act of 1996, receiving more than 10 tonnes of waste per day or with a total capacity exceeding 25,000 tonnes, other than landfills of inert waste.
Description of Activity	The acceptance of waste at a landfill facility where the proposed rate of acceptance exceeds the identified threshold.

Waste Activities under the Waste Management Act

The classification of an activity as recovery or disposal is an important consideration from a legislative viewpoint, in terms of correctly classifying an activity, such that it has appropriate authorisation to be undertaken.

As per the Waste Framework Directive 2008/98/EC, 'recovery' is defined as:

> *"any operation the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy"*

Annex II to the Waste Framework Directive contains a non-exhaustive list of recovery activities, which are replicated in the Fourth Schedule of the Waste Management Act, 1996 as amended. In a landfilling context, wastes are generally recovered through their use as daily and temporary cover materials, where they replace other non-waste materials that could also be used as cover, as well as construction materials in, for example, internal haul roads.

'Disposal' is defined in 2008/98/EC as:

> *"any operation which is not recovery even where the operation has as a secondary consequence the reclamation of substances or energy"*

Annex II to the Directive contains a non-exhaustive list of disposal activities, which are those replicated in the Third Schedule of the Waste Management Act, 1996 as amended. Again, in a landfilling context, wastes placed within the landfill cell void that serve no recovery use are considered as being disposed.

In terms of the waste activities proposed as part of this development, wastes to be accepted have the potential, to varying degrees, to be either 'recovered' or 'disposed of' in keeping with the definitions of 2008/98/EC and the Third and Fourth Schedules of the Waste Management Act 1996, as amended.

Table 2-5 over outlines different situations in which incoming waste types could be identified as undergoing recovery or disposal activities. Further background to the likely origin of these wastes is provided in Chapter 4 'Need for the Proposed Development & Alternatives Considered'.

The acceptance of IBA in dedicated cells is described in more detail in Section 2.5.2 following - the placement of this material could potentially be classified as a recovery or disposal activity, depending on a number of factors.

Table 2-5: Waste Types, Quantities & Recovery and/or Disposal Application

Waste Types	Total Quantities Envisaged	Recovery Activity	Disposal Activity
Incinerator Bottom Ash	Up to 150,000 tonnes per annum	In the event of the acceptance and placement of IBA in dedicated cells, prior to a subsequent offsite recovery application, being considered as an 'R13' storage activity [2]	In the event of the acceptance and placement of IBA in dedicated cells with no subsequent recovery
Soils & Stones & Other C&D wastes	Up to 290,000 tonnes per annum	Where used as cover and/or construction materials during landfilling operations	When not used as cover and/or construction materials and deposited within the landfill void
Residual Municipal Solid Waste (including municipal bulky waste)		Where residual MSW fines are processed, either onsite in the proposed biological treatment plant or offsite, and utilised as cover material during landfilling operations	Where residual MSW is deposited directly within the landfill void
Non-municipal Bulky Waste		Unlikely to be utilised in a recovery application	Where non-municipal bulky waste is deposited directly within the landfill void
Street Sweepings & Cleansing Wastes		Unlikely to be utilised in a recovery application	Where street sweepings and cleansing wastes are deposited directly within the landfill void
Non-hazardous Industrial Wastes		Unlikely to be utilised in a recovery application	Where non-hazardous industrial wastes are deposited directly within the landfill void
Stable Non-Reactive Hazardous Waste (SNRH)	Up to 5,000 tonnes annum[3]	Will not be utilised in a recovery application	SNRH to be deposited directly within landfill void.

To this end, the likelihood of the further use of this material in a recovery application (most likely the R5 recovery activity[4] as per the Fourth Schedule of the Waste Management Act 1996, as amended) is an important factor in the designation of placement of this material in dedicated cells as a recovery or disposal activity.

C&D soil and stones type material, as well as stabilised residual fines materials may also be recovered, when used in daily and temporary cover applications at landfill sites. The use of this material as cover, and hence classification as recovery, is governed by the facility licence and will be undertaken in accordance with the EPA Guidance Note "Guidance Note on Daily and Intermediate Cover at Landfills"[5]

[2] Where Class R13 of the Third Schedule of the Waste Management Acts 1996 to 2011, is "Storage of waste pending any of the operations numbered R 1 to R 12 (excluding temporary storage (being preliminary storage according to the definition of 'collection' in section 5(1)), pending collection, on the site where the waste is produced)" where it could be followed by a Class R5 recovery operation

[3] Not to exceed 49,999 tonnes over the lifetime of the facility.

[4] Where R5 is "Recycling/reclamation of other inorganic materials, which includes soil cleaning resulting in recovery of the soil and recycling of inorganic construction materials"

[5] Guidance Note on Landfill Daily and Intermediate Cover, EPA 2014

Residual MSW accepted at landfill is, on the whole, disposed of within the landfill void – one situation where material of residual MSW origin can be recovered is when residual MSW fines which have undergone biological stabilisation, such that it falls within applicable stabilisation limits[6], are used as daily or temporary cover materials within the landfill.

The activities outlined in Tables 2.9 and 2.7 identify the recovery and disposal activities, in accordance with the Third & Fourth Schedules of the Waste Management Act 1996, as amended, that may apply to the proposed development, and reflect the different situations as outlined in Table 2.4 and above, where materials may be classified as being recovered or disposed.

[6] Respiration activity after four days (AT4) is <7 mg O_2/g DM

Table 2-6: Relevant Disposal Activities as per Third Schedule of the Waste Management Act 1996, as amended

Third Schedule Waste Disposal Activities	
Class D1	Deposit into or on to land (e.g. landfill, etc.)
Class D5	Specially engineered landfill (e.g. placement into lined discrete cells which are capped and isolated from one another and the environment, etc.)
Description of Activity	Classes D1 & D5 relate to the deposition of non-hazardous wastes in lined cells that are on, in and under land
Class D4	Surface impoundment (e.g. placement of liquid or sludgy discard into pits, pond or lagoons, etc.)
Description of Activity	Class D4 relates to the storage of leachate in lagoons prior to disposal off-site at a suitable wastewater treatment plant and the use of surface water ponds to control the quality and quantity of the surface water run-off from the site
Class D8	Biological treatment not specified elsewhere in this Schedule which results in final compounds or mixtures which are discarded by means of any of the operations numbered D 1 to D 12
Description of Activity	Biological treatment of residual waste. Treatment of leachate.
Class D9	Physico-chemical treatment not specified elsewhere in this Schedule which results in final compounds or mixtures which are discarded by means of any of the operations numbered D 1 to D 12 (e.g. evaporation, drying, calcination, etc.)
Description of Activity	Treatment of leachate
Class D13	Blending or mixing prior to submission to any of the operations numbered D 1 to D 12 (if there is no other D code appropriate, this can include preliminary operations prior to disposal including pre-processing such as, amongst others, sorting, crushing, compacting, pelletising, drying, shredding, conditioning or separating prior to submission to any of the operations numbered D1 to D12)
Description of Activity	IBA handling Mixing of different leachate streams prior to treatment and/or disposal off-site.
Class D15	Storage pending any of the operations numbered D 1 to D 14 (excluding temporary storage (being preliminary storage according to the definition of 'collection' in section 5(1)), pending collection, on the site where the waste is produced).
Description of Activity	Class D15 relates to the temporary storage on-site of unacceptable waste in the waste quarantine area prior to transport to another site. Class D15 relates to the temporary storage of baled MSW in the biological treatment facility building prior to transport off-site.

Table 2-7: Relevant Recovery Activities as per Fourth Schedule of the Waste Management Act 1996, as amended

Fourth Schedule Waste Recovery Activities	
Class R3	Recycling/reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes), which includes gasification and pyrolysis using the components as chemicals
Description of Activity	Class R3 refers to the onsite biological treatment of residual fines
Class R5	Recycling/reclamation of other inorganic materials, which includes soil cleaning resulting in recovery of the soil and recycling of inorganic construction materials
Description of Activity	Class R5 refers to the use of soils, C&D materials, IBA and other inorganic materials as cover materials and/or in construction related activities
Class R11	Use of waste obtained from any of the operations numbered R 1 to R 10
Description of Activity	Class R11 refers to the use of stabilised residual fines from the biological stabilisation of the organic fraction of municipal solid waste as cover material
Class R12	Exchange of waste for submission to any of the operations numbered R 1 to R 11 (if there is no other R code appropriate, this can include preliminary operations prior to recovery including pre-processing such as, amongst others, dismantling, sorting, crushing, compacting, pelletising, drying, shredding, conditioning, repackaging, separating, blending or mixing prior to submission to any of the operations numbered R1 to R11)
Description of Activity	Where R12 refers to the washing and screening of IBA (trials) Class R12 refers to the recovery of metals from IBA (trials)
Class R13	Storage of waste pending any of the operations numbered R 1 to R 12 (excluding temporary storage, pending collection, on the site where the waste is produced).
Description of Activity	Class R13 may refer to the placement of IBA material within dedicated cells prior to its subsequent recovery in off-site applications, dependent on the duration of its storage and other factors. Class R13 refers to the storage of baled recyclable waste in the biological treatment facility building. Class R13 refers to the storage of baled MSW in the biological treatment facility building.

Waste Quantities

Waste quantities defined in Table 2-8 are indicative and will be subject to availability of national landfill capacity and to prevailing market conditions. Accordingly, it is not proposed to limit waste disposal or recovery for respective waste inputs.

Chapter 4 'of Volume 2 of this EIAR considers that there is a significant capacity requirement for the overall waste tonnages proposed as part of this application totalling 440,000 tonnes per annum. In the event of any of the proposed capacities not being utilised in a given year, which is considered an unlikely situation, the presence of such capacity will provide contingency capacity, the requirement for which is identified in Chapters 3 and 4 of Volume 2 of this EIAR.

To inform the modelling of potential impacts related to noise and air quality addressed in subsequent chapters of this EIAR, as well as to inform the future cell phasing of the development, Table 2-8 presents a likely breakdown of waste types to be accepted at the facility in the coming years and the rate at which they may be accepted, based on the intended operational development of Knockharley Landfill Facility as informed by the market knowledge of the applicant and their consultants.

Table 2-8: Possible Future Breakdown of Incoming Materials to Facility

Incoming material type	Annual intake	Description
Residual MSW	65,000	Biological fraction (unstabilised)
Fines materials - MSW		
Soil & stone and other C&D materials	225,000	Stabilised and inert
Non-recoverable bulky waste individual industrial waste streams & SNRHW		
Fines materials –C&D, C&I, MSW		
Street Sweepings & Cleansing Wastes		
IBA	150,000	No biological fraction
Total	**440,000**	

Drawing No. LW14-821-01-P-0050-005 Proposed Site Layout Plan with Infrastructure and Waste Locations in Volume 4 of this EIAR shows the proposed cell footprints for respective waste types. Cell layout and filling sequence have been designed to accommodate changes in waste streams (volume and input rate) and final cell footprints may change to reflect incoming waste streams.

The material types as presented in Table 2-8 are discussed as follows:

Residual Non-Stabilised Waste

Residual non-stabilised waste is residual MSW material with a biodegradable fraction, originating from household, commercial and industrial waste collections, where thermal treatment and/or export capacity for the management of this material may not either be available at certain times, e.g. thermal plant routine shut down or where suitable treatment is not available.

Included within this waste stream are quantities of waste originating from repatriation activities or historic legacy sites undergoing remediation, which can only be managed at landfill.

It is assumed that a portion of fines accepted at the facility from time to time will have a gas generation potential and therefore has been included in the non-stabilised portion of waste.

These residual non-stabilised wastes will be placed in cells developed within the existing permitted landfill footprint where it will, under anaerobic conditions, result in landfill gas production, which will be either utilised to generate electricity or flared in accordance with facility licence conditions. Leachate from these wastes will be collected from the cell drainage layer and discharged via existing pipework for leachate treatment, as described in Section 2.7.1.

Stabilised and Inert Wastes

Stabilisation' means the reduction of the decomposition properties of the biodegradable fraction of waste to such an extent that offensive odours are minimised and that the Respiration Activity after four days (AT4) is <7 mg O_2 /g DM thereafter[i].

The term stabilised is used to reflect the relatively 'non-reactive' nature, in terms of leachate and landfill gas generation of this waste. It includes stabilised fines, bulky waste, street sweepings, stable non-reactive hazardous waste and inert wastes.

Stabilised and inert waste will be landfilled in separate specific cells and isolated from the non-stabilised waste, by use of using a 1.0 mm LLDPE membrane, (use of an impermeable LLDPE membrane prevents oxygen ingress into anaerobic cells)

It is proposed to provide landfill capacity at Knockharley for non-hazardous soil and stone and C&D waste as there is significant under capacity in the Country for these materials at present. This is discussed in further detail on Chapter 4 'of Volume 2 of this EIAR. Final capping material will be additional to the above.

It is estimated that non-recyclable bulky wastes and individual industrial origin waste streams that are not suitable for thermal treatment will be landfilled at Knockharley. Stabilised fines material may comprise non-biodegradable C&D/C&I type fines, as well as residual MSW fines stabilised on site in the biological waste treatment facility or at other locations prior to acceptance on site. Street sweepings and other cleansing wastes may be accepted. Stable non-reactive hazardous waste shall be accepted on site up to 5,000 tonnes per annum but not exceeding 49,999 tonnes over the lifetime of the facility. Stable non-reactive hazardous waste will be landfilled within dedicated sub cell areas within cells 27 and or 28.

Waste will be contained within plastic sheeting and covered with stable inert waste. Landfill locations of respective consignments will be recorded. Best practice will be carried out in accordance with EPA Technical Guidance.

Once deposited, waste will be covered immediately to a depth of at least 250 mm and by the end of the working day at least one metre of cover will be placed on all flanks and surfaces. Prior to final capping at least two metres of suitable material will be placed below the liner. The waste will be placed in areas removed from gas extraction.

These stabilised and inert wastes will not produce landfill gas and so a system of passive venting to atmosphere via carbon filters, shall be employed for the specific cells in which this material is placed. Leachate collected from these cells will be handled separately to other leachates generated on site. This is, described in Section 2.7. It is likely that a proportion of the stabilised and inert waste accepted at the facility will be utilised for daily cover in the residual non- stabilised waste cells, as a recovery activity.

Incinerator Bottom Ash (IBA)

It is proposed to accept up to 150,000 tonnes per annum of IBA in a dedicated IBA facility. The design is such that the IBA area will ultimately "piggy back" onto the adjacent landfill cells. Only inert waste will be placed under the "piggy back" area to provide future stability for the IBA material. This is described in more detail in Section 2.5. A passive gas venting system shall be employed within these cells, while leachate generated shall be managed in accordance with the manner described in Section 2.7.

It is the intention of the operator to store IBA in lined cells for future recovery off-site and permission is sought to carry out trials to facilitate recovery.

2.3.5 Future Cell Construction

Future cell construction within the currently permitted development will continue to be constructed in the same manner as cells currently constructed i.e. using a 1.0 m composite barrier system comprising an underliner drainage system to control groundwater, 1.0 m clay (permeability of $1*10^{-9}$ m/s) or equivalent, overlain with a 2.0 mm thick HDPE drainage liner.

A 500 mm drainage stone layer will be placed above the HDPE barrier within which collection pipework will facilitate leachate removal. Side slopes will be overlain with a protection geocomposite or similar, to protect the liner during waste placement.

Cell depth below existing ground level will continue as per the existing planning permission and IED Licence. Overburden will continue to be used for the engineered clay barrier and for screening bunds, as discussed in more detail in Section 2.14.3.2, Section 2.14.3.6, and in Chapter 11 Soils, Geology and Hydrogeology of Volume 2 of this EIAR.

During waste placement, horizontal and vertical gas collection pipework will be installed to facilitate extraction, under negative pressure, of landfill gas, as may be required in cells designated for the placement of non-stabilised residual waste. During cell construction, the perimeter gas collection pipework will be extended from the in-situ above ground system on-site.

Leachate from cells is currently pumped from the base of cells via a rising main to a below ground floating cover leachate lagoon onsite, prior to tankering off-site to a wastewater treatment plant. Future leachate treatment is described in more detail in Section 2.7. Future cell construction will include similar leachate extraction infrastructure.

At time of writing Cells 1 through 16 (See Drawing LW14-821-01-P-0000-002 Existing Site Layout in Volume 4 of this EIAR) have been constructed, Cells 17 and 18 are under construction and Cells 19 through 28 have yet to be constructed.

2.4 Proposed Changes to Current Permitted Cell Development

The proposed changes to the operation of the landfill under this application include:

- intensification of landfilling
- increase in final contour height
- operation of 2 no. active faces in the permitted landfill development

These are discussed in the following sections.

There will be no changes to the existing landfill gas management system, leachate management system, surface water management system – albeit a new attenuation pond is required to manage flows in the northern portion of the site. There will be no changes to existing practices associated with nuisance control or other operational practices in place for the existing landfill facility.

2.4.1 Proposed Intensification of Landfilling in Existing Permitted Footprint

The existing permitted development is as described in Section 2.1. It is proposed to intensify the filling of the existing permitted landfill by increasing rate of waste acceptance to 440,000 tonnes per annum and to continue landfilling until the void in the remaining permitted cells is utilised. No change is proposed to the existing permitted footprint of the landfill Phases 1-7. Permission is sought to operate the landfill until the void is filled.

2.4.2 Increase Final Contours

In is proposed to increase the void capacity of the existing permitted footprint by raising the profile of the landfill from 74 m AOD to 85 m AOD. The existing final contour of previously capped cells will remain as is. The increased profile will apply to operational cells post grant of permission. The increased void associated with reprofiling will be approximately 217,000 m^3.

2.4.3 Proposed Future Cell Phasing & Filling

The proposed cell phasing and filling for the existing permitted landfill cells will require 2 no. working faces and the proposed IBA Cells will require a working face.

This is illustrated in Figure 2-2, please note that the size of the working face will be a condition of the licence, e.g. face 2 shall be no more than 25 m long and 25 m wide (i.e. <625 m^2 surface area), no more than 2.5 metres in height after compaction, and have a slope no greater than 1 in 3. The larger faces in Figure 2-3 are only to illustrate the concept. The proposed IBA cell development is discussed in Section 2.5.

The primary objectives of separate working faces are to:

- Separate the different leachates by composition to facilitate targeted and appropriate treatments.
- Facilitate management of different settlement characteristics associated with respective wastes.
- Facilitate more effective management of odour emissions from, and oxygen ingress into, the anaerobic waste body.
- Facilitates alternate engineering design solutions to manage landfill gas e.g. vertical wells under negative extraction in anaerobic cells and passive venting from horizontal wells in the "stabilised aerobic waste body.
- Mitigates the risk of collision from vehicle movements.

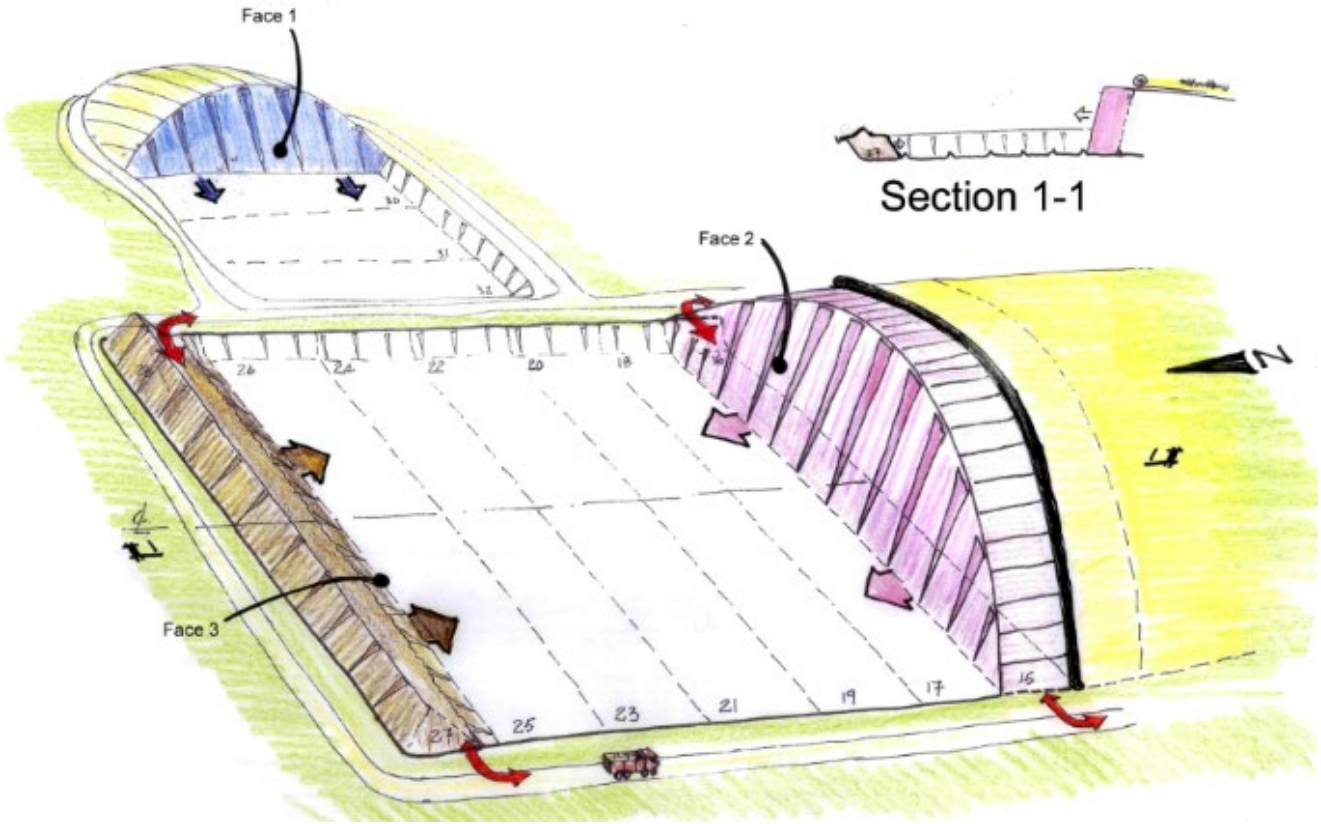


Figure 2-2: Artist Impression of Operational Waste Faces

Drawing LW14-821-01-P-0050-010 Proposed Filling Sequence Volume 4 of this EIAR and Figure 2-2 illustrate the proposed cell layout with cell numbers as defined in the permitted cell development and the proposed operational waste faces which are:

- Face 1 (Blue) is the IBA working face. The blue arrow reflects the fill direction (westerly) of the proposed IBA cell 29 to Cell 33.
- Face 2 (Pink) is the residual non-stabilised waste face and the pink arrow illustrates the direction of filling (northerly).
- Face 3 (Brown) is the stabilised and inert waste face. The brown arrow indicates the direction of filling (southerly direction).

2.4.3.1 Face 1 IBA

Face 1 for IBA in proposed cells 29 through 33 discussed in Section 2.5.5.

2.4.3.2 Face 2 Non-Stabilised Residual

Face 2 which is the current operational face will accept residual non-stabilised waste with the face developing progressively in a northerly direction. This broad waste stream typically has a significant organic fraction, is readily compressible and produces landfill gas under anaerobic conditions. Landfill gas will be collected under negative pressure via horizontal and vertical pipe systems and treated in engines (to produce electricity) or flares. During operations, proactive use of daily and intermediate covers will contain odours, facilitate development of anaerobic conditions within the waste body and isolate the waste from rainfall inputs.

2.4.3.3 Face 3 Stabilised and Inert Waste

Face 3 will accommodate deposition of stabilised and inert wastes. During operations, proactive use of daily and intermediate covers will isolate the waste from rainfall inputs. This broad waste stream will typically be less compressible than residual non-stabilised wastes, contain minimal/no organic matter and as such will not produce odours or landfill gas. Such emissions as may be produced will be vented passively via an appropriate filter to atmosphere via, typically, horizontal piping system and the waste will be landfilled under aerobic conditions.

Placement of stabilised and inert waste in cells 27 and 28 and moving in a southerly direction is designed to maximise the distance between residential receptors on the northern boundary and Face 2. Inert waste will be placed in cells 20 and 22 to create a stable foundation for the future piggy back of the IBA facility.

2.4.3.4 Filling Sequence

Subject to waste intake rates and operational considerations, placement location/filling sequence may change and waste types within the permitted cells may overlap at the interfaces between respective waste faces.

Figure 2-3 over illustrates the proposed filling sequence at respective faces.

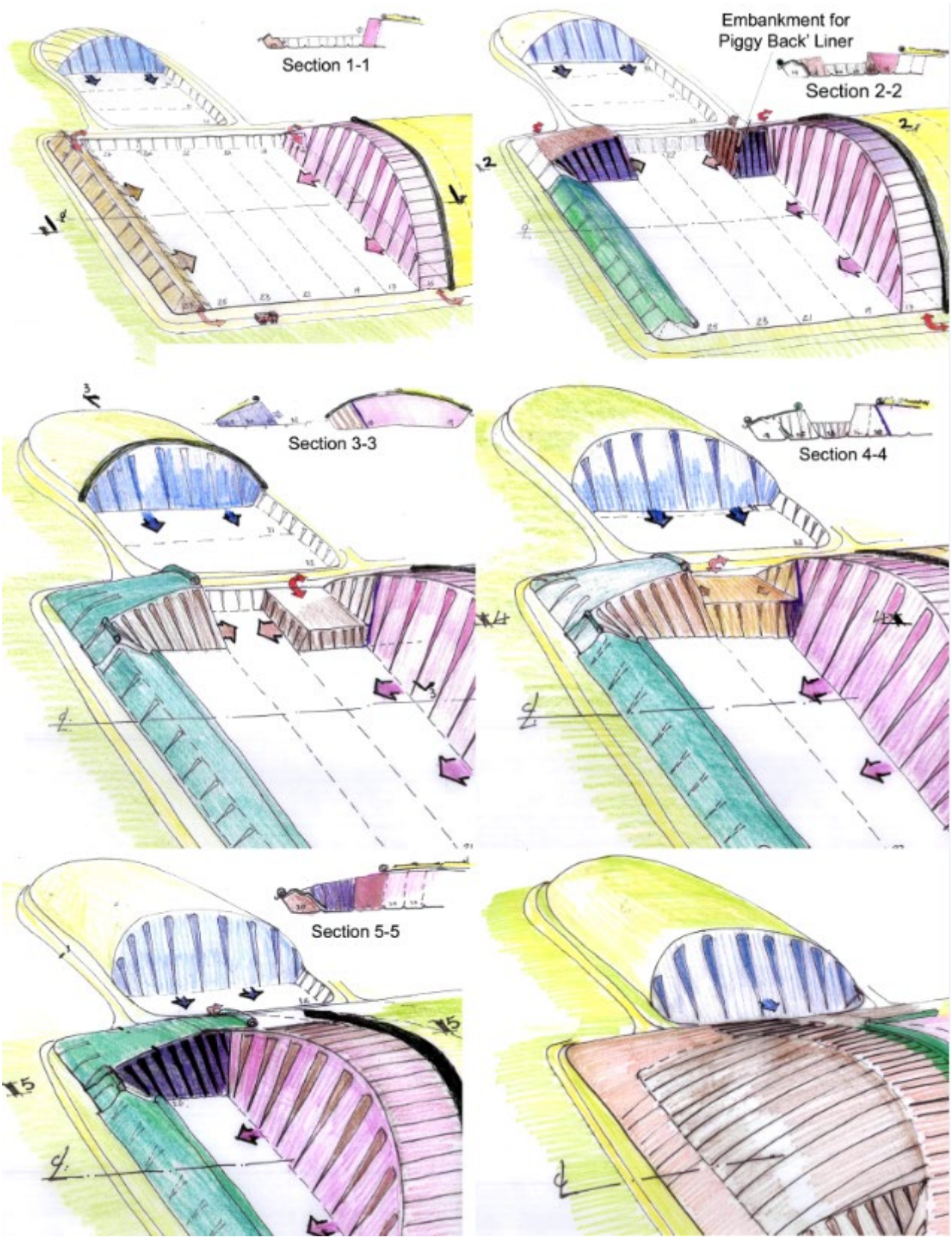


Figure 2-3: Cell Filling Direction Permitted and Proposed Development Footprint

Filling sequence for residual non-stabilised waste

Drawing LW14-821-01-P-0050-010 Proposed Filling Sequence Volume 4 of this EIAR and Figure 2-3 show the filling sequence for the (pink) residual non-stabilised waste. Residual non-stabilised waste will be placed in a south to north direction commencing in cells 17 and 18, reflecting current practice.

Permanent capping will also progress in a south to north direction. There will be one working face within each cell and individual cells or sub cells, will typically be filled in east-west / west-east directions. Filling will typically commence in the low point of cells which will always be adjacent to the perimeter access roads. Whilst the location of the active face on any working day will change it will typically be limited to a width approximately equal to 25 m and the plan and vertical locations will change as filling progresses such that working areas may be placed over one or more cells.

Cells will be subdivided into units approximately 50 m wide by 50 m long to facilitate management of leachate and landfill gas.

To reduce leachate volumes every effort will be made to minimise the working face. Initially rainfall runoff from empty cells (clean) will be directed to the storm water collection system. Once waste is placed in a cell/sub cell rainfall percolation inputs within the cell will be directed to the leachate collection system.

Once the cell floor is covered with waste, operations will be structured to minimise the working face and to place temporary covers on adjacent waste to facilitate management of odour and to isolate the waste body from rainfall inputs to reduce leachate production.

Filling sequence for stabilised and inert waste

The filling sequence for stabilised and inert waste is designed to:

- Reduce leachate volumes – Cell formations will be divided into sub-cells by leachate collection pipework in all cells, approximately 30 m wide by 50 m long, to facilitate isolation of rain falling on empty cells (clean) from rain falling on active cells (leachate). Pipework will be designed to collect, segregate and discharge respective streams to designated outlets (rain to surface water and contaminated rain / leachate to leachate management facility) as required.
- Maximise distance between Face 2 non-stabilised residual waste with gas generation potential and the northern receptors.
- Provide screening for northern receptors by placing stabilised and inert waste in the northern most cells 27 and 28 such that waste placement operations in cells 17 onwards will be screened as waste height in cells 27 and 28 and subsequent cell increases.
- Hermetically isolate the residual non-stabilised (anaerobically landfilled) waste from the aerobic stabilised and inert waste and IBA waste bodies using a LLDPE 'piggy back' liner or similar within cells during waste placement.
- Facilitate future 'piggy back' placement of IBA prior to final capping by placing (inert) material in cells 20, 22, and 24 that will not be subject to the settlement typically associated with MSW.

The filling sequence for stabilised and inert waste, will commence in cells 27 and 28 and fill direction will initially be in a southerly direction. Placement and fill direction of stabilised and inert waste will be subject to material availability and the active face may alternate to a south to north direction subject to finished contours in the adjacent (residual non-stabilised) cells. However only one active face will be open to accept stabilised and inert waste at any one time.

To facilitate a hermetic seal at the interface between the aerobic face and adjacent anaerobic bodies, the stabilised and inert waste needs to form an embankment below and ahead of the advancing active Face 2 (non-stabilised waste). The embankment, see Figure 2-3 Sections 2-2, 3-3 and 4-4 will facilitate installation of an impermeable "piggy back" liner (see green cover, see Figure 2-3, Section 5-5 in advance of non-stabilised waste placement. The "piggy back" liner will be placed within cells 18, 20, 22, 24 and 26.

2.4.3.5 Leachate Balance Permitted Development

The planned intensification will impact leachate production, and this is summarised in Table 2-9. Residual non-stabilised wastes will produce similar flow rates to that being produced at present. The intensified inputs will however reduce the cumulative generation of waste as the cells will be open for shorter periods.

Inert and stabilised waste may produce higher flow rates and higher volumes than residual non-stabilised waste as they will have a lower absorptive capacity and require an additional working face. However, it will be easier to install temporary covers to reduce overall volumes.

The inert and stabilised waste cell will have a lower absorptive capacity that traditional non-stabilised residual wastes and will therefore produce more leachate.

Table 2-9: Predicted Annual Landfill Leachate Generation

Year	Annual Leachate Generation m^3
2017	15,830
2018	10,552
2019	21,811
2020	19,188
2021	26,827
2022	27,531
2023	20,995
2024	28,031
2025	10,838
2026	5,419
2027	2,710
2028	1,355
2029	677
2030	339
2031	169
2032	85
2033	42

2.4.4 Proposed Capping and Restoration Programme

Residual non-stabilised waste temporary capping

As part of ongoing current operations at the site, the active area of the landfill is covered with daily cover. The near-horizontal working platform is being covered with soil and woodchip and the slope of the working face will be covered with synthetic cover sheets at the end of each working day.

Daily soil/woodchip covers will be installed as areas of the landfill reach respective lift heights. These cover systems are used to minimise odour nuisance, facilitate gas extraction, contain litter, discourage scavenging birds and to provide a working platform for vehicles.

Temporary synthetic low-permeability covers (intermediate capping) are installed as areas of the landfill reach full height.

Temporary synthetic covers are designed to facilitate odour control, to minimise leachate generation and to allow differential settlement to occur prior to installing the final landfill cap. These practices will continue for future residual non-stabilised waste inputs.

Stabilised and inert waste temporary capping

Capping systems over in stabilised and inert wastes will adopt similar approaches albeit that odour and landfill gas will not be generated.

Permanent engineered cap

There are no significant proposed changes to the permanent engineered cap makeup that has been and will be placed on the permitted development.

The proposed changes to the capping will comprise:

- an increase in post settlement final cap height from 74 m AOD to 85 m AOD, and
- an increase in cap area to accommodate the proposed IBA development

The final cap makeup will be similar in the permitted and proposed development and subject to EPA approval.

A fully engineered cap will be placed over all wastes within 12 months of wastes reaching the pre-settlement final contours. This cap will comprise an under liner geocomposite for management of gas and/or leachate, a 1 mm fully welded LLDPE liner, sub-surface drainage layer, subsoil layer and topsoil layer. The overall thickness of the soil layers will be 1 m in accordance with the requirements of the licence. Approximately 96,000 m² of the existing permitted footprint has been permanently capped at the time of writing and an area of approximately 250,000 m^2 will be capped in the future (anchor trench footprint excluding swales).

The IBA cell footprint discussed in Section 2.5, (excluding wedge infill), will be approximately 58,000 m^2. The final cap footprint for the permitted and proposed development to the anchor trench will be approximately 390,000 m^2.

Surface drainage swale outfalls will convey storm runoff from the permanent cap to either the existing storm water attenuation pond on the southern boundary or to the proposed surface water attenuation outfall on the north-eastern boundary of the site (refer to Section 2.8).

Future permanent capping will continue on a phased basis as described above. Landscaping on the cap will comprise an amenity grassland mix. Following completion of the cap, the landfill will enter the aftercare phase, which will be undertaken in accordance with the conditions of the licence.

2.5 Proposed IBA Facility Development

2.5.1 Introduction

It is proposed to develop five dedicated cells (no. 29 through no. 33) for the acceptance and placement of IBA material only, directly to the east of the permitted facility footprint and directly north of the site accommodation and weighbridge. Cell 33 is termed the 'wedge' as it sits at the interface between the existing landfill and the proposed IBA area. The location of the IBA facility is shown in Drawing No. LW14-821-01-P-0000-003 Proposed Site Layout. The "wedge" cell 33 is not shown on the proposed layout drawing as it will be created post filling of cells, 20, 22, 24 and 32. The proposed IBA facility design will facilitate its future recovery.

IBA will be delivered to site over the existing facility weighbridge and directed to these cells where it will be placed.

The dedicated IBA cells will tie into adjacent filled cells 20, 22 & 24 of the current permitted footprint and the final capping profile will cover all wastes within both types of cells with no evident visual delineation when viewed externally. The cap makeup will be identical.

IBA leachate will be collected from the IBA storage cells, passed through temporary localised suspended solids lagoons to mitigate the risk of solids blocking pipes and managed as described in Section 2.7.

This section includes the following:

- Overview of IBA Landfilling
- Cell design, Construction and Phasing
- IBA Acceptance
- Overview of IBA Landfill Operations
    - IBA Cell layout
    - IBA Filling Sequence
    - Weathering
    - Placement, Working Face, Covers
    - Management of Surface water runoff
    - Management of Leachate
    - Management of Hydrogen
    - Management of Temperature
    - Management of Dust
    - Management of Noise
    - Future 'Winning' of IBA

2.5.2 Overview of IBA Placement

The landfilling of IBA in its own dedicated cells as a 'monofill' introduces specific issues that are not realised in the landfilling of other materials, such as non-stabilised residual (MSW) waste. To inform the design and operational considerations of the proposed IBA cells, a review of available literature sources related to the landfilling of MSW IBA residues was carried out to identify issues to be considered and addressed.

2.5.3 Cell Design, Void & Construction

2.5.3.1 Cell Design

The proposed IBA cells will be constructed using a 1.0 m composite barrier system comprising an under-liner drainage system to control groundwater, 1.0 m clay (permeability of 1 x10^{-9} m/s) or equivalent (bentonite enhanced geocomposites or similar), overlain with a 2.0 mm thick HDPE drainage liner. A 500 mm drainage stone layer will be placed above the HDPE barrier within which will be collection pipework to facilitate leachate removal. Side slopes will also be overlain with a protection geo-composite and/or drainage stone to protect the liner during waste placement and to facilitate collection and controlled passive venting of hydrogen gas (described below).

The proposed IBA cell HDPE liner formation, whilst being connected to the existing waste cell development at the anchor trench interface, will be isolated hermetically from those adjacent landfill cells.

Isolation will occur within the adjacent landfill development in:

- cells 20, 22 and 24 as shown in Figure 2.4 Section 5 illustrating the 'piggy back' liner isolating inert soils from the adjacent anaerobic waste; and
- within the IBA 'wedge' infill (cell 33) isolating IBA leachate from the underlying inert soils.

Leachate and hydrogen gas produced within the IBA cell will be managed by independent collection systems.

IBA waste undergoes an exothermic weathering process during which time significant heat is generated and hydrogen and carbon dioxide gases are emitted. Weathering will typically be accommodated under cover within a dedicated weathering area within the IBA cells (described in more detail in sections following).

Figure 2-5 illustrates the proposed IBA cell footprint and provides an indicative section through the IBA cells.

The blue lines in the IBA cell show locations of recessed drainage pipework within the drainage layer at the base of the cell.

2.5.3.2 Cell Construction

Cells 29 and 32 will be constructed as a single entity to facilitate weathering, landfilling and future recovery/winning of IBA, as may be required. As the cells approach capacity, Cell 33 will be the last IBA cell to be constructed prior to filling in the remaining void to raise the landfill to its final finished planning contour height of 85 m AOD and will tie into the final cap on the adjacent cells. Cell 33 is termed the 'wedge' and is the lined 'cell' connection between the IBA cells and the MSW cells.

Cells 29 through 32 within the IBA footprint will be approximately 225 m long and 48 m wide and will be further subdivided in the base by leachate collection pipework such that each sub cell will be approximately 24 m wide (see Drawing No. LW14-821-01-050-006 IBA Cell Layout and Leachate Pipework in Volume 3 of this EIAR).

The 2D plan footprint of the IBA landfill including wedge infill (cells 29 through 33) will be approximately 81,000 m^2.

The 2D plan footprint of the IBA landfill excluding wedge infill (cells 29 through 32) will be approximately 57,829 m^2.

2.5.3.3 IBA Void Capacity

Void capacity will be subject to the need or otherwise to 'win' material as discussed in 2.3.3. If winning is implemented the 'wedge' infill may not be capped, or capping may be deferred. Accordingly, indicative voids are presented below for two scenarios:

- Cells 29 through 32 (excluding wedge infill); and
- Cells 29 through 33 (including wedge infill)

The void capacity of cells 29 through 32 (excluding 'wedge' infill) to be 645,331 m^3. Assuming a density of 1.6 t/m^3 this equates to 1,032,530 tonnes.

The void capacity of the "wedge" infill will be will be 245,112 m^3. Assuming a density of 1.6 t/m^3 this equates to 392,179 tonnes.

Total estimated capacity for IBA is 1,424,709 tonnes.

2.5.3.4 Engineered Cap

A fully engineered cap will be placed over waste once final contours have been reached in accordance with the licence. This cap will comprise an under liner geocomposite for management of gas and or leachate, a 1 mm fully welded LLDPE liner, sub-surface drainage layer, subsoil layer and topsoil layer. The overall thickness of the soil layers will be 1 m in accordance with the requirements of the licence. Surface drainage swale outfalls will convey storm runoff either to the storm water attenuation pond on the southern boundary or to the proposed surface water attenuation outfall on the north-eastern boundary.

As with cells 17 to 28, future permanent capping will continue on a phased basis and landscaping on the cap will comprise an amenity grassland mix. Following completion of the 1.0 m cap, the landfill will enter the aftercare phase.

2.5.3.5 Screening Berms

Screening berms on the eastern and northern boundaries of the IBA cells (see Drawing Nos. LW14-821-01-P-000-003 Proposed Site Layout and Cut Fill Phasing Plan LW14-821-01-P-0050-011 in Volume 4 of this EIAR), will be constructed using overburden from the cell excavation. The berms will mitigate visual and noise impacts associated with landfill related operations on sensitive receptors on these boundaries.

2.5.4 Access and Traffic Control

2.5.4.1 Access & Traffic Control

Access to the IBA cells will be via a new access road to the north of the existing site accommodation, with traffic being directed there from the existing site weighbridge. Vehicles delivering IBA will utilise the existing private entrance road to Knockharley Landfill and existing weighbridge, prior to travelling to the dedicated cells. All waste vehicles entering and exiting the facility must pass over the weighbridge. Appropriate signage will direct waste vehicles to delivery locations.

2.5.4.2 Acceptance

Incoming incinerator bottom ash (IBA) will be transported to the site in articulated covered trailers and following acceptance at the existing facility weighbridge, will be directed to the IBA facility. Upon arrival at the IBA facility, the delivery truck will be directed either to the weathering storage area or to the IBA working face, as appropriate.

2.5.4.3 Site Access

Access to the weathering area and to the IBA working face will be via surfaced perimeter roads. In addition to the perimeter road surrounding the IBA cells, there will be a concrete road in the middle of the weathering area to facilitate unloading of articulated delivery trucks and loading of weathered IBA onto site vehicles. Within the IBA (Areas 1 through 4) the IBA material formation will always be compacted prior to vehicular trafficking to facilitate safe vehicle movements and vehicle tipping.

2.5.4.4 Inspections

Incoming materials following acceptance at the weighbridge, be they deposited in the weathering area or at the working face will be tipped, levelled and visually inspected for the presence of non-conforming materials i.e. non-IBA materials, unburnt organic fractions, large size materials which, if identified, will be removed and temporarily stored in the dedicated quarantine area and then consigned off site for appropriate management, or for landfilling within cells 23 to 28 of the existing landfill, assuming that it conforms with relevant landfill acceptance criteria.

2.5.4.5 One-way system

Vehicles will travel using a one-way system albeit that flow directions will change subject to stockpile movements in the weathering area and placement methodologies.

Incoming articulated vehicles after exiting the weighbridge will turn left into the IBA facility, tip their loads and exit the site in an anticlockwise direction via a dedicated wheel wash before exiting the site via the weighbridge (see Figure 2-4).

Site vehicles will take weathered IBA from respective stockpiles and access the cells in a clockwise direction.

Vehicles will drive over previously tipped and compacted materials and tip the load on a compacted formation. Thereafter vehicles will drive out in a clockwise direction and return to the weathering area for re-loading.

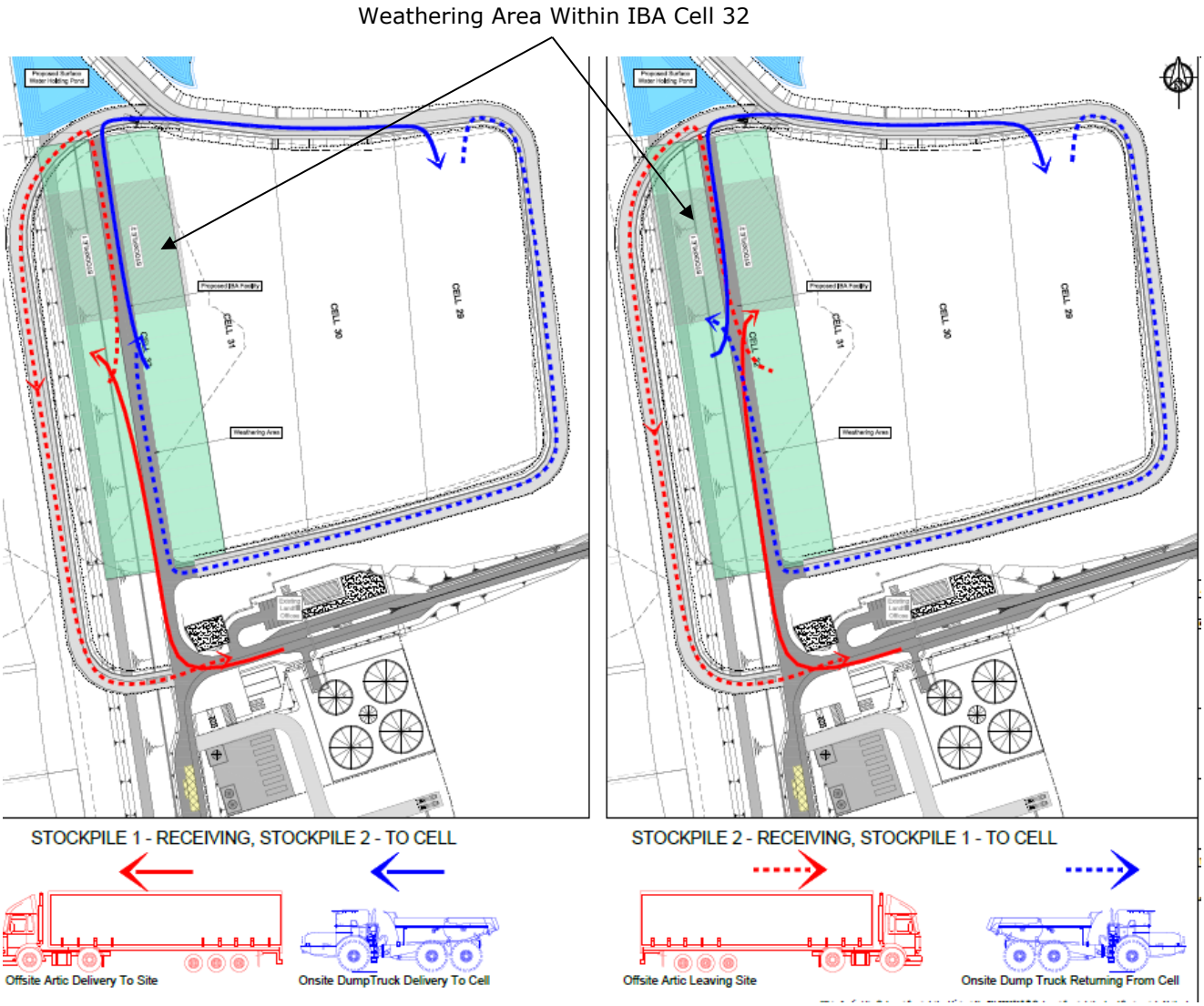


Figure 2-4: Traffic Movements

2.5.5 IBA Area Operations

2.5.5.1 IBA Cell Layout

Figure 2-5 presents an aerial overview of the proposed IBA cell footprint encompassing cells 29 through 32. The cell footprint will be divided into four distinct areas during the operational period, which will vary in size and shape depending on the rate at which the cells are filled and if recovery operations are to be implemented in the future.

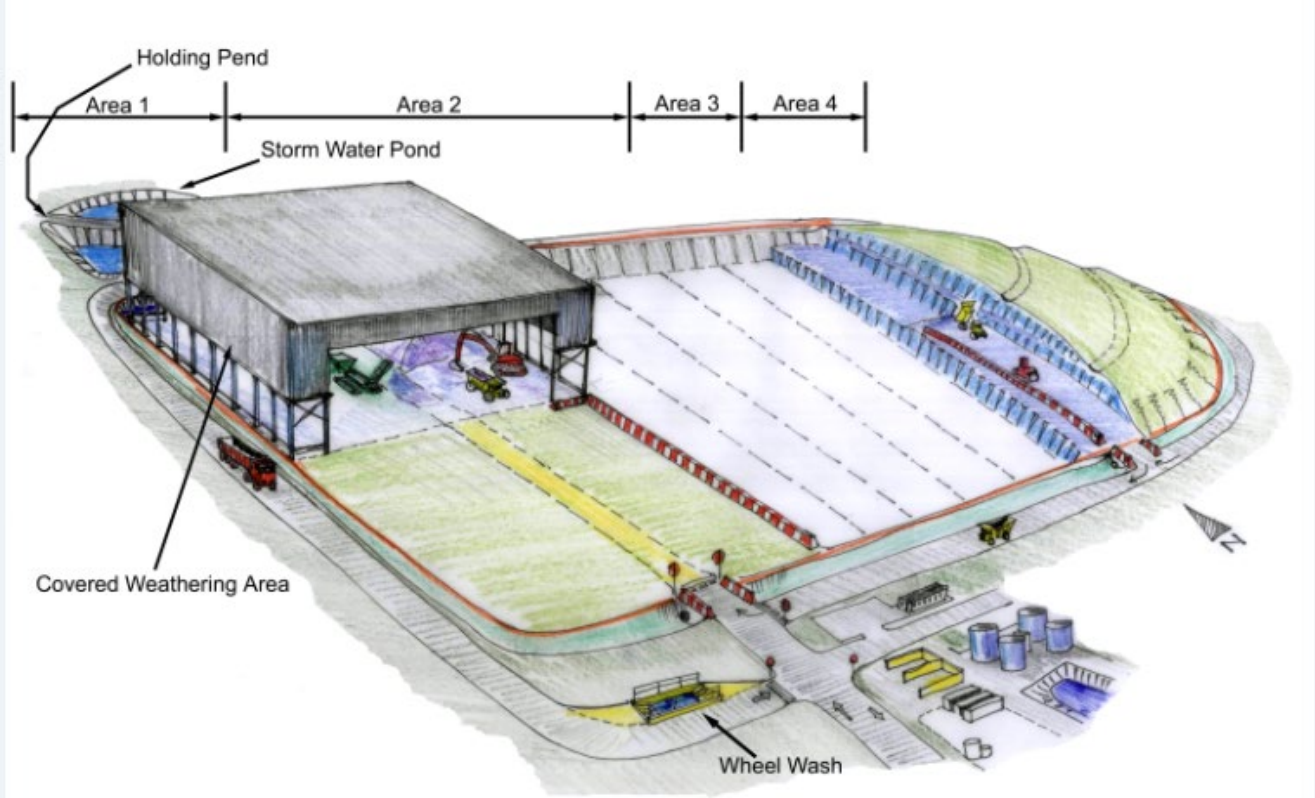


Figure 2-5: IBA Operational Layout (View from Southwest)

Area 1

Area 1 (overlying cell 32) will be assigned to weathering of IBA prior to placement and will provide a covered weathering footprint of approximately 5,776 m^2 (76 m x 76 m). It will comprise a central access reinforced concrete formation route to facilitate access to 2 no. stockpiles. Both stockpiles within Area 1 will each have sufficient capacity to accommodate up to 3 months of IBA acceptance (c. 37,500 tonnes) and temporary storage so that an appropriate weathering period is provided for. Incoming IBA material will be tipped at the relevant stockpile location and placed in the stockpile using a front-end loading shovel. The stockpiling process will facilitate turning of the IBA material during the weathering period, as required.

The building will be a single span structure with roof and side wall ventilation. Its primary objective will be to minimise leachate production and reduce dust and noise impact on adjacent receptors.

The building may also facilitate recovery trials which may include metal recovery, crushing, screening, and washing of IBA.

If an additional weathering footprint is required, the footprint Area 1 will be extended.

In the northern end of Area 1, (see Figure 2.9) the temporary settlement ponds will attenuate IBA leachate and facilitate settlement of suspended solids to mitigate the risk of solids blocking leachate pipework.

A pump sider riser sump in this temporary settlement pond location will pump leachate generated in Area 1 to a holding tank/lagoon in the Leachate Management Facility for treatment and/or tankering offsite to a wastewater treatment facility, as described in Section 2.7.

To mitigate the risk of high pH liquids causing injury to humans, mammals or other the leachate from the weathering area collected from below the weathering building will be directed to the side riser adjacent to the settlement pond and will be pumped via a sealed settlement unit as with all other IBA cell side risers to the leachate management facility and the open water surfaces of the pond will be covered with netting and / or floating covers.

Area 2

Area 2 illustrates the empty cells that initially will have no IBA in place but will accept IBA as the working face develops from the east. Until waste is placed in Area 2, runoff from this area will be considered as clean surface water and directed for discharge via surface water swales (refer to Section 2.8).

Area 2 will be developed progressively subject to IBA inputs.

Area 3

Area 3 illustrates the active area where IBA will be progressively placed. Placement of IBA will occur in 'lifts' of c. 500 mm, in a north-south direction in the respective cells. The filled IBA footprint will progress incrementally from the east to west as respective lifts are developed.

Area 4

Area 4 illustrates IBA with temporary or permanent capping in place. As the area is filled progressively from east to west, temporary sealing/covers and permanent covers will be installed to prevent rainfall ingress to mitigate leachate generation.

Cell formation for the proposed IBA cells will be recessed below original ground level to facilitate below ground containment of leachate. Drainage within the cells will further sub-divide cells to facilitate segregation of clean rainfall runoff and leachates of differing quality. Cell design will be carried out in accordance with guidelines defined in the EU Landfill Directive for non-hazardous cells and the Environmental Protection Agency Landfill Site Design Manual.

2.5.5.2 IBA Filling Sequence

Cell filling will start in cell 29 and progress in a westerly direction through cells 29, 30, 31, 32 and 33.

Figure 2-6 illustrates a section east to west through the IBA footprint above cells 29 and 30 illustrating the filling sequence of respective lifts. Lifts 1 through 4 will be in Cell 29 and will be filled in the first year of IBA acceptance.

Placement of IBA materials will be such that cell 29 will provide supplemental screening to existing perimeter screening berms for works in Cell 30. Similarly, Cell 30 works will provide screening to Cell 31 and Cell 31 works will provide screening for Cells 32 and 33.

The interface between the permitted development will be Cell 33 in the proposed IBA cell development i.e. the 'wedge'.

This is shown in Figure 2.7. To the west in the permitted landfill to facilitate this interface stabilised inert materials will be landfilled under aerobic conditions. Cells 29 through 33 will be landfilled under aerobic conditions where the hydrogen gas will be allowed to vent passively to atmosphere.

Respective waste faces will be typically 24 m wide and will extend approximately 250 m in length (north to south).

Lifts illustrated in Figure 2-6 are approximately 4.0 m high albeit that during operations actual placement lift height will be limited to 2.0 m at any one time. IBA will be installed to grade within each lift in 'mini' lifts 500 mm thickness and compacted thereafter.

Figure 2-6 illustrates how respective operational lifts will be placed. Each lift shown below will be typically 4.0 m deep, 24 m wide and approximately 225 m long and the respective lifts will accommodate approximately 35,000 t of IBA and take approximately 3 months to place assuming an intake of 150,000 t annually.

Figure 2-6 shows that lifts through 16 once placed, will be permanently capped such that these will act as a supplemental screening and noise berm for subsequent works in adjacent areas.

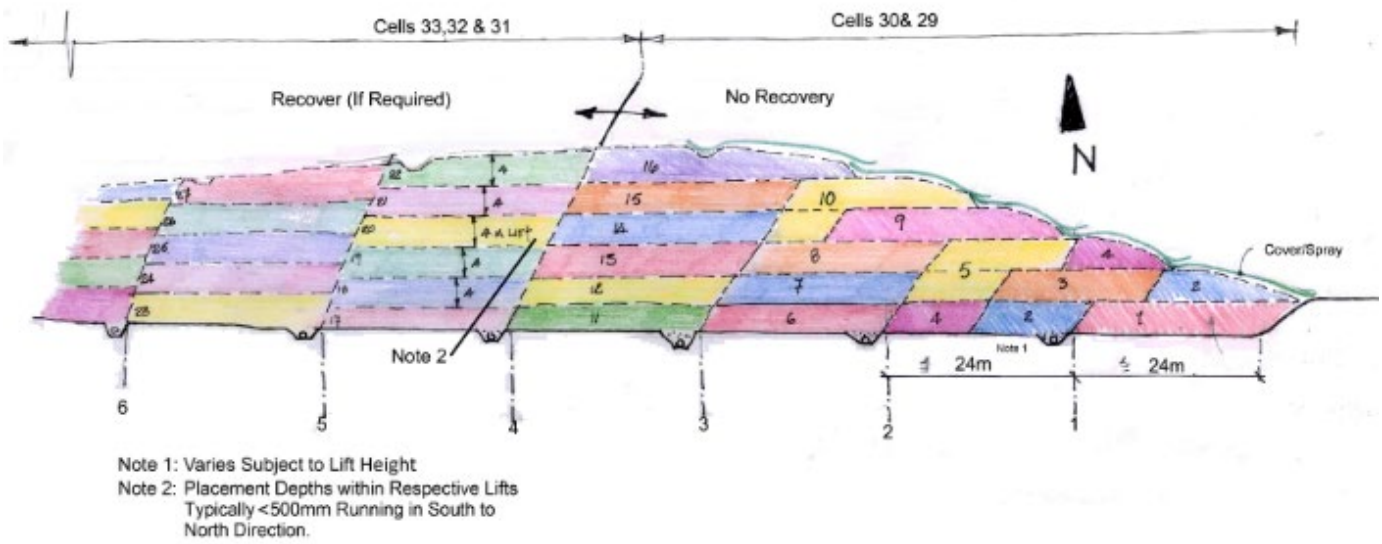


Figure 2-6: IBA Sectional Filling Sequences

Cell 33 "Wedge" infill will be the last cell to be filled See Figure 2.7 below:

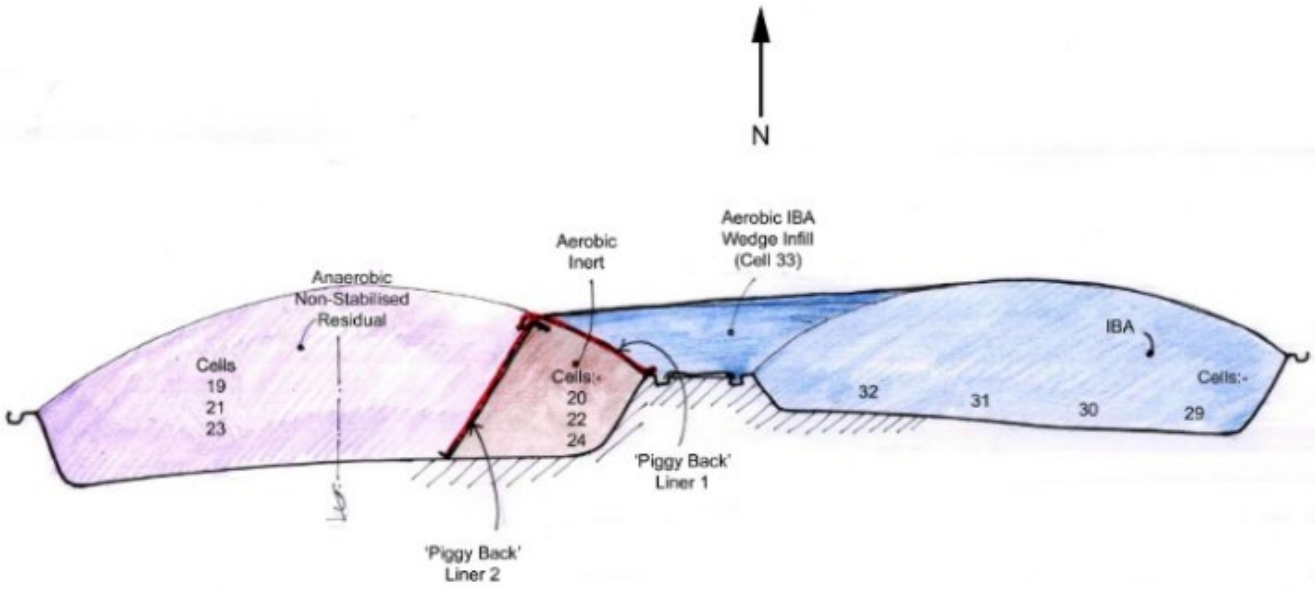


Figure 2-7: Section through Cell 33 "Wedge"

2.5.5.3 Weathering

Section 2.5.2 referenced weathering as being a process whereby silica, calcium, aluminium and sulphate minerals along with heavy metals in the presence of carbon dioxide and water undergo complex physio chemical carbonation (and other) processes.

To understand the operational impacts associated with placement of IBA, this section describes weathering with respect to the pH characteristics of leachate. There are three major stages in weathering that can be identified by the pH characteristics of the IBA and / or leachate. Stage 1 weathering will occur at the incinerator. Operations at Knockharley will accommodate weathering Stages 2 and 3 within the IBA landfill footprint.

Stage 1 will occur when un-weathered IBA leaves the combustion chamber prior to quenching. Typically, IBA will have a pH > 12 in this uncarbonated phase. It will be quenched at the incinerator and thereafter it will be transported to a processing plant for the removal of metals or to processing equipment at the landfill for a similar metals removal process. IBA received at the facility will be in covered trailers.

Stage 2 weathering will occur following placement of IBA in the IBA cells within the dedicated weathering area 1 as shown in Figure 2.6 (or within cells subject to location) over a period of 3 months or more during which time the IBA will become carbonated following exposure to water and carbon dioxide. During this stage of the weathering process, hydrogen gas will be produced, and exothermic reactions may cause elevated temperatures. Hydrogen is potentially explosive between 4% and 75% by volume of air in the presence of an ignition source. The building will have no gables, perforated side sheeting will terminate 6.0 m above ground level and the roof will have ventilation provision to facilitate a well-ventilated space to mitigate the risk of explosive conditions developing.

Specific design and operational practices will be put in place to manage safe venting of hydrogen to atmosphere and to mitigate the risk of high temperatures damaging the HDPE liner of the cell. During this weathering process the pH of leachate will reduce and will be typically < 10.5. During placement, dust will be managed to mitigate potential impacts.

The IBA will be moist when tipped but wind will dry out the surface and therefore dust mitigation measures will be required on an ongoing basis/as part of standard operation procedures in the IBA area.

Stage 3 the final stage of weathering, will occur following placement in cells over many years during which time the pH of leachate from carbonated IBA will typically stabilise between 8 and 8.5. Nominal volumes of hydrogen may also be produced and design provision in the engineered cap and within the IBA body will facilitate safe venting of hydrogen to atmosphere.

Placement operations will therefore be designed to:

- prevent liner damaged from elevated temperatures
- mitigate the uncontrolled release of hydrogen
- Isolate high pH leachate in the weathering area and in dedicated tanks within the leachate management facility
- facilitate weathering

2.5.5.4 Placement Criteria

Operational procedures will be developed to mitigate the risk of elevated temperatures damaging the basal liner system. Typically, Area 1 within the IBA cells will provide for a c. 3-month weathering process prior to placement of IBA within the designated cells.

For subsequent placement of IBA within cells in the lifts illustrated in Figure 2-6, for heights exceeding 2.0 m, Stage 2 weathering of IBA material will need to have occurred within the dedicated weathering Area 1.

Whilst the majority of IBA will undergo Stage 2 weathering in within Area 1 under cover as previously described, weathering may also be facilitated through direct placement with the cells subject to location and prescribed operational criteria. These criteria will require (but not be limited to) presence of a weathered formation layer above the liner (acting as an insulator) with evidence of falling temperatures and sufficient time to allow weathering to occur (> 3 months) prior to subsequent lifts or liners being placed.

2.5.5.5 Placement of IBA in Cells

The first lift in contact with the cell formation will vary between 1.0 m and 2.0 m depth above the liner. This initial lift will be placed to protect the liner, as it will provide both a 'thermal blanket' and a physical barrier. This first layer will also form a tipping platform for subsequent landfill operations.

The lift height of 4.0 m presented in Figure 2-6 was selected to illustrate the lift thickness required to accommodate 3 months of waste inputs. It is not a prescriptive requirement and during operations, lifts are unlikely to exceed 2.0 m and will be subject to operational considerations. The placement of materials will start on the eastern boundary in Cell 29 and respective placement lifts will result in the development of the landfill body.

IBA materials will be placed over large plan areas in vertical lifts within the active placement area.

IBA within respective lifts will be placed in layers not exceeding 500 mm in height, graded to form a smooth finish with falls to facilitate surface water management and compacted to 90 % proctor maximum dry density to facilitate safe tipping of trailers.

Articulated trailers or dump trucks (Volvo A40 or similar) will drive onto the working face, tip in a controlled manner and exit in a one-way system.

The tipped materials will be graded using proprietary equipment (e.g. 20 tonne 360 excavator or grader Cat 120k or paver Barber Green BG-260D or similar), inspected for signs of contamination and compacted using a vibrating roller (Bomag single drum or similar).

2.5.5.6 Management of Surface Water Runoff

Once IBA materials are placed, surface water management procedures will facilitate surface water runoff to minimise rain water infiltration and subsequent leachate generation.

The surface water management procedures include a combination of temporary covers, dust suppression sprays and permanent capping will be progressively installed. These practices will also mitigate potential dust impacts.

Following placement of IBA, temporary impermeable covers or sprays[7] will shed runoff into horizontal contoured swales (see Figure 2-8) which will be formed within the final capping profile.

Leachate (light green area in Figure 2-8), will be directed to the active face. Clean surface water (from dark green areas in Figure 2.10) will be directed to a new surface water holding pond immediately upstream of the new northern storm water attenuation lagoon.

Water from the new surface water holding pond outfall will, subject to quality, be:

- used for dust suppression
- discharged to receiving waters via the new storm water attenuation lagoon
- directed to the on-site floating cover storage prior to transfer off-site to a wastewater treatment facility.

Further detail on proposed surface water management is outlined in Section 2.8.

Figure 2-8 illustrates two swales on a cap that has reached its final height. The lower swales have sandbags or similar placed at outfall to prevent runoff entering the cell. The upper swale illustrates with no sand bags shows how swale runoff can be directed into the cell.

[7] Numerous products are available e.g. Posi-Clear Dust Control http://www.lscenv.com/dust-control-pg.html, or similar

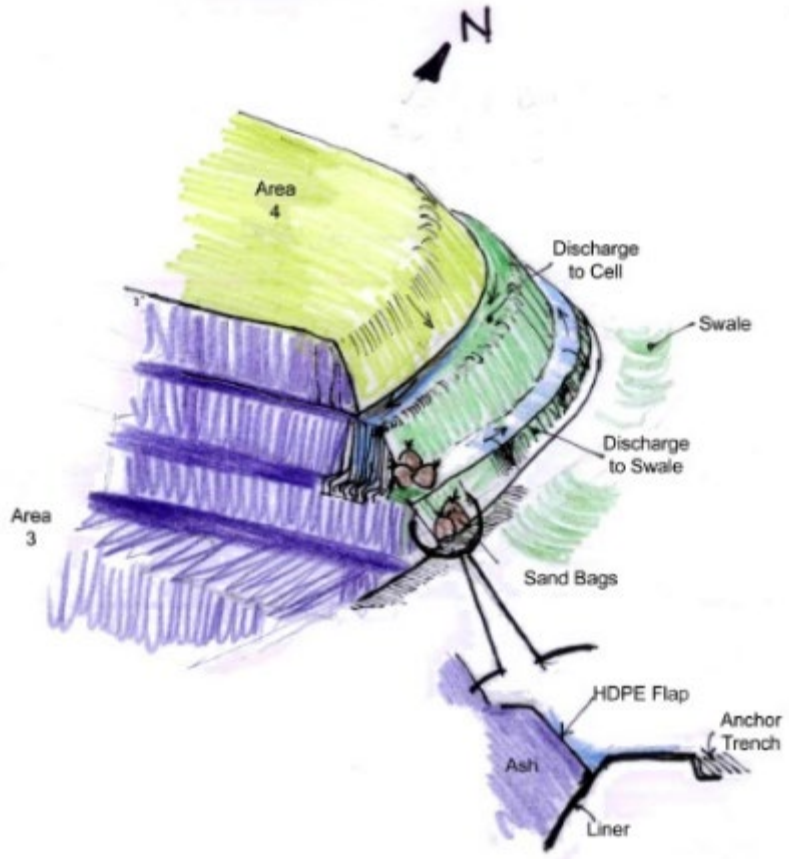


Figure 2-8: Surface Water Management (Intermediate Cap)

Note: Leachate – from light green area. Clean surface water – dark green from capped/sealed area. Purple illustrates – IBA.

2.5.5.7 Management of Leachate During and Post IBA Placement

With reference to Figure 2-5, leachate from the IBA landfilling operations will develop from the following sources:

- weathering stockpiles in 'Area 1'
- IBA placed within cells ('Areas 2, 3 and 4') i.e. from active face

Leachates with differing pH will be produced within the IBA cell footprint. pH will vary according to source location and extent of weathering. A pH of up to 12 can be expected from the weathering Area 1. Over the weathering process the pH of leachate in Areas 2, 3 and 4 will reduce to approximately 8. When the IBA is placed in layers in Areas 1 through 4, the 'strength 'of leachate generated (in terms of contaminants such as salts and heavy metals) will also vary, with a more concentrated leachate expected from Area 1 and a minimally contaminated leachate generated during placement expected in Areas 2, 3 and 4.

To facilitate targeted and cost-effective treatment, leachate streams from respective sources will be collected and managed separately, prior to treatment on site and/or tankering off-site to a wastewater treatment facility.

The leachate treatment methodology is described in detail in Section 2.7. The following sections describe the handling philosophy required within respective areas.

Area 1

All leachate from the IBA weathering Area 1 will be collected from the basal stone drainage and from surface runoff in perimeter edge drains which will direct leachate to a temporary settlement pond located on the northern boundary of Cell 32.

Figure 2-9 over shows the layout of the settlement pond and weir. Solid materials within runoff from Area 1 will settle by gravity within the pond and will be retained behind a weir. Leachate will pass over the weir into an adjacent side riser pump sump (not shown in Figure) and from there to onsite storage tanks via a pumped rising main.

The settlement pond will be de-sludged as required during operations. De-sludged material will be placed within the Area 2, 3 or 4.

Netting and/or floating covers to prevent mammals drinking contaminated storm water have been omitted for clarity.

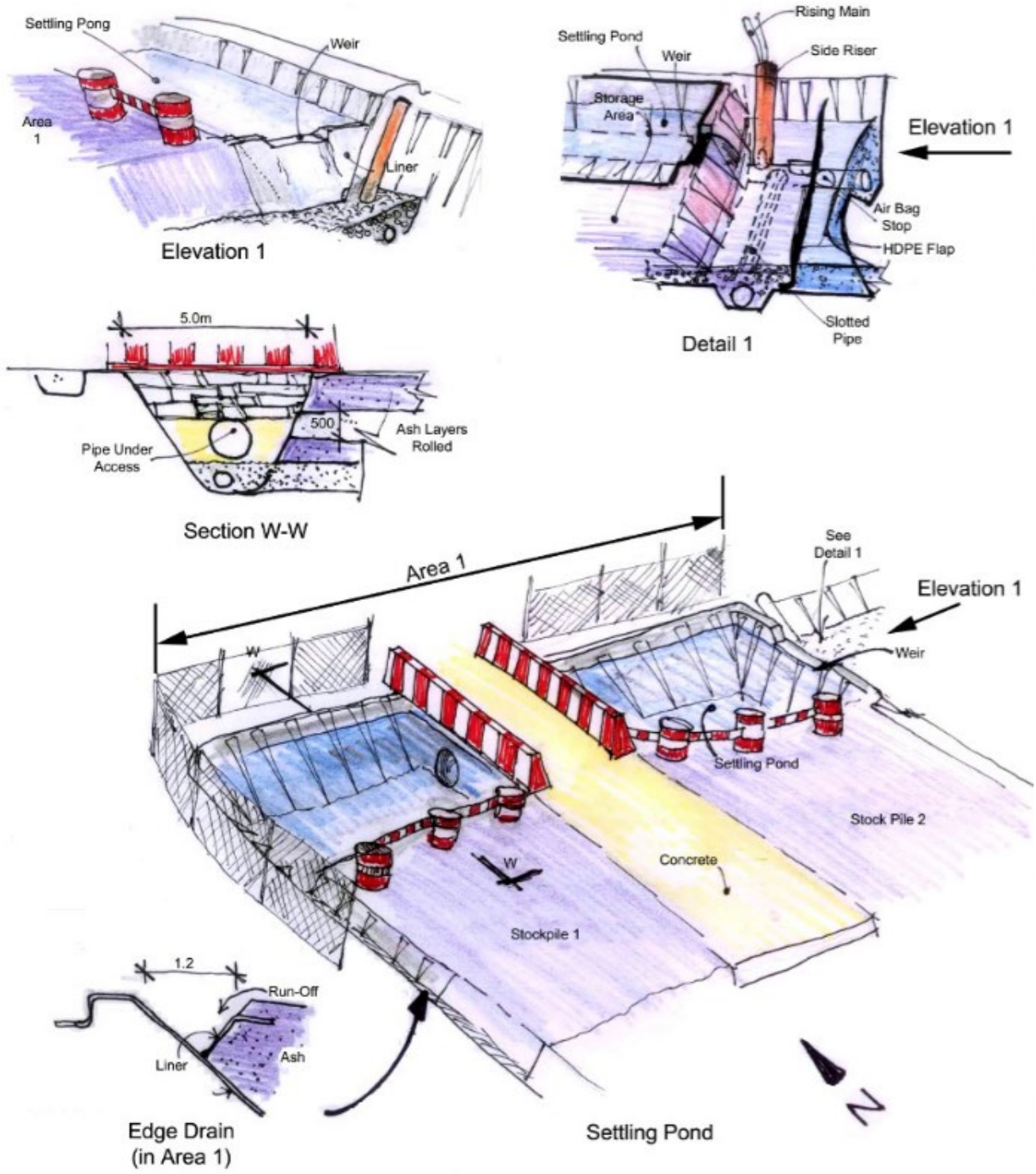


Figure 2-9: Weathering Area Leachate Management

Areas 2, 3 and 4

Leachate generated within active areas 2, 3 and 4, and will be collected within the cell drainage layer and pumped via a rising main to a small sedimentation tank (see settling pond in Drawing No. LW14-821-01-P-0050-006 in Volume 4 of this EIAR) to remove suspended solids before being pumped to covered attenuation leachate storage tanks. On-site attenuation storage will be sufficient to manage at least 1-month of leachate production.

2.5.5.8 Management of Storm Water Runoff

The proposed storm water outfall system on the northern boundary will comprise two storm water lagoons, a holding pond and an attenuation lagoon.

All surface water from the IBA cells will be directed to a holding pond immediately upstream of the northern attenuation lagoon. Continuous monitoring of TOC and Electrical Conductivity will be carried out. If runoff is clean it will be directed to the northern attenuation storm water lagoon. If runoff is contaminated an automated motorised valve will isolate the holding pond from northern attenuation stormwater lagoon and contaminated runoff will be pumped to covered leachate lagoons within the leachate management facility (see Section 2.7). Holding pond and covered attenuation storage within the leachate management facility will be sufficient to manage at least 1-month of surface runoff. Water as may be present in the storm water attenuation or holding ponds may also be used for dust suppression or wetting of IBA as may be required to facilitate weathering.

2.5.5.9 Water Balance IBA Development

Leachate generation from IBA cells will be impacted significantly by the weathering area, and active, open area of which will typically be similar year on year.

In addition, as IBA waste reaches a finished level temporary covers or final cap will be installed to isolate rainfall inputs from the IBA waste body.

Table 2-10 is an estimate of the annual water balance for the IBA area.

Table 2-10: Annual Water Balance for IBA Development

Location	Annual Volumes (m^3)	pH	Comments
IBA Weathering	4,156	12	Assume 5% rainfall (roofed area)
Clean runoff	38,447	7	Storm water
IBA active face	10,067	8 to 10	Assume 250 m x 350 m
Temporary capping	15,901	7	Storm water
Permanent capping	15,901	7	Storm water
Recovery	38,447	8	Not applicable
WWTP	**14,223**		**Estimated WWTP capacity required**

2.5.5.10 Management of Hydrogen Gas

As previously identified, hydrogen gas production is a by-product of IBA weathering, with peak gas production expected to occur within 3 to 4 months following receipt of IBA on-site. Thereafter, research shows that hydrogen gas production declines rapidly over 12 or more months.

Hydrogen is not detrimental to the environment and is not considered a greenhouse gas.

The following design and operational procedures will facilitate safe venting of hydrogen to the atmosphere during weathering, waste placement and post capping and will mitigate the risk explosion.

- All pumps and control equipment in confined spaces will be EX rated.
- Pipes within the leachate stone drainage layer will have vented rodding eyes and operations will maintain free draining conditions within the stone drainage layer to facilitate passive venting from same.
- Leachate drainage pipework will at high points terminate in a collector pipe linked to a vertical riser that will facilitate egress of hydrogen at a fenced point source 5.0 m above the surrounding ground level (during operations and post final capping).
- Horizontal slotted gas pipe will be placed at horizontal spacings no greater than 40 m and at staggered vertical lifts no greater than 12.0 m spacing. This will facilitate egress of gas produced at depth within the IBA material.
- Hydrogen gas produced during weathering, be it in the dedicated weathering Area 1 or in Area 3 cells, will naturally vent to atmosphere via surface emissions, during turning and placement and from dedicated piped point sources within placed material.
- Hydrogen gas produced from capped material in Area 4 will be vented to atmosphere from dedicated outlets at the top of the landfill
- Temporary covers and or spray products will be used with passive venting systems to mitigate leachate production and facilitate passive venting of hydrogen.
- Potential future extraction of IBA, if carried out, (refer to Section 2.5.6 following) will require appropriate method statements to facilitate working practices where hydrogen may be present.

2.5.5.11 Management of Potential Temperature Impacts During IBA Placement

Peak temperatures will develop during the initial weathering in Area 1 or within active areas if weathered in situ and appropriate measures will be employed to prevent any potential damage to the HDPE liner.

The following operational procedures will be implemented to mitigate the risk of elevated temperatures compromising the full life cell liner integrity during the IBA weathering period of approximately 3 months:

- Initial IBA placement in the weathering Area 1 will be used to form a level and stable platform atop a thermal blanket prior to stockpiling activities. Placement will be limited to less than 2.0 m above the stone drainage layer to facilitate weathering for a period not less than 3 months. During this initial weathering process the heat will be encouraged to dissipate via surface emissions to atmosphere. Such heat and hydrogen as may develop within the stone drainage layer will be removed either passively in the case of air or pumped in the case of leachate being present. Following weathering this layer will also provide a thermal barrier between liner and subsequent IBA lifts.
- IBA stockpiles above the previously described platform will be limited to 6.0 m if placed on a dedicated weathering location in Area 1.
- IBA lifts of weathered materials in adjacent areas will be placed in mini lifts of 500 mm to facilitate trafficking and a maximum lift 2.0m in one operational pass to mitigate the risk of vehicles overturning over steep embankments. This will also facilitate dissipation of heat.
- Subject to Agency approval, the basal HDPE liner under the weathering slab will be protected against elevated temperatures below the leachate stone drainage layer by:
    - A thermal protection barrier in contact with the HDPE liner, and/or
    - a permeable stone drainage layer below the weathering formation to remove heat and/or hydrogen via passive or pumped venting, and/or
    - a saturated drainage layer and pumping system designed to facilitate heat exchange.
- If weathering is being carried out in cells, respective 2.0 m lifts shall be left in place for a minimum period of 3 months.
- All weathering and landfill placement works will be subject to site specific method statements.

2.5.5.12 Management of Potential Dust Generation During IBA Placement

There is potential for dust impact in the absence of mitigation measures. Dust will be managed using a combination of the following:

- dust suppression using water
- dust suppression spray (will also make surface impermeable to shed surface runoff)
- temporary covers to shed surface runoff

Weathering Area 1

IBA tipped in within the weathering area (building) will be in stockpiles < 6.0 m high and materials will be subject to subsequent moving operations using front end loaders, 360^{o} excavators or similar. IBA in these areas will be kept moist using overhead sprinkler systems or similar.

Active cell Areas 2, 3 and 4

Dust production during placement of IBA in cells will be negligible as the IBA will require wetting to facilitate compaction.

The primary potential source of dust in the active cell areas will come from vehicle movements, post compaction and following evaporation within cells in the absence of mitigation measures

Potential dust generation in these areas will be mitigated by compaction of placed IBA using smooth rollers and thereafter by a combination of the following:

- sprinklers
- vehicle mounted dribble bars
- dust suppression sprays

Once IBA has reached its final profile, temporary covers or a permanent LLDPE liner will mitigate the risk of dust generation.

Air quality is also discussed in Chapter 7 'of Volume 2 of this EIAR.

2.5.5.13 Management of Noise During and Post IBA Placement

Screening berms on the eastern boundary of the IBA cells have been designed to mitigate potential noise impacts from IBA related operations.

Thereafter IBA in cells 29 and 30 will facilitate supplemental visual screening for subsequent and adjacent landfill operations.

Noise is discussed in Chapter 9 of Volume 2 of this EIAR.

2.5.6 Future Winning of IBA Material

As identified in Section 2.3.3, potential exists for the future winning of the IBA placed within these cells i.e. the extraction of IBA material for recovery.

A significant factor in the decision to propose the development of IBA cells as part of this proposed development is to enable the future recovery of this material, for use in offsite applications such as road construction (embankments, sub-bases), concrete block or cement production.

It is acknowledged that there are several steps and processes to be undertaken before this could happen, but the availability of the IBA material within its own dedicated location means that there is potential for its future winning should a recovery use be identified. This will be subject to future regulatory approval.

2.5.6.1 Recovery of IBA

Recovery of IBA is well developed in the UK and continental Europe, where the use of incinerator bottom ash aggregate (IBAA) is quite commonplace and is approved for use by the Environment Agency.

IBAA refers to the IBA material that has been produced to a specification for an identified end use. 7 million tonnes of IBAA has been produced from IBA and utilised in the UK to date[8] according to anecdotal references IBAA displays properties that are similar to other 'virgin' aggregates and displays good pozzolanic (cementitious) properties, making it a suitable foundation aggregate.

In the Netherlands, where annual IBA generation runs at approximately 1.8 million tonnes per annum, the historical approach to IBAA use has been to adopt an 'isolate, constrain and monitor' approach when IBAA is used in application such as embankment construction – this effectively required the encapsulation of IBAA within a HDPE liner within an embankment, which among other things, placed continual aftercare requirements on the embankment. This approach has now been discarded by the Dutch authorities such that targets have been set for other recovery applications, subject to IBA being further processed through washing and/or separation.

2.5.6.2 IBA Transfer Off-Site for IBA Recovery Trials

IBAA may be developed in Ireland if appropriate standards are developed. Commercial trials will be required for the development of these standards.

For the purpose off facilitating future recovery trials off site, there may be a requirement to transfer weathered IBA materials off site. Material from the weathered stockpiles in areas 1 and 2 will be used for the trials. Crushing of the IBA may be required to loosen the material for haulage.

The annual material transferred off-site will not exceed the maximum annual intake level and will be backhauled in IBA delivery vehicles.

Operational procedures will be developed for the loading of weathered IBA from the Area 1 stockpiles.

2.5.6.3 IBA Processes within Weathering Area

As described previously in 2.5.5.3 Covered articulated trailers will tip IBA within the weathering area (building) it will be stockpiled, and eventually loaded using front end loaders of tracked excavators into site dump trucks for transfer to the IBA cells.

It may also be necessary to turn stockpiles periodically. To stream line the weathering process it is proposed to carry out site-based trials within the covered weathering area to examine the impacts of metals recovery, screening and washing on the weathering process and to implement same as may be appropriate.

Typically, the trials will require mobile screening plant to facilitate separation of metals and washing. The screening equipment will be loaded using the same loading shovels and tracked excavators required to manage stockpiles. The screening equipment will be similar to that used to screen the engineered clay barrier during cell construction.

[8] http://www.smithsbletchington.co.uk/assets/files/Ibaa-brochure.pdf

2.6 Proposed Biological Treatment Facility

2.6.1 Overview

It is proposed to develop an aerobic biological treatment (composting) facility as part of the overall development. This facility will process residual MSW fines accepted at the landfill, to stabilise this material, prior to landfilling. The facility will compost 25,000 tonnes per annum of MSW fines material. A sketch of the proposed facility is shown in Figure 2.10.

This facility is termed a 'Type 8' facility and it will require approval by the Department of Agriculture, Food and the Marine (DAFM) to operate. The design and operation will be in accordance with the "Conditions for Approval and Operation of a 'Type 8' Composting/Biogas plant transforming Category 3 catering waste", DAFM 2014 (herein after referred to as the 'Conditions Document').

In the future, the facility maybe reconfigured to process the source segregated organic fraction of municipal solid waste i.e. brown bin" material, through a relatively minor internal reconfiguration of the processing building. Such a reconfiguration would be driven by market demand for composting capacity and would subject to regulatory approval. This EIAR examines the potential impacts of biological treatment of 25,000 tpa of MSW fines. The facility, in whatever configuration, will continue to operate post void utilisation.

The stabilisation process which residual MSW fines will undergo within the treatment facility is defined by the EPA to a respiration activity limit is <7 mgO_2/g DM.

Graph 2.1 shows the impact of biological treatment on the reactivity of MSW against time. As can be seen the reactivity decreases as the time within the managed biological treatment system is extended. The proposed treatment facility at Knockharley Landfill is expected to have a retention time of approximately 10 weeks to achieve the EPA stability standard of <7 mg O_2/kg DM, as shown in Graph 2.1.

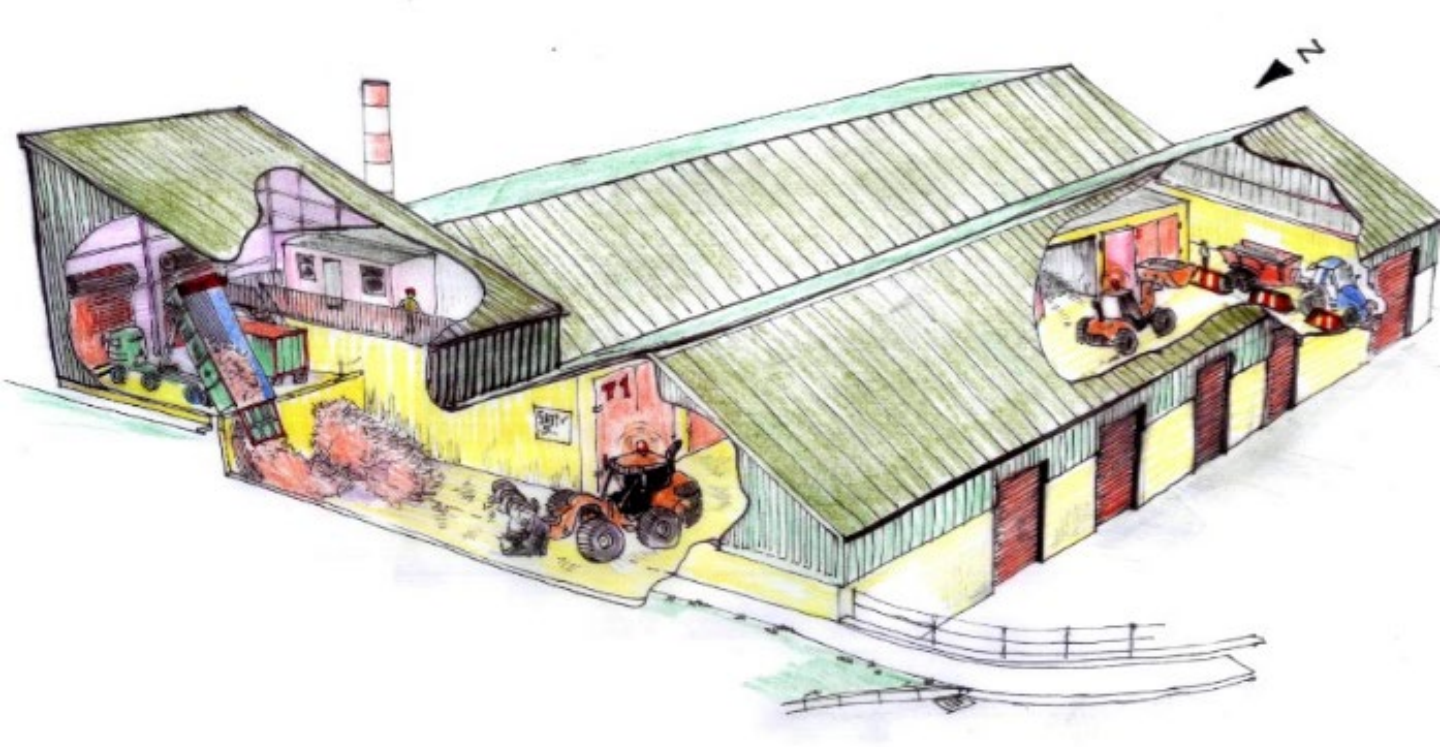
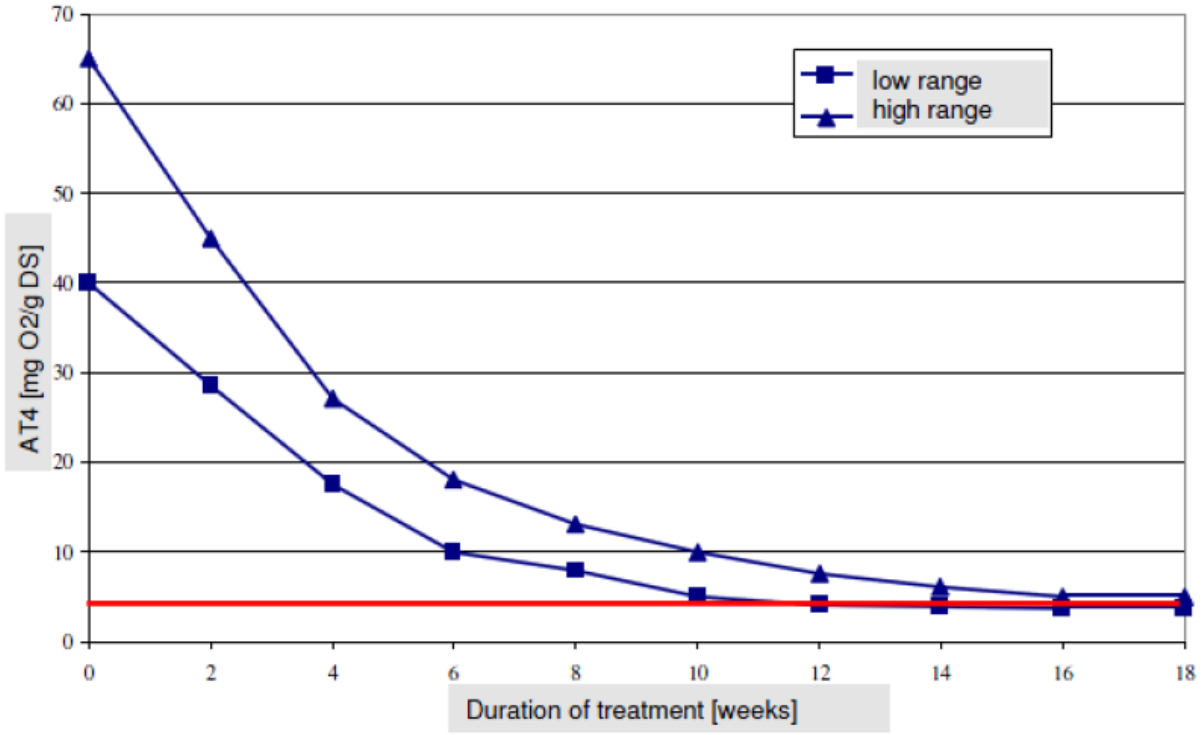


Figure 2-10: Proposed Biological Waste Treatment Facility



Source: Ingenieurgesellshaft Witzenhausen Technical Consultants

Graph 2-1: Typical Reduction in the Biodegradability of MSW as a function of time (based on high and low levels of biological reactivity in the source material)

Therefore, the purpose of the proposed biological treatment facility is to:

- Reduce both the quantity and biodegradability of waste going to landfill in accordance with the facility licence, the Landfill Directive 1999/31/EC and the EPA Pre-Treatment & Residuals Management Guidance (2009).
- Reduce the potential for environmental nuisance in the absence of mitigation caused by the landfilling of biodegradable waste such as odours, landfill gas generation, leachate generation, attractiveness to vermin, flies and birds, etc.

The biological treatment proposed will use composting as its core technology. Composting harnesses a natural process whereby organic matter is broken down by bacteria in the presence of oxygen, producing carbon dioxide and water vapour. Over time, the organic components within the waste (carbohydrates, proteins etc.) are metabolised by these bacteria, resulting in the reduction in mass/volume of the input material and the production of a stabilised humus type material of low respirability/biological activity, to meet the relevant standard previously identified.

In addition, the facility is designed to accommodate storage of baled recyclables and or baled MSW on the ground floor and above the compost tunnels.

2.6.2 Access and Traffic Control

The proposed biological treatment facility will be located within the south-eastern corner of the facility, directly north of the existing landfill gas compound. It will occupy an area of c. 5,400 m^2. Ground levels in this location are in the region c. 56 mOD and as such the facility will be at a lower level than the haul road around the landfill.

Access to the facility will be via the existing facility entrance road and weighbridge, followed by a left turn in a southerly direction along the existing internal road. A new entrance and access road to the biological treatment facility will be constructed off the internal road.

The facility operations will make use of an existing road off the perimeter haul road to the landfill gas compound, see Figure 2.11 and Drawing No. LW14-821-01-P-050-0008 Traffic Management Biological Treatment Facility in Volume 4 of this EIAR.

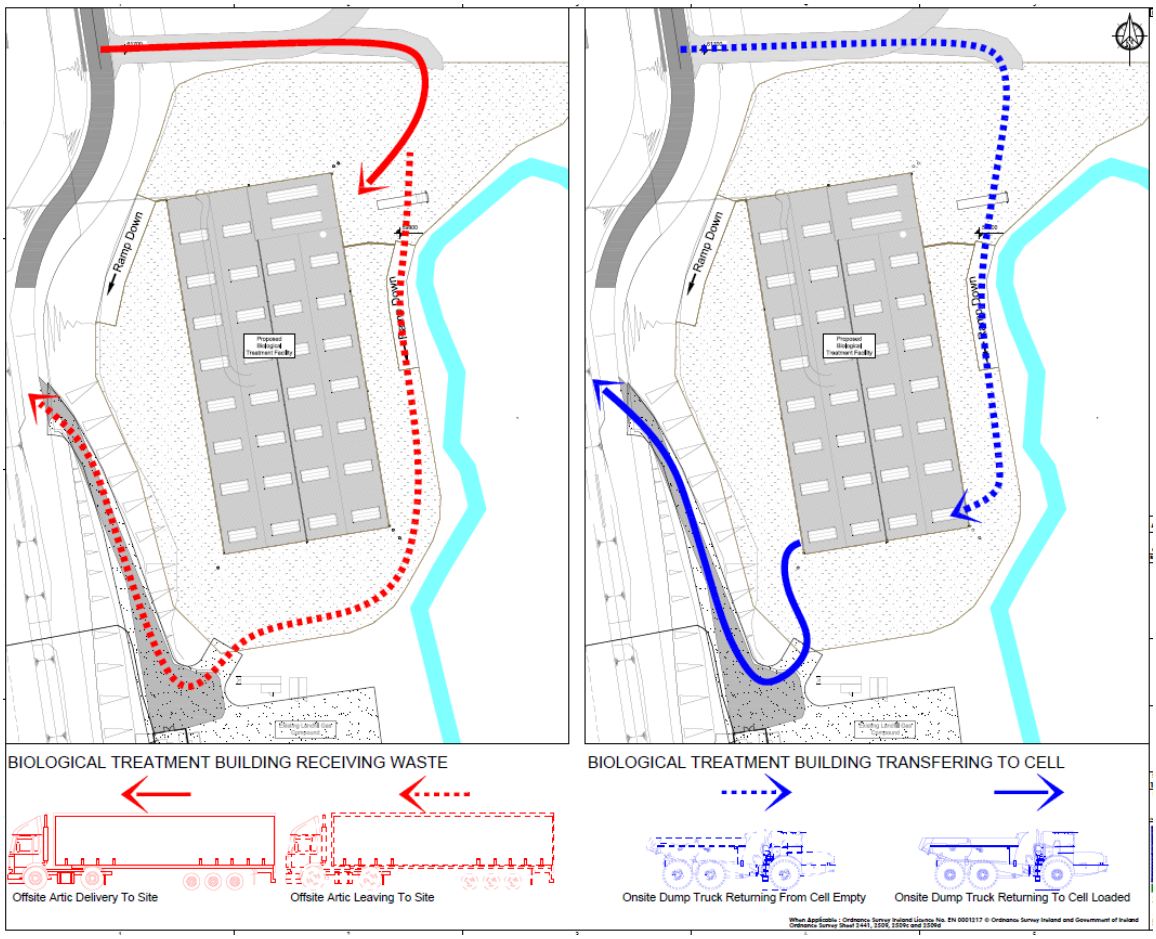


Figure 2-11: Traffic Movements to and from the Biological Treatment Facility

2.6.3 Principal Building Dimensions & Layout

Figure 2-10 is an artist impression of the proposed facility building and Drawing No. LW14-821-01-P-1700-005 in Volume 4 of this EIAR shows the sections and elevations of the facility. The following is a list of the major structural components of the proposed biological waste treatment facility:

- Facility processing building of 108 m in length, 50 m in width and varying between 12 m and 17 m in height, of portal frame construction, with 9 no. roller shutter doors containing:
  - Incoming material stockpile area
  - 12 no. aerobic composting tunnels (25 m x 6 m x 5 m) with single doors
  - Outgoing material stockpile area
  - 1 no. biofilter and a stack with 3 no access hatches to facilitate placement and removal of biofilter material.
  - Storage space for baled recyclables
- Marshalling yard and adjacent hardstanding with an approximate footprint of 1.31ha.

The ground elevation at this location varies between 56 and 59 mOD and the finished floor level of this building is at 57.0 mOD with the southern end of the building at 59 mOD. The general building height is 12 m to ridge height. There is a local increase in building height to accommodate tipping vehicles where the height above the tipping bay varies approximately between 14.0 m and 17.0 m. The biofilter stack height is approximately 20 m above ground level. Overall, the processing building at its highest at the southern end (excluding the stack will be approximately 74.0 m AOD). The building will be constructed in a portal frame configuration of reinforced concrete and cladded steel. The colour of the steel cladding will be RAL 1006020 or similar.

The aerobic composting tunnels will be typically 25 m long, 6 m wide and 5 m in height. The tunnels will be constructed from reinforced concrete designed to withstand strong chemical attack and high abrasion. They will be sealed by insulated stainless steel lined sliding doors. The tunnels will be equipped with an aerated floor system with a computer-controlled blower system that will be mounted in a gallery on the roof of the tunnels overlooking the tunnel loading area.

2.6.4 Composting Process

2.6.4.1 Waste Acceptance

Waste will enter the facility via the newly constructed road and marshalling area and will enter the processing building via fast acting roller shutter doors on the north-eastern side of the building. Both incoming vehicles and out-going vehicles will be in "clean areas" (shown below in Figure 2-12 as salmon colour), replicated from Drawing No. LW14-821-01-P-1700-0002 Proposed Biological Treatment Facility Ground Floor Plan in Volume 4 of this EIAR where dimensions and text descriptions are legible.

Input materials (residual fines) will be delivered by walking floor or tipper transfer trailers in a pre-screened form, directly suitable for composting. Record keeping and acceptance procedures in accordance with the requirements of the DAFM Conditions Document and the EPA licence shall be implemented.

Given the sequencing and logistics of compost tunnel filling and unloading, sufficient space on the floor will be provided to accommodate daily operations. As a minimum, the bio-waste will be stockpiled until the volume of feedstock is sufficient to half - fill a composting tunnel (c. 260 m^3).

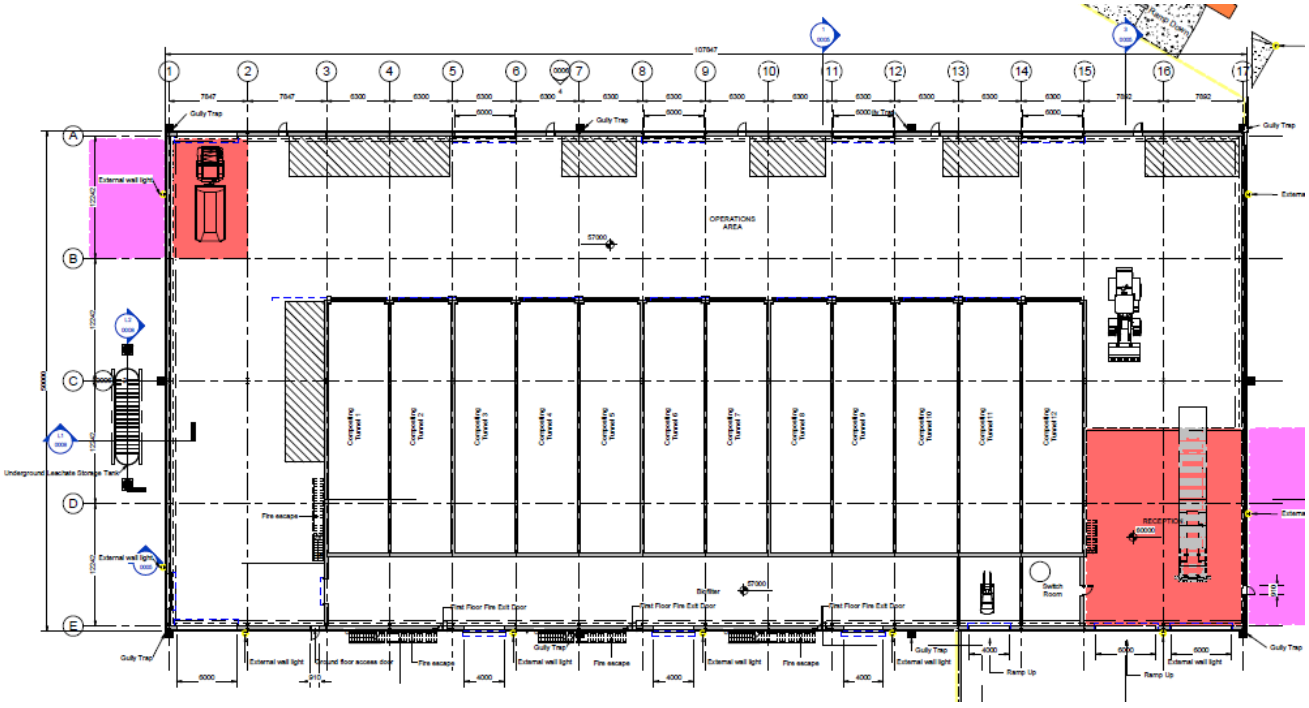


Figure 2-12: Layout of Biological Treatment Facility

The building will operate under negative pressure to mitigate potential dust and odour emissions. The incoming material will be inspected during unloading. Residual fines material will be mixed and blended with a portion of retained post-stabilised material and/or woodchip (or similar) amendment material in the reception hall floor before being loaded into a composting tunnel. The added stabilised material inoculates the incoming material with micro-organisms before composting and provides stability to facilitate aeration.

2.6.4.2 Tunnel Filling and Operation

Material will be loaded into the composting tunnels using a front-end loader where it will remain for an appropriate period of aerobic maturation. Each full tunnel of material shall be considered as a 'batch' in terms of the logistics of the process. The material readily de-waters (through evaporation and free drainage) and the aerobic microbial population rapidly increases.

The composting process for the tunnels will be controlled by a PLC/PC interface which records time and temperature and controls airflow within the waste from individual tunnel blowers/fans located in a gallery on the roofs of the composting tunnels, with air delivered through a network of piping located within the tunnel floors. As a result, temperature will be maintained for the appropriate time period to ensure pasteurisation.

Typically, the compost will be turned mechanically a number of times (2-3 times) within its overall composting duration to break up compaction. Depending on facility logistics, composting material may be unloaded from one tunnel into another, several times during the composting process, resulting in a fully stabilised material, with a final moisture content of 30-40%.

2.6.4.3 Testing and Storage

Upon completion of the composting process, the composted 'batch' of material will be unloaded from the tunnel in a dedicated 'clean' vehicle and placed in the outgoing stockpile area which will be separated from the tunnel area by moveable barriers to prevent vehicle entry and facilitate tipping of clean material over the barrier. (see Figure 2.10)

While located within the outgoing stockpile area, the material will be sampled and analysed, for compliance with AT4. Where more than one batch is located within the outgoing stockpile area, these batches will be kept separated by moveable concrete walls, of Alfabloc variety or similar. Sufficient capacity for storage of 1 – 1.5 weeks stabilised output will be provided in the outgoing stockpile area.

2.6.4.4 Dispatch

When results are obtained indicating that a batch meets the appropriate AT4 standard, the composted fines material will be loaded into a tipper trailer that enters the facility building via a fast-acting roller shutter door on the south-eastern side of the building and exits the building through the fast-acting roller shutter door on the south-western side of the building. Record of dispatch in accordance with the requirements of the DAFM Conditions Document will be maintained.

Vehicles exiting the facility through the roller shutter door on the western flank will be subjected to cleaning procedures in accordance with the DAFM Conditions Document in a designated cleaning area located outside of this door.

2.6.5 Air Handling

2.6.5.1 Ventilation System

The ventilation system will extract:

(1) 'Moderate-strength' aerobic exhaust from the composting tunnels, which will be subjected to bio-filtration and or/ scrubbing, prior to venting via blowers to atmosphere via stack;

(2) 'Low-strength' building ventilation air that will be mixed with the treated exhaust from the scrubber and treated via the biofilter prior to venting to atmosphere via stack

The ventilation system within the main building void will be designed for 3-6 air changes per hour. This ventilation rate allied with a good building skin integrity, will ensure that all odorous air produced within the facility will be contained and directed to the odour abatement system.

The processing building will be designed to be operated under slight negative pressure. Ventilation pipe work installed in the head space of the building and within tunnels will be connected to a high-volume medium-pressure blower that will draw off the warm, buoyant building air that will be generated by a combination of emissions in the processing building from the input materials in the intake area and from fugitive emissions from the movement of the material between composting tunnels.

2.6.5.2 Scrubber

Exhaust air from the composting tunnels, generated by the active aeration of the compost, will be extracted and passed through an acid scrubber if required subject to technology. The acid scrubber will be designed to remove odorants that are poorly degraded in biofilters. This particularly includes ammonia and amines. The removal of ammonia is particularly important as its oxidation in biofilters can give rise to elevated emissions of nitrous oxide, a strong greenhouse gas. An appropriately scaled acid scrubber will be installed to treat air from the proposed facility design if required to mitigate potential emissions by design.

The following minimum design performance and specification in Table 2-11 will influence the design of the scrubbing plant if required.

Table 2-11: Acid Scrubber Process Characteristics for the Development

Parameter	Values
Inlet NH_3 Concentration	100-250 mg/Nm³
Liquid Recirculation Rate	30 m³/h
Liquid Temperature	55 °C
pH in Sump	2.0
Packing Vol	10 m^3
Safety Factor	1.25
Outlet NH_3 Concentration	<0.50 mg/m³
NH_3 Removal Efficiency	99%

With the removal of ammonia and amines, the airstream will be mixed with the low strength building ventilation air and directed to the biofilter.

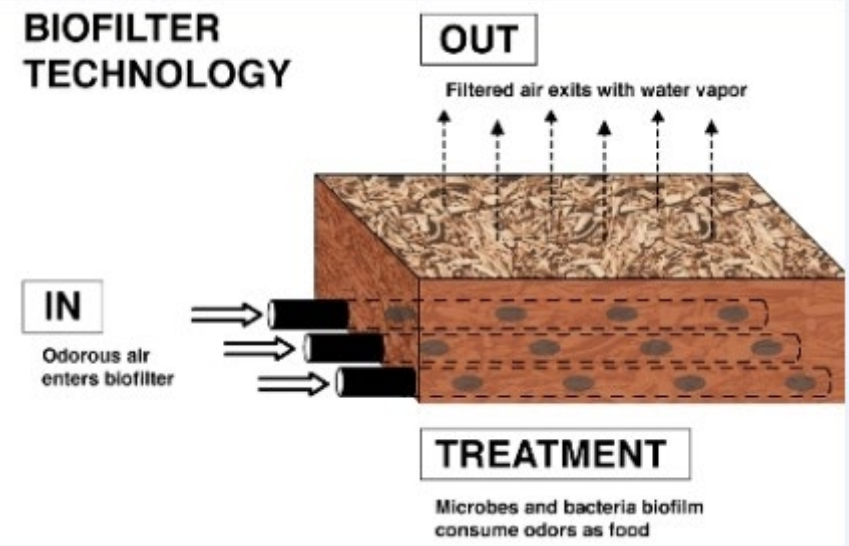
2.6.5.3 Biofilter

The combined scrubber exhaust and the building ventilation air will be mixed and directed to the biofilter located at the western side of the building (mitigation by design). The biofilter bed will comprise either a proprietary high surface-area inorganic media such as clay or activated carbon or an organic media such as woodchip, peat, bark or combinations of same. The biofilter will be designed to allow an empty bed retention time (EBRT) of between 40 and 60 seconds.

The design will consider contingency for media change-out and preventative maintenance to ensure optimal performance. The inlet air distribution floor within the biofilter will provide homogenous airflow throughout the biofilter bed medium thereby eliminating short-circuiting and poor treatment.

The operation of the biofilter with a continuous moving liquid film will minimise the build-up of contaminants within the media and will allow for the continuous control and addition of nutrients, minerals, pH and biofilm development. A schematic of a typical biofilter is illustrated in Figure 2-13.

As part of the overall odour treatment system, an integrated SCADA monitoring system will be incorporated into to allow for continuous monitoring of performance of the ventilation and odour control equipment.



Source: www.environmental-systems.co.uk/services/odour-control/

Figure 2-13: Typical Schematic of a Biofilter Bed

The biofilter will be on the western side of the building, as shown in Figure 2-12. The containment of the biofilter will be within concrete walling with an airtight fabric roof. All air will be directed to a single emission stack to ensure good dispersion of the residual odour plume to mitigate odour nuisance.

The biofilter design will ensure compliance with EPA emission standards for odour, ammonia, hydrogen sulphide and mercaptan concentrations. The overall incorporation of robust preventative maintenance procedures, containment measures, focused extraction, zoned and cascade ventilation, SCADA control, monitoring, trending and data-logging and multiple stages of treatment will ensure that odours will not cause impact on the surrounding area and that the odour control system will operate at optimal capacity.

Further detail in relation to the assessment of impacts on air quality and climate is provided in Chapter 7 of Volume 2 of this EIAR.

2.6.6 Effluent Management

The proposed biological treatment facility will generate a few effluents for management. The facility will be designed to maximise the reuse of effluents within the process, such that it operates on a balanced process water requirement, with a slight 'water demand' possible i.e. all effluent generated within the facility will be re-circulated within the process, with a potential requirement for fresh input water.

As the facility will be completely enclosed, the generation of contaminated storm water will be avoided. The facility will generate a few effluents that will require management including:

1. Internal floor wash-down
2. Vehicle wash-down (internal and external)
3. Composting tunnel leachate
4. Odour abatement effluents
5. Sanitary wastewater from welfare facilities
6. Leachate storage tank adjacent to Biological Facility

2.6.6.1 Vehicle Wash-Down

There will be internal vehicle wash-down facilities shown in Figure 2-12 (salmon colour) within the building at both the northern and southern ends and a wash down facility area located external to the roller shutter door on the northern external flank of the building (purple colour), which will be a concrete area of c. 200 m^2 graded to fall to a dedicated collection tank. Given the expected incoming traffic, truck wash down is expected to generate approximately 30 - 50 m^3/month, including for rainfall which will be captured in the external wash-down area. This wash down will drain to the leachate storage tanks.

2.6.6.2 Internal Floor Wash-Down

The internal floor area of the facility will all be subject to wash-down. Wash down of these floors will be reuse in the composting process and excess wash-down is expected to generate approximately 10 - 12 m^3 of effluent per month. This wash down will drain to the leachate storage tanks.

2.6.6.3 Composting Tunnel Leachate Management

It is not proposed to add moisture to the input residual fines material when being placed within the first composting tunnel due to the expected moisture content of the incoming material but, during the composting process, the composting material will lose moisture due to the process heat generated plus seepage/drainage from the material itself.

The in-floor aeration system will also act as a leachate collection system from the material when it is in the composting tunnels, such that leachate generated within the composting tunnel will be collected and directed towards a leachate holding tank(s). The aeration system will be configured using a series of controlled valves such that valves will be open during periods when air is not being delivered to the tunnels to allow leachate to freely drain, but which will be closed when air is being blown into the composting tunnel so that no air is lost from the system.

The leachate initially generated by the composting process will then be added to the composting material that is being transferred from one tunnel to another, in order that optimum moisture content is maintained within the composting material – this will either be done manually using a hose pipe as material is being placed within the tunnel or through in-tunnel roof sprinklers when material has been placed within the tunnels.

2.6.6.4 Odour Abatement Effluents

The odour abatement system will consist of a wet scrubber in tandem with a biofilter. The biofilter is designed to operate in a bio-trickling mode with the recirculation of the effluent generated back through the bio-filter.

At full capacity, the scrubbers will generate up to 20 m^3/month of excess wastewater with the biofilter generating a net 25 m^3/month. The leachate from the scrubber will be directed to the leachate holding tank.

2.6.6.5 Sanitary Wastewater from Welfare Facilities

Effluent from welfare facilities will generate up to 200 litres per day and will discharge to a 2,000 litre proprietary biocycle unit. Treated effluent will be discharged thereafter by pumped rising main to the leachate treatment and storage area) and tankered off site.

2.6.6.6 Leachate Storage Tank

Up to 120 m^3 per month of leachate may be generated at the proposed facility from the sources outlined. This leachate will be collected through a series of sumps that will drain to underground leachate storage tanks of 120 m^3 total capacity, located adjacent to the composting tunnel footprint. All leachate collected within the process will be captured together for re-use within the composting process, where a significant water demand will exist when composting material is being moved from one tunnel to another.

The leachate tank will be equipped with level indicators and high-level alarms to ensure visibility on the liquid levels within the tanks.

While the facility will be designed such that a sufficient quantity of leachate for addition to composting material is available always, a pipeline shall be provided from the leachate tanks to the wider landfill site leachate collection lagoons to allow for pumping to these lagoons in the unlikely event of the tanks capacity being reached or exceeded.

Likewise, a pumped water supply pipe shall be provided from the existing surface water attenuation lagoon at such that surface water in the lagoon can be supplement the leachate tanks for use for the composting process, should there be a deficit of compost 'make-up' water.

The leachate storage tank will have secondary containment provided by a 1.0m thick clay barrier k $1*10^{-9}$ m/s or similar.

2.6.7 Surface Water Management

Runoff from clean areas of the facility, such as the roof, marshalling yard and roadways external to the building will be collected and conveyed to the southern and existing surface water attenuation pond.

2.6.8 Ancillary Infrastructure

Key ancillary proposed developments are discussed as follows:

- Removal of a small area of trees adjacent to the south-east corner of the building.
- Relocation of site installed drains and minor services within the building footprint.
- Access roads and hardstands to facilitate access and egress and working areas around the building on all sides. These will drain into to the adjacent site surface water system.
- Water supplies to the building including internal wash down systems at vehicle egress points.
- External below ground tanks for leachate storage.
- External biotreatment unit with pumped discharge of treated effluent to the leachate management facility.
- Retaining walls to facilitate incoming vehicle access to the building and to facilitate a 'level' working platform surrounding the building on what is currently sloping ground with natural falls exceeding 3.0 m.
- Additional below ground pumped leachate rising mains.
- Additional below ground ducting for water, telemetry and power.

2.6.9 Operational Aspects

2.6.9.1 Traffic Control & Marshalling Area

The biological treatment plant shall be surrounded by a hard-surfaced marshalling area with appropriate drainage to allow for vehicle circulation and movement throughout the site. Vehicles shall enter the facility from the northern proposed access road off the internal perimeter road, through an entrance gate and all vehicles delivering waste material, shall enter the facility processing building through the northern eastern roller shutter door and shall exit the facility through the north-eastern roller shutter door. Upon exiting the facility, all vehicles shall be subjected to a wash-down procedure in accordance with the requirements of the DAFM Conditions Document.

All vehicles collecting stabilised waste from the facility shall enter the building through the south-western roller shutter door and exit the building through the south-eastern roller shutter door. All vehicles shall be subjected to a wash-down procedure in accordance with the requirements of the DAFM Conditions Document and wash facilities will be provided at both exit and entry doors to facilitate reverse movements if required.

2.6.9.2 Security

A paladin fence of c.2.4 m in height will be installed along all sides of the marshalling area and access to the site outside of operational hours will be restricted.

2.6.9.3 Staff Resources

It is expected that the proposed facility will be operated by 4 primary staff at full capacity. These will comprise one facility manager, one supervisor and 2 machine operatives working in one shift.

2.6.9.4 Staff Welfare

Within the building an office and welfare facilities (WC, sink, shower, changing room) will be provided.

2.6.10 Health and Safety

2.6.10.1 Vehicle Safety

There are risks and hazards associated with operating any type of biological treatment facility and operators will be trained to operate the equipment. Drivers and operators of all vehicles and plant shall hold all appropriate training credentials. Dedicated pedestrian areas will be identified within the building to avoid accidental contact with reversing loaders and delivery lorries.

2.6.10.2 Infectious risks

Training for all staff will include:

- precautions such as regular washing of hands before eating
- procedures on protective clothing washing before re-use
- protecting wounds and open sores
- appropriate respiratory protection
- vaccinations in line with HSE recommendations.

2.6.10.3 Air quality

The primary gases generated in the process will be water vapour and carbon dioxide. In addition, other gases will be present in trace amounts, including ammonia, organic acids, alcohols, sulphides and other odorants.

These gases will be subject to double containment within the composting tunnels and the gases will be retained within the odour abatement and biofiltration systems prior to discharge to atmosphere after treatment.

Within the building dust, gases and bioaerosols will be managed and treated by the ventilation system. The level of ventilation will be typically increased during compost transfer periods, i.e. when the material in the tunnels is being turned. At these times, there is potential for increased levels of emissions and therefore, these operations will be undertaken by operators within air-conditioned loader cabs and offices. High rates of air exchange in the tunnels and transfer corridors will be maintained at these times to maximise visibility, to maintain high oxygen concentrations and to extract waste air.

2.6.10.4 Risk of Fire

Fire can occur from the overheating of any machinery and potentially from self-heating of the material within the incoming and outgoing storage piles and within the composting tunnels.

However, the moisture content of the compost piles will be continuously monitored to optimise biological activity and this process also acts as a fire prevention measure. Therefore, the risk of spontaneous combustion is very low with these mitigation measures.

No naked flames or smoking will be allowed at the facility, in keeping with the no smoking policy for the wider site and machinery will be serviced regularly in accordance with manufacturers recommendations.

The Fire Prevention Management Plan and Emergency Response Procedure for the site will be updated to reflect the proposed development and shall be submitted to the EPA for approval.

2.6.10.5 Fire Safety Certificate

Meath County Council Fire Officer will be informed of the development prior to commencement of operations as part of the preparation of emergency procedures for the site in line with the requirements of the facility licence. An application for a Fire Safety Certificate will be made prior to the construction phase of the proposed development to ensure full compliance with Part B of the current Building Regulations.

The number and location of pedestrian access and egress points may change be subject to fire safety assessments.

2.7 Proposed Leachate Storage and Treatment

Refer to Drawing No. LW14-821-01-P-0600-01 Layout Leachate Management Facility in Volume 4 of this EIAR.

- The construction and operation of a leachate management facility comprising:
    - 3 no. additional floating cover leachate storage lagoons (L2. L3 and L4) of c. 3,000 m^2 each
    - 2 no. bunded above ground tanks for raw leachate from IBA cells (S1 and S2) approximately 25 m diameter 6.0 m high.
    - 3 no. bunded above ground tanks:
        - 1 no. tank (S3) for treated leachate from landfill leachate approximately 20m diameter 6.0m high.
        - 1 no, tank for treated leachate from IBA approximately 25 m diameter 6.0 m high (S4).
        - 1 no. tank for leachate concentrate 10 m diameter by 6.0 m high (S5).
    - Modular - typically containerised plant units (C 1 through C6), on concrete slab of c. 1,600 m^2 and 1 no. elevated tank 5 m diameter 10 m high (T1) with provision for 2 no. additional low level (<5.0 m high) bunded storage tanks for dosing and other compounds (T2 and T3).
    - Extension of the existing loading area to accommodate 2 no. 25 tonne articulated tankers
    - 1 new tanker loading area to accommodate 2 no. 25 tonne articulated tankers.

Permission is sought for the continued operation of this plant post filling of the landfill cells onsite to facilitate continued leachate management.

The leachate plant will be designed to facilitate treatment of respective leachate streams as may be required prior to transfer to off-site wastewater treatment plants. The different leachate streams will be generated from the following sources:

- residual non-stabilised waste in landfill
- stabilised and inert waste in landfill
- IBA cells (weathering, placement cells and contaminated stormwater runoff)
- biological treatment facility

The leachate management facility will:

- Provide at least 1 month's on-site attenuation storage for all leachate streams using both elevated above ground bunded tanks and below ground floating cover lagoons.
- Facilitate on-site treatment and or conditioning of respective leachate streams.
- Provide tankering loading facilities for transport of treated and un-treated leachate to wastewater treatment plants.

2.7.1 Location and Layout

The facility will be located south of the administration building and adjacent to the existing covered leachate lagoon.

2.7.2 Leachate Storage

Raw leachates will be stored in lagoons, underground tank and or above ground bunded tanks.

Lagoons will be constructed using a composite containment system comprising 2.0 mm HDPE overlying 1.0 m clay barrier with a permeability < $1*10^{-9}$ m/s. Surface runoff from rainfall will be directed from floating covers to the site surface water system.

Above ground bunded tanks will have proprietary systems to accommodate drainage of clean surface water runoff to surface water site drainage system under normal operations. In the event of a spill or tank damage, bund contents will be discharged to a wastewater treatment plant or similar approved. Bunds will facilitate containment of 110% of the largest tank or 25% of total storage capacity whichever is greater. In addition, rainfall storage over and above bunded capacity will be provided in excess of 50 l/m^2.

Leachate from respective sources will be stored separately to facilitate site specific pre-treatment as required.

On-site raw leachate capacity will accommodate no less than 1 month's storage. Pumping to these storage lagoons will be automated and controlled by proprietary SCADA control systems or similar.

If leachate is treated on-site, treated effluent will be stored in adjacent bunded above ground tanks. On-site capacity for treated effluents will accommodate no less than 7 days treatment throughput.

Tables 2-12 and 2-13 over summarise the capacities of the proposed storage tanks and lagoons.

Table 2-12: Raw Leachate Storage

Notation	Leachate source	Tank description	Width/diameter/Volume	Height /Depth
L1	Residual non-stabilised waste	Existing floating cover lagoon	50 m x 50 m	< 1.0 m high <5.m deep
L2	Stabilised and inert waste	Proposed floating cover lagoon	<60 m x 60 m	<1.0 m high <5.0 m deep
L3	IBA recovery	Proposed floating cover lagoon	<60 m * 60 m	< 1.0m high < 5m deep
L4	IBA contaminated storm runoff	Proposed Floating Cover Lagoon	<60 m * 60 m	< 1.0m high < 5m deep
S1	IBA weathering	Proposed Bunded tank	25 m Ø	< 6.0 m high
S2	IBA cells	Proposed Bunded tank	25 m Ø	< 6.0m high
None	Biological facility	Below ground storage	120 m^3	0 m

Table 2-13: Treatment Units and Treated Leachate Storage

Notation	Contents	Tank Description	Diameter /Size	Height / Depth
S3	Treated stabilised and inert	Proposed Bunded tank	20 m Ø	< 6 m
S4	Treated IBA leachate	Proposed bunded tank	25 m Ø	< 6 m
S5	Concentrate from leachate treatment process	Proposed bunded tank	6 Ø	<10 m
T1	Modular containerised vertical tank	Covered bunded storage	10 m * 5 m	< 6 m
T2 & T3	Chemicals for Dosing	Bunded storage tanks	5 m Ø	< 5 m
C1–C6	Various leachates for treatment	Containerised proprietary treatment units	12 m * 3 m	< 3 m unit (container only)
None	Proprietary Bio Treatment plant adjacent to and servicing biological facility	Below ground tank	< 5 m * 5 m * 3 m	< 4 m deep

Refer to Drawing No. LW14-821-P-0600-001 Layout Leachate Management Facility in Volume 4 of this EIAR.

2.7.2.1 Treatment

The need or otherwise for on-site treatment as advised previously may be subject to factors such as local waste water treatment facilities, IE licence conditions, commercial considerations or other which may change over the lifetime of the facility.

Accordingly, a dedicated plan area 40 m*40 m will be provided to accommodate proprietary containerised modular leachate treatment units. Any treatment carried out on site will be subject to EPA approval.

Storage of materials if required to support treatment, e.g. caustic for pH balancing, will be in modular bunded units located on the dedicated concrete pavement plant area.

Drainage from the concrete pavement area, roads, floating covers and tank roof systems will discharge into the existing on-site surface water drainage system discharging to the existing southern storm water attenuation pond.

2.7.2.2 Tanker Loading

It is proposed to upgrade the current tanker loading facility to facilitate collection of treated or untreated leachate from the lagoons and tanks on-site within the leachate treatment facility. This will allow filling of two tankers concurrently.

Each tank / lagoon will have a valved discharge pipe that will terminate in the tanker loading area at a manifold.

The vacuum tanker or similar will drive into the tanker loading area and a flexible pipe will connect the tanker to the manifold. Typically, a vacuum in the tanker facilitates removal of effluent from respective tanks.

The tanker loading area will retain and connect to the in-situ below ground drainage system to accommodate, as required, spills and runoff from this area which will be discharged to the in-situ leachate lagoon for subsequent treatment and or transfer off site to a waste water treatment facility.

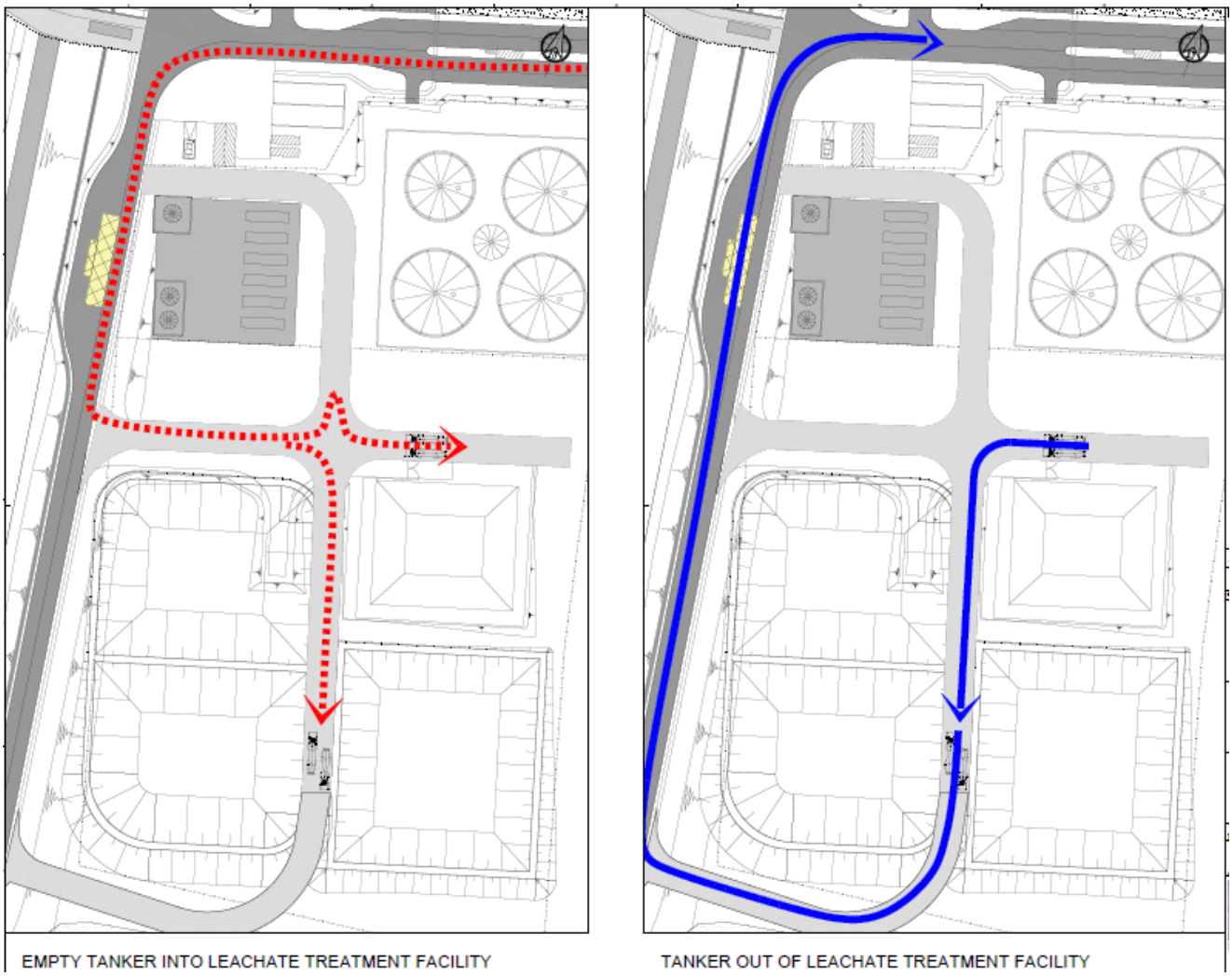


Figure 2-14: Traffic Movements to and from the Leachate Management Facility

2.7.2.3 Operative Wash Area

There will be operational procedures for:

- tanker loading
- leachate storage
- leachate treatment

Operatives will be trained in accordance with these procedures and in accident and emergency procedures. In the event of an accident, an external shower wash down and medical station will be located adjacent to the bunded storage.

2.7.2.4 Odour Control

All tanks and exhaust from vacuum tankers will have dedicated venting with carbon filters to facilitate passive or pumped venting of gases which may be dissolved in leachate.

2.7.2.5 Traffic Management

Traffic associated with leachate management will use the existing site road infrastructure and the tankers will exit the facility over the weighbridge as per existing procedures to record the transfer of leachate (volume and destination) off-site.

Up to 14 no. daily vehicle traffic movements will be associated with the following:

- Transfer of leachate off-site to WWTPS (articulated 25 tonne and 15 tonne rigid tankers)

In addition, occasional deliveries to support leachate treatment may require product deliveries using articulated 25 tonne and 15 tonne rigid delivery vehicles.

The proposed traffic movements are shown in Figure 2-14 and in Drawing No. LW14-821-01-P-0500-0009 Traffic Management Leachate Management Facility in Volume 4 of this EIAR.

2.7.2.6 Security & Staff Resources

The existing security and facility staff will operate the leachate storage and treatment facility. Training will be provided as appropriate.

2.7.2.7 Surface Water & Foul Water Infrastructure

Surface water runoff from hard standings, bunds, roof systems and roads will be directed into the existing on-site surface water drainage network and will pass via the existing petrol interceptor to the southern storm water attenuation lagoon.

Leachate spills, contaminated arisings from the tanker loading area, or other spills from bunded containers will be tankered off site.

2.7.2.8 Fire Control

The Fire Prevention Management Plan and Emergency Response Procedure for the site will be updated to reflect the proposed development and will be submitted to the EPA for approval.

Meath County Council Fire Officer will be informed of the development prior to commencement of operations as part of the preparation of emergency procedures for the site in line with the requirements of the facility licence. An application for a Fire Safety Certificate will be made prior to the construction phase of the proposed development to ensure appropriate measures are in place.

2.7.2.9 Other Services and Ancillary Infrastructure

The leachate management facility will have provision for the following services:

- Water
- Telemetry
- Power
- Lighting
- Laboratory
- Operative wash area (as described previously)
- Leachate recirculation (subject to Agency approval)

2.8 Proposed Surface Water Drainage Infrastructure Northern Catchment Area

The site has a watershed running approximately east to west through the permitted Phase 4 cell development area of the landfill, see Figure 12.2 Chapter 12 Surface Water of Volume 2 of this EIAR.

Historically surface runoff from the landfill and adjacent lands south of the watershed has discharged surface waters by overland flows, piped drainage and surface water drainage networks to the surface water attenuation pond and wetland south of the landfill.

It is proposed to develop a northern surface water attenuation pond to facilitate surface water generated in the northern catchment. This is shown in Drawing No. LW14-821-01-P-0500-0001 Proposed Layout Plan of Surface Water Management Infrastructure in Volume 4 of this EIAR.

An artist's impression of the northern surface water management pond system is included as Figure 2.15.

To provide access to the northern part of the site, it will be necessary to replace an existing culvert across the existing stream. This new culvert will also facilitate flooding described below. A Section 50 application in accordance with the Office of Public Works (OPW) document 'A Guide to Applying for Consent under Section 50 of the EU (Assessment and Management of Flood Risks) Regulations SI 122 of 2010 and Section 50 of The Arterial Drainage Act, 1945' will be submitted to the OPW to seek permission for this crossing.

Refer to Drawing No's LW14-821-01-P-0500-0001 through 0004 in Volume 4 of this EIAR. The proposed surface water management infrastructure consists of:

- A surface water holding pond with a 1,000 m^2 top water footprint and live capacity >2,000 m^3 upstream of the new surface water attenuation lagoon to facilitate containment, if required, of contaminated storm water. The pond will have a composite lining system comprising a 2.0 mm HDPE liner overlying a 1.0m clay ($1*10^{-9}$ m/s) barrier. Flows into the pond will be via baffled chute inlet structures. An automated "slam shut" control valve will be installed within an inlet weir to facilitate isolation, if required of incoming (contaminated) surface water flows. The weir structure will also have provision for a pump to discharge contaminated storm water into the leachate collection pipework system. Flows will discharge via the sluice valves/overflow weir, through a culvert (or in emergency conditions via a ford overlying the culvert) normal conditions via a baffled chute to the surface water attenuation lagoon.
- A surface water attenuation lagoon, with a 3,880 m^2 water footprint, live capacity > 4,698 m^3 to:
    - Attenuate surface water runoff from the permitted and proposed developments.
    - Facilitate settlement of suspended solids.

  The lagoon will have dead storage to accommodate solids, an overflow weir discharging via a baffled chute structure to accommodate extreme storm events into the adjacent stream, and a constant discharge outflow structure (floating inlet or similar) discharging to a wetland.
- A wetland, footprint 250 m^2 at the outlet of the surface water attenuation lagoon to the north of the currently permitted footprint. This structure is designed to polish surface water flows and reduce further suspended solids suspensions below statutory guidelines. The wetland will also have an overflow weir to accommodate failure of the outflow structure which will be the primary discharge outlet to the receiving drain/watercourse via a circular riser weir discharging via a piped outflow to the existing watercourse.
- The existing storm water drain/watercourse is typically 800 to 1000 m deep with a top width of approximately 2.0 m. It will require a permitted minor realignment at the north-eastern corner of the permitted development over an approximate length of 171 m requiring an increase in stream length approximately equal to 8 m. A section 50 application will be made to the OPW to seek consent for this realignment.
- IBA french drain perimeter pipework taking surface runoff from the IBA perimeter road and discharging runoff into:
    - IBA cells during operations, and;
    - Holding pond via petrol interceptor post operations.

- A culvert 1500 mm diameter with an 825 mm orifice or similar approved at the entrance, c. 45 m long in the existing drain/watercourse is proposed to off-set loss of flood storage by constructing the permitted cell footprint and the proposed storm water attenuation pond within an existing flood plain. The culvert will restrict upstream extreme runoff flows and cause water level upstream of the culvert to backup resulting in flooding of lands immediately upstream of the culvert and contained within the confines of the waste licence (and planning) boundaries of the proposed development. A 1:30 year storm events will pass through the culvert with no impacts on upstream levels.
- Ancillary infrastructure includes:
    - 2 no. culverts (60 m) connecting the attenuation lagoon to the holding pond and the baffled chute outfall to the surface water attenuation lagoon.
    - 2 no baffled chute inlet structures discharging swale drainage flows into the holding pond.
    - 1 no baffle chute energy dissipation structure discharging holding pond outflows into the storm water attenuation lagoon.
    - 1 no baffled chute conveying emergency spills from the storm water attenuation lagoon to the Knockharley Stream.
    - 1 no emergency spill each on holding pond and attenuation lagoon.
    - Surface water quality monitoring stations at interface between Holding pond and Attenuation pond and at outfall from wetland into receiving drain/watercourse.
    - Infrastructure to support management of surface water monitoring and contaminated water arisings should they occur, (monitoring, pump sump, control valves).

Surface water management is described in Chapter 12 of Volume 2 of this EIAR.

2.8.1 Surface Water Attenuation

The permitted and proposed developments will be constructed on an existing 1000-year flood plain. Accordingly, replacement storage measures detailed in Chapter 12 of Volume 2 of this EIAR are proposed to offset volume lost from the permitted development.

Surface water runoff from all roads, hard standings and development north of the watershed divide will be diverted to the proposed northern surface water drainage attenuation outfall via a surface water trunk pipe. This pipe will vary from a 225 mm diameter up to a 750 mm diameter. The pipe will discharge into a holding pond and thereafter into the new northern attenuation pond and wetland, via a Class 1 bypass proprietary oil/water separator.

The attenuation system will be designed to manage the runoff from the development for up to a 1 in 100-year design return period storm event.

Surface water arising south of the watershed divide will discharge to the existing "Southern" storm water management system details of which are presented in Appendix 12.1 of Volume 3 of this EIAR proposed IBA cell area will drain via the main perimeter swale into a holding pond and thereafter enter the storm water attenuation pond via a culvert and baffled chute inlet. This pond has sufficient capacity to the accommodate increased

Surface water runoff from the "Northern" catchment will first pass through a proposed holding pond. The function of the holding pond will be to provide a containment facility in case contaminated surface water enters the storm water system. Flow will then pass to the proposed "Northern" surface water attenuation lagoon.

The function of the surface water attenuation lagoon will be attenuation and suspended solids management. Sizing details for the Proposed "Northern" attenuation is presented Appendix 12.4 of Volume 3 of this EIAR. The attenuation pond will have 4,969 m^3 dead storage, 4,698 m^3 live storage and 750 mm freeboard. The catchment area north of the watershed is c 62 ha and the greenfield 20-year outflow rate will be designed to throttle flows to 255 l/s.

Outflows from the storm water pond will enter wetland via a floating weir or similar and will be discharged thereafter into the receiving Knockharley stream/storm drain via a piped outfall with rip rap or similar lining protection. The attenuation pond will also have an emergency spill capable of passing a 1:100-year discharge of 3,240 l/s into the receiving watercourse via a baffled chute.

The lagoon will be designed to accommodate a suspended solid loading of 2,500 mg/l and deliver an outflow containing less than 35 mg/l in accordance with current licence emission limit values.

The receiving wetlands will provide additional polishing to reduce suspended solids loading to typically less than 5 mg/l once wetland vegetation has been established.

This attenuation design approach is appropriate according to The CIRIA SUDS Manual C753 ISBN: 978-0-86017-759-3 (published December 2015) as pre-treatment devices for SUDS components receiving point source inflows.

The perimeter swales will have an approximate depth 600 mm with a bottom width of 1,000 mm and side slopes of 1 in 3.

The swales will be constructed in accordance with The CIRIA SUDS Manual C753 version 6. Surface water swales will initially commence at the storm water attenuation lagoon outfall and be constructed around the landfill footprint and embankments as the facility develops.

The storm water attenuation pond will be lined with a composite barrier, comprising a HDPE membrane and a 1.0 m clay basal layer with a permeability of $1x10^{-9}$ m/s, which is the same specification as the landfill cell clay barrier. The constructed wetland will comprise a shallow clay-lined pond both naturally colonised and planted with appropriate species. The outflow from the constructed wetland will flow into the local water course/drainage network at the north-eastern corner of the site. The 1:20 year outflow discharge rate will be 255 l/s.

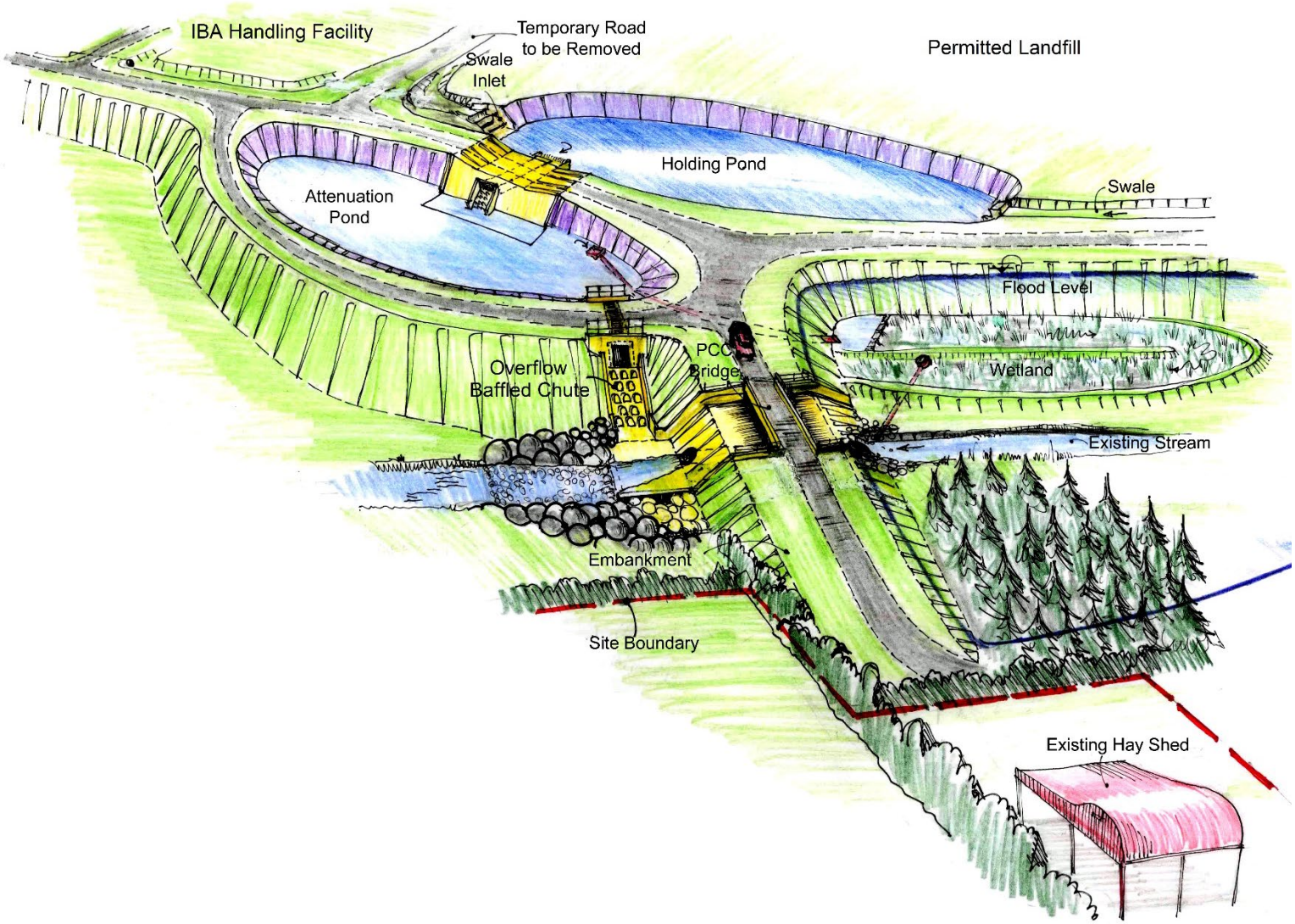


Figure 2-15: Artist Impression Northern Stormwater Attenuation Pond and New Flood Area

2.9 Earth Balance & Proposed Berms

Perimeter screening berms will be constructed using excavated materials from the cell development. The proposed berms are shown on Drawing No. LW14-821-01-P-050-0011 Cut Fill Phasing in Volume 4 of this EIAR. It is proposed to construct screening berms along the western boundary to a maximum of 10 m in height, on the eastern boundary to a maximum height of 10 m and on the northern boundary, to a maximum height of 6 m, with a total berm footprint of c. 11.3 ha. Haul roads for construction of the berms will be in or immediately adjacent to berm footprint.

2.10 Proposed Tree Felling & Replanting

The development of the proposed IBA cells, as well as the installation of the proposed screening berms, will necessitate the felling of approximately 12.5 ha. of commercial forestry currently in place within the boundary of the existing facility. A total of 37.7 ha of forestry is in place. Post restoration the forestry will comprise more than 40 ha. The replanted areas will require restoration of forestry over proposed screening berms (8.8 ha) and new planting within the site of 7.1 ha. Felling and Replanting locations are presented in Drawing No. LW14-821-050-003 Existing Forestation, Proposed Felling and New Planting in Volume 4 of this EIAR. In the context of this development reforestation means restoring forestry in areas that were felled to facilitate development, i.e. replanting. New planting/forestation means planting forestry in areas that were not previously forested to maintain the same level of forestry on the site.

The existing and forestry and proposed felling and replanting is discussed in more detail in Chapter 10 of Volume 2 of this EIAR.

Typically, woodland to be felled is immature woodland comprising mixed broadleaved/coniferous woodland (WD2). The trees are largely less than 4-5 m in height in the still immature sections and comprise a mixture of Alder, Silver Birch, Beech, Willow species, Sitka Spruce and Lodgepole Pine (among others). The more mature compartments now comprise trees up to 10m in height though wet conditions underfoot have restricted growth in some locations. These are largely in the northwest of the site.

It is expected that the clear felling will occur in sequential phases prior to clearance of the areas required for IBA cell development and the areas required for berm development and will correspond with one of the phases of construction of landfill cells.

It is assumed that the clear felling over respective areas will occur over periods between 4 and 8 weeks.

It is also proposed that replanting of the felled forestry will take place within the site and this replacement planting will occur on the berms to be developed. The replant lands will be properly certified as suitable for forestry by a certified forester. Replanting will be influenced by the following criteria:

- not occurring within an environmentally designated area
- not within high ecological value habitat
- replanting to be in accordance with Forest Service Guidelines e.g. 'no-plant' buffers from aquatic zones to be implemented.
- no fertilization to take place when replanting

All felling and replanting will be undertaken in accordance with the Felling Act 2014.

The felling will be the subject of a Felling Licence from the Forest Service and will be in accordance with the conditions of such a licence. Subject to receipt of planning, Knockharley Landfill Ltd. will apply to the Forest Service for the necessary Limited Felling licence(s) for clear felling works at the Knockharley site, in line with the requirements of the Forestry Acts 1988 to 2014.

Clear felling has the potential to impact adversely upon the environment if undertaken in an uncontrolled manner; however, the adoption of felling procedures, operating techniques and control measures will mitigate any potential adverse environmental effects.

The impacts associated with clear felling in respect of other aspects, such as hydrology and water quality, ecology, soils and geology, traffic, etc. are appraised in detail in the relevant chapters of the EIAR.

No felling will be required for the proposed development during the decommissioning phase and as such the operational and decommissioning phases of development are not discussed in this chapter, other than in respect of turbulence felling.

2.10.1 Proposed Felling Methodology

A harvester or processor is used for harvesting operations, which incorporates the felling of trees, de-branching, and cutting them into required lengths. Processing is the term used to describe de-branching and cross-cutting. The harvesting machine operates the harvesting head which is located on the front arm of the machine. The head contains the saw, wheels for moving and de-branching the tree, measuring devices for measuring the length and diameter along the tree, and a urea applicator. A typical harvester/processor is shown in Plate 2-7.

(source: www.teagasc.ie)

Plate 2-7: Typical Harvester Unit

The harvester will fell four rows of trees at each side of the machine, so from a standing position 8 rows of trees, within the reach of the machine, are cut. The rows of trees are typically planted 2m apart, so a harvester can cut a c. 16m wide strip. Therefore, the harvesting racks, laid down as the harvester moves along will be c. 16m apart.

The harvesting or extraction rack is the path used by timber harvesting and extraction machinery. It is normally formed by the harvesting machine during the cutting of the timber using the branches and crown of the tree. The covering of branches on the extraction rack is also called a brash mat or lop and top.

A number of racks at c. 16 m centres will be required to clear the respective cell and berm development areas which can link together along a central extraction corridor, as required.

Each tree will be cut at its butt as close to the ground as possible. Each tree will then be de-branched and processed into several lengths of log which are dependent on the tree diameter and its length. The minimum useable diameter is generally 7 cm. The harvesting machine is calibrated to make maximum use of each tree to avoid unnecessary wastage.

The processed logs will be dropped in piles beside the extraction racks with the different categories of logs grouped together to facilitate forwarder extraction.

A forwarder is a mechanically propelled machine which uses a hydraulic arm to gather timber logs and stacks them on the body of the machine.

It then transports the logs to the required location and stacks them in heaps. A forwarder has a rotating operating area which allows it to be operated efficiently going forward or backward. A typical forwarder is shown in Plate 2-8.

A forwarder will be used to transport the timber logs from the forested areas to intermediate storage areas within the Knockharley site before collection and transport off-site.

The proposed storage areas are shown in Drawing No. LW14-821-050-0003 Existing Forestation, Proposed Felling and New Planting in Volume 4 of this EIAR are located adjacent to the proposed internal road network within the facility, for ease of loading/storage of the timber. The timber logs will be transported along the racks laid down by the harvester to join into the existing landfill site roads. The extraction or haul distances will vary throughout the site depending on the distance to the existing site roads but has been laid out to minimise the length of travel. Temporary adjoining roads, from the harvesting area/racks to the existing landfill roads, will be developed utilising suitable virgin material available within the Knockharley Landfill. As the proposed felling will be undertaken in conjunction with a phase of landfill cell development at the Knockharley landfill site, the development of these temporary adjoining roads will be included within the specification associated with this construction phases.

(source: www.teagasc.ie)

Plate 2-8: Typical Forwarder Unit

Smaller forwarders which can transport up to 12m^3 of timber will be used throughout the site.

The forwarder transports each different category of logs separately and stacks them at the forest road in separate piles in a stable and safe condition.

Dense, fresh brash mats are the most important part of a felling site as they serve to avoid soil damage, erosion and sedimentation. These will be designed and installed to protect the underlying soil from damage, while avoiding aquatic zones and will be maintained throughout the felling operation. Their purpose is to prevent breaking of the ground surface thus preventing silt or nutrient run-off.

Brash mats will be installed along the extraction racks to protect the underlying soil from damage and will be well maintained and functional throughout the harvesting operation. The minimum amount of brash necessary to support the machinery will be used throughout the site. The bulk of the brash will be bundled and recovered from the site in a process known as forest residue recovery.

Double- wheeled machinery and close poling (laying timber or logs side by side perpendicular to the direction of travel to spread the load across a low bearing surface) will be used as necessary to maximise the recovery of brash and where the bearing capacity of the ground may be poor.

Before any harvesting works commence on site all personnel, particularly machine operators, will be made aware of the following and have copies of relevant documentation:

- the felling plan, surface water management, construction management, emergency plans and any contingency plans
- environmental issues relating to the site
- the outer perimeter of all/any buffer and exclusion zones
- all health & safety issues relating to the site

The harvested timber will be transferred off site. The proposed traffic movements associated with the removal of timber off site is discussed in Chapter 8 Roads, Traffic and Transportation of Volume 2 of this EIAR.

2.11 Relocation of ESB Powerline & Substation Construction

2.11.1 Relocation of Existing 20KV line

An existing 20 KV overhead ESB powerline, which runs roughly north-south through the eastern portion of the Knockharley Landfill site, provides power to the landfill facility administration buildings via a 'spur' that runs overhead to the buildings.

The proposed route of the relocated powerline is shown in Drawing No. LW14-821-01-P-0000-003 Proposed Site Layout.

This spur runs over an area that will be impacted by the development of the proposed IBA cells area and the screening berm to the east of the cells, and thus will require relocation.

A new connection will be made approximately 100 m south of the existing connection point on the 20 KV line, such that an overhead line will run from this new point, roughly parallel with the existing entrance road, to the administration building.

All works in relation to the relocation of the powerline will be undertaken by ESB Networks or an approved contractor and will likely involve, *inter alia*:

- the erection of powerline poles by approved contractors
- the pulling of the electrical cable along the poles
- the disconnection of power and the temporary interruption of power supply associated with the 20 KV line
- the reconnection of the new cable as part of the powerline
- the powering up and checking of the new line

2.11.2 New ESB Substations

It is proposed to construct 2 no. new ESB substations located within the existing Knockharley Landfill site boundary. Station 1 will be at the north-eastern corner of the currently permitted landfill footprint. Station 2 will be adjacent to the proposed Biological Management facility. The location of the substations is shown in Drawing No. LW14-821-01-P-0000-003 Proposed Site Layout in Volume 4 of this EIAR and details of the substations are provided in Drawing LW14-821-P-1700-010 in Volume 4 of this EIAR.

Overhead lines will be constructed to connect into ESB substation subject to ESB approval and shall connect into overhead lines running east west parallel to and offset from the Kentstown Road on the northern boundary of the facility.

2.12 Proposed Ancillary Developments

To facilitate intensification of the permitted cells and the proposed IBA cell development, ancillary infrastructure will be required for the management of surface water, leachate, air and for traffic movement. These have been discussed in the relevant sections above.

2.12.1 Ancillary Services

The permitted development has provision for:

- Above ground gas collection ring mains, site lighting and overhead power lines, site access.

The proposed development will require extension of the following in-situ services:

- Below ground services associated with power, water supply and telemetry to leachate, groundwater side risers and associated proposed development areas.
- Additional leachate side riser pump installations to remove IBA leachate from the cells.
- Above ground temporary site lighting in cells and permanent site lighting on:
  - The proposed IBA cell perimeter road.
  - The proposed leachate management facility.
  - The proposed biological facility.

2.13 Environmental Controls

The facility was designed and is being operated in accordance with the EU Landfill Directive 1999/31/EC (hereinafter referred to as the Landfill Directive), IE Licence W00146-02 and Technical Amendments A, B, C and D and the EPA Manuals on landfill selection, design, operation and monitoring.

It is not proposed, nor is it deemed necessary, to implement changes to the comprehensive environmental controls and monitoring that are presently in operation for the permitted development.

Environmental Controls are currently implemented via monitoring and reporting undertaken in accordance with Schedule D of the existing facility licence.

As identified previously, the proposed development will require an updated licence to reflect the proposed operations as outlined herein. An application is being prepared for the Environmental Protection Agency (EPA) to follow the planning application to which this EIAR relates.

Pre-application consultation has been undertaken with the EPA and further detail on this is provided in Chapter 5 of Volume 2 of this EIAR.

Subsequent sections hereinunder will therefore refer to, current licence conditions or future variants as may be required to identify how controls will be implemented.

2.13.1 Groundwater Protection

Leachate has the potential to impact on groundwater quality in the absence of mitigation.

The existing landfill facility was designed and is being operated in accordance with the EU Landfill Directive 1999/31/EC (hereinafter referred to as the Landfill Directive), IE Licence W00146-02 and Technical Amendments A, B, C and D and the EPA Manuals on landfill selection, design, operation and monitoring. The remainder of the permitted landfill development and the proposed IBA cell area will be designed in accordance with the EU Landfill Directive.

Prior to any construction on site, EPA approval is required for all specified engineering works. Following construction an independent Construction Quality Assurance (CQA) report will be prepared for submission to the EPA for approval.

All containment structures such as lagoons and tanks shall be designed to mitigate any potential impacts on groundwater. Please refer to section 2.6.3 and 2.7. All bunds, tanks, lagoons, containment structures and pipework are, and will be subject to integrity assessment every 3 years in accordance with the licence.

A leachate management system will control leachate generated in the landfill, the IBA cells and the biological treatment facility. Leachate management is discussed in Sections 2.2.6, 2.5.5, 2.6.3 and 2.7.

Groundwater monitoring is carried out quarterly with biannual reports submitted to the Agency which are available on the EPA web site. Monitoring will continue in accordance with the licence. As part of the preparation of this application, 3 new boreholes were installed in 2016 to facilitate baseline sampling at locations downgradient of proposed infrastructure.

Leachate lagoons and tanks will be designed, constructed and operated as discussed in Section 2.7. All lagoons and bunds will be tested for integrity at 3-year intervals in accordance with the licence.

Groundwater control

Historically groundwater has required drainage systems below the cell liner systems to intercept such groundwater as may be present.

Typically, groundwater from site has been present in sand lenses within the boulder clay and flow rates are historically very low. Such groundwater as may be pumped will be directed to the existing storm water lagoons as is presently the case or to the proposed northern storm water lagoon. This was discussed in Section 2.2.5. This method of groundwater control will be employed for all future cell development on site.

Historic evidence shows that groundwater pumping has little if any influence on surrounding groundwater elevations.

Once cells are full, subject to Agency approval, groundwater may be allowed to rise above leachate levels within cells, to mitigate further the risk to groundwater. Under these circumstances and in the unlikely event of a leak in a liner, groundwater elevation would be higher than the 1.0 m leachate depth conditioned in the waste licence and groundwater would enter the cell as opposed to leachate egressing from the cell.

The potential impacts to groundwater and mitigation measures are discussed in Chapter 11 of Volume 2 of this EIAR.

2.13.2 Protection of Air Quality

The following have the potential to impact on air quality in the environment in the absence of mitigation measures:

- Landfill gas generated by the landfilling of waste
- Malodourous waste materials accepted and managed at the facility (including leachate)
- Dust, particulate matter and traffic emissions generated at the facility

There is an existing landfill gas collection and management system at the facility which will be extended (collection network) to include the permitted development. There is sufficient treatment capacity on site to treat landfill gas produced by the proposed development. This is discussed in Section 2.2.9.

An air handling system will be installed in the proposed biological waste treatment facility to manage air quality in the building and emissions from it. A new monitoring point will be located at the stack emissions point from this facility. This is discussed in Section 2.6.

Operational practices in accordance with the licence are and will be employed to manage nuisance from dust and odour.

Air quality is discussed in further detail in Chapter 7 of Volume 2 of this EIAR.

2.13.3 Surface Water Protection

The facility was designed and is being operated in accordance with the EU Landfill Directive 1999/31/EC (hereinafter referred to as the Landfill Directive), IE Licence W00146-02 and Technical Amendments A, B, C and D and the EPA Manuals on landfill selection, design, operation and monitoring.

A second surface water attenuation lagoon and wetland with an associated surface water holding pond and a new flood plain is proposed for the facility to facilitate management of surface water in the northern portion of the site. It is proposed to create a new surface water sampling point at the outlet from the northern wetland. There are existing monitoring points upstream and downstream of the proposed discharge location.

Surface water at the facility is managed in accordance with the surface water management plan. Surface water during construction will be managed in accordance with the Outline Construction Environmental Management Plan (CEMP) in Appendix 2.0 of Volume 3 of this EIAR.

The potential impacts on surface water are addressed in Chapter 12 of Volume 2 of this EIAR.

Surface water monitoring and reporting of results is and will continue to be carried out in accordance with the licence.

2.13.4 Noise Control

Noise monitoring is and will be carried out in compliance the licence and the licence specified noise emission limits. The potential impacts of noise on the environment are discussed in detail in Chapter 9 of Volume 2 of this EIAR. Two new noise monitoring points are proposed on the local road to the east of the facility, located to monitor potential noise emissions from the proposed IBA facility and the proposed biological treatment facility.

2.13.5 Nuisance Controls

2.13.5.1 Vermin Control

Strict management and mitigation measures are in place and have been successful in the control of populations of vermin in the vicinity of the landfill. These measures include the following:

- Daily cover material comprising soil-like material is placed on the active area of the landfill to deny access for scavenging birds and vermin to the waste
- The surface area of exposed waste is minimised during operations and good housekeeping practices are employed to minimise the potential for scavenging
- Professional vermin control experts are employed to control vermin levels using standard humane methods. Measures used as part of this programme include internal and external bait boxes, rodenticides and insect control measures. Vermin control commenced before the onset of landfilling
- Baiting is undertaken monthly, or more frequently as required
- Precautions are taken to avoid non-target species from coming in contact with vermin bait e.g. rodenticides. This includes the following: laying bait in areas not accessible to non-target species and strict control of vermin population levels. The success of the programme is manifest by the diversity of fauna that has colonised the site since farming has ceased and landfilling has commenced.

These measures will be extended to provide vermin control for the proposed biological treatment facility.

2.13.5.2 Litter Control

Measures used to control litter at the site include the following:

- The active tipping area is kept to the minimum area required to efficiently operate the site
- The active tipping area is covered daily with soil-like material
- All waste in non-active areas of the landfill is always covered with soil or an alternative mineral layer
- Netting systems are employed around active areas of the site
- Mobile litter cages are used as necessary close to unloading vehicles
- A minimum buffer of approximately 100 m exists between the landfill footprint and the site boundary. This ensures that in the event of a failure in the netting system the primary receptor of any litter will be on land owned by the site operator and a clean-up can be instigated immediately
- All waste is delivered to the site in covered vehicles. Any vehicle delivering uncovered waste is deemed to be in breach of waste acceptance contract conditions and appropriate action is taken by Knockharley Landfill Ltd. This action is designed to ensure that this practice does not recur
- Future deliveries of biodegradable waste will also be in fully-covered vehicles that will be unloaded indoors with no potential for littering
- Waste contractors are prohibited from using minor roads on their approach to and departure from the site and all access is directly from the N2
- Staff at the site patrol the nearby roads regularly to ensure that there is no litter emanating from vehicles using the facility. The nature of the waste to be deposited on the north face will be less prone to litter nuisance
- The site is closed in the event of severe wind conditions.

These measures will continue to be employed at the facility and shall be reviewed annually.

2.13.5.3 Bird Control

The number of scavenging birds such as gulls and crows attracted to the landfill site are minimised by the following measures:

- Daily cover material comprising soil-like material is placed on the active area of the landfill to deny access for scavenging birds to the waste
- The surface area of exposed waste is minimised during operations
- The number of birds at the surface water attenuation pond is monitored regularly by site personnel confirming the success of the bird control measures.

In over ten years of operation, there has been no significant increase in the number of birds at the site. Current procedures will be maintained as part of controls associated with the proposed increase in waste acceptance. The pre-treatment of MSW such that the biodegradable fraction of waste is reduced in accordance with specific conditions of W01465-02 reduces the attractiveness of the waste to birds and vermin.

2.13.6 Other Environmental Controls

The controls in place to mitigate potential impacts on the human environment are discussed in Chapter 6 of Volume 2 of this EIAR.

The controls in place to mitigate potential impacts on roads, traffic and transportation are discussed in Chapter 8 of Volume 2 of this EIAR.

The controls in place to mitigate potential impacts on biodiversity are discussed in Chapter 10 of Volume 2 of this EIAR.

The controls in place to mitigate potential impacts on soil are discussed in Chapter 11 of Volume 2 of this EIAR.

The controls in place to mitigate potential impacts on landscape are discussed in Chapter 13 of Volume 2 of this EIAR.

The controls in place to mitigate potential impacts on material assets are discussed in Chapter 14 of Volume 2 of this EIAR.

The controls in place to mitigate potential impacts on archaeology are discussed in Chapter 15 of Volume 2 of this EIAR.

2.14 Construction Phase Methodology

2.14.1 Construction Programme

The proposed cell layout and phasing for the permitted and proposed developments are presented in Table 2-14. Drawing LW14-821-01-P-0050-011 Cut and Fill Phasing in Volume 4 of this EIAR shows the proposed construction cut locations and phasing of screening berms associated with key mile stone developments. This drawing should also be read in conjunction with Drawing no. LW14-821-01-P-0050-003 Existing Forestation Proposed Felling and New Planting in Volume 4 of this EIAR as programming was designed to facilitate replanting / new planting within 2 years following felling as may be required.

It is preferable, from a construction viewpoint, that construction of the facility take place during the summer months to take advantage of longer daylight hours and drier weather. However, this is dependent on a number of factors including the implementation of appropriate mitigation measures in relation to the ecology of the development locations (refer to Section 11).

Upon appointment of a contractor for the works, a programme will be developed taking account required mitigation factors.

Table 2-14: Proposed Construction Phasing

Infrastructure	Cell Construction Programme (years post grant of permission)	Screening Berm
Cells 19, 20, 21, 22, 28, 29 and cell weathering area 32	0 through 2	Berms A and B
Advance works, security, felling, suspended solids management, site clearance, haul roads, services	0 through 1	Berm A
Surface water management infrastructure	0 through 1	Berm A
Screening Berms	1 through 8	Berms A through D
Leachate infrastructure	1 through 5	Berms A through D
Miscellaneous infrastructure	1 through 5	Berms A through D
Cells 24, 26 and 27	3 through 4	Berm C
Cells 23. 25 and 30	5 though 6	Berm D
Cells 31 and remainder 32	7 through 8	Berm E
Capping	1 through 8	

Infrastructure provision (access roads, power, telemetry, gas, leachate, surface water) will be developed concurrent with cell construction.

2.14.2 Construction elements

The key construction elements are as follows:

- advance works
- general earthworks and associated concrete works
- internal roads
- deforestation
- screening berms
- access Roads
- IBA storage facility
- additional above ground and below ground floating cover lagoons to store incoming and treated leachates
- leachate management facility
- a weathering / future reprocessing area within the IBA cells
- an additional wheel wash to clean vehicles leaving the IBA cell development
- additional leachate rising mains and associated suspended solids management systems tanks
- additional below ground ducting for water, telemetry and power
- biological treatment facility
- upgrading of leachate management facility
- new underground ESB power supplies and remove existing overhead power supplies

2.14.3 Construction Methods and Materials

2.14.3.1 Advance works

The following section outlies the key construction related deliverables required prior to development of Cells and associated Infrastructure:

- Establishment of site security, fences and Works compound (s) with appropriate welfare provision.
- Establishment of temporary surface water management measures requiring construction of silt fences and or localised settlement ponds to contain suspended solids associated with dig and deposition areas.
- Site clearance for screening berms.
- Installation of site access roads requiring stripping and stockpiling of topsoil and installation of granular formations atop separation membranes.
- Felling in accordance in accordance with the Felling Act 2014.
- Relocation / exposing of existing services to facilitate connection to proposed works.

2.14.3.2 Overview of Earthworks and Associated Concrete Works

Construction element broadly fall under two categories for earthworks related operations; earthworks and structures.

Bulk dig and construction of stockpiles and screening berms

An earth balance will define excavation locations and fill (typically screening berm) locations subject to construction program considerations and detailed design.

Prior to earthworks taking places advances works described above will require construction of haul roads, silt ponds and installation silt fences to mitigate impact of suspended solids on adjacent watercourses.

Thereafter overburden material will be excavated using tracked 360° excavators and transported in off road dump trucks to screening berm locations where material will be placed, compacted in layers, profiled, top soiled planted with trees and grass seed. If boulder clay (at depth) is encountered it will be stockpiled for reuse as engineered clay in lining systems, see below.

Where ground water is present gravity and or pumped drainage will be provided with outlets via suspended solids pond into receiving surface waters.

In all lagoons engineered clay will be installed in layers and compacted using a sheep's foot roller or similar in layers to ensure compliance with permeability specifications after which 2.00 mm welded HDPE lining materials will be installed.

Production of engineered clay

Following removal of overburden to screening berms or stockpiles, in-situ boulder clay will be excavated, passed through trommels to remove boulders exceeding 50 mm diameter and stockpiled or placed within excavations to form a 1.0 m engineered clay barrier.

Boulders will be used on site as granular fill in haul roads.

Engineered clay (with boulders removed) will be placed and compacted in layers not exceeding 250 mm typically to a proctor maximum dry density of 98% or more subject to permeability testing.

Concrete works

Concrete works will typically require local excavations, drainage and suspended solids management for dig and concrete pours and into which structures will be built requiring placement of blinding, shutters, reinforcement and final concrete pour. Near watercourses, where possible precast concrete (e.g. culvert) to mitigate any potential impacts on surface water will be used.

Swales and inlet structures will be excavated, profiled and seeded asap to mitigate development of suspended solids

2.14.3.3 Internal Roads

Internal roads will comprise:

- Haul roads during construction. These will typically comprise stone aggregate compacted using vibrating rollers on separation membranes.
- Paved roads in the IBA cells constructed using reinforced concrete over IBA formations.
- Perimeter roads using conventional barber greens, vibrating and dead rollers for:
    - IBA cells
    - Permitted development.

2.14.3.4 Screening Berms

Screening berms will be constructed on a phased basis concurrent with overburden from cell excavation works. Prior to berm installation, top soil will be stripped back formation compacted and soils as may become available placed and compacted in layers.

Layers will be overfilled and once berms are at the final height is reached will have side slopes profiled receive and allow subsequent placement of topsoil, seeding and tress as required.

To minimise erosion, storm drainage will be installed prior to bulk earth moves and silt fences will be placed around screening berms until a grass cover has become established.

Prior to earthworks taking place temporary haul roads will also be installed.

2.14.3.5 Surface Water Management

Prior to any earthworks or forestry works taking place, measures to mitigate potential impact on surface water from suspended solids will be implemented. Where permanent measures are not in place temporary settlement ponds and or silt fences will be established to mitigate the risk of suspended solids entering water courses.

Settlement ponds will typically have below ground excavation facilitating gravity flows where possible lined with a synthetic material and a discharge pipe system with appropriate downstream protection in the receiving water using concrete or rip rap to dissipate energy and prevent downstream erosion.

Prior to cell development works taking place, the northern catchment storm water infrastructure will be constructed.

Excavated materials will be removed to screening berms. Clay barrier material won from underlying boulder clays to produce engineered clay will be placed in layers and compacted to 98% maximum dry density.

Thereafter a 2mm textured HPPE liner will installed with welding being monitored by independent CQA.

Inlet and outlet structures and associated protection works will constructed using reinforced concrete.

2.14.3.6 IBA Cells

Overburden will be removed and placed in screening berms. In-situ boulder clays will be engineered via screening to remove boulders. A ground water drainage system will be installed to accommodate prevailing site conditions upon which the engineered clay barrier will be installed and compacted to 95% maximum dry density.

Thereafter a 2 mm textured HPPE liner will installed with welding being monitored by independent CQA upon which a protection geotextile will be placed prior to installation of a 500 mm drainage stone blanket within which will be a HDPE drain pipe network will terminate in HDPE sider risers.

Headwalls and valve chambers associated with leachate pumping will be constructed using reinforced concrete and pipework and telemetry ducts will be constructed using HDPE welded pipework.

2.14.3.7 IBA Weathering Facility

The construction of the IBA Weathering Facility is described as follows.

The storage area will be constructed within the IBA footprint in cell 32. Following completion of the cells a level formation will be established using IBA materials to facilitate acceptance of IBA materials. A single span portal frame building (76 m x 76 m) will be constructed on concrete pad foundations within the in the IBA weathering footprint.

Initially IBA material will be placed in thin layer above a thermal protection barrier to mitigate elevated temperatures damaging the liner.

To facilitate weathering. Once a level platform of weathered IBA is in place, a central access road will be constructed using reinforced concrete.

Clay barrier material will be won from underlying boulder clays excavated to form cells. Boulders within the excavated clay will be removed via screening and engineered clay will be placed in layers and compacted to 96% maximum dry density.

Thereafter a 2mm textured HPPE liner will installed with welding being monitored by independent CQA.

Inlet and outlet structures and associated protection works will constructed using reinforced concrete.

2.14.3.8 Leachate Management Facility

The primary elements associated with the leachate management facility will comprise:

- Floating cover lagoons excavated below ground and lined with 1.0 m clay barrier. Clay barrier material will be won from underlying boulder clays excavated to form cells. Boulders within the excavated clay will be removed via screening and engineered clay will be placed in layers and compacted to 96% maximum dry density. The floating cover will be constructed using LLDPE.
- Overground tank constructed using glass lined prefabricated steel tanks founded on a reinforced concrete foundation with reinforced concrete bund walls to facilitate emergency containment.
- Leachate tanker loading facility constructed with reinforced concrete bays and associated HDPE pipe drainage to adjacent tanks to accommodate spills. Pipework from tanks and lagoons will be below ground welded HDPE.
- Reinforced concrete area on granular fill to accommodate containerised treatment modules as may be required for future treatment and or conditioning of leachate road.
- Surfaced dressed access road on granular formation facilitating access to the facility.

2.14.3.9 Biological Treatment Facility

The biological treatment facility will be a portal frame building surrounded by a concrete working area to facilitate access and egress of vehicles.

Prior to building construction, the topsoil will be stripped back under the footprint of the buildings. Additional excavation will be carried out to the formation level of foundations and underground tanks, where required. The foundations will be ground bearing reinforced concrete pads/strips on a suitable stratum. Once the foundations are poured, rising walls will be constructed. These will be comprised of a mixture concrete blockwork walls and reinforced concrete retaining "push walls" in material handling areas and in tunnels. Push walls will be designed to retain the weight of stockpiled material and pushing forces from loading vehicles. Due to site topography, import of fill material to raise the levels to the underside of floor will be required. Imported fill shall be a granular engineered fill, compacted to provide a suitable subgrade for the building floors. Floors will be steel, or fibre reinforced concrete industrial floors on a suitable depth of compacted granular fill.

The steel frame will be erected on the reinforced concrete substructure. The frame will consist of rolled steel columns and rafters at 5-7m typical spacing. Cold rolled light gauge steel purlins and cladding rails will be fixed to the main columns and rafters. The frame will be cladded with corrugated coated steel cladding, to match the existing building. Access to the building will be by fast acting industrial roller shutter doors, with personnel access/fire escape doors as required to comply with Fire Regulations.

The walls and roof of the composting tunnels will be entirely of reinforced concrete construction.

External cladding will be affixed to the steel frame when completed.

Roof drainage will consist of gutters and downpipes draining the pitched roofs, the roof of the composting tunnels will be "flat" with a nominal fall. The concrete surface of the tunnel roof will be made waterproofed by means of a bonded membrane system. All roof water will be collected for harvesting.

Below ground tanks leachate tanks will use proprietary fibre glass or similar encased in concreted and surrounded by a 1.0m engineered clay barrier.

The external marshalling yard areas will be topsoil stripped. Imported fill will be required on the lower portion of the site to raise the subgrade to the final levels. The yard will be paved with steel or fibre reinforced concrete slabs and ramps similar to the internal floors of the building. The slab will be jointed to control cracking. The slab will bear on a layer of compacted granular fill. Services and drainage in the yard area will run underneath the slab.

The concrete slabs will be laid to falls, surface water drainage will be by means of gullies or drainage channels. Reinforced concrete retaining walls and gabion structures will be constructed along the western boundary of the facility footprint to retain the raised ground levels.

Drainage runoff will pass through petrol interceptors by gravity into the existing stormwater system. Manhole chambers will be constructed using reinforced concrete.

2.14.3.10 Wastes generated during construction

The wastes/spoils likely to be generated during the construction phase are presented in Table 2-15 below.

Table 2-15: Potential Wastes Generated during Construction Phase

Waste	Source
Hardcore, stone, gravel, concrete and plaster	Materials used during construction
Timber	Temporary supports, concrete shuttering and product deliveries
Miscellaneous building materials	Chemical toilets
Waste from chemical toilets	Packaging materials
Plastics	Unused quantities at end of construction period
Lubricating oils, diesel	

All wastes will be collected at the end of the construction phase, taken off site, and reused, recycled, recovered or disposed of according to best practice in an authorised facility. Lubricating oils and diesel will be removed from the site and disposed of by an approved waste contractor in accordance with the European Communities (Waste Oil) Regulations, 1992, as amended.

An Outline Construction Environmental Management Plan has been prepared and included in Appendix 2.0 of Volume 3 of this EIAR which includes a draft waste management plan to be implemented during the construction phase.

2.14.4 Hours of work

Construction work will generally be carried out during daylight hours. Construction work will generally be confined to the following times:

07:30 to 18:30 Monday to Saturday

2.14.5 Construction Traffic & Access

The facility's construction will lead to construction-related traffic on the roads in the proximity of the development.

It will include:

- Site personnel driving to the work site and site compounds (by car, van and 4x4)
- Delivery of liner materials, tanks, steel, cladding and other construction materials by van and HGV
- Movement of construction equipment and refuelling trucks to and around the site
- Import of fill material and concrete
- Export of felled timber

A detailed Traffic Management Plan will be prepared prior to the commencement of the construction work. This will be drawn up in consultation with Meath County Council. Written procedures will also be put in place to deal with refuelling machinery in line with best practice. The Outline Construction Environmental Management Plan is prepared and included in Appendix 2.0 of Volume 3 of this EIAR which includes a Draft traffic management plan to be finalised to take account of relevant conditions attached to any permission or IE review granted and implemented during the construction phase.

Potential impacts from construction traffic are further dealt with in Chapter 8 Roads, Traffic & Transportation of Volume 2 of this EIAR.

2.14.6 Construction Compound

A temporary Contractors Compound will be required for the duration of the construction cycles. It will consist of a hardcore area surrounded by secure fencing, comprising site office, canteen, toilet facilities, storeroom and staff parking areas. Fuel/oil storage areas will be bunded in accordance with best practice. The compound will move around site to accommodate the cycles of construction.

Temporary toilet facilities will be required for construction workers. These will consist of temporary 'portaloo' type chemical toilets located within the construction site compound.

2.14.7 Environmental Management

The Outline CEMP is included as Appendix 2.0 in Volume 3 of this EIAR. It sets out the key construction and environmental management issues associated with the proposed development. This plan will be finalised to take account of relevant conditions attached to any permission or IE review granted.

2.15 Management of the Facility

2.15.1 Operational Hours

The IE Licence currently permits the following operational and waste acceptance hours:

Hours of Operation:

- 07.30 to 18.30 Monday to Saturday

Hours of Waste Acceptance:

- 08.00 to 18.00 Monday to Saturday

No changes to the hours of operation or waste acceptance are proposed.

2.15.2 Management & Staffing

Knockharley Landfill currently operates with 6 no. permanent personnel:

- Landfill Manager
- Assistant Landfill Manager
- Site Foreman
- Weighbridge Operator
- 2 no. general operatives

When operational, it is envisaged that further operational personnel will be required in addition to those currently employed, for the operation of the various elements of development as follows:

IBA Cells:

- 1 no. overseer
- 3 no. general operatives/plant drivers

Landfill - 2nd Working Face:

- 1 no. overseer
- 2 no. general operatives/plant drivers

Biological Treatment Plant:

- 1 no. overseer
- 3 no. general operatives/plant drivers

Therefore, it is envisaged that 17 no. personnel shall be employed on a full-time basis when the proposed development is operational.

2.15.3 Management of wastes generated onsite

All non-process related wastes generated onsite (from administration building, weighbridge office etc.) will continue to be managed by a suitable waste management contracting company and will be taken offsite for treatment at relevant approved waste management facilities.

2.16 Environmental Monitoring & Reporting

Environmental monitoring and reporting is undertaken in accordance with Schedule D of the existing facility licence W0146-02. Additional monitoring locations will be proposed as part of the required licence review of W0146-02 and are shown on Drawing No. LW14-821-01-P0050-002 in Volume 4 of this EIAR

There are also a number of engineering/design monitoring requirements under the existing licence, which will be maintained within any revised licence, as summarised below.

2.16.1 Stability and Settlement

A survey of the landfill body site is carried out once per year and submitted to the EPA in accordance with Condition 8 of the existing licence. If settlement is found to be interfering with the integrity of the cap or interfering with run-off from the landform, measures will be taken to reinforce the cap or reshape the landform as required. No issues have arisen to date. The most recent survey was carried out in May 2018.

The height difference between the permitted and proposed development will be realised with slopes not steeper than 1:20 such that impacts of differences in differential settlement will be minimal.

Where non-stabilised residual waste abuts inert and stabilised waste differential settlement rates and extents will differ significantly and reprofiling may be required over several years subject to annual survey findings.

Preliminary design studies also informed selection of the proposed side slopes to ensure that translational cap and rotational stabilities within the waste body will not present long-term problems.

2.16.2 Contingency Arrangements

Contingency arrangements for the current landfill operation as conditioned in the licence i.e. emergency response procedures, will apply to the proposed development.

2.16.3 Closure and Restoration

On closure, the landfill body will be capped, and the area returned to vegetation in compliance with Closure, Restoration and Aftercare plans agreed with the Agency. As part of the facility licence review, the existing Closure, Restoration and Aftercare plan will be revised to account for the new elements of development i.e. increased waste acceptance, IBA cell development, biological treatment plan development etc.

2.16.4 Reporting

Quarterly, bi-annual and annual environmental reports are submitted to the Agency in compliance with Schedule E of the existing licence for the facility. All records of monitoring are also kept in the information room. The general public can request sight of all monitoring data associated with the landfill and this practice will continue after review of the existing facility licence. Since 2016, all monitoring compliance reports are available online on the EPA website www.epa.ie.

2.17 Description of Natural Resources Used

Natural resources will be consumed during both the construction and operational phases related to the proposed development.

2.17.1 Construction Phase – Natural Resource Consumption

Natural resources consumed during the construction phase will include:

- diesel fuel for construction machinery
- steel in the building construction
- granular material for use as in-fill material for site development works and in concrete

While exact quantities are difficult to quantify at this juncture, it is expected that the following maximum quantities of resources will be consumed during construction:

- 9,975 m^3 of concrete
- 1,547 tonnes of steel
- 212,000 litres of diesel
- 52,495 m^3 of granular fill material

2.17.2 Operational Phase – Natural Resource Consumption

Natural resources consumed during the operational phase will include:

- Diesel fuel for site machinery (loading shovels, compactors, tracked machines etc.)
- Woodchip/peat/bark (if used for biofilter bed media)
- Water

Machinery

Biological Facility:

- Front end loader 2
- Tractor trailer 1

IBA Landfill:

- 30 t off road vehicles 2
- Roller 1
- Grader 1
- 360 excavator 2

Permitted development:

- Compactors 2

Fuel consumption per year assuming the average plant consumes on average 50 l/day average 275 days will be 151,250 l annually.

Biofilter

With a biofilter bed depth of approximately 3 metres, and a biofilter length of 70 m and width of 7m, approximately 1,450 m^3 of woodchip/peat/bark (if used as bed media) would require replacing very 3 – 4 years. This 'spent' woodchip could then be consumed within the composting process as a structural amendment material or as a daily cover within the landfill cells.

Water

Potable water loading on site will be less than 40,000 l annually.

Water loading for dust suppression will be significant and is estimated at 3,650,000 l annually but will typically use surface water runoff or contaminated runoff from cells.

Electricity Use within the Biological Treatment Facility

The estimated electricity usage at the proposed biological treatment facility is estimated at 750 – 1,000 MWhrs per annum.

2.18 Regulatory Control

As identified previously, the proposed development will require an update of the licence to reflect the proposed operations as outlined herein. An application is being prepared to the Environmental Protection Agency (EPA) which will be submitted concurrently to the planning application to which this EIAR relates.

Pre-application consultation has been undertaken with the EPA and further detail on this is provided in Chapter 5 of Volume 2 of this EIAR.

Works associated with the development of the surface water attenuation lagoon to the north of the proposed IBA facility and the realignment of the stream on the north-eastern corner of the permitted landfill development will each require a Section 50 consent from the Office of Public Works (OPW).

Felling associated with the removal of existing forestry at the location of the proposed screening berms will require a Felling Licence from the Forestry Service.

The acceptance and processing of residual municipal solid fines at the proposed biological treatment facility will require a 'Type 8' facility approval by the Department of Agriculture, Food and the Marine (DAFM).

2.19 Decommissioning

As an existing licensed landfill facility, closure, a restoration and aftercare plan has been agreed with the EPA which relates the period aftercare cessation of waste acceptance at the site. This plan centres on the creation of nature trails and a wetland at the site.

As part of the update of the facility licence, a revised closure, restoration and aftercare plan will be agreed to address the aftercare period when:

- waste acceptance within the landfill body ceases
- waste acceptance at the IBA cells ceases
- waste acceptance at the biological treatment facility ceases

Upon cessation of waste acceptance and processing proposed as part of this application, it is anticipated that the following closure and restoration measures will be undertaken at a minimum:

- The plant used within the individual development elements will be removed from the site.
- Portable structures will be removed from the site, where applicable.
- Road sweeper vehicles will be employed to clean the site.
- Tanks will be decommissioned and emptied, backfilled filled and or removed by a licensed contractor with ground reprofiled.

The restoration and aftercare plan covering decommissioning will be subject to Agency approval.

Knockharley Landfill Ltd. has put in place the financial provision to cover any liabilities associated with the operation of the facility including closure and aftercare of the facility. This financial provision is reviewed and revised annually.

In the event of receiving permission and an IE licence in respect of the proposed development, the financial aspects of the closure, restoration and aftercare management plan will be revised to include the biological treatment waste facility and IBA cells development. This will ensure that the financial provision is available to fully decommission the facility when appropriate.

2.20 Health & Safety

The proposed facilities will be designed, constructed and operated in accordance with the:

- Safety, Health & Welfare at Work (Construction) Regulations 2013
- Safety, Health & Welfare at Work Act 2005
- Safety, Health & Welfare at Work (General Application) Regulations 2007
- Safety, Health and Welfare at Work (Biological Agents) Regulations 2013
- Best practice guidelines
- Relevant BREF/BAT guidance
- The facility IE licence
- DAFM Type 8 facility approval

2.20.1 Health & Safety During Design

Design stage risks can be described as risks which can easily be identified at the design stage, and detailed design will eliminate or minimise risks where possible.

FT is appointed as Project Supervisor for the Design Process (PSDP) for the preliminary design phase of the development. This role is carried out in accordance with the Safety, Health and Welfare at Work (Construction) Regulations 2013.

The PSDP ensures that the appropriate Design Stage Risk Assessments are prepared and that a safety file is developed and maintained for the works. These are required to demonstrate that the designers have taken account of the General Principles of Prevention as required by the Safety, Health and Welfare at Work (Construction) Regulations 2013.

Where possible, the facility design stage will eliminate and minimise many of the potential risks at construction stage. However, health and safety risks at construction stage will need to be properly managed.

2.20.2 Health & Safety During Construction

The construction contractor will be appointed as Project Supervisor for the Construction Stage (PSCS) in accordance with the Safety, Health and Welfare at Work (Construction) Regulations 2013. The suitability and competence of the contractor to fulfil this role will be carefully assessed by Knockharley Landfill Ltd. prior to the appointment.

A site-specific Health and Safety Plan for the construction phase of this project will be prepared in accordance with the Safety, Health and Welfare at Work (Construction) Regulations 2013. This will address all safety aspects of the construction project including, but not limited to:

- site access and general induction training
- general site safety
- chains, ropes and lifting gear
- special provisions for hoists
- protective clothing and footwear required
- lockout/tag-out procedures for safe electrical
- method statements for work procedures
- miscellaneous items

2.20.3 Operational Health & Safety

Access to the site is currently restricted to employees, waste trucks and occasional visitors and this will continue to be the case. Procedures are in place at the facility to ensure the health and safety of all persons entering the site, including the signing in/out of all visitors.

All new staff working at the site will be made familiar with the contents of the site-specific Health and Safety Plan. Health and safety practices are reviewed on an annual basis to ensure that they are in line with best practice in this sector and will continue to be so.

Regular safety audits are carried out on-site to ensure the safety of all personnel working there. Furthermore, suitable operation and maintenance procedures are currently in place to facilitate the safe operation of the whole site and these will be amended to reflect the proposed new facilities.

Vehicular traffic movements within the site are restricted and monitored and all traffic movements are subject to strict procedures, in full accordance with health and safety requirements.

Other operational health and safety aspects, such as noise and air quality are discussed in other Chapters of this EIAR. Measures have been taken in the design of the proposed infrastructure to minimise the potential impact of these aspects on health and safety.

Existing IE licence W0146-02 currently require the following procedures/systems to be in place at the facility:

- Full training for all employees
- Accident Prevention Policy – procedures to identify hazards onsite
- Emergency response procedures - setting out all procedures that, in the event of an emergency, will be undertaken by personnel at the facility

As identified, a review of W1046-02 will be undertaken – this review process will require the review of the existing procedures to reflect the proposed development.

Given the nature of the material to be accepted at the proposed biological treatment facility, all operational recommendations outlined in and legally required by the 2013 Code of Practice for the Safety, Health and Welfare at Work (Biological Agents) Regulations 2013 shall be adhered to.

[i] Municipal Solid Waste –Pre-treatment & Residuals Management, An EPA Technical Guidance Document, EPA 2009 amended 2011