

WML001 License Variation: Seaweed from Seasonal Beach Cleansing



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1.0 Information Summary

Waste Management License: WML001

EWC Code & Description: 20 02 01 Biodegradable (municipal garden & park) waste

EWC Treatment Code: R3 Recycling of organic substances not used as solvents (including composting)

Anticipated Annual Quantity: 1,000 – 2,000 tonnes

Rationale: The Government of Jersey (GHE Highways – the waste producer) removes stranded seaweed from the high-tide line of beaches popular with tourists and residents between March and September. Seaweed flies and malodour associated with decomposition which may cause a nuisance to beach-goers, or nearby residents when carried inland by wind, are removed with the seaweed. GHE Solid Waste proposes to receive seaweed wastes produced in this way.

2.0 Purpose

Composting would normally take place under WML003 however seaweed collected from the strandline is unsuitable for processing at the Green Waste site due to the presence of sand, stones, plastics and dog waste. These contaminants are incompatible with the machinery used to shred green wastes and are undesirable in the finished compost product. Seaweed waste from the strand line is instead received and processed separately under WML001.

3.0 Scope

This document is designed to meet the requirements of WML001 by detailing the waste acceptance criteria, treatment methods and site engineering in place for treating seaweed wastes produced during seasonal beach cleansing. It includes details on waste composition, site engineering and pollution control measures.

Health and safety risk assessments and control measures associated with the proposed activities are not included in this application as these fall outside the remit of the waste management licensing system and are instead recorded elsewhere according to internal procedures.

4.0 Location Details

This application applies **only** to the site defined by the boundaries of WML001. Seaweed received in this way is stored in engineered containment Cell 32 which is situated in Area 8 of the Site General Arrangement plan ([Appendix D](#)).

Landfill & Drainage Engineering

Cell 32 is an engineered containment cell located at the most southerly end of the bank of containment cells. Construction was completed in August 2009. Cell design and finished construction details are located in [Appendix C](#). The available surface area of the cell is approximately 2,200 m².

An excavated pit is lined with a protective geofabric with an impermeable membrane above. The drainage layer sits on the base of the cell and is covered with a final woven protective geotextile. A layer of hoggin and screened IBA protects the basal liner. The pit has been filled with fly ash and in 2014 was covered with a layer of inert material to provide hard standing.

A drainage channel follows the roadside bank and has diptubes DT32N and DT32S which are used for leachate depth and quality monitoring, and leachate removal. A small lagoon lined with an impermeable membrane sits at the southern end. The cell surface is graded to direct surface runoff towards the lagoon during periods of heavy rainfall where it can be captured.

Access Routes

Access to Cell 32 requires the following route:

- Entry to the reclamation site over the IN weighbridge
- Use of the haul roads roughly following the sea wall to the cell

Roads are maintained as described in the Working Plan for the site. Speed humps are not provided.

Incompatible Wastes

No other cells are located below Cell 32. The waste stored below is inert fill used to reclaim land from the tidal lagoon. Leachate generated by seaweed is not expected to cause any adverse reactions travelling through the fly ash waste deposited in the cell or in contact with the liners.

Between 2014 and 2015, the cell was used as a dewatering facility for sludge cake which would then be transported to the ERF for incineration. This similar organic waste is considered compatible.

The nearest engineered containment cells are Cell 30 (bagged asbestos waste), the Cell 30 extension (bagged asbestos waste) and Cell 29 located below Cell 30 extension (inert fill contaminated with asbestos). Asbestos is considered stable and non-reactive and does not pose a risk of reaction if the wastes were to mix.

5.0 Waste Acceptance

Pre-Acceptance

Seaweed from beach cleansing is accepted by prior agreement only.

Only seaweed which has been delivered by GHE Highways is accepted.

All waste enters site over the IN weighbridge, where the driver makes their waste type known to the weighbridge operator via the intercom.

Visual Acceptance Criteria

The waste is inspected as far as practicable prior to tipping by viewing CCTV footage of the vehicle on the weighbridge. Waste is inspected again immediately upon tipping into the cell.

The waste must clearly have been removed from a beach and not have excessive amounts of sand, rocks, stones, plastics or other contaminants present.

The majority of the waste must be comprised of *vraic* (wrack and other brown algae). Small amounts of green sea lettuce are also permissible.

Loads which are exclusively or majority green sea lettuce are rejected.



Olfactory Acceptance Criteria

It is expected that seaweed loads delivered will have an odour, especially on hot days as decomposition rates increase.

Particularly odorous consignments, or those with a malodour attributable to wastes other than seaweed will be rejected.

Chemical Acceptance Criteria

There is no requirement for chemical testing prior to receiving seaweed waste. Samples from St Aubin's Bay provide a reference for expected chemical composition ([Appendix A](#)).

Quantities

The limited surface area of the cell means that quantities of seaweed exceeding 2000T in any year cannot be accepted. Stranded seaweed has been received and processed in cell 32 since 2016 in the following amounts:

Year	Quantity (T)
2016	706
2017	1105
2018	1329
2019	1846

6.0 Operational Details

Equipment

- 10t/16t tipping vehicle
- Payloader or 360 excavator
- Mechanical grader

Method & Techniques

- Waste seaweed is tipped into continuous lines in cell 32 by the delivery vehicle
- Windrows are formed with spacing suitable to allow access by waste handling machinery
- The windrows are rotated to allow aeration of the decomposing seaweed ensuring that any internal materials that have begun anaerobic digestion are exposed to oxygen, allowing a return to aerobic digestion
- Turning is undertaken regularly, but only when weather conditions are unlikely to cause a nuisance to nearby residents or businesses
- Mechanical grading is undertaken approximately one month after the final delivery of the year
- “Black sand” produced is used as an engineering material across the La Collette Reclamation Site; for dressing liners or embankments of engineered cells
- Any waste burnable litter is directed to the ERF for disposal
- Any remaining inert materials (rocks, stones) are directed to the tip head
- Oversized organic materials are returned to a windrow to continue decomposition over winter and mixed with new seaweed delivered the following season

Placement and Cover

Placement is as described in the methods above. Covering the waste is not required or desirable during the treatment process. Stockpiled black sand is placed upon and covered with an impermeable membrane in cell 26/28 to avoid dust generation, loss of product and site contamination.

7.0 Environmental Management

Pests

Insects

The location and types of seaweed treated at the Reclamation Site form the ideal habitat for kelp flies to breed.

Kelp flies, in particular *coelopa frigida*, are widely distributed and are found on most shorelines in the temperate Northern Hemisphere. They feed primarily on stranded algae and tend to populate near bodies of water. The life cycle is approximately 30 days; adults lay eggs on the leaves of *Lamniaria* or

Fucus species and hatch more quickly with higher temperatures. Larvae burrow into the pile and feed on the bacteria coating the leaves before pupating and emerging as adults. Blooms along shores create a pest problem for human beach-goers and may occasionally be blown inland.

One of the purposes of removing seaweed from beaches is to mitigate this problem.

The prevailing wind at the Reclamation site is south-westerly. The nearest residential area roughly north of cell 32 is approximately 900 m away with Havre des Pas beach between which would likely intercept most significant volumes of flying insects.

Scavenging Birds

Scavengers such as seagulls may be attracted to other detritus contaminating the seaweed, although visual screening prior to acceptance ensures the volume of edible materials is small enough that the number of birds does not cause a nuisance.

Scavenging Animals

As the seaweed remains damp for much of the time, it is unlikely to be attractive to scavenging mammals such as rats. Any which may be present would be deterred from nesting by regular turning of the windrows.

Emissions to Air

Odour

Anaerobic decomposition of seaweed generates ammonia (NH₃), hydrogen sulphide (H₂S) and methane (CH₄) gases. A build-up of these gases can become more odorous over time.

By laying seaweed out in narrow windrows, the surface area exposed to air is increased thus reducing anaerobic decomposition in favour of aerobic. Regular turning of windrows further increases the availability of air within the pile and reduces the rate at which NH₃, H₂S and CH₄ are produced and allows for natural dispersion as gases are generated. In addition, the placement of the waste is as far from sensitive receptors as is possible.

To reduce nuisance to human receptors including site users, windrows will be turned only when there is a northerly or no wind, ensuring any malodours are carried to sea.

An odour management plan will be implemented in the event that complaints are received from nearby residents.

Dust

The methods used to remove seaweed from beaches leads to the collection of additional materials such as sand which is retained whilst the seaweed remains damp.

On dry and windy days, the La Collette site is misted with sprayed water to reduce airborne dust.

Visible dust emissions are recorded on site diaries, and a dust management plan will be implemented in the event of excessive dust arising.

Emissions to Land

Visible debris and litter will be hand-picked during seaweed deposition. Any seen during routine site maintenance will be collected and any ejected during the grading process will be disposed of appropriately.

Landfill Gas

Landfill gas is a product of organic wastes decomposition. The seaweed received and processed is turned regularly to prevent anaerobic decomposition and allowing gases generated to disperse naturally before building up to harmful levels, and the end product is removed from the cell. It is therefore unlikely that landfill gases will be produced following completion of the decomposition process.

Monitoring for landfill gas generation is not required whilst the cell remains open and current usage continues. A risk assessment will be carried out prior to capping and will be used to inform any future monitoring regime.

Emissions to Water

Sources

The delivery of seaweed to the cell may produce contaminated leachate through the natural dewatering of the material as it settles. Expected contaminants include plastics, metals and dog waste in small amounts.

As seaweed holds water in its cell structure, this may also be released as it breaks down through decomposition. Seaweed, especially wrack varieties, is an effective pollution bioindicator and is known to absorb heavy metals which would be expected to be released during decomposition. Representative samples from St Aubin's Bay indicate the types and relative quantities of contaminants released.

Rainwater runoff may wash any surface contamination of the seaweed into the resulting leachate.

Prevention

By holding the seaweed in an engineered cell, any contaminants leaching from the seaweed are contained by the impermeable membrane, while high-volume excess runoff is directed to a small lagoon, allowing any excess liquor to be removed as required.

Monitoring

Water quality monitoring is undertaken according to a schedule set out in the Operational Water Quality Monitoring Plan. Dip tubes are used to monitor leachate quality at the potential polluter source. Boreholes represent the pollution pathway whilst the surrounding sea surface water is the nearest sensitive receptor as the waters are controlled and a designated Ramsar site.

Dip tube DT32S is monitored on a six-monthly basis. It represents the potential pollution source as leachate and runoff from natural dewatering. Inorganic and dissolved metals suites are analysed every six months, with the addition of an organics suite once per year.

Borehole BH2RD is monitored quarterly, with inorganic and dissolved metals suites analysed each quarter, and the organics suite analysed every six months. It provides an understanding of groundwater at close proximity to the sea wall, and provides an indication of possible leaks being carried inland by the incoming tide.

Surface water SW6 and SW8 represent the nearest receptor sampling point on the potential pollution pathway. It is monitored quarterly, to the same regime as BH2RD.

Analysis of results ([Appendix B](#)) from 2011 to date indicate that fluctuating determinants at source do not influence the results seen at the pathway or receptor sites, although there is sometimes a correlation seen when comparing BH2RD to SW6 and SW8. This shows that the engineered containment is effective.

8.0 Environmental Risk Assessments

Receptor	Source	Harm	Pathway	Probability of Exposure	Consequence Severity	Magnitude of Risk	Justification	Risk Management	Residual Risk
Ground and sea water	Contaminated runoff from surface contaminants and decomposition products	Water quality deterioration, oxygen depletion, fish kill, algae blooms.	Runoff of surface water during settling, rainwater or decomposition products. Transport through soil by groundwater.	Low	Moderate	Moderate	Waste originated from the sea and would usually remain stranded on beaches until washed or removed by the next tide. No evidence of water quality deterioration around the island.	Waste is stored in an engineered containment cell with scheduled leachate monitoring and extraction.	Low
Local human population	Litter contaminants in waste	Nuisance, loss of amenity.	Air transport	Low	Low	Low	Small amounts of litter present, often tangled with seaweed waste. Litter removal undertaken regularly across the site.	Visible litter is removed during acceptance and screening.	Low
Local human population	Odour	Nuisance, loss of amenity.	Air transport then inhalation	Moderate	High	High	Historic complaints indicate malodour travels without dispersing.	Seaweed is turned regularly to reduce anaerobic decomposition and associated odour. Turning is carried out only when wind is northerly.	Moderate
Local human population	Pests: flies	Nuisance, loss of amenity.	Reproduction then air transportation inland	Low	Low	Low	Distance to nearest residential receptor is >900 m. Treatment carried out at maximum possible distance between receptors and seaweed.	Regular windrow turning to reduce the number of insects hatching at the same time and encouraging shoreline waders to eat adult flies and larvae brought to the surface.	Low

Receptor	Source	Harm	Pathway	Probability of Exposure	Consequence Severity	Magnitude of Risk	Justification	Risk Management	Residual Risk
Local human population	Pests: scavenging birds	Harm to human health from wastes carried off site and faeces. Nuisance, loss of amenity.	Air transport and deposition.	Low	Moderate	Moderate	Little food attractive to scavenging birds present.	Litter removal and regular turning reduces food sources further.	Low
Local human population	Pests: scavenging mammals	Harm to human health from wastes carried off site and faeces. Nuisance, loss of amenity.	Transportation over land.	Low	Moderate	Moderate	Wet environment unattractive as a nesting site. Little attractive food present.	Regular turning reduces food sources and availability of nesting sites. Bait boxes placed across site.	Low
Local human population	Dust	Nuisance, loss of amenity.	Air transport then deposition or inhalation.	Low	Low	Low	Relatively large particle size of sand unlikely to become airborne. Waste remains wet, naturally suppressing dust.	Defined dust management and suppression procedures in place.	Low
Local human population. Sea water & marine environment.	Fire	Air quality deterioration, smoke and fumes, loss of amenity.	Air transport.	Moderate	High	High	Decomposing seaweed produces flammable methane gas. Dried seaweed has historically been used as a fuel source.	Fire prevention policies are in place. Site security measures in place and reviewed regularly to prevent unauthorised access to the site. Regular turning of windrows reduces build-up of flammable gases.	Moderate

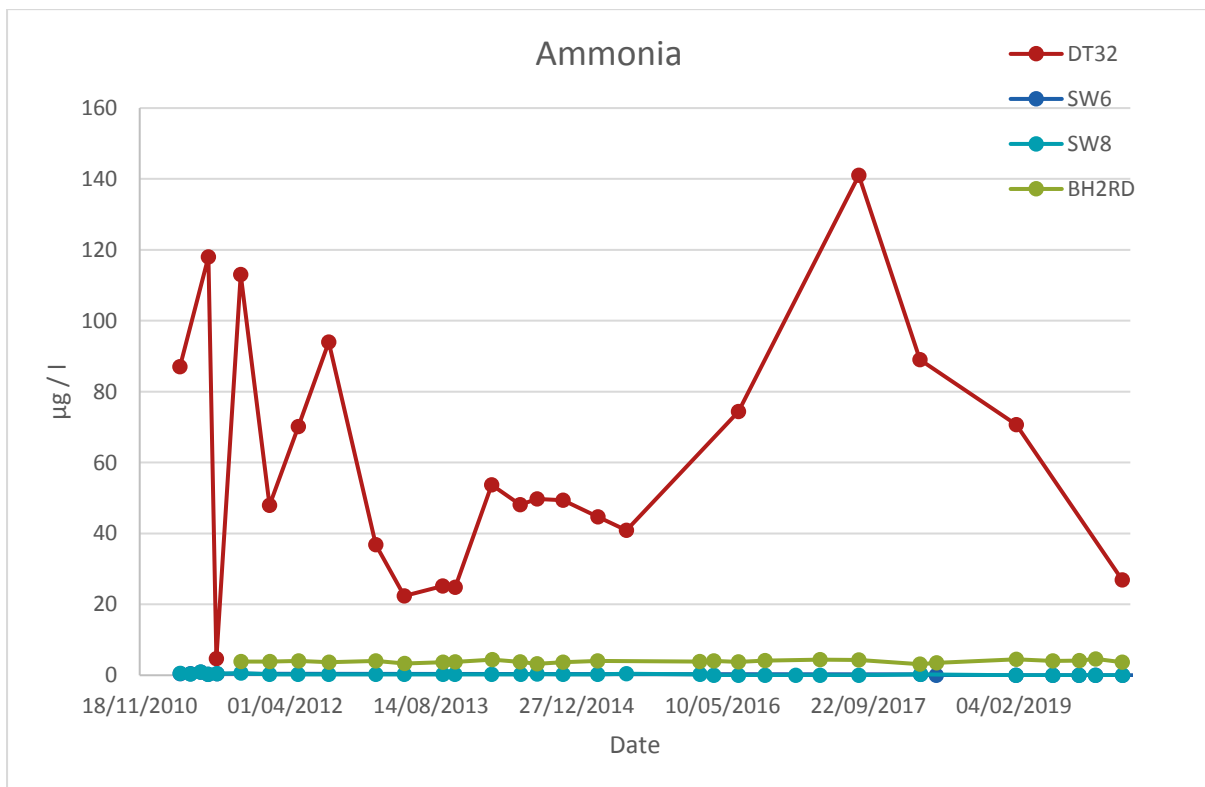
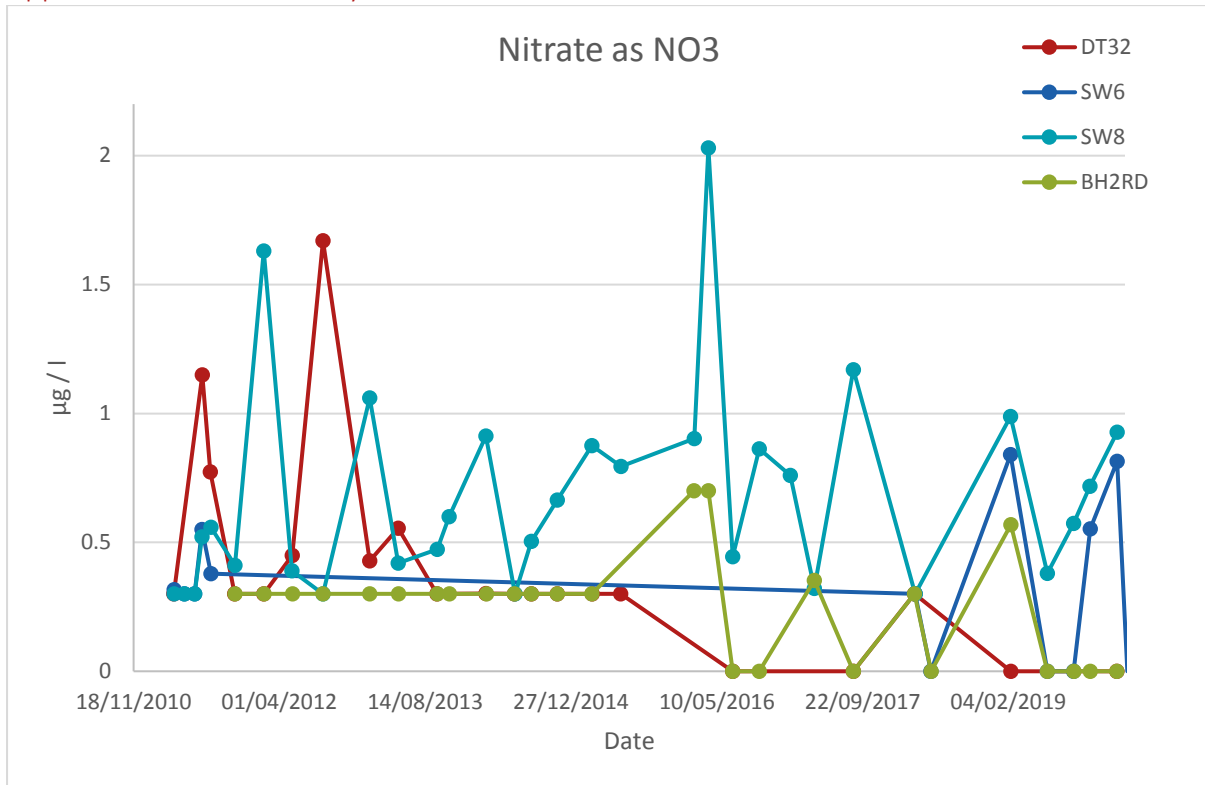
Appendix A – Chemical Analysis of Stranded Seaweed from St Aubin’s Bay

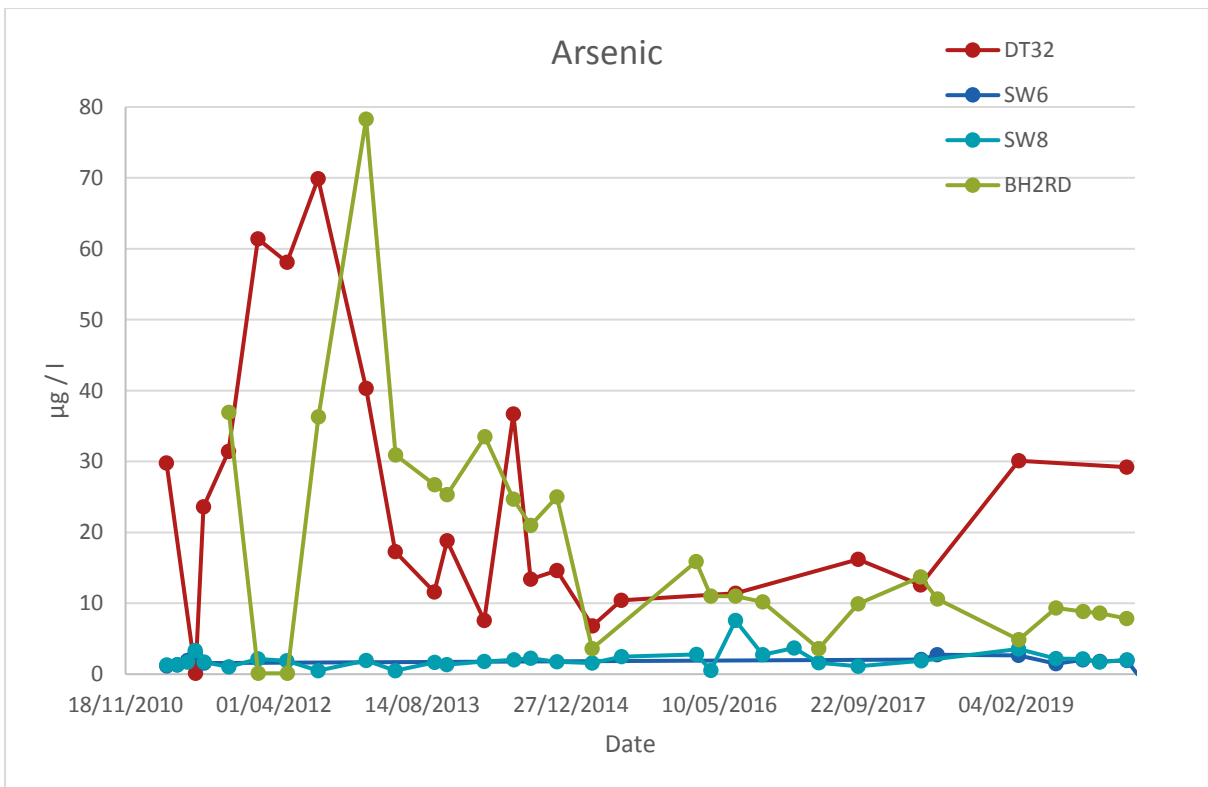
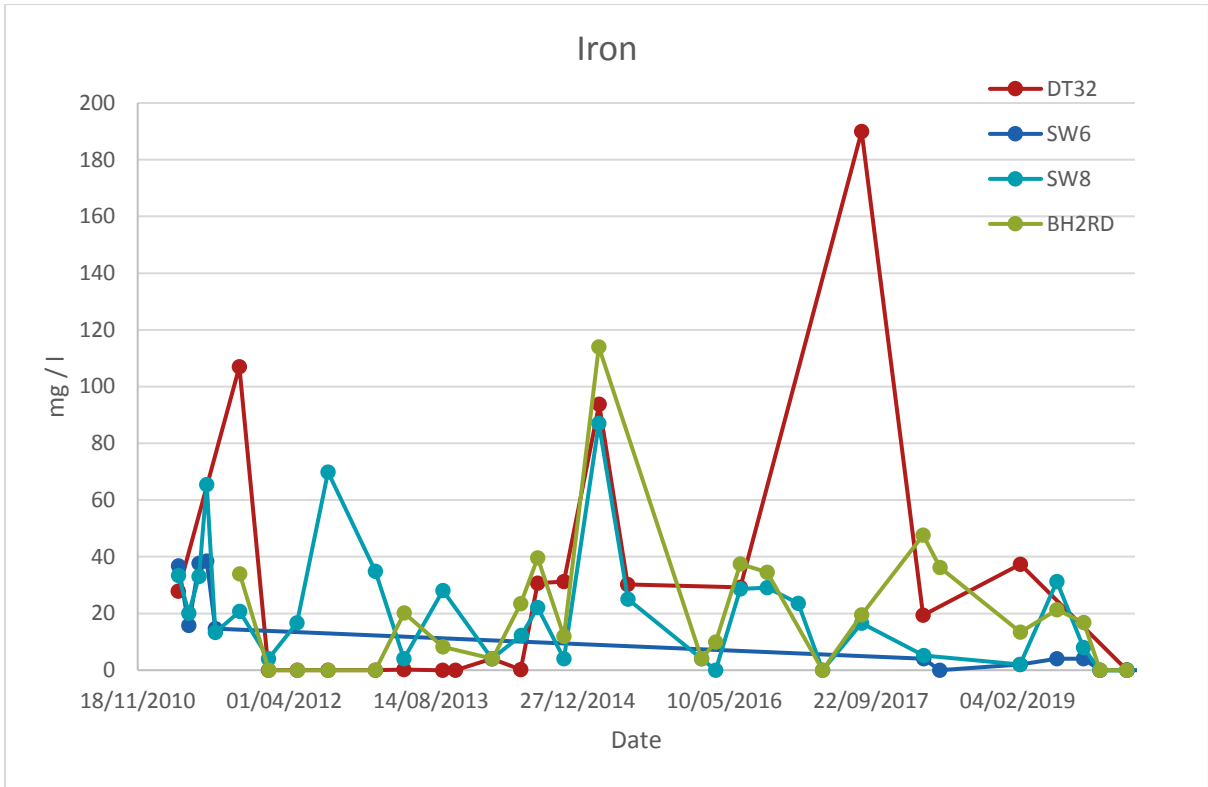
Determinand	Units (wet)	Sample 74184	Sample 74185
Dry Matter	%	15.6	14.8
pH	pH unit	6.61	6.23
Total Nitrogen	Mg / kg	3200	2990
Ammoniacal Nitrogen	Mg / kg	17.94	1.48
Nitrate Nitrogen	Mg / kg	1.56	1.48
Total Phosphorus	Mg / kg	630	600
Total Potassium	Mg / kg	5750	5270
Total Magnesium	Mg / kg	6970	6880
Total Sulphur	Mg / kg	16810	17170
Total Copper	Mg / kg	0.43	0.36
Total Zinc	Mg / kg	2.04	1.61
Total Sodium	Mg / kg	13210	12990
Total Calcium	Mg / kg	2055.3	1901.7
Iron	Mg / kg	601.38	255.15
Molybdenum	Mg / kg	0.37	0.15
Manganese	Mg / kg	3.48	2.60
Lead	Mg / kg	0.31	0.3
Cadmium	Mg / kg	0.02	0.02
Mercury	Mg / kg	0.03	0.03
Nickel	Mg / kg	0.25	0.21
Chromium	Mg / kg	0.62	0.61
Arsenic	Mg / kg	0.91	1.17



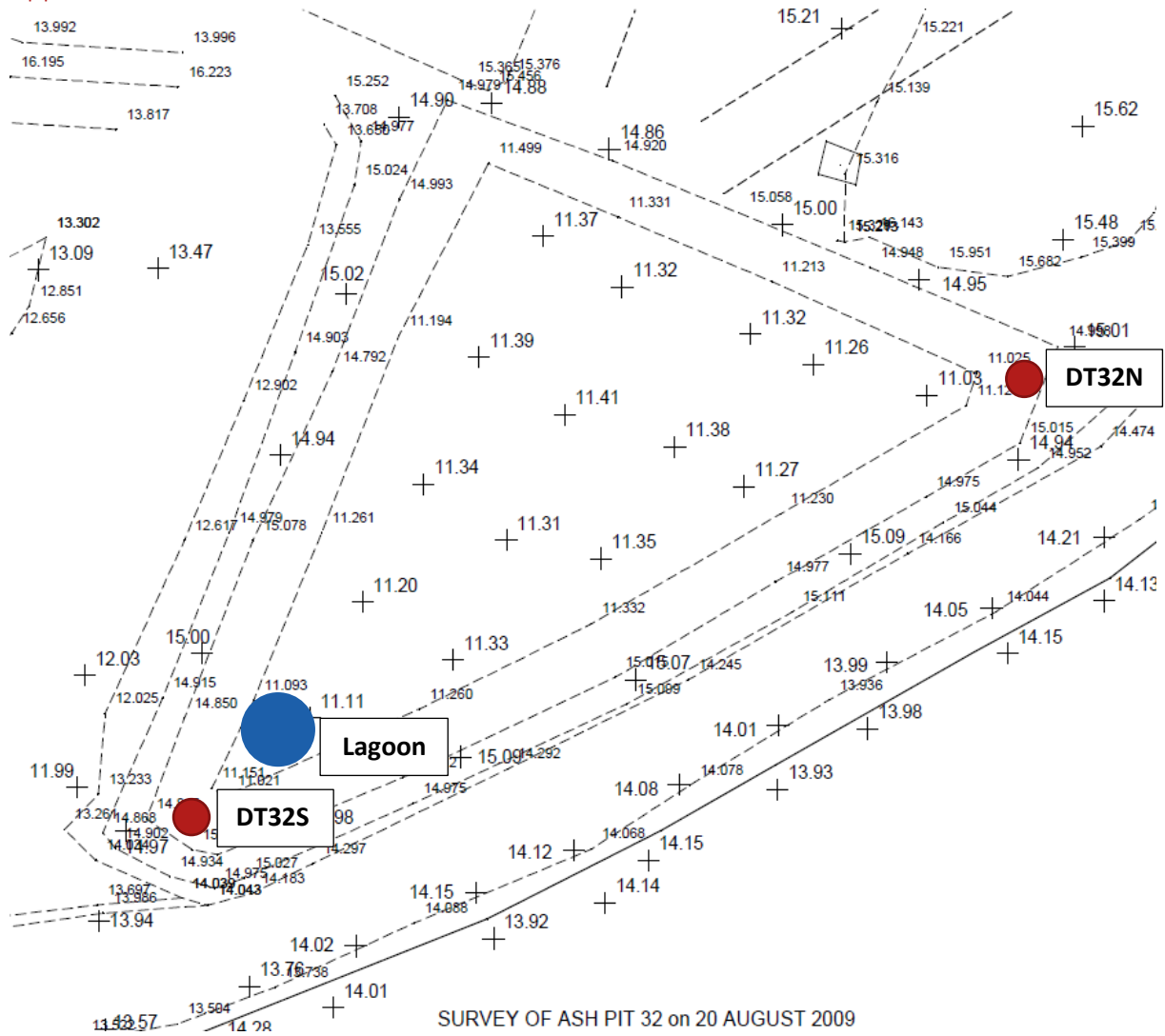
Sample locations St Aubin’s bay, 17th August 2016

Appendix B – Water Quality Data





Appendix C – Cell 32 Construction



As-Built Survey Drawing 656/175

NOTES ABOUT THE LINING MATERIALS

THE BASE, THE DRAINAGE CHANNEL, THE SIDE SLOPES AND A MINIMUM OF 1 METRE OVERLAP AT THE TOP ARE TO BE COVERED WITH A 400g/m² PROTECTIVE GEOFABRIC

AN IMPERMEABLE MEMBRANE LINER IS TO BE LAID ON THE 400g/m² PROTECTIVE LAYER.

THE IMPERMEABLE MEMBRANE ON THE BASE OF THE ASH PIT IS TO BE COVERED WITH A DRAINAGE LAYER

THE IMPERMEABLE MEMBRANE ON THE SIDE SLOPES AND A MINIMUM OF 1 METRE OVERLAP AT THE TOP ARE TO BE COVERED WITH A 400g/m² PROTECTIVE GEOFABRIC

THE FINAL COVERING FABRIC SHALL BE A LAYER OF 15kN WOVEN GEOTEXTILE COVERING THE BASE THE SIDE SLOPES AND THE OVERLAP AT THE TOP

Lining Specification, Drawing 656/169

Appendix D – Site General Arrangement, 2020

