

Consolidation of an Environmental Monitoring Programme
for
Sant Antnin Waste Treatment Plant

June 2021

Introduction

The overall objective of this document is to compile a comprehensive report comprising of an Environmental Monitoring Programme (EMP) and the rationale behind the design of such monitoring programme for the Sant Antnin Waste Treatment Plant (SAWTP) as required by the Integrated Prevention and Pollution Control (IPPC) permit. The EMP takes into consideration all the monitoring presently carried out on site, both operational and that requested through the IPPC permit. The parameters being tested and the frequency with which they are being tested have been assessed and reviewed.

This EMP includes a description of the waste treatment plant and its activities, operations, and surroundings. This is essential to understand the chemical compounds that may be released during operation, and in return, the potential environmental impact on site and on the surroundings elicited by the plant. Unfortunately, the Materials Recovery Facility (MRF) Process no longer takes place on site due to the fire incident that occurred in May 2017. However, a manual process known as the Rudimentary Sorting Line (RSL) shall now take place instead to cater for “grey bag” recyclable waste. Moreover, a Ferrous sorting line was added in the list of operations here at SAWTP and in the near future a glass sorting line will be operational.

History of the site

Scant information about any historical industrial uses of the site could be found. This is most likely because of the fact there was indeed no past industrial activity on the site. That general area on the outskirts of Marsascala was used as a broad unregulated landfill during the times of the British. The Family Park adjacent to the site is built almost entirely on the former dumping site. This is denoted by its elevation when compared to the adjacent road level. It is likely that the SAWTP is built, at least in part, also on land which formerly housed the landfill. The Water Services Corporation (WSC) water treatment tanks were built besides the site in the 1970s. These are to date still operational.

Given the fact that a landfill existed on or very near to the SAWTP, the baseline levels of contaminants in terrain on site and close by are most likely higher than average. Unfortunately, no onsite or offsite baseline soil, water or air analysis exists. This should have ideally been carried out before the commissioning of the SAWTP to be able to compare current levels with levels that existed prior to operational activity. It is pointless to carry out baseline tests at this stage after years of operations. However, monitoring has been carried out regularly in recent years. In the absence of proper baseline levels, current levels should be compared to previous data and any upward trends should be noted and investigated further.

A major fire incident occurred on the 22nd May 2017. The fire originated from the RDF stored in the outside yard and progressed until the other end of the MRF shed opposite the MTP, completely destroying it and its contents in the process.

Site Plan

The site plan of SAWTP, showing hardstanding and markings of items of interest, is presented in Figure 1 and Figure 2.

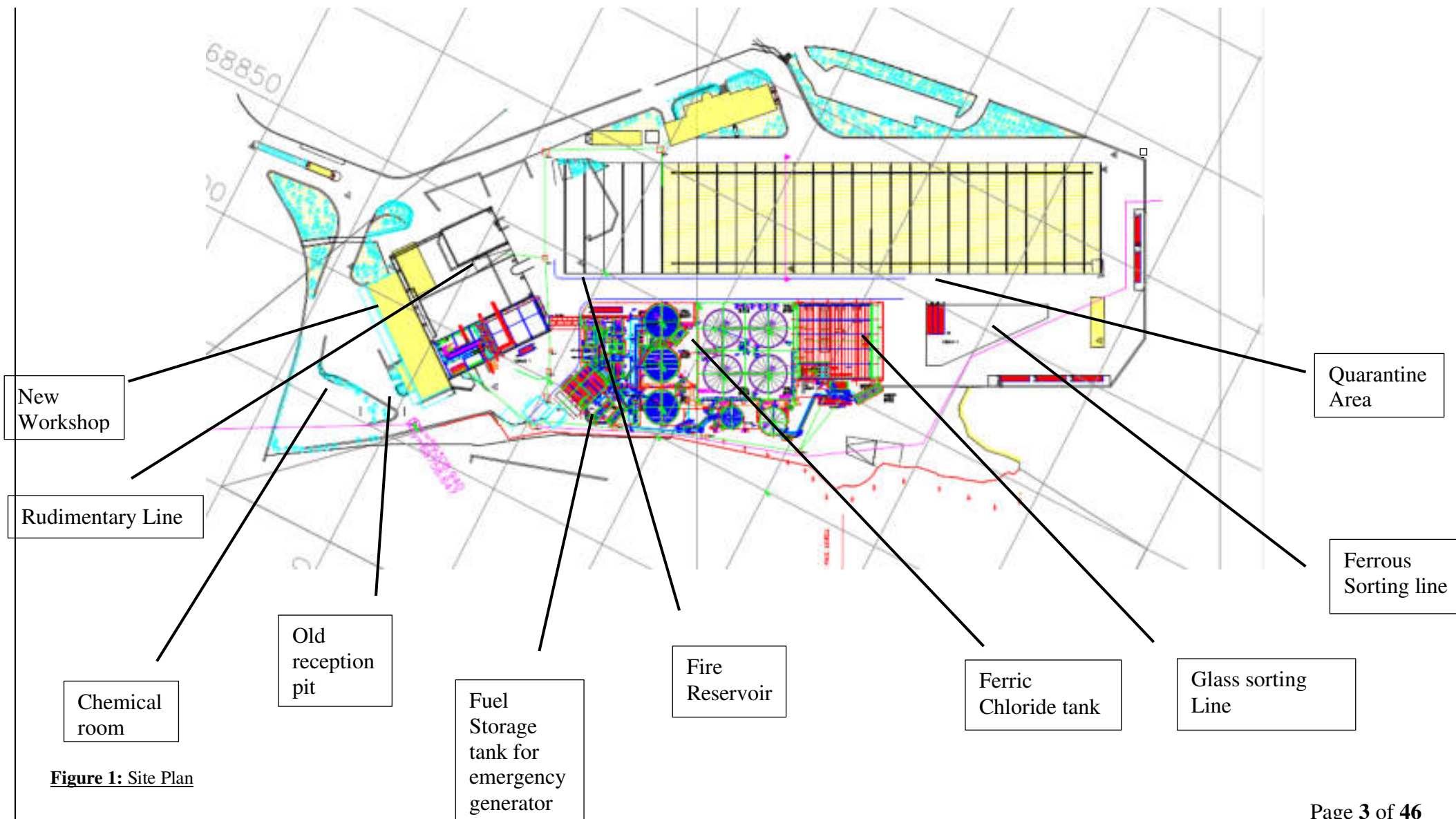
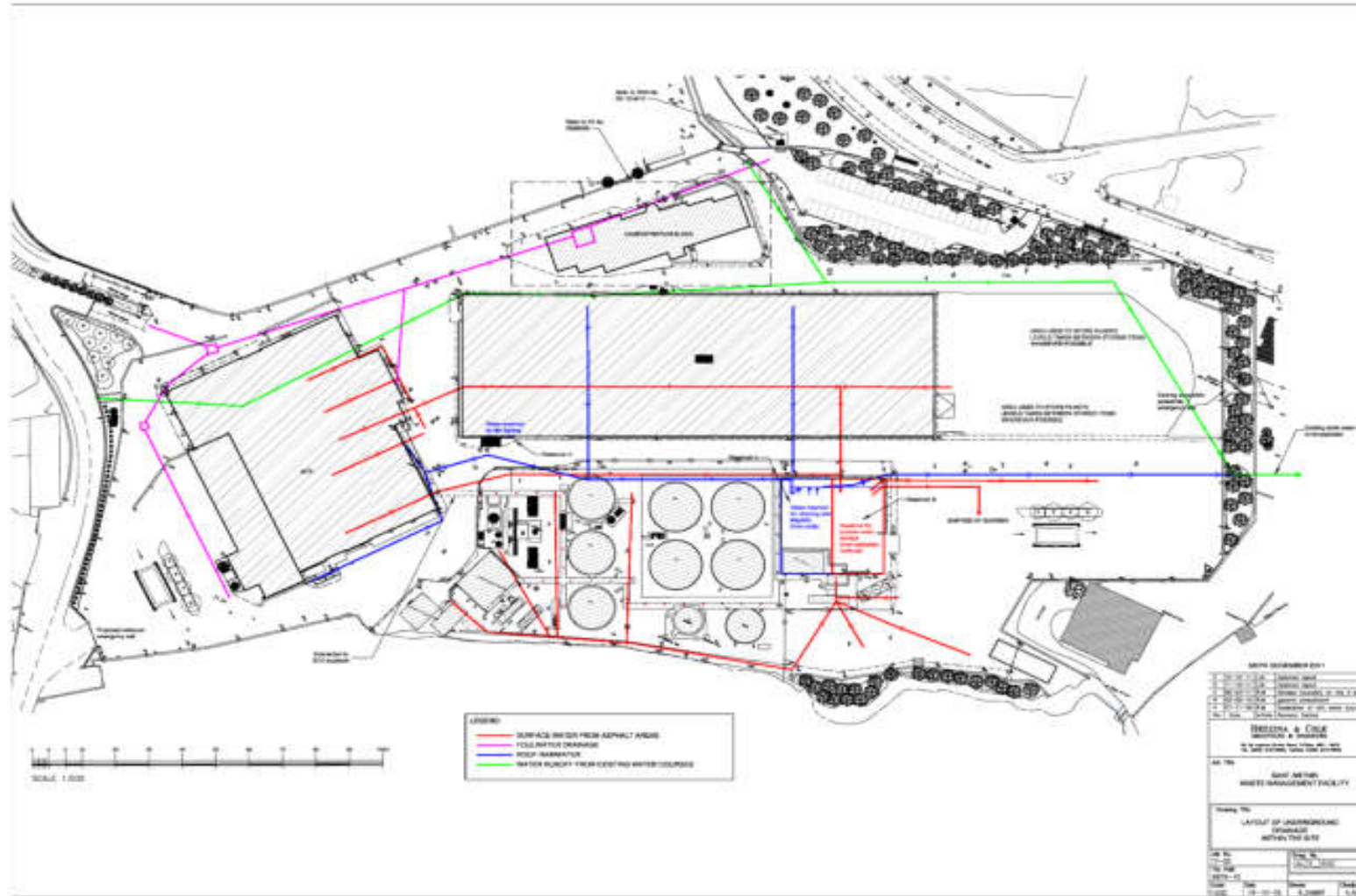


Figure 1: Site Plan

Figure 2: Site Plan



Tanks & Reservoirs present on site

There are 3 above ground tanks, 3 beneath ground reservoirs, and a disused pit present on site. A description of each follows.

1. Process Water tank
 - Location: Besides Gas Bubble
 - Volume: 805m³
 - Diameter: 11.10m
 - Height at highest: 8.47m
 - Height at lowest: 8.32m
 - Built with panels, not double walled
 - Bunding present: No

2. External Yard Reservoir
 - Location: Beneath External Yard
 - Volume: 1800m³
 - Use: Collection of black water – leachate of digestate
 - Permeability: See Figure 3 and Figure 4

3. De-watering Reservoir
 - Location: Beneath Compost Shed
 - Volume: 1200m³
 - Use: Stored fresh water supplied by bowsers for use in process water
 - Permeability: See Figure 3 and Figure 4

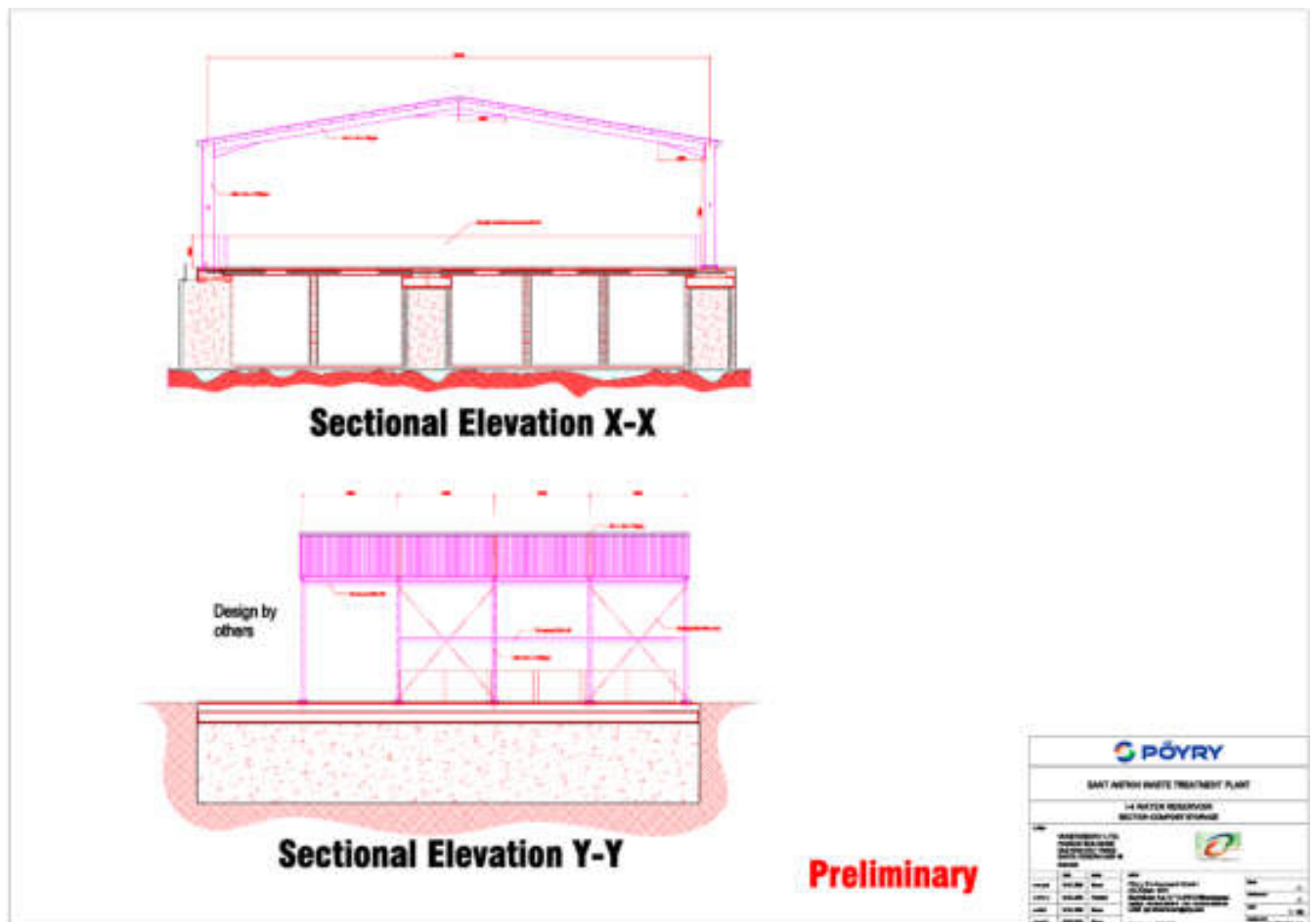


Figure 3: Layout plan for Compost & De-watering Reservoirs

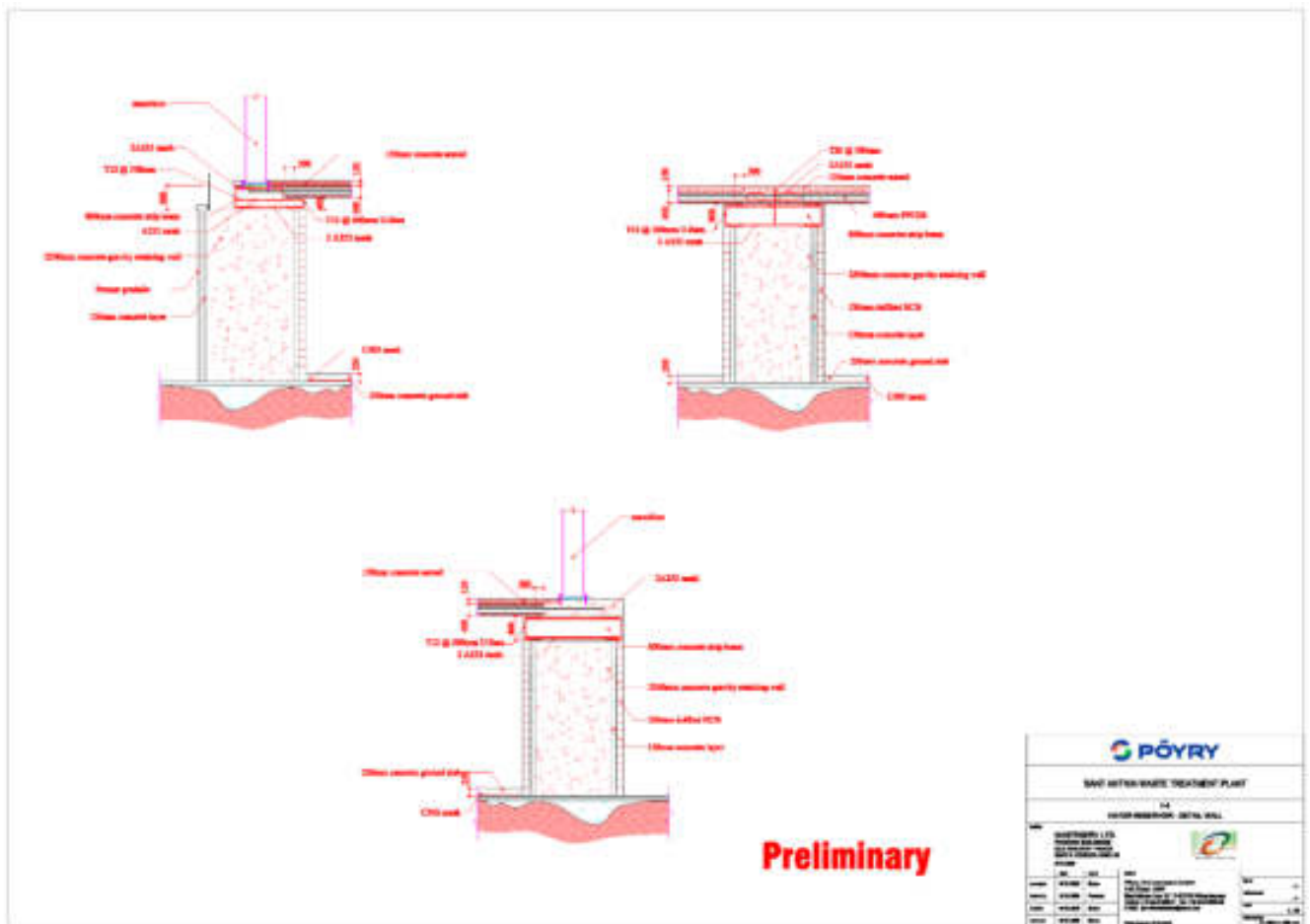


Figure 4: permeability plan for Compost & De-watering Reservoirs

4. Fire Reservoir

- Location: Besides ex-MRF site (see Figure 1)
- Volume: 600m³
- Permeability: See Figure 5
- For more information refer to Fire Protection Report by Fire Engineer Fred Wilson dated 11th December 2007

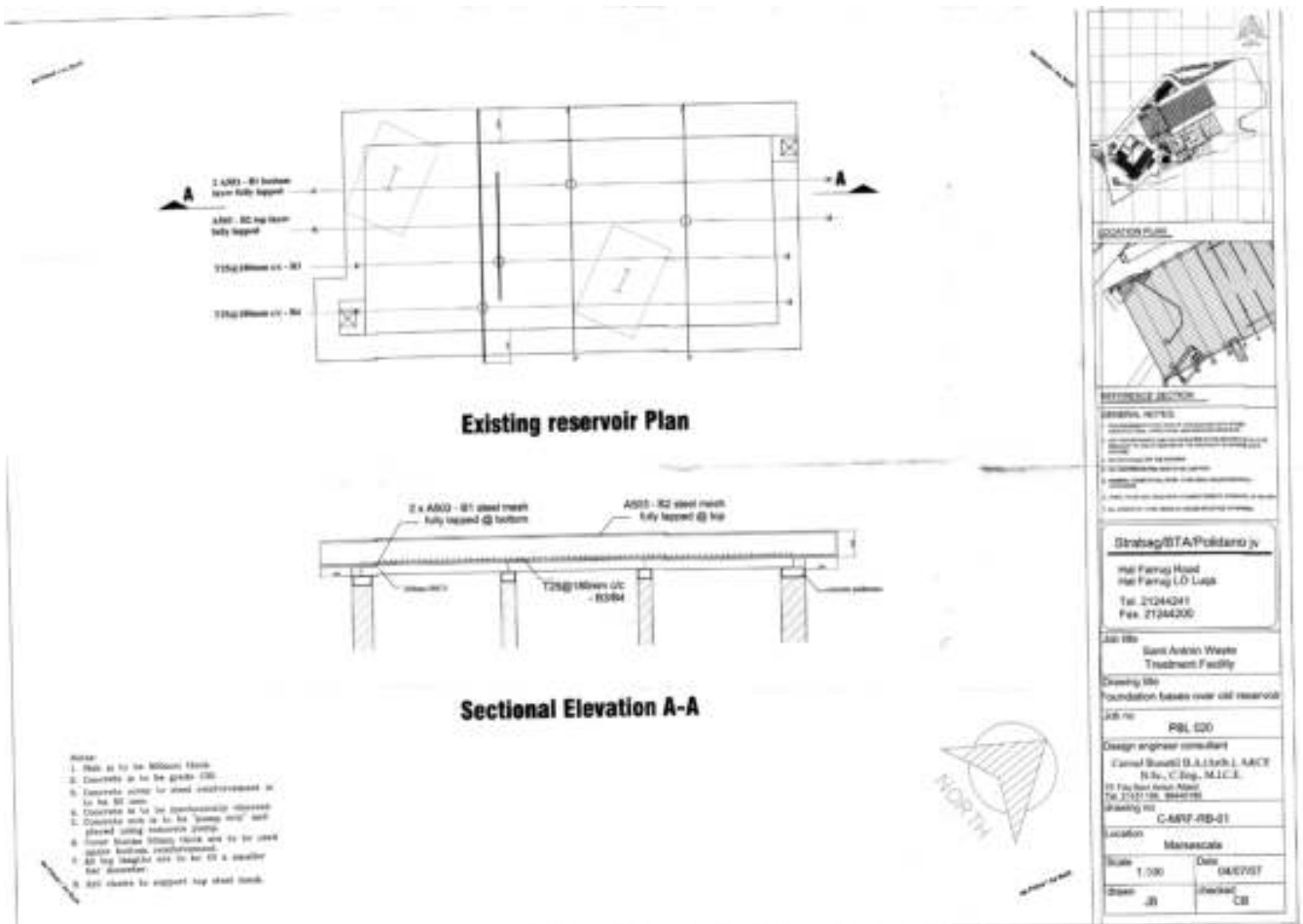


Figure 5: Fire-water reservoir plan

5. Old reception pit

- Location: Beneath WAS (see Figure 1)
- Storage capacity: Unknown. Currently disused.
- Bunding present: No

6. Ferric chloride tank (see Figure 6)

- Quantity: 1
- Location: See Figure 1
- Storage capacity: 17m³
- Bunding present: No

7. Fuel storage tank (see Figure 7)

- Quantity: 1
- Location: See Figure 1
- Storage capacity: 3m³
- Bunding present: Yes



Figure 6: Ferric Chloride storage tank



Figure 7: Fuel storage tank

External waste storage areas present on site

There are currently 3 external waste storage areas present on site. These are:

1. External Shed
2. Yard near family park
3. Ex-MRF site (began to be used as such after the MRF shed was destroyed by the fire incident)

The external yard was used to store the digestate produced from the OPP process. This was deposited via the two conveyor belts. The digestate is mechanically shifted around the External Yard with a wheel loader to make use of the entire space and avoid a pile up beneath the conveyors. The External Yard is surrounded by three high walls at the sides and rear but is open on the front to allow vehicular access. A gutter is present along the front to collect leachate and redirect it to the External Yard Reservoir below. The photograph in Figure 8 shows the external yard. Please note that the OPP is not in operation so no digestate is produced.



Figure 8: Digestate heap in the External Yard beneath the two conveyors

The storage area in the Yard near the family park has been extended to incorporate also the entire area formerly occupied by the MRF shed. The list of wastes stored in this combined area is given in Table 1. Photographs of each waste stream follow.

Table 1: List of waste stored at Yard – Ex-MRF site

Type	Description	EWC Code
1	Aluminium Cans	19 12 03
2	Ferrous Cans	19 12 02
3	PP Ropes (unprocessed)	20 01 39
4	EPS	19 12 04
5	Car Bumpers	16 01 19
6	PP Crates	19 12 04
7	Aluminium Profile	19 12 03
8	Glass Packaging	19 12 05
9	Rigid Plastic (Deckchairs)	19 12 04
10	Plastic Toys (Mixed Plastics)	19 12 04
11	PET Clear and Colour	19 12 04
12	HDPE	19 12 04
13	Cardboard	19 12 01
14	Grey/Green Bag (unprocessed)	15 01 06
15	Stainless steel (sinks etc)	19 12 03
16	Metal Ferrous Scrap	19 12 02

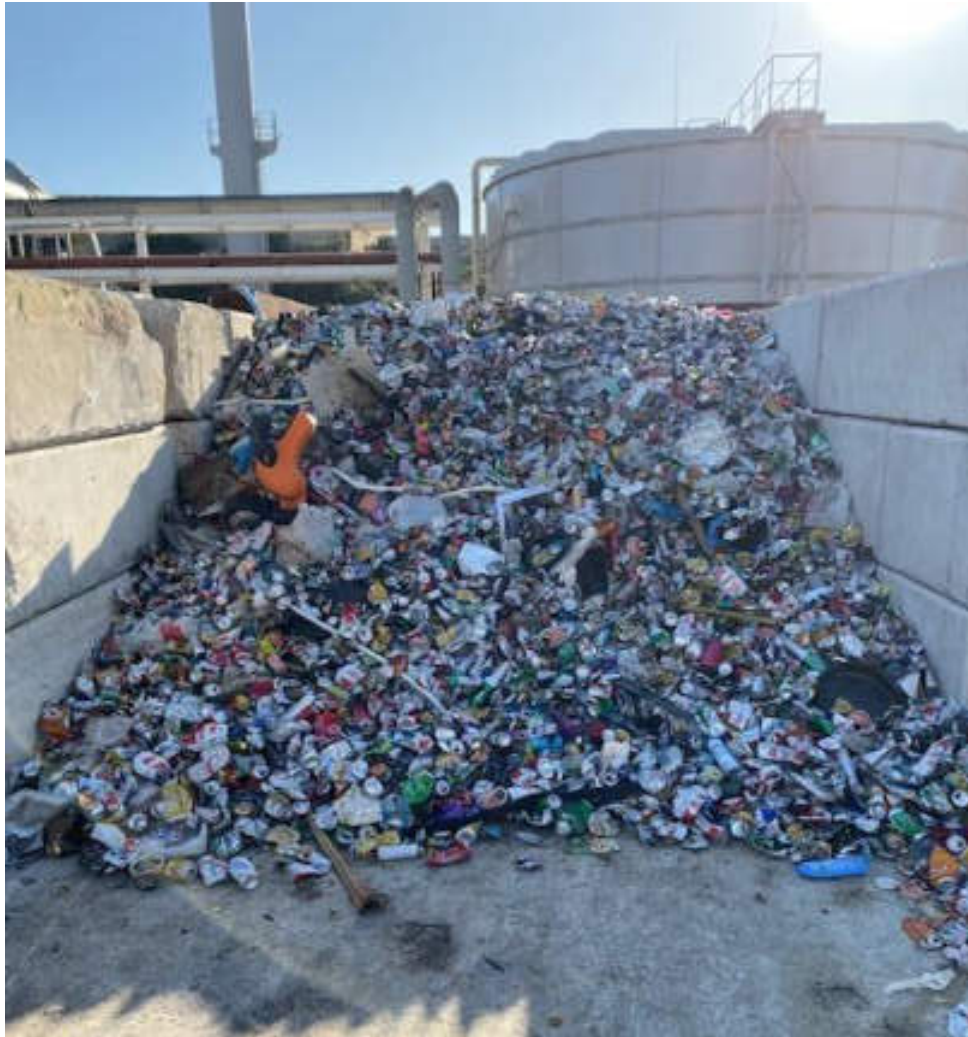


Figure 9: Aluminium cans (EWC 191203)



Figure 10: Ferrous cans (EWC 191202)



Figure 11: PP Ropes (unprocessed) (EWC 200139)



Figure 12: EPS (expanded polystyrene) (EWC 191204)



Figure 13: Car bumpers (EWC 160119)



Figure 14: PP crates (EWC 191204)



Figure 15: Aluminium profile (EWC 191203)



Figure 16: Glass packaging (EWC 191205)



Figure 17: Rigid Plastic (Deckchairs) (EWC 191204)



Figure 18: Plastic toys (mixed plastic) (EWC 191204)



Figure 19: PET Clear and Colour (EWC 191204)



Figure 20: HDPE (EWC 191204)



Figure 21: Cardboard (EWC 191201)



Figure 22: Grey/Green Bag (unprocessed) (EWC 150106)



Figure 23: Stainless steel (EWC 191203)



Figure 24: Metal ferrous scrap (EWC 191202)

Monitoring requirement as per IPPC Permit IP 0005/13/B

Wasteserv is obliged to maintain and implement an EMP which ensures that emissions are monitored as specified in this Permit, and the results of such monitoring shall be assessed. The programme shall ensure that monitoring is carried out under an appropriate range of operating conditions, and that measurements for the determination of concentrations of substances specified in this Permit shall be carried out representatively.

Sampling and analysis of all chemical compounds shall be carried out following appropriate CEN standards. If CEN standards are not available, ISO standards, national or international standards, which will ensure the provision of data of an equivalent scientific quality, as agreed in writing with the Authority, shall apply.

Monitoring equipment, techniques, personnel and organisations employed for the EMP of this Permit shall be from a certified or accredited laboratory or laboratory in the process of accreditation, as confirmed by the National Accreditation Body (NAB-Malta). As part of the Annual Environmental Report (AER), Wasteserv shall provide evidence of certification or accreditation of laboratories used for the emissions monitoring programme. Wasteserv shall notify the Authority at least 10 working days in advance of undertaking monitoring and/ or spot sampling.

Wasteserv shall maintain records of all monitoring taken or carried out (this includes records of the taking and analysis of samples, instrument measurements (periodic and continual), calibrations, examinations, tests and surveys) and any assessment or evaluation made on the basis of such data, for at least a period of 5 years. Such records may be requested at any time by ERA. Albeit all that is specified in this EMP, ERA reserves the right to request for additional monitoring, as deemed necessary.

Discharges to the public sewer

Wasteserv must seek to obtain a Sewer Discharge Permit from the Water Services Corporation (WSC) and shall supply all the information requested by the WSC and take all the necessary actions as instructed by the WSC and/or ERA. Wasteserv shall forward to ERA a copy of any Sewer Discharge Permit issued by the Water Services Corporation within 10 days of its issue.

Monitoring shall be carried out annually from the identified sewer discharge points, or on an *ad hoc* basis if and when required, and analysis shall be carried out for the parameters listed in Schedule C of S.L 545.08, or as may be amended by the WSC. The parameter list given in Schedule C of S.L 545.08 is reproduced in Table 2.

Wasteserv shall follow the conditions of the Sewer Discharge Permit, as may be updated from time to time by the WSC and the provisions of the Sewer Discharge Control Regulations (S.L 545.08).

Wasteserv shall inform ERA of any changes to the Sewer Discharge Permit of the installation or changes made by the WSC to monitoring requirements or frequency of monitoring. Wasteserv shall report discharges to the sewer as part of the Annual Environmental Report of the installation, in addition to any other reporting requirements set by the WSC.

No discharges of trade effluent into the sewer (whether from off-site or on-site discharge points) are allowed, unless specifically authorised by the WSC. Prior to any discharge of trade effluent, the Operator must provide evidence of authorisation from the WSC to ERA.

Table 2: Schedule C of S.L 545.08

N°	Parameter	Disposal Limits		Method
1	pH	6 – 10	scale	APAT CNR IRSA 2060 Man 29 2003
2	Temperature	40	°C	APAT CNR IRSA 2100 Man 29 2003
3	Settleable Solids (Total)	20	mg/l	APAT CNR IRSA 2090 C Man 29 2003
4	Suspended Solids (Total)	500	mg/l	APAT CNR IRSA 2090 B Man 29 2003
5	Nitrogen (Kjeldahl)	100	mg/l	EN 25663:1993
6	Sulphide	10	mg/l	APAT CNR IRSA 4160 Man 29 2003
7	Hydrocyanic Acid	10	mg/l	<i>In situ meter</i>
8	Sulphate	1000	mg/l	EN ISO 10304-1:2009
9	Oil and Grease (free & emulsified)	200	mg/l	APAT CNR IRSA 5160 A1 Man 29 2003
10	Chlorine (Free)	100	mg/l	<i>In situ meter</i>
11	Chloride	1000	mg/l	EN ISO 10304-1:2009
12	Chromium (Dissolved)	-	mg/l	EN ISO 17294-2:2016
	Chromium (Total)	5	mg/l	EN ISO 17294-2:2016
13	Silver (Dissolved)	-	mg/l	EN ISO 17294-2:2016
	Silver (Total)	5	mg/l	EN ISO 17294-2:2016
14	Nickel (Dissolved)	-	mg/l	EN ISO 17294-2:2016
	Nickel (Total)	5	mg/l	EN ISO 17294-2:2016
15	Copper (Dissolved)	-	mg/l	EN ISO 17294-2:2016
	Copper (Total)	5	mg/l	EN ISO 17294-2:2016
16	Lead (Dissolved)	-	mg/l	EN ISO 17294-2:2016
	Lead (Total)	1	mg/l	EN ISO 17294-2:2016
17	Zinc (Dissolved)	-	mg/l	EN ISO 17294-2:2016
	Zinc (Total)	10	mg/l	EN ISO 17294-2:2016
18	Total non-ferrous metals Calculation	30	mg/l	Calculation
19	Total soluble non-ferrous metals Calculation	10	mg/l	Calculation
20	Arsenic (Dissolved)	-	mg/l	EN ISO 17294-2:2016
	Arsenic (Total)	0.05	mg/l	EN ISO 17294-2:2016
21	Fluoride	10	mg/l	EN ISO 10304-1:2009
22	Boron (Dissolved)	-	mg/l	EN ISO 17294-2:2016
	Boron (Total)	2	mg/l	EN ISO 17294-2:2016

It should be pointed out that the analysis of pH, temperature, electrical conductivity, hydrocyanic acid and free chlorine must be taken on site using appropriately calibrated *in situ* instruments within 15 minutes of sample collection. This is because these parameters tend to vary right away. Analysis for the remaining parameters must be carried out at an ISO 17025:2017 Accredited laboratory within 48 hours of sampling, to ensure that sample integrity is maintained. The methodologies used for laboratory analysis of the individual parameters must be established standard methods.

Rudimentary Sorting Line

The Grey Bag is loaded into the bag opener. The Bag Opener opens the bags and the material falls onto an incline conveyor. The incline conveyor transports the material from the bag opener to the sorting conveyor. Sorters are stationed at the sorting conveyor; each assigned a material to collect. The collected materials are dropped into the underlying bunkers and baled accordingly. The bales are then transported to the storage areas. This is depicted in

Figure 25.

Ferrous sorting line

Unprocessed ferrous is transferred from Malta North to SAWTP. This is stored in the dedicated receiving area for the unprocessed ferrous that is situated next to the FSL.

The unprocessed ferrous is sprayed with water to attenuate the amount of dust. The wheel loader operator fills the self-dumping hoppers with unprocessed ferrous. The forklift driver grabs the self-dumping hopper and unloads it in the hopper of the FSL. The unprocessed ferrous goes on the first conveyor belt leading to a suspended permanent magnet. The ferrous parts go on a second conveyor belt, while the non-ferrous parts keep going to the reject's container. The ferrous metal that pass on the second conveyor belt is further cleaned manually by the 4 operatives. The clean ferrous go to the clean ferrous container, while the rejects removed by the operators go to another reject's container.

The clean ferrous is sold and the rejects are taken to the landfill.

Glass sorting line

Unprocessed glass packaging is stored in the dedicated receiving area. The glass is fed by means of a wheel shovel in a vibrating feed hopper. From the feeding hopper the glass is passed on a conveyor belt where it is manually cleaned from bulky items, CSP (Ceramics, Stones and Porcelain) contaminates and ferrous objects. The clean glass packaging is collected and stored until sold. The rejects are taken to the landfill.

Mass Flow Diagram & Emissions Inventory

Date of last update: 19.05.2021

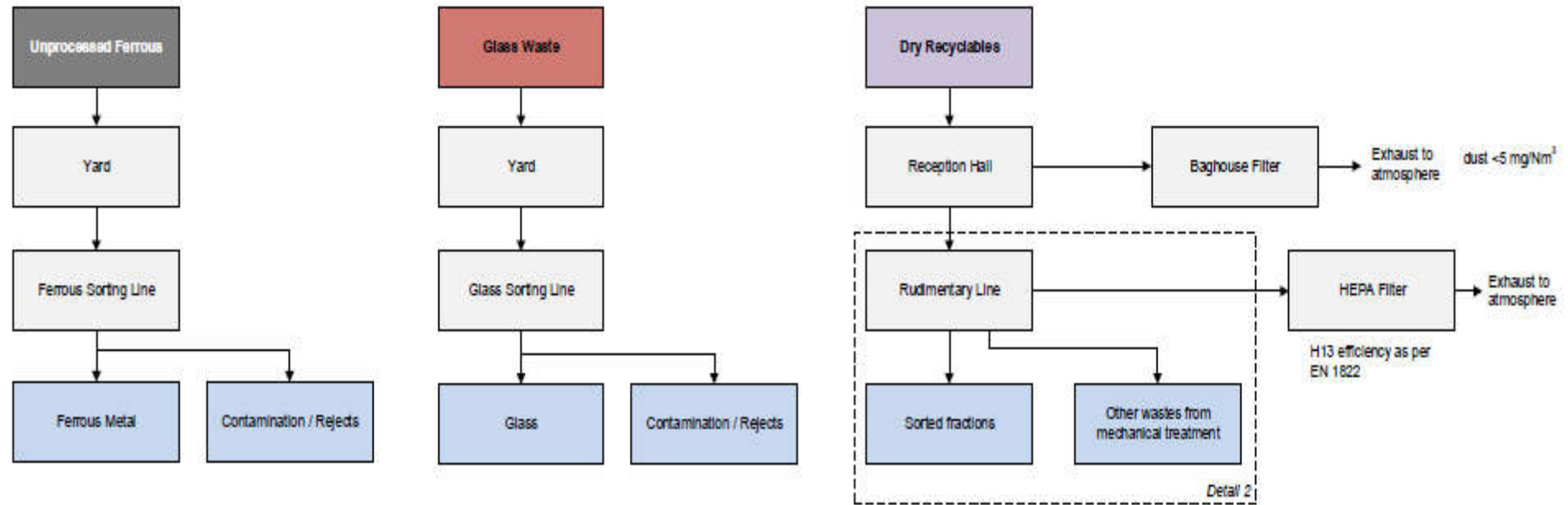


Figure 25: Process flow chart

Analysis on Water from the External Yard Reservoir

Water in this reservoir should be collected and subjected to analysis for all parameters listed in Table 2. The free chlorine and hydrocyanic acid tests may be omitted in this sample since analysis would produce an inconclusive result. Since these are colorimetric tests, the typically dark coloration of this water impacts negatively on the ability to distinguish the coloration inferred by any free chlorine or hydrocyanic acid present.

Given the nature of this water, it is recommended that the tests listed in Table 3 are also carried out.

Table 3: Additional parameters to Schedule C of S.L 545.08

N°	Parameter	Disposal Limits ^a		Method
23	Chemical Oxygen Demand	1000	mg/l	ISO 15705:2002
24	Biological Oxygen Demand 5	500	mg/l	APAT CNR IRSA 5120 Man 29 2003
25	Phosphorus (Total)	20	mg/l	EPA 6020B:2014
26	Mercury (Dissolved)	<i>must not be present</i>		EN ISO 17294-2:2016
	Mercury (Total)	<i>must not be present</i>		EN ISO 17294-2:2016
27	Cadmium (Dissolved)	<i>must not be present</i>		EN ISO 17294-2:2016
	Cadmium (Total)	<i>must not be present</i>		EN ISO 17294-2:2016
28	PFOA	-	-	ASTM D7979-17
29	PFOS	-	-	ASTM D7979-17
30	Phenol Index	-	-	APAT CNR IRSA 5070 A2 Man 29 2003
31	Total Nitrogen	-	-	UNI 11658:2016
32	Total Organic Carbon (TOC)	-	-	EN 1484:1997

^a the disposal limits were provided by WSC

Analysis for the parameters other than those measured *in situ* must be carried out at an ISO 17025:2017 Accredited laboratory within 48 hours of sampling, to ensure that sample integrity is maintained. A monthly sampling and analysis frequency is recommended for all parameters except for PFOA and PFOS, which are to be monitored on a six-monthly basis, in accordance with BAT 7. The methodologies used for laboratory analysis of the individual parameters may vary from the ones listed but must be established equivalent standard methods.

Rainwater (firefighting) Reservoir

This section is for sanitary purposes only.

The water contained in this reservoir is filled with second class water. This water cannot be disposed of in the public sewer as per IPPC Clause 2.6.3.8. It should be used for second-class purposes or for firefighting only. Water in this reservoir should be collected and subjected to analysis identical to that of the External Yard Reservoir water on a quarterly basis.

Furthermore, given that this is a stagnant body of water, analysis should be carried out every 6 months for Legionella as per L.N. 5 of 2006. This is particularly important because of the risk of human exposure posed due to its designated use. The analysis must be carried out following ISO 11731:2017 at an ISO 17025:2017 Accredited laboratory, which must be specifically accredited for this test.

Offsite Monitoring - Soil

Due to the possibility of seepage of water from site particularly following instances of heavy rainfall, which would primarily affect locations to the West, North and East of the site, as well as from aerial emissions and depositions on fields surrounding the site (primarily Southern fields when taking into consideration the prevailing NW winds), it is recommended that soil samples be collected from around the site and subjected to analysis as listed on a quarterly basis. The locations are selected on the basis of prevailing wind direction and rainwater runoff, and hence potential risk of exposure to the public. Therefore, the sampling should be carried out from the sites identified in Table 4 and Figure 26.

Table 4: Offsite soil monitoring locations

Number	Location
1	Dalli field
2	Family Park
3	South fields
4	Dar Frate Jacoba

Sampling should be carried out following the relevant guiding standards of the ISO 18400 series. It is recommended that samples be taken from the top 0 m – 0.15 m layer after scraping off the grass and any surface stones, as well as from a dept of 0.30 m – 0.40 m. Sampling for soil should be done using soil coring equipment, specifically an Edelman Auger soil corer, to collect the soil fractions at the specified depths. This soil profiling will shed light on most recent contamination at the surface and cater for farming practices such as addition of soil supplements as well as soil churning. Sampling at further depths should be carried out if contaminants are found at 0.40 m.

Offsite Monitoring - Crops

For the same reasons given for offsite monitoring of soils, monitoring of crops that are cultivated and intended for human consumption should also be carried out from the same locations listed and subjected to analysis on a quarterly basis.



Figure 26: Offsite monitoring locations for soil and crops

Offsite Monitoring - Groundwater

Due to the possibility of seepage of water from site, particularly following instances of heavy rainfall, it is necessary to monitor the quality of groundwater within the surrounding boreholes to determine whether the operational activity of the site is contaminating the groundwater. There are three identified registered boreholes in the immediate vicinity of the site. The ground water flow direction and gradient is towards the Marsascala creek in the East. Two of these boreholes, referred to as Dalli and Family Park, are situated downhill, and thus would serve as ideal indicators. Albeit the third borehole, known as Saliba, is situated uphill of the site, it is found merely across the road. Therefore, this location could easily be affected by emissions from the facility or possibly serve as a background test from comparison purposes with those collected from the other two boreholes. Sampling from boreholes situated further away is not recommended since samples obtained from such points would not reflect the environmental effects of the facility. Therefore, the sampling should be carried out from the sites identified in Table 5 and Figure 27.

Table 5: Offsite groundwater monitoring locations

Number	Location
1	Saliba (St. Anthony Quarry)
2	Dalli
3	Family Park

It has been confirmed that all boreholes are duly registered with the MRA. The owners of Saliba and Dalli boreholes have granted access for sampling purposes, providing they are informed beforehand of the proposed visit. Signed agreement letters with both Dalli and Saliba have been received and are attached.

Following the submission of an application with MRA, Wasteserv is now the owner of the borehole situated in the Family Park car park. The Notification number is 0848/08.

A WSC borehole named 'Sant Antnin 1' (WSC BH Number 10369) was previously available within the grounds of the Sant' Antnin facility. The WSC was consulted to determine its location. This was situated near the workshop, but its access is now concealed and no longer available.

Notwithstanding the recommendation to refrain from drilling a borehole on site, a monitoring borehole located within closer proximity of the key liquid collection facilities would be important to monitor groundwater in its direction of flow. Therefore, it is recommended that a new, small diameter monitoring well is installed in a practical location to the South of the site (along the perimeter in the vicinity of the South Fields). Given that this shall be an onsite monitoring borehole (and thus of Wasteserv Malta Ltd.'s ownership), this should be cased and grouted for the first 10 m below ground level and the wellhead should be elevated and protected to ensure no seepage of surface waters. A procurement process for the installation of this monitoring well shall be launched as soon as possible.



Figure 27: Offsite monitoring locations for groundwater

The groundwater from the four boreholes should be collected and subjected to analysis listed in Table 2 and Table 3 on a quarterly basis. Given the type of operations and waste streams handled, analysis for parameters listed in Table 6 should also take place on an annual basis.

Table 6: Additional parameters to be monitored

Hydrocarbons C<12	EPA 5021A 2014 + EPA 8015D 2003
Hydrocarbons C>12	EPA 3510C 1996 + EPA 8015D 2003
MTBE	EPA 5021A 2014 + EPA 8015D 2003
Total Hydrocarbons expressed as n-hexane	EPA 5030C 2003 + EPA 8015D 2003; EPA 3510C 1996 + EPA 8015D 2003
BTEXS ¹	EPA 5030C 2003 + EPA 8260D 2018
Polycyclic Aromatic Hydrocarbons (PAHs) ²	EPA 3510C 1996 + EPA 8270E 2018
Chlorinated aliphatic hydrocarbons ³	EPA 5030C 2003 + EPA 8260D 2018
Chlorinated aromatic hydrocarbons ⁴	EPA 5030C 2003 + EPA 8260D 2018
Halogenated aliphatic hydrocarbons ⁵	EPA 5030C 2003 + EPA 8260D 2018
PCBs ⁶	EPA 3510C 1996 + EPA 8270E 2018
Dioxins & Furans ⁷	EPA 3510C 1996 + EPA 8280B 2007
Markers ⁸	EPA 5030C 2003 + EPA 8260D 2018
Organotin compounds ⁹	UNI EN ISO 17353:2006

¹ BTEXS suite:

Benzene, Toluene, Ethylbenzene, o/p/m-Xylene isomers, Styrene

² PAHs suite (USEPA16):

Acenaphthene, Acenaphthylene, Anthracene, Benzo[a]anthracene, Benzo[a]pyrene, Benzo[e]pyrene, Benzo[b]fluoranthene, Benzo[g,h,i]perylene, Chrysene, Dibenzo[a,h]anthracene, Fluoranthene, Fluorene, Indeno[1,2,3-c,d]pyrene, Phenanthrene, Pyrene, Naphthalene

³ Chlorinated aliphatic hydrocarbons suite:

Chloromethane, dichloromethane, trichloromethane, vinyl chloride, 1,2-dichloroethane, 1,1-Dichloroethylene, trichloroethylene, tetrachloroethylene, 1,1,1-dichloroethane, cis 1,2-dichloroethylene, trans 1,2-dichloroethylene, 1,2-dichloroethylene, 1,1,1-trichloroethane, 1,2-dichloropropane, 1,1,2-trichloroethane, 1,2,3-trichloropropane, 1,1,2,2-tetrachloroethane, carbon tetrachloride, 1,1,1,2-tetrachloroethane, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, monochlorobenzene, hexachlorobutadiene

⁴ Chlorinated aromatic hydrocarbons:

Monochlorobenzene, 1,2-Dichlorobenzene, 1,3-Dichlorobenzene, 1,3-Dichlorobenzene

⁵ Halogenated aliphatic hydrocarbons suite:

Tribromomethane, 1,2-dibromoethane, dibromochloromethane, bromodichloromethane

⁶ PCBs suite (7 congeners):

28, 52, 101, 118, 138, 153, 180 + Total

⁷ Dioxin and Furan Compounds:

Dioxins:

2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD)
1,2,3,7,8-pentachlorodibenzodioxin (PeCDD)
1,2,3,4,7,8-hexachlorodibenzodioxin (HxCDD)
1,2,3,6,7,8-hexachlorodibenzodioxin (HxCDD)
1,2,3,7,8,9-hexachlorodibenzodioxin (HxCDD)
1,2,3,4,6,7,8-heptachlorodibenzodioxin (HpCDD)
octachlorodibenzodioxin (OCDD)

Furans:

2,3,7,8-tetrachlorodibenzofuran (TCDF)

1,2,3,7,8-pentachlorodibenzofuran (PeCDF)
2,3,4,7,8-pentachloro-dibenzofuran (PeCDF)
1,2,3,4,7,8-hexachloro-dibenzofuran (HxCDF)
1,2,3,6,7,8-hexachloro-dibenzofuran (HxCDF)
2,3,4,6,7,8-hexachloro-dibenzofuran (HxCDF)
1,2,3,7,8,9-hexachloro-dibenzofuran (HxCDF)
1,2,3,4,6,7,8-heptachloro-dibenzofuran (HpCDF)
1,2,3,4,7,8,9-heptachloro-dibenzofuran (HpCDF)
octachlorodibenzofuran (OCDF)

⁸ Markers suite:

Isopropyl benzene (Cumene), Dipentene, 4-Isopropyl toluene, 1,3,-Butadiene, 1,2,4-Trimethylbenzene

⁹ Organotin compounds:

Monobutyl tin (MBT), Dibutyltin (DBT), Tributyltin (TBT)

Where a sampling point is fitted with a pump, this should be allowed to run for at least 2 minutes before collecting the sample to ensure that the water in the pipe is flushed out, and that a representative water sample is collected. Where a sampling point is not equipped with a pump, a bailer should be used instead. Adequate purging should take place before an aliquot is considered as being a suitable sample. This is necessary since stagnation and stratification may occur in the water body.

Onsite Monitoring – Groundwater

There are currently no boreholes within the site area, however, the Family Park borehole is situated only a few metres away and downstream of the site, and a new onsite borehole is being proposed along the periphery close to the South Fields. Therefore, the results reported from samples collected from these boreholes shall be presumed to be a close representation of onsite groundwater quality.

Onsite Monitoring – Land

MEPA granted the permit for the current SAWTP in 2006. Phase 1 (Materials Recovery Facility) became operational in February 2008, while the second and final phase (Mechanical Biological Treatment Plant) was commissioned on 25th November 2010. Unfortunately, an onsite land baseline data set was never collected from the site; this still needs to be collected as soon as possible. A separate Method Statement with a detailed proposal has been prepared and approved by ERA. A procurement process for the collection of this baseline data shall be launched as soon as possible. Cores shall be collected and subjected to a depth profile analysis from each of the 16 sampling locations identified and shown in Figure 28.

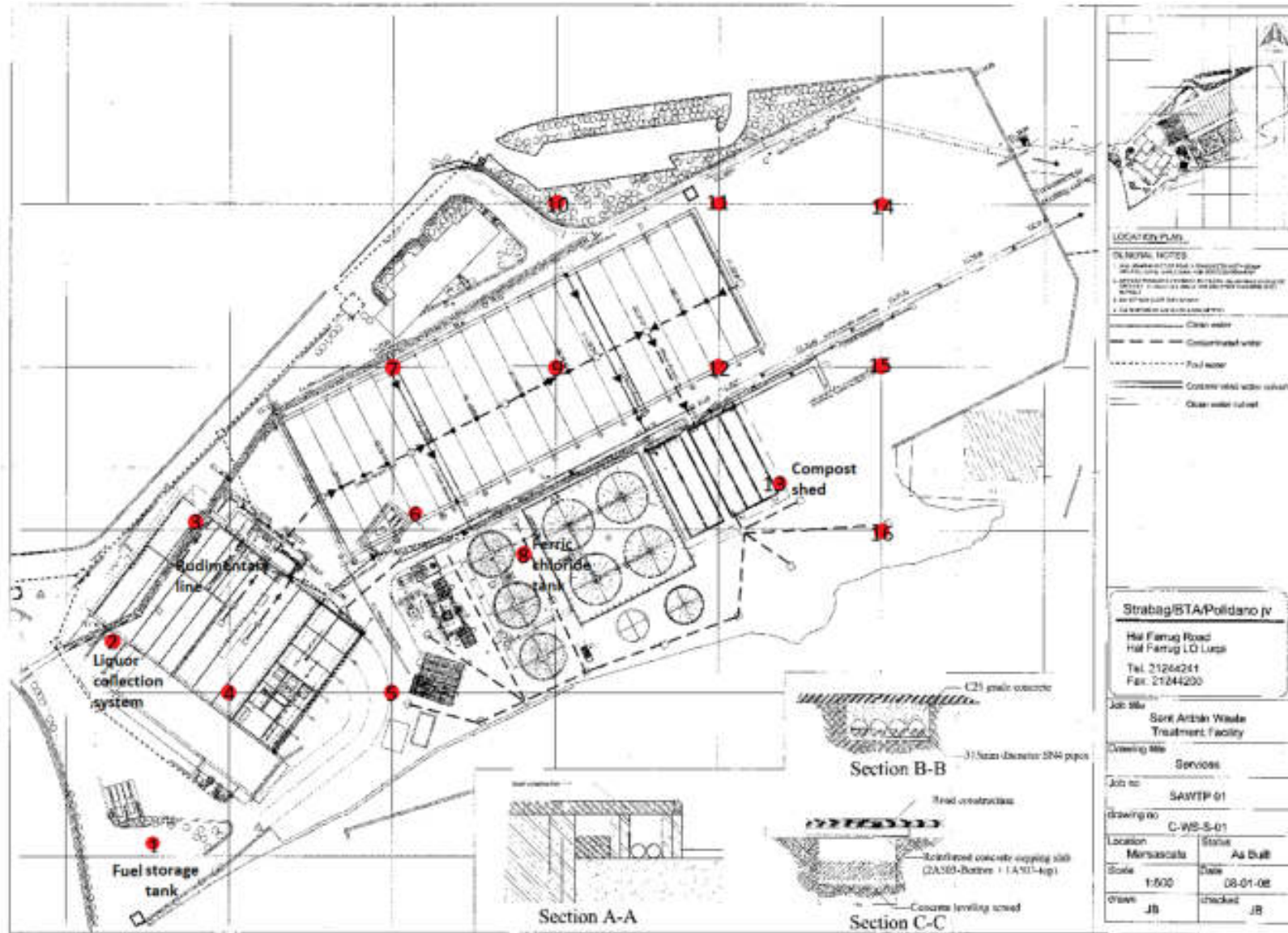


Figure 28: Site plan denoting proposed land sampling locations as red dots. Each point has been given a number.

Emissions to air

Emissions to air via point sources shall only arise from the emission points specified in Table 7.

Table 7: Point sources identified with emissions to air

Emission point references	Source
PS 1	Rudimentary line extraction vent (MRF Extraction vent)
PS 2	MTP extraction vent (Reception Hall)
PS 6	Emergency diesel generator

The limits for emissions to air for the parameters and emission points set out in Table 2.6.2 of the IPPC permit shall not be exceeded. An amended version including only the remaining PSEs, and updated to include latest BATs, is reproduced in Table 8. These limits refer to dry gas and volume flows without dilution at a temperature of 273,15K and a pressure of 101,3 kPa. Limits for PS4 should also be corrected to an oxygen level of 3%.

Table 8: Limit values for emissions to air at the designated point sources

Emission point references	Parameter	Limit	Reference
1	Dust	5 mg/Nm ³	BAT 25
1	TVOC	20mg/Nm ³	BAT 25
2	Dust	5 mg/Nm ³	BAT 25
2	TVOC	20mg/Nm ³	BAT 25
6	Oxides of Nitrogen	250mg/ Nm ³	BAT 25
6	Carbon Monoxide	-	BAT 25

The methodologies used for sampling of the individual parameters must be established standard methods. The recommended methods and limits of detection are given in Table 9.

Table 9: Sampling methods and limits of detection for emissions to air

Parameters	Method	Limit of Detection	
Physical parameters			
Flow	EN ISO 16911-1:2013 Annex A	1	m ³ /hr
Temperature	EN ISO 16911-1:2013 Annex A	0.1	°C
Chemical Parameters			
Oxygen	EN 14789:2006	0.1	%
Humidity	EN 14790:2006	-	g/Nm ³
Total VOCs	EN 12619:2013	0.001	mg/Nm ³
TPM	EN 13284-1:2017	0.1	mg/Nm ³
Ammonia	NIOSH 6015	0.1	mg/Nm ³
NO ₂	D.M. 25.08.2000	35	µg/m ³

SO ₂	D.M. 25.08.2000	35	µg/m ³
CO	EN 15058:2006	0.1	mg/Nm ³

Monitoring of all the emission points except for the 6 shall be carried out every month. Monitoring from PS6 shall be carried out if and when required. Monitoring of the emergency generator shall take place every three years starting from year 2021. Monitoring from all other point sources shall be carried out while the plant and equipment are in full operational order. A copy of the monitoring results shall be included as part of the AER.

Ambient air emissions

Ambient emissions to air should be measured both onsite and offsite for the below exhaustive list, compiled and derived from potential gases that may form from the operational activities on site. Having an identical list would allow for comparison. This list is given in Table 10.

Table 10: Sampling methods and limits of detection for ambient air quality monitoring

Parameter	Limit of Detection		Method
Aspergillus	1	cfu	ISO 14698-1:2003 / M.I.981 Rev.01/2002
Yeasts	1	cfu	ISO 14698-1:2003 / M.I.981 Rev.01/2002
Total Coliform Counts	1	cfu	ISO 14698-1:2003 / M.I.981 Rev.01/2002
E. coli	1	cfu	ISO 14698-1:2003 / M.I.981 Rev.01/2002
Noise	40 – 110	dB	BS 4142:2014
Vibrations velocity	0 – 254	mm/s	BS 6472-1:2008
Hydrogen Sulphide	1	µg	EPA TO15A / NIOSH 6013
Ammonia	1	µg	VDI 3496 / NIOSH 6015
Total Mercaptans	25	µg	NIOSH 2542
Total Suspended Particles (TSP)	10	µg	VDI 2463-8:2014 + MDHS 14/4:2014
PM ₁₀	10	µg	EN 12341:2014 + MDHS 14/4:2014
PM _{2.5}	10	µg	EN 12341:2014 + MDHS 14/4:2014
Methane	10	ppm	EPA TO15A / ASTM E260-96
Skatoles	10	µg	NIOSH 2546
Indoles	10	µg	NIOSH 2546
Asbestos	0.01	f/ml	HSG 248:2005
Arsenic in PM ₁₀	0.5	µg	EN 14902:2005
Cadmium in PM ₁₀	0.5	µg	EN 14902:2005
Nickel in PM ₁₀	1	µg	EN 14902:2005
Lead in PM ₁₀	5	µg	EN 14902:2005
Mercury in PM ₁₀	0.01	µg	EN 13211:2001
Non-methane VOC's	2	µg	EN14662:2005 / EN 13649:2002 / ISO 12884:2000
Benzene	5	µg	EN14662:2005 / EN 13649:2002 / ISO 12884:2000
Carbon Monoxide	0.1	ppm	EPA TO15A / ASTM E260-96
Nitrogen Dioxide	5	µg	NIOSH 6700
Sulphur Dioxide	5	µg	NIOSH 6700
Ozone	1	µg	EN 14625:2005
Dioxins & Furans	0.01	ng	ISO 16000-12:2008

Polycyclic Aromatic Hydrocarbons:	10	ng	ISO 16362:2005
· acenaphthene			
· acenaphthylene			
· anthracene			
· benzo[a]anthracene			
· benzo[a]pyrene			
· benzo[e]pyrene			
· benzo[b/j/k]fluoranthene			
· benzo[ghi]perylene			
· chrysene			
· coronene			
· dibenzo(a,h)anthracene			
· fluoranthene			
· fluorene			
· indeno(1,2,3-cd)pyrene			
· phenanthrene			
Polychlorinated Biphenyls (28, 52, 77, 81, 101, 105, 114, 118, 123, 126, 138, 153, 156, 157, 167, 169, 180, 189)	0.5	ng	ISO 16000-12:2008

Analysis for the parameters must be carried out at an ISO 17025:2017 Accredited laboratory within 24 hours of sampling for the microbial tests, and within 7 days for the chemical tests, to ensure that sample integrity is maintained. The methodologies used for laboratory analysis of the individual parameters may vary from the ones listed but must be established equivalent standard methods.

Onsite monitoring – Ambient air quality

Onsite monitoring should be carried out on a quarterly basis from 6 locations. These are given in Table 11 and Figure 29.

Table 11: Onsite ambient air monitoring locations

Station N.	Location
1	Waste Acceptance Station (Inside)
2	Waste Acceptance Station (Outside)
3	MTP (Inside)
4	MTP (Outside)
5	Ferrous sorting line
6	External Yard

Monitoring should be carried out for all parameters simultaneously at Stations N. 1 and 2, and at Stations N. 3 and 4, to be able to compare indoor and outdoor levels, thus determining fugitive emissions.



Figure 29: Onsite ambient air monitoring locations

Offsite Monitoring – Ambient air quality

Offsite monitoring should be carried out on a quarterly basis from four stations. These are given in Table 12 and Figure 30.

Table 12: Offsite ambient air monitoring locations

Station N.	Location
1	Bellavista (Tal-Bidni Reservoir)
2	Inspire
3	Family Park
4	St. Anthony Quarry

The locations were chosen based on them being the closest habitable areas / independent receptors.



Figure 30: Offsite ambient air monitoring locations

Odour (Sniff Testing & Olfactometry)

This section is for operational purposes only.

Sniff Testing

Sniff testing should be carried out from nine stations, some along the perimeter and others in central locations within the site. These are listed in Table 13 and shown in Figure 31.

Table 13: Sniff testing locations

Station N.	Location
1	Security (Opposite Dar Frate Jacoba)
2	Opposite WSC
3	Security (Visitors parking)
4	Stores (beneath operations building)
5	Behind SAWWTP
6	Receiving Area MTP
7	Compost Shed
8	MRF Yard
9	MTP parking lot
10	Bellavista

Wind speed and direction should be noted. Sniff testing should be avoided on rainy days since rainfall may abate odour dispersion. Also, the operator carrying out the sniff test must not be suffering from sinus or cold and flu symptoms, and consumption of aromatic drinks and foods and application of toiletries must be avoided, to ensure the best sensitivity of the sense of smell.

The template presented in Figure 32 should be used for sniff testing. Sniff testing should be carried out once every fortnight by Wasteserv personnel who do not work at SAWTP so that they will not be habituated to the typical odours of the plant, and on an *ad hoc* basis if and when required. Since this is a subjective test, it is recommended that this is carried out by the same person as much as reasonably possible.



Figure 31: Olfactometry monitoring locations

EkoCentre
Latmija Road, Marsaskala

Tel: (+356) 2385 8235
e-mail: ilona.galea@wasteservmalta.com

AMBIENT SNIFF TESTING

Sant' Antnin Waste Treatment Plant

Reporting odour level on: _____

Report Reference Number: _____

Sampling Point Reference	Time of Survey	Odour Intensity (1-5) 1= No odour 5 = Very strong	Odour Persistence (1-5) 1 = Briefly 5 = Throughout	Odour Offensiveness (1-3) 1 = Potentially 3 = Very offensive	Total Rating (I+P+O) >7= Significant	Notes
1. Security (opposite Dar Frate Jakobaj)						
2. Opposite WSC						
3. Security (Visitors parking)						
4. Stores (beneath Operations building)						
5. Behind SAWWTP						
6. Receiving area MTP						
7. Compost Shed						
8. MRF Yard						
9. MTP parking lot						

Meteorological Conditions		
Overview	Wind Direction	Wind Force

Monitoring undertaken by: _____

Observations during testing: _____

Signed: _____

Date: _____

Figure 32: Template for sniff testing

Olfactometry

Olfactometry testing in accordance with EN 13725:2003 should be carried out once every six months. Of the nine stations used for Sniff testing, three shall be chosen, whereby one shall be from an onsite location to serve as a reference, and two shall be chosen along the perimeter, which points shall happen to be downwind on the day of sampling. The nine stations are listed in Table 14.

Table 14: Olfactometry testing locations

Station N.	Location
1	Security (Opposite Dar Frate Jacoba)
2	Opposite WSC
3	Security (Visitors parking)
4	Stores (beneath operations building)
5	Behind SAWWTP
6	Receiving Area MTP
7	Compost Shed
8	MRF Yard
9	MTP parking lot

Wind speed and direction should be noted, as well as any other potentially odorous sources. Olfactometry testing should be avoided during rainfall since this may abate odour dispersion. However, in accordance with the BAT-34 Conclusion, olfactory monitoring from biological treatment of waste including OPP and External Yard shall always be carried out irrespective of the wind direction. The samples collected are to be sent to an ISO 17025:2017 accredited laboratory for analysis. These should arrive within 30 hours of sampling.

Noise and Vibrations

In accordance with the current permit IP 0005/13/B, noise levels during operations of the installation should not exceed the recommended level of marginal significance, *i.e.*, noise levels during operations must not exceed the baseline noise levels by more than 5dB.

Noise measurements shall be collected for a duration of 1 hour during the day and a 15-minute period during the night-time (*i.e.* covering two 5-minute samples) to cover minimum assessment periods for BS 4142:2014 evaluation.

Noise monitoring shall also be carried out upon commissioning of any new equipment which in the opinion of ERA has the potential to significantly increase noise emissions from the installation. The locations shall be chosen and the measurements and assessment made according to BS 4142:2014 and all the series of ISO 1996 and any other standard methodology stipulated by ERA.

In line with Schedule 5 of the IPPC Permit, noise data collected from monitoring must be reviewed by a person who is in possession of:

(a) Bachelor's degree in Acoustics, **or**

(b) Bachelor's degree in any of the following: Physics, Architecture, Civil Engineering or Engineering, Environmental Health, Environmental Science/Management, Occupational Health and Safety, **and** an MQF Level 7 specialisation in Acoustics, **or**

(c) Bachelor's degree in any of the following: Physics, Architecture, Civil Engineering or Engineering, Environmental Health, Environmental Science/Management, Occupational Health and Safety **and** in addition the consultant must be at least an associate member of the Institute of Acoustics or be employed by an organization who are members of the Association of Noise Consultants or equivalent grade of Membership of a professional body for those working in acoustics and noise in any one of the EU member states or any other reputable professional body to the satisfaction of ERA, **or**

(d) Certification for the collection of data, such as "Certificate of Competence in Environmental Noise Measurement" issued by the Institute of Acoustics (IoA) or any other equivalent qualification issued by a comparable Professional Association dealing with acoustics in any one of the EU and EEA Member States or any qualifications issued by an educational institution to the satisfaction of ERA **and** five (5) years' experience in noise measurements and assessments.

A method statement shall be submitted and approved by ERA prior to the commencement of any monitoring. This is being presented below.

The ratio between the quietest audible sound and the loudest tolerable sound is a million to one in terms of the change in sound pressure. Because of the wide range a scale based on a logarithmic basis is used in noise level measurement. The scale used is the decibel (dB) scale which extends from 0 to 140 decibels corresponding to the intensity of the sound pressure level. The ear has the ability to recognise a particular sound depending on the pitch or frequencies found at the source. Microphones cannot differentiate noise in the same way as the ear; and to counter this weakness the noise-measuring instrument applies a correction to correspond more closely to the frequency response of the ear. The correction factor is called "A Weighting" and the resulting measurements are written as dB(A). "A Weighting" refers to the noise level that represents the human ear's response to sound. The dB(A) is internationally accepted and has been found to correspond well with people's subjective reaction to noise. Typical dB(A) noise levels for familiar noises are given in Table 15.

Table 15: Typical noise levels

Approximate Noise Level dB(A)	Example
0	Limit of hearing
30	Rural area at night, no wind or adverse weather conditions
40	Library
50	Quiet office without noisy machinery, such as typewriters
60	Normal conversation
70	In car noise without radio
80	Household vacuum cleaner
100	Pneumatic drill
140	Threshold of pain

Source: Entec

The noise levels given in Table 15 are sound pressure levels (SPL) and describe the noise level at a point in space. Sound power levels (SWL) are used to describe the noise output of a noise source. Noise levels vary over time depending on noise generating activities. The following indices are used to take account of these variations:

- LAeq T is the equivalent continuous sound level and is the sound level of a steady sound having the same energy as a fluctuating sound over the same period (T). It is possible to consider this level as the ambient noise encompassing all noise at a given time. LAeq T is considered the best general-purpose index for environmental noise;
- LA90 T index represents the noise level exceeded for 90 percent of the measurement period and is used to indicate quieter times during the measurement period. It is usually referred to as the background noise level;
- LA10 T refers to the level exceeded for 10% of the measurement period respectively. LA10 T is widely used as a descriptor of traffic noise; and
- LAmax is maximum recorded noise level during the measurement period.

Noise monitors shall be placed in the designated monitoring stations. Precautions must be taken to minimize the influence on the readings from sources of interference such as:

- Wind, passing over the diaphragm of the microphone of the sound level meter which can generate noise interference
- Heavy rain, falling on the microphone windshield or nearby surfaces which can cause noise interference
- Electrical interference, which can be caused in the sound level meter by, for example, nearby power cables or radio transmitters
- Other miscellaneous noise emitting activities such as road works, loud music, etc., which would not normally be present.

Weather conditions must be recorded during the monitoring period. The sound level meter used must be a Class 1 or better. The use of Class 2 equipment is not allowed.

Vibration monitoring should be carried out in tandem with noise monitoring following standard method BS 6841:2008, to evaluate human exposure of vibration, albeit not in building but directly with basicentric axis aligned for people standing and directly facing the site from each specific measurement point. The measurements are for continuous vibration in vibration dose value (VDV) during the measurement periods of 1-hour daytime and 10-minutes night-time and normalized to cover both day and night-time full periods.

Onsite and offsite noise and vibration monitoring locations are shown in Figure 33. Onsite monitoring locations are listed in Table 16, while offsite locations are listed in Table 17.

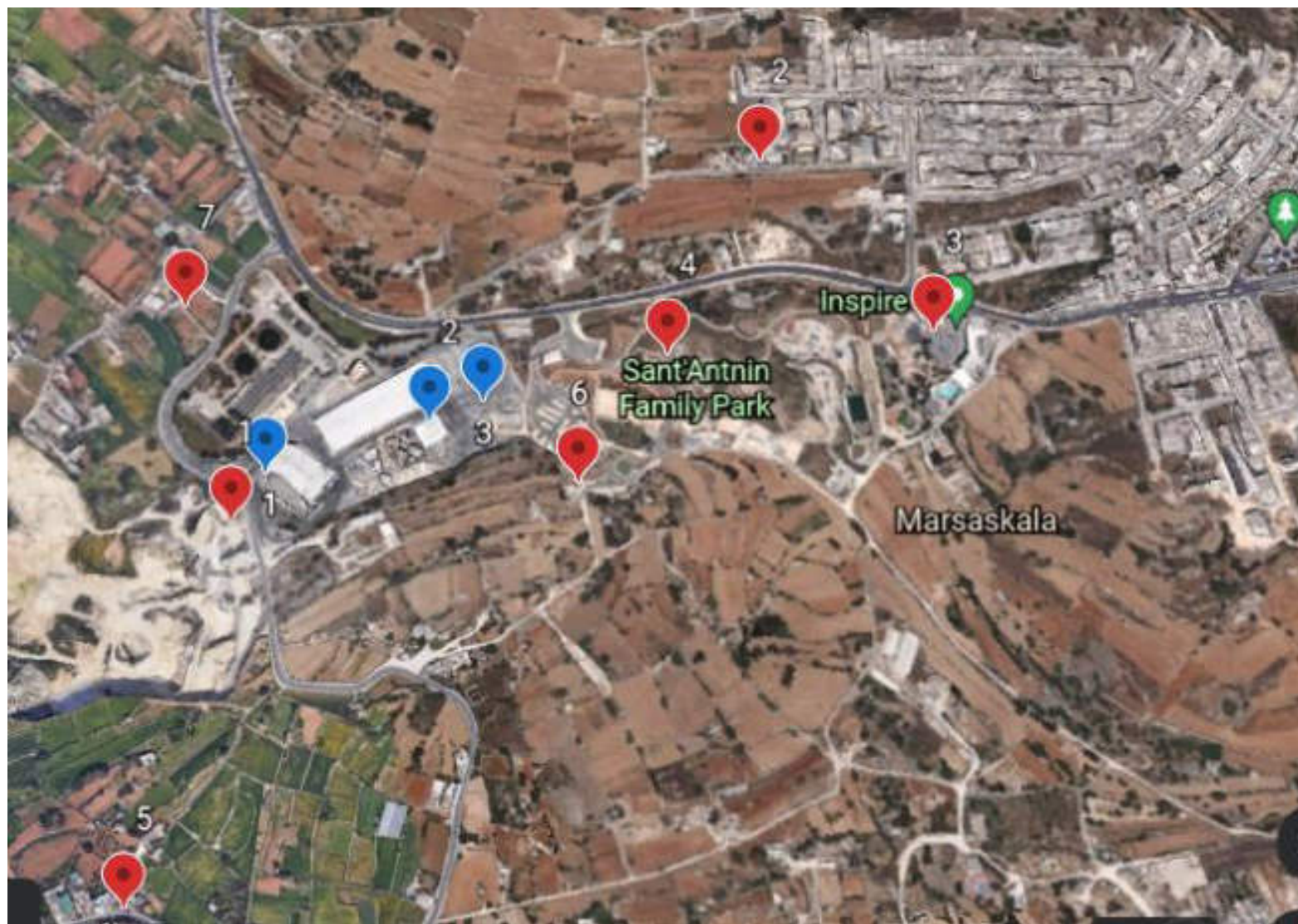


Figure 33: Onsite [annotations in blue] and Offsite [annotations in red] noise and vibration monitoring locations

Table 16: Onsite noise and vibration monitoring locations

Station N.	Location
1	Waste Acceptance Station (Inside)
2	Ferrous Sorting line
3	External Yard

Table 17: Offsite noise and vibration monitoring locations

Station N.	Location
1	St. Anthony Quarry
2	Bellavista Residences
3	Inspire
4	Family Park
5	Residential area located to the south of the site (35.856806, 14.546593)
6	St Anthony's chapel
7	Dar Frate Jacoba'

A set of baseline onsite and offsite noise and vibration data should be collected at a time when the facility is not in operation. This would serve for comparison purposes with actual monitoring data. Noise monitoring shall be carried out during representative operational times such as when there are grey bag processing, Ferrous sorting line and Glass sorting line operations.

DATE: 22/06/2021