

Project Description Statement

Proposed recontouring of the Ghallis landfill to increase height and maximise void space.



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Cover image from Google Earth (2017)

Introduction

1. Wasteserv Malta Ltd. has developed a proposal to recontour the Ghallis landfill as approved by development permit PA 964/11, to accommodate an increased landfill void space, thereby catering for demand for landfilling services. This proposed development consists of a vertical extension of approved pre- and post- settlement levels, retaining the same site area. This proposal has been submitted to the Planning authority as PA 04964/20: *'To carry out alterations from approved permit PA1586/18 including sanctioning of variations to Ghallis profile from that approved in permit PA 964/11 and alter the vertical height of the landfill profile to increase the volume capacity of Ghallis Non-Hazardous Landfill while retaining the site area.'*
2. This proposal builds upon efforts to increase landfill void space through PA 01586/18 titled *'To amend permit PA 964/11 and alter the internal lateral landfill profile to increase volume capacity of Ghallies non-hazardous Landfill while retaining site area'*, as approved in July 2019, which introduced specialised engineering techniques to increase the steepness of the profile of the eastern side of the Ghallis landfill. This proposal includes amendments to the footprint and contours of the project, to optimise gain of void space. A variation of the IPPC permit (IP 0001/06/C) would be required to allow the proposed extension.
3. The limited void space remaining at the Ghallis non-hazardous landfill is the most significant waste management issue at the national level. This facility is the only disposal option – barring export at a prohibitive cost – for non-hazardous waste streams where diversion to recovery or recycling is not an option.
4. The Ghallis landfill currently has a remaining void space of circa 300,000m³. The additional 9 to 12 months of landfill void space (circa 315,000m³) gained by the recontouring of the eastern side of Ghallis (gained via PA 1586/18) will be utilised concurrently with the remaining Ghallis void space, given that the wastes used in the recontouring must be compatible with the technology utilised in this project. The remaining landfill void space is expected to be filled rapidly, given current waste deposition rates.
5. The objective of this proposal is to provide an increased void space of just under 850,000m³ for disposal of waste by raising the landfill contours, to accommodate the demand for landfill services. The availability of new void space is essential once the void space in the existing landfill facilities is exhausted, and this must be provided in a manner that does not disrupt provision of service. This volume does not include approved void space, the required capping layers, or cut and fill required as part of site engineering works. An additional 230,000m³ will result from the optimisation of the contours approved via PA1586/18, bringing the total gain in void space to just over a million cubic metres.

6. The proposed increase in height of the landfill is essentially an alternative to uptake of land for the construction of additional engineered facilities for landfill, and serves to maximise land use in the area already committed for landfill. Alternative disposal technologies such as waste to energy are still under development. To allow for sufficient time to develop such alternative waste disposal options, obtain the required regulatory permits, and construct the required infrastructure, it is imperative that the lifetime of the Ghallis landfill be extended as far as possible. This is essential if alternatives are to be operational before available landfill void space is exhausted.
7. Furthermore, despite the introduction of alternative waste disposal facilities, the requirement for landfill would still remain for those waste streams for which there are no viable recovery or recycling options, that are not suitable for thermal treatment via waste to energy, or that are the non-hazardous output of such technology. In this regard, landfilling is expected to remain a necessary component of the Maltese waste management infrastructure.

Project Context: the ECOHIVE Complex at Maghtab

8. The waste management operations at Maghtab originally consisted of the old land raise that was developed in the 1970s. Increasing environmental awareness and accession of Malta to the European Union resulted in the closure of the Maghtab land raise, commencement of the rehabilitation process, and development of new facilities to handle the bulk of the national demand in terms of waste management solutions. Now known as the ECOHIVE complex, the facilities currently consist of the following components:
- Northern gate, reception facilities and office complex;
 - Internal haul roads;
 - Maghtab landfill – the dump site created in the 1970s, which has been the target of various measures to secure its rehabilitation;
 - Zwejra Landfill – an engineered landfill for the disposal of non-hazardous wastes permitted, developed and commissioned in 2004, immediately on accession to the European Union;
 - Ghallis landfill - an engineered landfill facility for the disposal of non-hazardous wastes, originally permitted for operation in 2007;
 - An area previously considered for the development of a hazardous landfill, that is currently proposed for the development of additional non-hazardous landfill capacity;
 - Malta North Mechanical Treatment Plant that receives Municipal Solid Waste for separates incoming waste streams into recoverable fractions, and pre-treats rejects prior to landfilling;
 - Malta North Bulky Line that separates a range of bulky wastes into recoverable fractions, and pre-treats rejects prior to landfilling;
 - Malta North Anaerobic Digestion (AD) plant – a facility for the anaerobic digestion of organic wastes from the MTP, as well as source segregated organic wastes and manure;
 - Various ancillary facilities such as a Combined Heat and Power plant used for the treatment of biogas and landfill gases; and
 - A Civic Amenity site located just outside the southern gate of the site.

The location of the main facilities outlined above are illustrated in Image 1 overleaf.

Image 1: the Magtab Environmental Complex: Magtab landfill rehabilitation and associated lagoons (light blue), Zwejra Landfill (dark blue), hazardous cell (currently used as RDF storage – red), Malta North AD plant (green) and Malta North MTP & Bulky Line (orange). Aerial photo from Google Earth (2008). The area marked in red is equivalent to the full extent of the proposed project.



9. The operational linkages between the various facilities at the Maghtab Environmental Complex are illustrated in Figure 1 overleaf. The latter consists of a high-level description of the waste material flows between the waste management facilities currently present within the Maghtab Environmental Complex. The outputs of the various processes include:

- Energy from biogas treatment;
- Recyclables for export;
- Refuse Derived Fuel (RDF) intended for eventual export;
- Hazardous wastes removed from incoming wastes as part of quarantine operations; and
- Digestate, the quality of which is still under evaluation.

However, it should be noted that the bulk of these material flows are still oriented towards landfilling.

10. The model highlighted in Figure 1 relies heavily on landfilling as the ultimate solution. Such gaps in waste management capacity have highlighted the need for the following waste management facilities:

- i. **Multi-Materials Recovery Facility (MMRF)** to facilitate recovery of materials (via diversion from landfill) that can be sent for recycling;
- ii. Additional capacity in terms of **Material Recovery Facilities** to replace destroyed capacity at Sant Antnin, and to facilitate recovery of materials from collection of mixed dry recyclables, that can be sent for recycling;
- iii. Additional capacity in **Civic Amenity sites**, with a particular focus on commercial premises and micro-enterprises;
- iv. A **Waste to Energy plant (WtE)** to facilitate recovery of energy from waste, and reduce volumes of waste sent to landfill; and
- v. Development of additional **landfill** capacity, given the extremely limited void space still available.

11. Figure 2 consists of a high-level description of the optimised process for management of waste streams received by Wasteserv Malta Ltd. at the Maghtab Environmental Complex. Such optimisation (including the introduction of a waste to energy plant) include also the optimisation of existing plant at Malta North, and the introduction of a Material Recovery Facility (relocated from Sant Antnin) to complement existing operations and address current gaps in waste management capacity.

12. The processes being described in figure 2 are currently in different phases of development. Nevertheless, it should be noted that although these reduce the scope for use of landfill, these do not remove the need for this facility as a last resort. Further developments will be required to eliminate the need for landfill in Malta, through the development of further infrastructure for waste treatment, and more critically, the adoption of the circular economy philosophy in the design and production of consumer items.

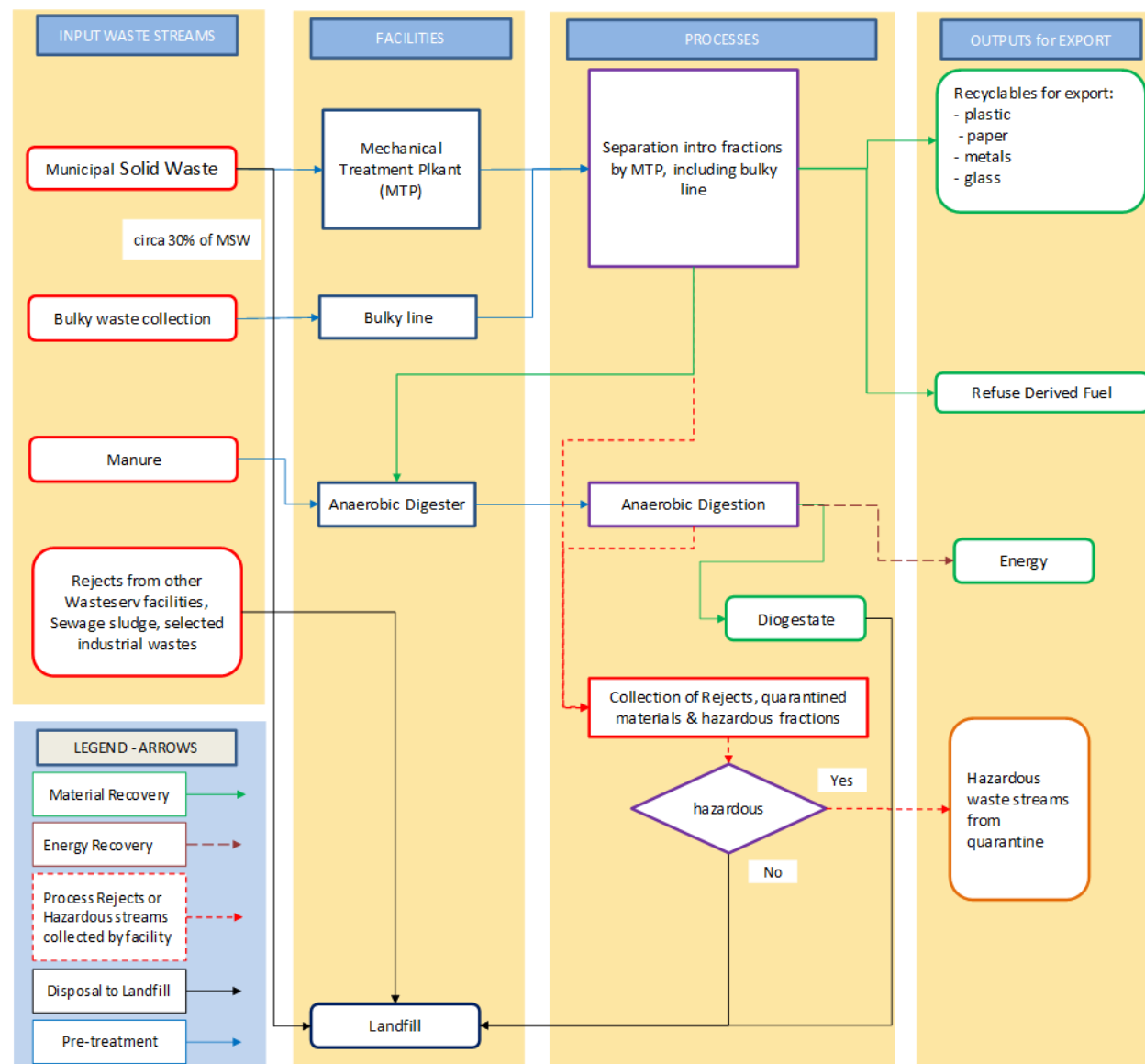
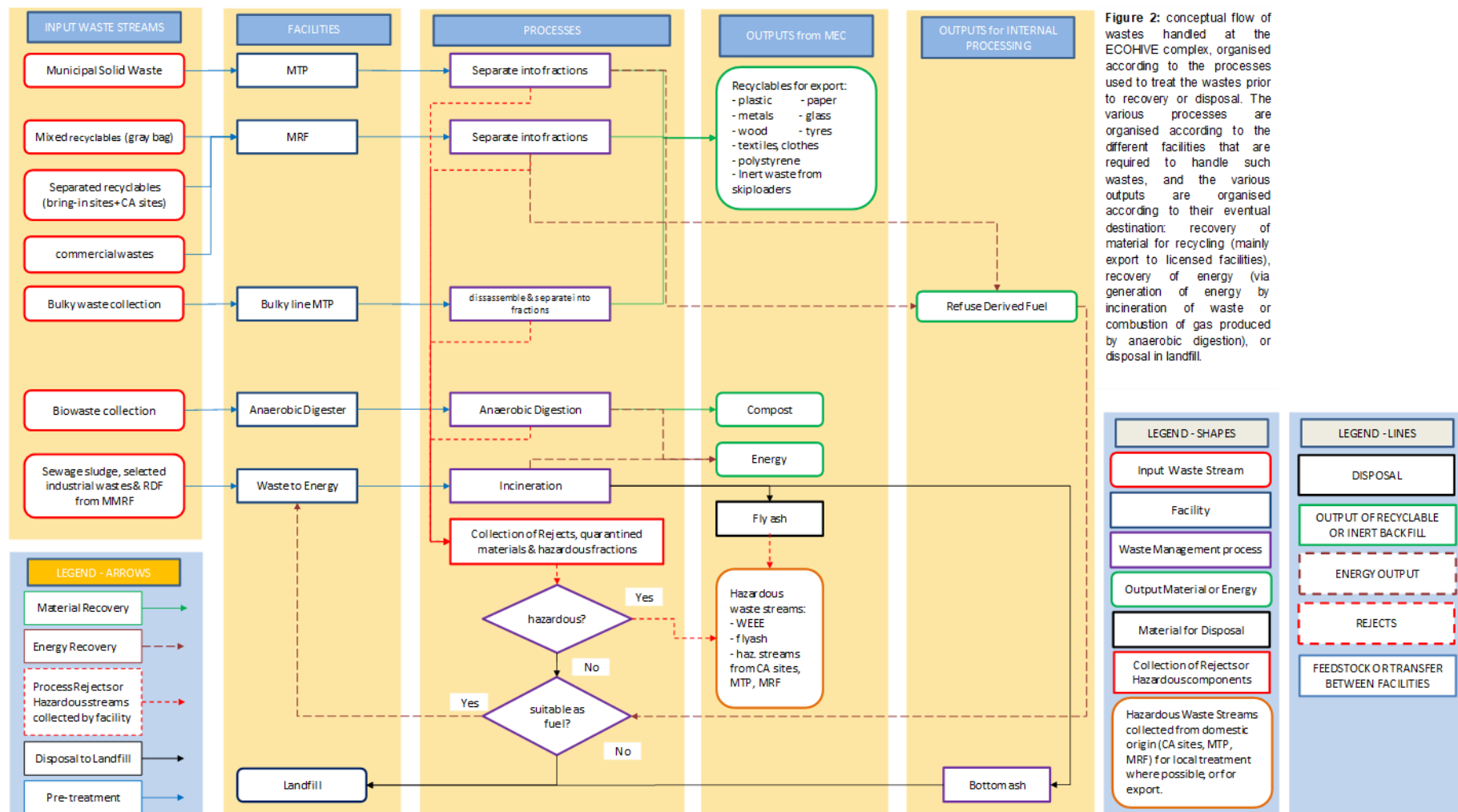


Figure 1: flow of wastes presently handled at Maghtab by Wasteserv Malta Ltd., organised according to the processes used to treat the wastes prior to recovery or disposal. The various processes are organised according to the different facilities required to handle such wastes. The various outputs are organised according to their eventual destination: recovery of material for recycling (mainly export to licensed facilities), recovery of energy (via generation of energy by incineration of waste or combustion of gas produced by anaerobic digestion), or disposal in landfill.



Site description and context

13. The Ghallis Non-Hazardous Landfill consists of an engineered landfill facility designed for the disposal of non-hazardous wastes, and forms the core part of the Maghtab waste management complex. The latter is dedicated to the disposal needs of all non-hazardous waste streams generated in Malta, or to the diversion of waste streams to recovery or recycling processes in other permitted facilities. This facility was designed as a disposal facility that implements the requirements of Directive 1999/31/EC on the landfill of waste as transposed by Legal Notice 168 of 2002 Waste Management (Landfill) Regulations.
14. The landfill facility was originally approved for development by PA 04834/04 after an Environmental Impact Assessment process. Various development permits were required to permit various modifications and upgrades; these included PA 00964/11, which defined the boundary of the Ghallis non-hazardous landfill. The latter development permit applications formed part of a Master Plan for the Maghtab Environmental Complex, which was assessed via an update to the original EIS (GF 00121/06).
15. PA 01586/18 titled '*To amend permit PA 964/11 and alter the internal lateral landfill profile to increase volume capacity of Ghallies non-hazardous Landfill while retaining site area*', was approved in July 2019, introducing specialised engineering techniques to increase the steepness of the profile of the eastern side of the Ghallis landfill, and thereby increasing landfill void space by just over 300,000m³.
16. The operations of this facility were originally permitted on the 6th April 2007 through the issue of the integrated pollution prevention and control permit IP001/06/A; the latest renewal of this permit was decided during March 2020, through the issue of IP001/06/C; approving the introduction of the engineering techniques that allowed the increased void space on the eastern side of the landfill.
17. Construction of the landfill proceeded in phases consisting of independent cells, and certified via Construction Quality Assurance reports that were prepared during the construction of each cell. The engineering specifications were derived from the results of hydrogeological, landfill gas and stability risk assessments, to ensure that operations at the installation would not result in an adverse effect on the surrounding environment. Each cell has its own leachate collection/extraction system, as well as a gas extraction system connected to a central gas management facility.

18. At present, the final cell is being infilled, and the gas extraction system that was the subject of the IPPC permit renewal in 2013 is being implemented. Work has commenced on the recontouring of the eastern slope of the landfill using specialised engineering techniques, to gain additional landfill volume, as approved via PA 1586/18.
19. The location for the proposed development is circa 1km southeast of Qawra, which is located on the further side of Salina Bay. The immediate adjacent area are the haul roads inside the Maghtab Environmental Complex, with agricultural fields to the west. Public access to the Maghtab Environmental Complex is precluded by various security measures.
20. The surrounding land uses have been surveyed in terms of nature and extent in the Master Plan for the Maghtab Environmental Complex - Environmental Impact Statement Update prepared in support of development permit Application No. PA 02342/06 (Adi Associates Environmental Consultants Ltd, 2011). Current surrounding land uses include:
 - i) The adjacent waste management facilities forming part of the Maghtab Environmental Complex, including the Civic Amenity site, the Malta North Waste Treatment Plant, and the Zwejra and Maghtab landfills;
 - ii) the Maghtab settlement over 600m away;
 - iii) The Salini Resort (Coastline) hotel at a minimum of 600m to the northwest of the furthest point of the extended area;
 - iv) Various residences to the west and the south;
 - v) A private waste management facility to the south;
 - vi) Various industrial units;
 - vii) Natural habitats in the vicinity of the Maghtab landfill that have been studied as part of previous Environmental Impact Assessments;
 - viii) Small farmhouses and ancillary buildings, including an adjacent cow farm; and
 - ix) Roads, including access roads to the Maghtab complex to the south, and the Coast Road to the west.

21. The various EIA studies carried out for developments related to the waste management facilities at Maghtab have included various studies on the cultural, archaeological and environmental characteristics of the areas surrounding the site. A review of the studies highlighted above indicate that the surrounding undeveloped areas include natural areas, mainly coastal steppe, and limited pockets of maquis vegetation. Other areas are either disturbed land, or agricultural fields.
22. The following areas – at varying distances away from the project area - have been designated as Special Area of Conservation as per Habitats Directive (94/43/EEC):
- The adjacent marine areas Zona fil-Bahar fil-Grigal ta Malta;
 - L-Ghadira s-Safra has been designated as Special Area of Conservation; and
 - Is-Salini)

While the proposed development should not impact these sites directly, the indirect effects of this development on these sites is expected to be the continuation of that exerted by the existing landfill facilities.

Project Description

23. This project involves the development of additional non-hazardous landfill void space within the existing confines of the ECOHIVE Complex at Maghtab, through the increase of the pre-and post-settlement heights of the landfill, and recontouring of the landfill mass to maximise void space. This intervention will preserve stability and function of the engineered structures, and will not involve any intervention outside of the permitted landfill boundary as highlighted in the approved IPPC permit.
24. The process of defining the proposed height is documented in *Ghallis Landfill Revised Restoration Design Report* (SLR, 2020). This has involved an assessment of the materials used to as part of the landfill engineering, and calculation of the maximum mass of waste that could be safely deposited on site. This report took into consideration the approved recontouring and steep wall structures approved on the eastern side of the landfill, and involved a Stability Risk Assessment. The latter has also taken into consideration the modifications being proposed for the steepwall engineered structures approved through PA 1586/18, to ensure that the proposals are compatible and coherent.
25. The SLR 2020 evaluation arrived at a proposed pre-restoration profile that could safely be accommodated, where:
 - the depth of waste was increased to 84m at the highest point;
 - the depth of waste over the leachate collection points was increase to 66m;
 - an offset of 35m from the new engineering capping system of the eastern side was maintained; and
 - appropriate benching profiles, vehicle access points and routes are defined.

The increased massing gained through the proposed restoration levels results in an increased void space of circa 850,000m³ for disposal of waste.

26. Appendix A provides plans that include the following details illustrating the nature and scale of the project including:
 - the latest topographic data illustrates the extent of infilling of the landfill;
 - proposed pre- and post-settlement levels, where the maximum height to be attained is 82m above median sea level;
 - sections comparing the existing site profile with the proposed final profiles;
 - isopachyte contours illustrating existing and proposed waste depths;
 - location of leachate control points and the extent to which waste deposition is proposed at each point; and
 - the point of contact with the approved steep wall engineered system on the eastern side of the landfill.

27. The SLR 2020 evaluation includes a Stability Risk Assessment that considers the effect of the proposal on the approved **bottom liner and geological barrier** laid as per the requirements of the Landfill Regulations S.L. 549.29 and the Council Directive 1999/31/EC on landfilling of waste. The proposal has been designed to ensure that the integrity and performance of these layers will not be compromised through the increased loading caused by the additional deposition.
28. The modifications proposed to the engineered steepwall systems shall include lining and capping systems that are overall identical to those approved in the last IPPC permit variation and renewal. The sole modification is the use of bentonite in lieu of the GCL layer at specific points; the permeability of the bentonite is an improvement over the approved GCL, and is more appropriate for use at in those locations in close proximity to the bedrock.
29. **Leachate collection** systems have also been considered; the stability risk assessment has calculated the depth of wastes that can be accommodated around the existing leachate collection points, and the manner in which the latter can be extended using risers to allow their continued function in terms of leachate management and monitoring. The existing pipework in the basal lining will be used to collect leachate from the sumps, which will be collected using pumps for treatment.
30. **Leachate treatment systems** are in the process of being developed for the entire landfill complex, and will be the subject of a variation to the IPPC permit for the site; a development permit application for leachate treatment facilities is being prepared for submission.
31. **Gas collection systems** are being deployed through modification and extension of the approved systems. Gas extraction wells installed within the waste mass will collect the generated gases, and diverted to a gas carrier mains line leading to the existing gas treatment i.e. the Combined Heat and Power plant. The deployment of gas extraction points and sumps at strategic intervals is being designed to ensure efficiency of the system, to cater for any condensate in the gas lines.
32. **Landfill capping and restoration levels:** capping materials and methodologies are currently approved by the current IPPC permit version. The SLR 2020 report proposes a geosynthetic capping system having a configuration that was determined through stability analysis, and included the following layers as required by the Landfill Directive:
- 300mm topsoil forming materials
 - 400mm subsoil forming material
 - 300mm Free draining granular material
 - Geogrid
 - Geocomposite drainage / protection layer.
 - 1mm double-textured geomembrane.
 - 250mm waste regulation layer.

33. **Services, water, foul water sewers, surface water drainage (including storm water drainage), and energy sources:** this project shall not involve any changes in existing services, foul water management, and energy sources barring equipment used for construction. Storm water management is incorporated in the project design, where drainage ditches will be included in the final capping and haul roads, for capture and treatment.

Process of Construction and Project Duration

34. The construction of the landfill will involve:

- i. deposition and compaction of the wastes until the required capping level;
- ii. preparation of the surface of the waste masses to accommodate placing of the capping layers;
- iii. placement of the capping layers;
- iv. protection and modification of leachate collection points, gas wells and associated infrastructure as required; and
- v. quality assurance processes and monitoring of stability as required.

A Construction Management Plan (see SLR (2000) *Ghallis Landfill Capping and Restoration Construction Quality Assurance Plan*) has been formulated, to define the scope of works and the measures required in terms of the associated environmental, health and safety requirements.

35. **Implementation phases – raw materials, energy, employment:** no raw materials will be used besides the geocomposite materials described in the previous sections, and the waste mass itself. Energy consumption will be limited to the fuel needed for the heavy vehicles required to excavate the void space, and to move and compact the wastes. This project is expected to involve between 15 – 30 people, who would be involved throughout all the processes described above. Machinery to be used will be excavators, trucks, and compaction vehicles.
36. **Wastes used in the project:** as indicated in the plans, 3,000 – 4,000m³ of RDF (originating from the processing of municipal wastes)¹ shall be used as stabilising material and shall provide protection to the lining materials of the engineered structures; this material is being landfilled in the first 'lifts' on top of the drainage layer.
37. **Waste generated:** the wastes generated in this project are expected to be minimal, given that the range of materials to be used will not result in the generation of appreciable amounts of wastes.

¹ Originating from treatment of municipal waste, and stored temporarily in the ex-hazardous cell, where it was mixed with limited amounts of inert material of geological origin used to cover the material. This has been characterised, and determined to be non-hazardous.

38. **Access requirements:** these will be serviced by internal roads currently available within the Maghtab complex, together with the additional routes defined on plan to allow access to the waste carriers bringing wastes on site. The project may involve the creation of additional access routes traversing the waste mass itself, as is currently required by logistic requirements of the waste deposition process.
39. **Project duration:** total duration of works is expected to be of about two to three years depending on landfilling rates.

Environmental Risks, Impacts & Mitigation

40. An environmental impact may be positive, neutral or negative, depending on the effect a causative agent would have on the environment. Impacts would be:
- **Positive** where the overall environmental aspect or medium would be improved or enhanced;
 - **Negative** where an impact would reduce the overall quality of an environmental aspect or medium; and
 - **Neutral** where the effect of the causative agent would not be relevant to the environmental aspect or medium, or not leave an impact that is discernible in terms of scale of change.
41. Impacts from this project can arise from either of two stages:
- A. the **operational stage**, which is that where the landfill is being infilled and recontoured, and
 - B. the **post-operational stage** where the landfill mass has been formed and capped, and is being maintained.
42. The environmental risks associated with the project are listed in Table 1 overleaf, together with the mitigation measures that are proposed to manage and mitigate such impacts.

Table 1: environmental risks posed during the development and operational & post-operational processes, and relevant mitigation measures

Risk	Risk: operational	Risk: Post-operational	Mitigation measure
Land use	Site already committed as landfill	Site already committed as landfill	Not applicable
Biodiversity	Site already committed and developed	Site already committed & developed	<ul style="list-style-type: none"> • Not applicable
Stability	Subsidence and landslide during infilling of waste	Subsidence and landslide	<ul style="list-style-type: none"> • Stability Risk Assessment to identify risks and design accordingly • Method statement to avoid destabilisation, • Deposition of waste in layers • Quality Assurance processes, monitoring and remedial measures
Dust	During transport of wastes on haul roads	On haul roads	<ul style="list-style-type: none"> • Monitoring of wind speed and direction prevalent in the works area • Use of fog cannon on site during works as dust abatement • Wastes will be covered with daily cover: either inert material or a geosynthetic layer • Specific environmental monitoring
Odour & other emissions	Odour from vehicles and tip face	Not applicable	<ul style="list-style-type: none"> • Monitoring of wind speed and direction prevalent in the works area • Use of fog cannon on site during works as dust abatement • Use of daily cover on tip face
Contamination of surface or ground waters	Contamination of storm or ground waters from waste or leachate, or operational leak from vehicles	Failure of integrity of basal landfill liner compromising leachate retention systems, or operational leak from vehicles	<ul style="list-style-type: none"> • Proper maintenance of vehicles & spill kits • Containment of waters on haul roads • Silting ponds to prevent silt runoff • Proper design and quality assurance of landfill liner
Ground contamination	Failure of integrity of basal landfill liner compromising leachate retention systems, or from vehicles	Failure of integrity of basal landfill liner compromising leachate retention systems	<ul style="list-style-type: none"> • Stability Risk Assessment to ensure liner stability and integrity • Landfill liner design to prevent possibility of liner rupture • Quality Assurance processes for liner and leachate collection systems already implemented and reviewed via SRA • Maintenance of vehicles to prevent operational spills, and maintenance of spill kits on site to cater for accidents

Risk	Risk: operational	Risk: Post-construction	Mitigation measure
Visual impact	View of operational landfill	View of capped landfill	<ul style="list-style-type: none"> • Sensitive design of landfill height and capping
Waste Management	Provision of essential waste management service	Not applicable	
Fire & exposure of potential hotspots	Landfill fire	Landfill fire	<ul style="list-style-type: none"> • Assessment of risk through visual inspection and thermographic cameras to detect hotspots • Hotspot management using leachate and/or water to dissipate heat in buried landfill mass • Fire management plan • Maintenance of stockpiles of inert material and necessary plant to respond to fire risk
Traffic	As per current scenario, with additional tip faces in use	As per current scenario for as long as ECOHIVE complex accepts waste	<ul style="list-style-type: none"> • traffic management within the ECOHIVE Complex

43. These may be summarised as follows:

- **Land use:** given the uptake and effective sterilisation of land has already been implemented during past development, the direct impact on land use is considered to be neutral. However, given that the increase in height effectively removes the commitment of other land for landfilling purposes, the impact on land use is considered **positive**.
- **Biodiversity:** the impact on land use is expected to have no repercussions on the biodiversity given that the use of the site is already committed to waste management activities, and no significant biodiversity is present on site; the impact is expected to be **neutral**.
- **Stability:** this project proposal is underpinned by a Stability Risk Assessment that manages risks; consequently, this impact is expected to be **neutral**.
- **Dust:** the impact is expected to be consistent with that currently experienced, so this impact is expected to be **neutral**.
- **Odour & other emissions:** these are expected to be comparable to those of the existing landfill operations currently approved – this impact is expected to be **neutral** over the longer term in that it is essentially a continuation of current practice.
- **Generation of leachate:** this is expected to be comparable to that of the existing landfill operations currently approved; this impact is expected to be **neutral** over the longer term in that it is essentially a continuation of current practice, and further leachate treatment facilities are planned.
- **Ground & groundwater contamination:** these are expected to be comparable to that of the existing landfill operations currently approved; this impact is expected to be **neutral** over the longer term in that it is essentially a continuation of current practice in a site approved for such use.
- **Visual impact:** the extent to which interventions on the Ghallis landfill would be visible from external viewpoints is detailed in the following section on visual impact; it is clear that there will be an impact on the skyline from various viewpoints, mainly in terms of an increased vertical massing. This impact is expected to be **negative**.
- **Waste management:** the objective of this proposal is the gain in void space at the Ghallis landfill, which would allow for the development of further waste management solutions for non-hazardous waste streams currently being deposited in this site - this impact is expected to be **positive** over the longer term.
- **Fire & exposure of potential hotspots:** this impact is expected to be **neutral** over the longer term in that it is essentially a continuation of current practice.
- **Traffic:** Changes in traffic are expected to be rerouting of existing traffic upon entry into the ECOHIVE Complex this impact is expected to be **neutral** over the longer term in that it is essentially a continuation of current practice. Traffic related to transport of wastes is expected to be constant, varying only with changes in generation patterns. The only difference will be the need to reroute traffic to different tip faces within the landfill complex.

44. The above environmental risks shall also be managed through the following:
- Health and safety risk assessments - further elaboration on the existing assessments and plans to include this project in scope
 - Method statements for the various processes
 - Stability assessments
 - the existing fire risk assessment and management plan - further elaboration on the existing assessments and plans to include this project in scope
45. **Cumulative impacts:** the main cumulative impact will be the increase in massing of the landfill mass, and its impact on the landscape. Otherwise, the majority operational risks detailed above are expected to be transient, and reversible in that they are limited in duration to the engineering works involved in the infilling and capping operations. The environmental impacts created are expected to be consistent with those currently experienced at the existing landfill complex. However, application of the mitigation measures indicated above, also through adherence to the conditions of the IPPC permit requirements, should serve to mitigate these risks.
46. **Environmental monitoring:** this will be required through all stages. The current monitoring programme includes H₂S, CH₄, VOCs, PMs, etc. A review of the monitoring programme indicates that the monitoring parameters employed are compatible with the monitoring requirements of this proposal.

Visual Impact

47. Given the history of the ECOHIVE Complex at Magtab, visual impact assessment should consider the various developments that have taken place over an appreciable span of time. These include:
- i. The original development of the Magtab land-rise in 1977, infilling the natural landforms that existed previously, and forming a waste mound which is now the dominant landscape feature in the Magtab area;
 - ii. The developments of the Zwejra and Ghallis landfills, which together allowed for the permanent closure and capping of the Magtab land-rise;
 - iii. The development of the Malta North waste management facilities and ancillary infrastructure; and
 - iv. The recontouring of the eastern boundary of the Ghallis landfill using proprietary engineering techniques that will allow the gain of additional landfill void space.

Two proposed developments are a Waste to Energy Plant just outside the eastern border of the Complex, and the proposed conversion of the hazardous cell to a non-hazardous cell on the western side of the Complex. These are further developments that are currently undergoing visual impact assessment in their own right.

48. The nature and extent of visual impacts arising from the complex have been evaluated previously in the *Master Plan for the Magtab Environmental Complex - Environmental Impact Statement Update prepared in support of development permit Application No. PA 02342/06* (Adi Associates Environmental Consultants Ltd, 2011). This study, and the reference points used for the assessment of visual impact, constitute an important reference point for the evaluation of new projects, to allow accurate monitoring of the changes in visual impact over time.
49. The process of development of the proposed project has considered the results of the above study. However, it must be noted that the formation of a landfill mass (and associated restoration levels) had already been considered as part of the development permitting process that approved the landfill complex. This proposed extension landfill is vertical, and the visual massing of this extension must consider existing and approved restoration levels.

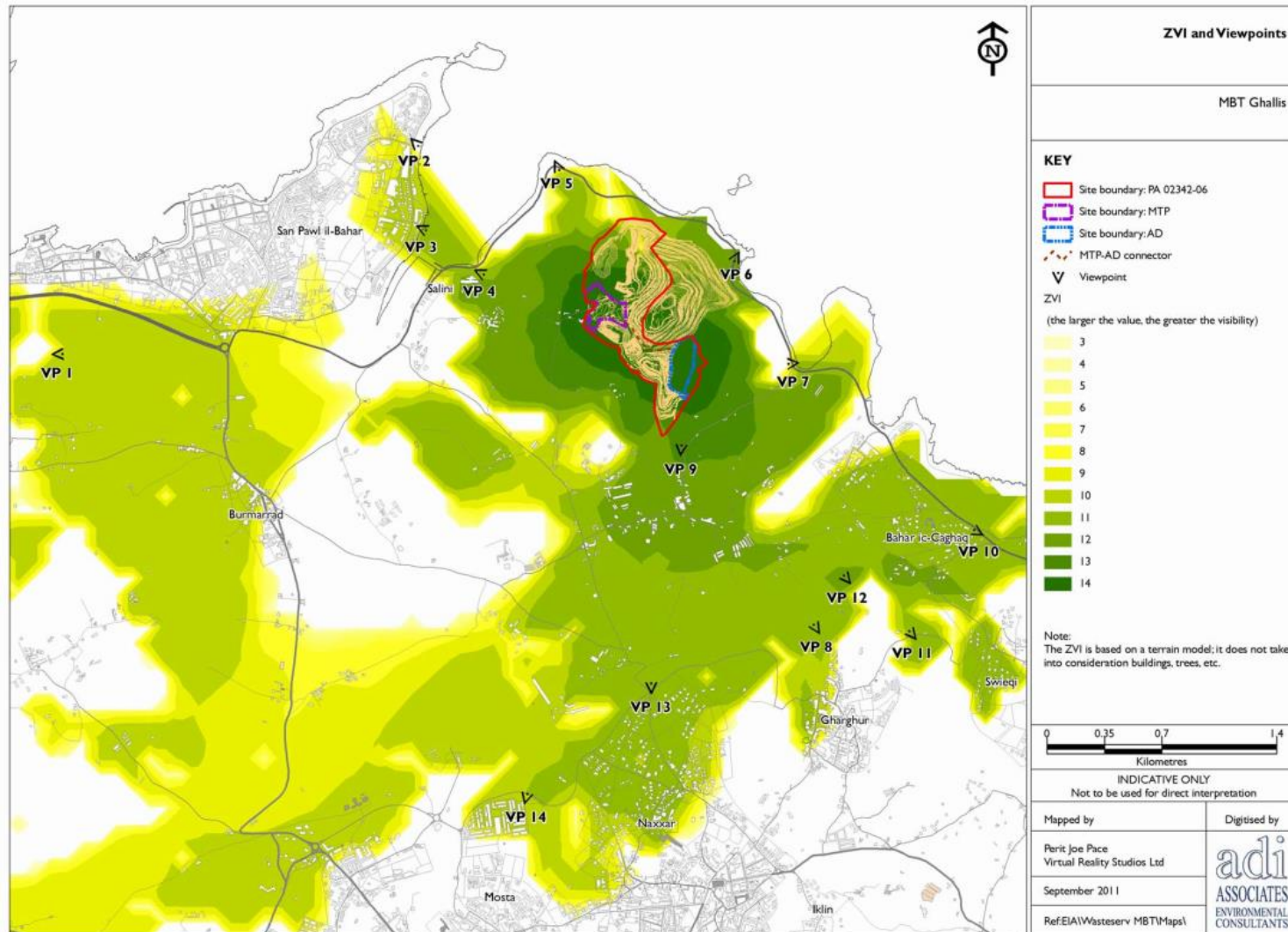
50. The study carried out in 2011 defined a Zone of Visual Influence (see Plan 1) to assess the impact of the Maghtab Environmental Complex as approved for the Malta North facilities (PA 02342/06 and PA 00964/11). This Zone of Visual Influence (ZVI), and viewpoints selected on this basis of this ZVI, were reused to generate a further set of photomontages that would allow assessment of visual impact for the recontouring of the Ghallis landfill (PA 1586/18). These photomontages were generated as required by the Planning Authority's *Best Practice Guide - Visual Simulations* by Perit Joseph Pace of Virtual Reality Studios Ltd., and these are attached as Appendix B. Given feedback received during the processing of PA 1586/18, a further viewpoint 15 was added. The photomontages are based on the vertical extension of the landfill, which is the most significant intervention; the alterations to the engineered structures approved via PA1586/18 are considered to be marginal with respect to the massing of the overall proposal.
51. A list of viewpoints is provided in Table 2, which itemises the various locations from which the photographs were taken, and describes the extent to which the proposed extension is visible in the photomontages provided. Appendix B includes:
- Photographs of all viewpoints listed in Table B in their present form (labelled as existing);
 - Photomontages of the proposed development with a black outline of the extent of the development already approved;
 - Photomontages (labelled proposed) of the final proposed landfill terrain (showing both approved and proposed landfill infill), with a render derived from that of the Maghtab landfill; and
 - Photomontage labelled wireframe with both approved and proposed massing is indicated in white.
52. The proposed extension to the landfill is visible from the following points:
- Point 1. Wardija: view of St. Paul's Bay and Burmarrad plains, with Maghtab landfill in the distance
 - Point 2. Triq il_Qawra Promenade, Bugibba
 - Point 3. Triq il_Luzzu, Qawra, facing Salina Bay
 - Point 4. Adjacent to Coastline Hotel
 - Point 8: Sqaq tax-Xaqquf, Gharghur: view of Burmarrad with St. Paul's Bay in the distance; Maghtab landfill
 - Point 12: Triq Ghaxqet I-Ghajn, I/o Gharghur: view of Maghtab and rural surroundings, with Maghtab landfill and St. Paul's bay in the distance
 - Point 13: Triq John Adye, T'Alla u Ommu: rural landscape surrounding Maghtab Environmental Complex and industrial development
 - Point 14: Triq I_Imsaqqqin, Mosta: rural landscape surrounding Maghtab Environmental Complex and industrial development
 - Point 15: Naxxar: junction between Triq il-Ghallis and Trejjet I-Irziezet

Table 2: list of viewpoints and description of impact of existing approved landfill, and proposed landfill extension

Viewpoint	Location	Visible (Y/N)	Description of Impact of approved landfill mass	Description of Impact of proposed extension
1.	Wardija: view of St. Paul's Bay and Burmarrad plains, with Maghtab landfill in the distance	Y	Approved landfill mass extends to the east and vertically in terms of impact on the skyline.	Proposal has Maghtab and the sea as a backdrop; visible extent of extension is a vertical increment.
2.	Triq il_Qawra Promenade, Bugibba: view of sea, and coastal area dominated by Maghtab landfill	Y	Approved increase in landfill mass has Maghtab land rise as a backdrop.	Proposal has Maghtab as a backdrop; extent of extension on the skyline is contained by Maghtab.
3.	Triq il_Luzzu, Qawra, facing Salina Bay	Y	Approved landfill mass extends further to the eastern side of Salina Bay in terms of impact on the skyline.	Proposal has Maghtab and the skyline as a backdrop; the final result in an incremental increase to the east, and in massing against the skyline.
4.	Adjacent to Coastline Hotel	Y	Approved landfill mass extends further to the eastern side of Salina Bay in terms of skyline.	Proposed visible extent of landfill mass is a vertical extension of the approved mass, having an impact on the skyline. Mass of the proposed restoration impinges on the skyline.
5.	Farm to the north of Ghallis landfill	Y	Approved landfill mass directly behind the farm.	Proposed landfill mass not visible from this position.
6.	North part of Coast Road	N	Approved landfill mass increases existing massing of landfill	Proposal not visible from this viewpoint.
8.	Sqaq tax-Xaqquf, Gharghur: view of Burmarrad with St. Paul's Bay in the distance; Maghtab landfill	Y	Behind Zwejra landfill – change is not perceptible	Behind Zwejra landfill – impinges incrementally on the distant view of St. Paul's Bay.
12.	Triq Ghaxqet l-Ghajj, l/o Gharghur: view of Maghtab and rural surroundings, with Maghtab landfill and St. Paul's bay in the distance	Y	Behind Zwejra landfill – change is barely perceptible	Behind Zwejra landfill – impinges incrementally on the distant view of St. Paul's Bay.
13.	Triq John Adye, T'Alla u Ommu: rural landscape surrounding Maghtab Environmental Complex and industrial development	Y	Behind Zwejra landfill – Malta North visible	Proposed landfill mass impinges on the skyline.
14.	Triq l_Imsaqfin, Mosta: rural landscape surrounding Maghtab Environmental Complex and industrial development	Y	Behind Zwejra landfill – Malta North visible	Proposed landfill mass impinges on the skyline.
15	Naxxar: junction between Triq il-Ghallis and Trejjet l-Irziezet	Y	Directly facing the landfill complex	An increase in massing against the skyline

53. **Viewpoints where the landfill complex as a backdrop:** the proposed development has the landfill complex as a partial or full backdrop for various viewpoints as highlighted in table 2. The proposed vertical extension will be visible in terms of line of sight, over the existing landfill mass (particularly the old Maghtab landrise) in the background. Although the rural setting of these viewpoints is deemed sensitive, the changes would tend to be restricted to the area immediately surrounding the waste management complex, intensifying the visual impact on viewpoints already affected by the original landfills.
54. **Viewpoint where the proposed development impinges on the skyline in terms of height, and laterally:** this is the case for those viewpoints where the proposed vertical extension is not masked by the existing landfill masses. The extension will be visible, with a clear elevation of the existing landfill mass against the skyline. Although the setting of this viewpoint is generally rural, the existing mass of the Maghtab waste management complex is a dominant backdrop. Given a final finish that is comparable to that of the existing landfill masses, the overall changes to the landscape would be a visible increment over the existing situation.

Plan 1: Zone of Visual Influence as defined in the EIA update carried out by Adi Associates Environmental Consultants Ltd, (2011). *Master Plan for the Magtab Environmental Complex. Environmental Impact Statement Update prepared in support of development permit Application No. PA 02342/06.*



Appendix A: Plans

Appendix B: Photomontages

Legend for following photomontages:

- Photographs of all viewpoints listed in Table B in their present form (labelled as existing);
- Photomontages of the proposed development with a black outline of the extent of the development already approved;
- Photomontages (labelled proposed) of the final proposed landfill terrain (showing both approved and proposed landfill infill), with a render derived from that of the Maghtab landfill; and
- Photomontage labelled wireframe with both approved and proposed massing is indicated in white.