



Coordinated Assessment for the Construction of a Materials Recovery Facility (MRF)

WASTESERV MALTA LIMITED

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SERVICE TENDER FOR THE ENGINEERING, PROCUREMENT
AND CONSTRUCTION OF A NEW MATERIALS RECOVERY
FACILITY

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1.0 INTRODUCTION

An Environmental Impact Assessment (EIA) is hereby being presented in relation to a development permit, PA/04863/22 (EA/00042/20). The application is entitled *“The proposed construction of a Material Recovery Facility (MRF) for the processing of grey bag and recovery of different streams of materials. The proposal includes ancillary office space, staff quarters and parking spaces”*

The EIA focuses on the assessment of potential environmental impacts rising from the physical characteristics of the whole project and the land use requirements during the construction, operational and decommissioning phases. Detailed Terms of Reference (ToRs) for this EIA were issued by the Environment and Resources Authority (ERA) in April 2023, in accordance with the ENVIRONMENTAL IMPACT REGULATIONS (S.L. 549.46).

Wasteserv Malta commissioned AIS Environment Ltd. (Malta) to coordinate the EIA process and compile all the necessary technical studies.

1.1 Structure of the EIA

The structure of this EIA is detailed in Table 1, along with the relevant sections of ERA’s Terms of Reference (ToRs) for ease of reference.

Table 1: Structure of the EIA

CHAPTER IN COORDINATED ASSESSMENT REPORT (EIA)	DESCRIPTION	RELEVANT SECTIONS OF ERA’s ToRs
1	Introduction	N/A
2	Description of the proposed development. This section includes the justification of the proposal and a description of the physical characteristics of the whole project and the land use requirements during the construction and operational phases.	Section 1.0
3	Assessment of alternatives	Section 2.0
4	A description of aspects of the site and its surroundings (i.e., environmental baseline)	Section 3.0

5	Assessment of environmental impacts and environmental risks of the proposed development	Section 4.0
6	Summary of impacts tables	Appendix 3
7	Required measures, identification of residual impacts and monitoring programme	Section 5.0
8	Conclusions	N/A
9	References	N/A

2.0 DESCRIPTION OF THE PROPOSED DEVELOPMENT

2.1 General Introduction

According to the LONG-TERM WASTE MANAGEMENT PLAN 2021 - 2030, Malta is currently facing the challenge of significantly improving its performance in the waste sector as it currently ranks among the lowest-performing EU Member States in this area.

Population statistics published by NSO¹ show that between 2014 and 2020 the total population of Malta increased by 73,579 inhabitants, while municipal waste increased by circa 58,000 tonnes (Eurostat²). When small countries like Malta experience rapid population growth, they tend to experience a surge in waste production which often leads to various waste management issues. Reducing the amount of waste generated at source while maximising the amount of recycling and re-use potential is fundamental to invert this negative trend.

In 2019, the LOCAL GOVERNMENT ACT (Chapter 363 of the Laws of Malta) was amended to establish the function of Regional Councils to issue tenders for waste management services for local councils within their regions. The Waste Management Plan for Malta 2021-2030 highlights several measures aimed at enhancing Malta's waste management performance, including those related to regionalization of waste collection³. In accordance with the amended LOCAL GOVERNMENT ACT, these measures aim to promote the establishment of economies of scale through regional waste collection. To facilitate this, six regional service tenders were published on 19th May 2022 for "Household Waste Collection using Low Emission Vehicles," which serve the door-to-door collection of household residual waste (black bag), organic waste (white bag), and recyclables (green/grey bag plus glass). The proposed amendments aim to implement the regionalization reform in the management of packaging waste in line with the aforementioned regional tenders. As a result, Regional Councils are required to establish systems for the regional door-to-door collection, transport, and treatment of all municipal packaging waste generated, achieve the recycling targets for such packaging waste, and report data to ERA accordingly. Producer Responsibility Organisations (PROs) will be responsible for financing these systems based on their market share and maintaining overall management of the recycling points.

¹ [News2022_222.pdf \(gov.mt\)](#) – accessed on 07/03/2024.

² [Database - Waste - Eurostat \(europa.eu\)](#) – accessed on 07/03/2024.

³ <https://era.org.mt/amendments-to-the-packaging-and-packaging-waste-regulations-to-reflect-the-regional-collection-of-waste/> - accessed on 07/03/2024.

In general, collection systems include door-to-door kerbside collections for different waste streams like recyclables, glass, organic waste, and residual waste, along with a bulky waste service upon request. Alternatively, waste can be deposited at centrally located bring-in banks for paper, plastic, metal, and glass managed by PROs or at civic amenity sites for bulkier waste managed by Wasteserv Malta Ltd.

Over recent years, Malta has been striving to improve its recycling efficiency and reuse of municipal waste in line with the targets set out by the European Commission in 2008 following the publication of the WASTE FRAMEWORK DIRECTIVE. In particular, each EU Member State's goal is to take the necessary measures to achieve a minimum of 60% re-use and recycling of municipal waste by weight by 2030, and 65% by weight by 2035. In order to achieve these targets, Malta's strategic objectives set out through the LONG-TERM WASTE MANAGEMENT PLAN 2021 - 2030 are to:

- Maximise the resource value in waste through different management options;
- Innovate by designing waste prevention initiatives to lower Malta's per capita generation rate;
- Reform the collection system to increase economies of scale, harmonise collection practices and modernise the collection fleet;
- Study the feasibility of an enhanced producer responsibility framework to complement Malta's transition to a circular economy and reflect further on the true cost of waste management;
- Promote further the involvement of the private sector in waste management.
- Build the necessary waste management facilities to treat recyclable, organic and residual waste to achieve Malta's targets.

In line with the latter point, waste management and resources need to be optimized by ensuring that any waste generated is efficiently and effectively treated in order to minimise its environmental footprint whilst maximising its potential as a resource. Investing in both new and existing waste management facilities will ensure a modern and efficient waste infrastructure that not only meets Malta's current needs but will set in place the required treatment facilities for the sustainability of future waste management in the Maltese Islands.

With the aim of fulfilling European requirements and improve the sustainability of the national waste management of Malta, the construction of a Materials Recovery Facility (MRF) is being proposed (PA/04863/22). The development of a MRF is considered a project of high importance in the country's policy initiatives to reduce landfilling while improving the recycling rates of source-separated and co-mingled dry recyclables. The project is essential to help the Nation meet its' recycling rates of municipal waste targets by 2030 coupled with its broader obligations to combat climate change. In fact, the MRF will be specifically designed to meet the recovery and

recycling targets as defined in European Directives. The proposed scheme will also be designed in such a way to ensure that any emissions and environmental impacts arising from its operations are in conformity with the requirements and standards stipulated in the EU INDUSTRIAL EMISSIONS DIRECTIVE 2010/75/EU (IED).

The IED aims to achieve a high level of protection to human health and the environment by reducing harmful industrial emissions across the EU. On the other end, Malta is already committed to curb GHG emissions under the EU CLIMATE ACTION REGULATION through the LOW CARBON DEVELOPMENT STRATEGY (LCDS), which seeks to reduce the 1990 emission levels by up to 20% in 2020, 55% in 2030 and achieve climate neutrality (net zero carbon emissions) by 2050.

WasteServ Malta Ltd. is tasked with organizing, managing, and operating integrated waste management systems in the Maltese islands to promote a circular economy approach by maximizing recyclable material extraction and generating renewable energy from waste. WasteServ carries out the majority of its operations at the ECOHIVE Complex, the largest investment in Malta's waste management sector aimed at advancing the country towards a circular economy. To achieve these goals, the Waste Management Plan of Malta includes a range of measures, such as establishing a new Material Recovery Facility (MRF).

The new MRF is specifically designed to manage separated recyclable waste streams including paper, cardboard, plastics and metals. Since February 2008, such waste streams were received and processed at the MRF that was located at Sant' Antnin Solid Waste Treatment Plant in Marsaskala. This plant remained in operation until May 2017 when a fire made the full recovery of the building and associated equipment unfeasible. Various temporary solutions within the Malta North Plant at the ECOHIVE complex have been implemented by Wasteserv to circumvent the issue and maintain the country's recycling efforts.

In 2024, WSM commissioned a temporary MRF with a 40,000t capacity at the ECOHIVE complex. The facility is composed of a reception area for recyclable waste, a pre-filtering line, a bag opener& buffer, pre-sorter, ballistic separator, magnetic separator, eddy current separator, optical separators, conveyor belt systems, air compressors and balers⁴.

The proposed MRF will be designed to align with environmental sustainability goals while also providing economic and social benefits. The facility will complement the existing waste management plants and assist the Nation in increasing its recovery

⁴ <https://era.org.mt/wp-content/uploads/2024/11/WSM-Presentation.pdf>

rates and in meeting its targets and obligations as established by the WASTE FRAMEWORK DIRECTIVE.

2.2 Scheme site and immediate surroundings

The proposed development is located in Malta's North-Eastern coast, at about 700m distance away from Qalet Marku, Naxxar (Figure 1). The scheme will form part of the ECOHIVE Complex at Magħtab in conjunction with other waste management plants such as the Anaerobic Digestion Plant (ADP); Waste-to-Energy (WtE); Civic Amenity site; Żwejra and Magħtab landfills. The complex shall also entail the planned Organic Processing Plant (OPP) and Thermal Treatment Facility (TTF) which are currently subject to planning permit procedures (Figure 2).



Figure 1: Map showing the location in Malta (Source: Google Earth, 2020).



Figure 2: Site location (MRF at Maghtab forming part of the ECOHIVE Complex).

2.2.1 A description of the Present Land Uses and Environmental Characteristics of the Site

The site lies within the Naxxar local council boundary in the outskirts of the Magħtab suburb, eastwards of the Żwejra landfill. The town of Naxxar boasts a rich history and offers a diverse range of places of interest for visitors. The exact origins of Naxxar are uncertain, but evidence of habitation dates back thousands of years. This is demonstrated by the Tal-Qattara and Ta' San Brinkaw caves, megalith remains from the Bronze Age period at Tal-Qadi and Qaliet Marku, and the Bronze Age cart ruts that can be seen from Salina to it-Tarġa and near the Għadira tal-Wej. Several chapels also dot the Naxxar area, including the Church of St. Michael the Archangel in Salina, and the churches of St. John the Evangelist and St. Mary of the Angels in Bahar ic-Cagħaq⁵.

Naxxar's natural geography offers a sheltered environment for its residents. Historically, the area was used as a reconnaissance point, and throughout the ages, various forms of defense have been built to protect against enemies. Coastal defenses, such as towers, trenches, batteries, redoubts, and beach posts, were erected to resist landings from the sea. Inland defenses, such as pillboxes and fortifications were constructed to impede the enemy's advance if they landed successfully.

⁵ Source: <https://naxxar.gov.mt/tourism/>

The Scheme Site falls within the purview of the Magħtab Environmental Complex (also known as ECOHIVE Complex), managed by Wasteserv. The area is dominated by various waste management facilities including recycling plants, the Zwejra and Għallis engineered landfills, along with other commercial, industrial and residential areas in the surroundings.

The footprint of the entire site earmarked for development is around 21,373m², whereby the MRF building shall occupy 11,900m², welfare, which includes facilities which are not involved in the processing of waste such as reception building, canteen etc. shall occupy 400m² whilst the remaining 9,073m² shall be used for manoeuvring and access of vehicles. Shallow terraces dipping eastwards to the coastal area of Qalet Marku are separated by rubble walls. Although seemingly of degraded state, these structures are protected under the RUBBLE WALLS AND RURAL STRUCTURES REGULATIONS (S.L.552.01). These rubble walls represent a physical boundary to small parcels of agricultural land. Furthermore, sporadic residential buildings are found within a buffer area of 100m distance from the site extension.

The site is located in close proximity to older sections of the landfill, which are primarily composed of unconsolidated construction waste, with older portions covered by vegetation, including *Acacia* sp. and *Eucalyptus* sp. The dominance of invasive species confirms the frequent and significant disturbance from anthropogenic activity.⁶

The scheme falls under the governance of the CENTRAL MALTA LOCAL PLAN, more specifically within the Baħar iċ-Ċagħaq region of the locality of Naxxar (Figure 3).

⁶ Scott Wilson, *Development of Rehabilitation Strategies Magħtab, Qortin and Wied Fulija Landfills Summary Report FINAL*, 2004, <https://environment.gov.mt/en/Documents/Downloads/05aMepaFinal.pdf>

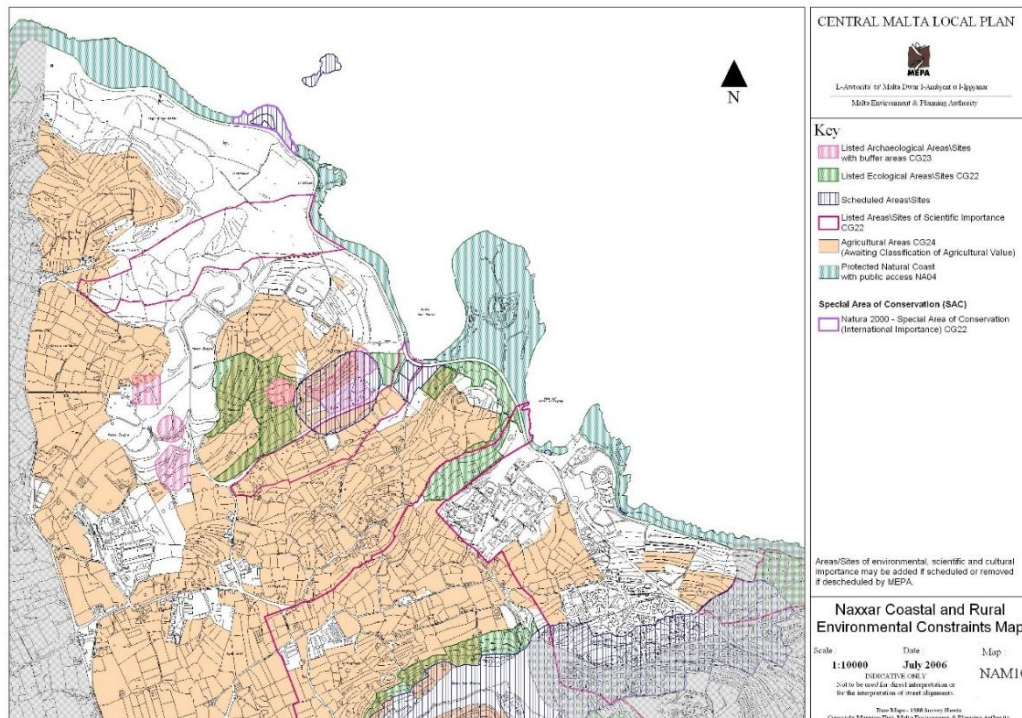


Figure 3: Large-Scale Coastal and Rural policy Map for Baħar ic-Cagħaq, Naxxar (Source: CMLP, 2006)

More importantly, the site is about 1.3km away from a nearby terrestrial Natura 2000 site also known as *I-Għadira is-Safra u l-Iskoll tal-Għallis* (MT0000008) which is designated as a Special Area of Conservation (SAC) via Government Notice 1522 of 2019. Other marine and bird protection areas are present within or in close proximity to the proposed MRF, chiefly:

- Terrestrial Environment:
 - MT0000007 - *Is-Salini* designated as a Special Area of Conservation via Government Notice 1379 of 2016; and
- Marine Environment:
 - MT0000105 - *Żona fil-Baħar bejn il-Ponta ta' San Dimitri (Għawdex) u Il-Qaliet* designated as a Special Area of Conservation of International Importance via Government Notice 682 of 2018; and
 - MT0000112 - *Żona fil-Baħar ta' madwar Għawdex* – Special Protected Area via Government Notice 1311 of 2016.

Natura 2000 sites comprise a network of protected areas established by the EU to conserve wildlife and habitats. The network covers various sites across all EU Member States, including Malta. The main objective of the Natura 2000 network is to protect and conserve threatened species and habitats, and to ensure the long-term survival of Europe's most valuable and threatened species and habitats.

2.3 Justification for the proposal

Data collected through the National Statistics Office exhibit a 4.4% increase in the total quantity of waste generated in Malta in 2022. Such figures amount to approximately 2.6 million tonnes⁷. Decreases in waste generation were noted from the collection of separated waste from Civic Amenity Sites (10.9% or 4,188 tonnes), bring-in sites (7.3% or 265 tonnes), the collection of the organic waste bag (11.5% or 2,678 tonnes) and the grey/green bag (1.5% or 422 tonnes). On the other hand, glass collection increased by 0.9% (30 tonnes). On a positive note, waste treatment reached a total of approximately 2.5 million tonnes, increasing by 6.1% over 2021 levels, while recycling in waste management facilities increased by a further 17.8% accounting for 209,679 tonnes.

Eurostat data⁸ was also analysed for statistical analysis to allow for a comparative assessment between EU Member States. Due to its small size, the total amount of waste generated by Maltese households is one of the lowest among EU countries with 0.16 million tonnes in average for a timeframe ranging from 2004 to 2020. On the opposite, Malta's mean yearly recycling rates from 2000 to 2022 reveal one of the worst records at European level compared to an EU average of about 39% (Figure 4).

⁷ [NSO Malta | Solid Waste Management: 2022 - NSO Malta \(gov.mt\)](#) accessed on 15/02/2024.

⁸ [Waste statistics - Statistics Explained \(europa.eu\)](#) accessed on 15/02/2024.

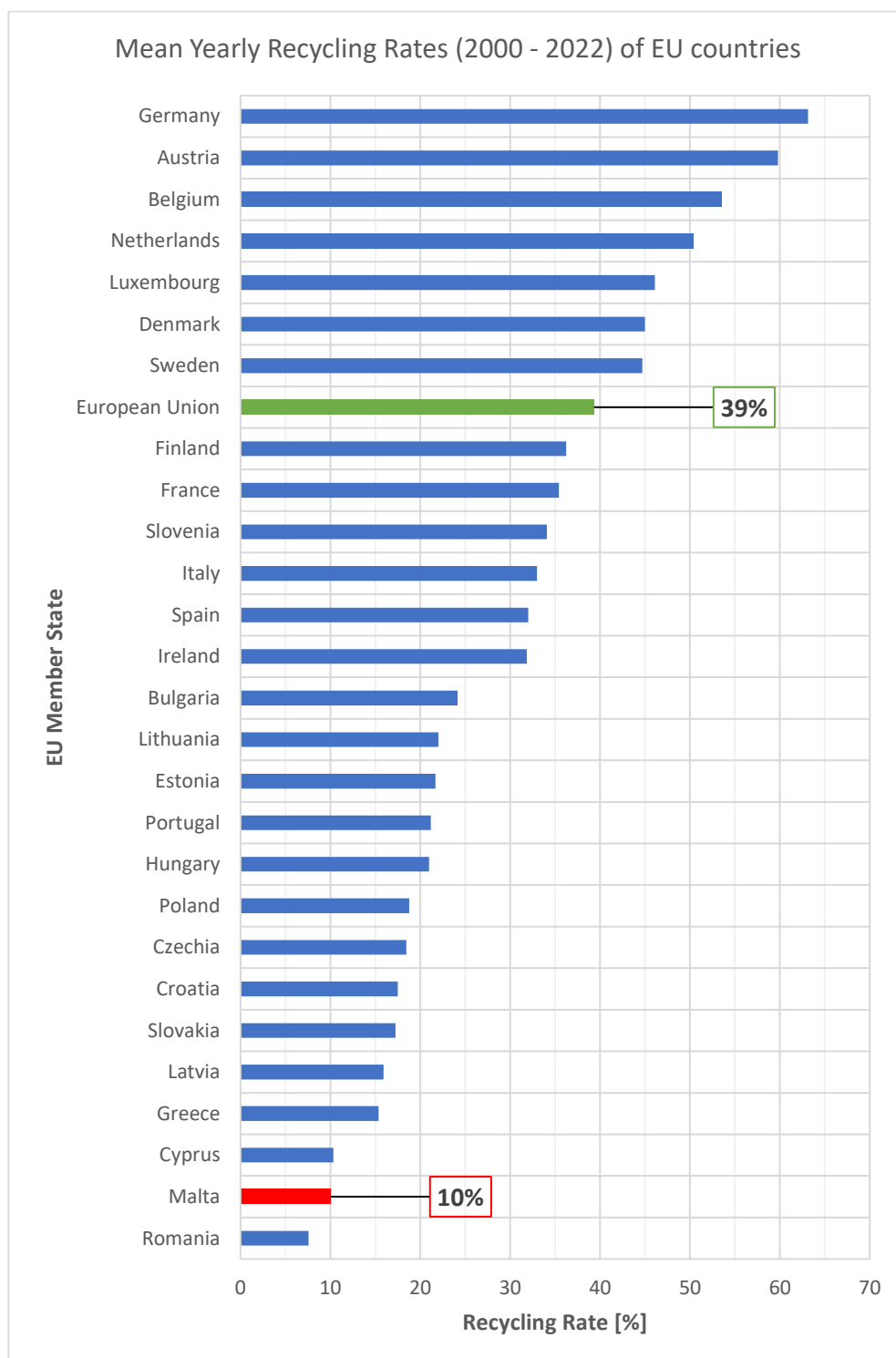


Figure 4: Mean Yearly Recycling Rates for a timeframe of Data Availability from 2000 to 2020 for each EU Member State (Data Source: EU Waste Statistics).

Figure 5 exhibits interesting trends for the Maltese Islands in terms of the total waste generated by households, and landfill and recycling rates.

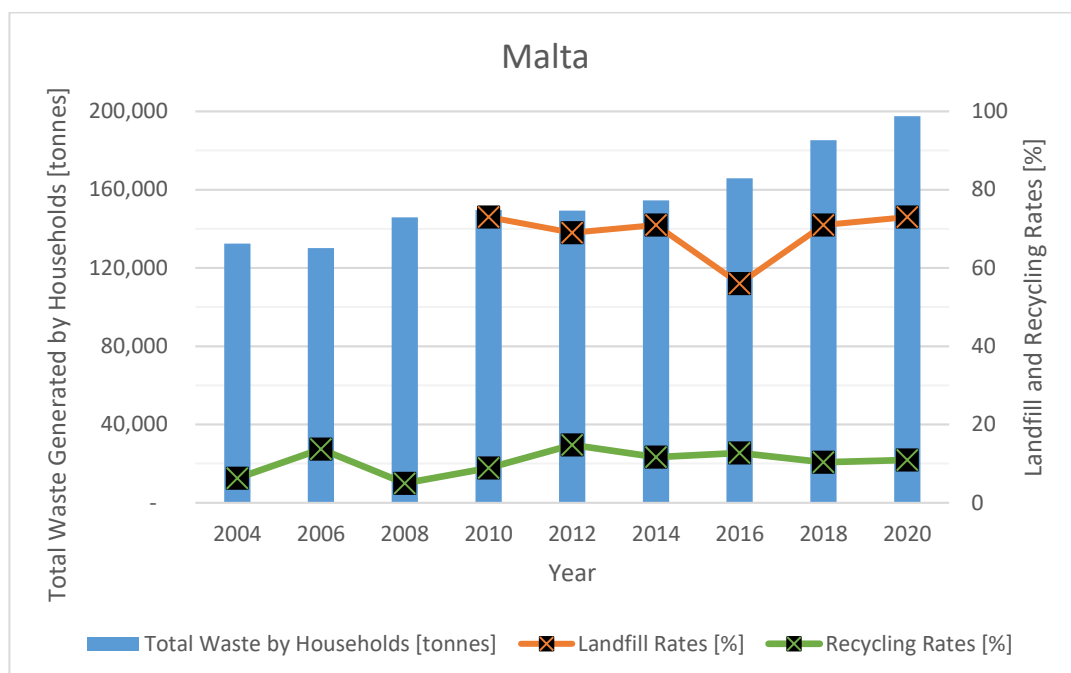


Figure 5: Time Series of Total Waste generated by Households (Blue bars), Landfill Rates (Orange) and Recycling Rates (Green) of the Maltese Islands (Data Source: EU Waste Statistics).

In accordance with Figure 5, the total waste generated by households increases at a mean rate of 2% every year. Spikes in waste production were recorded in between the years 2006 and 2008, and 2016 and 2018 accounting for a 6% growth. Between 2010 to 2020, landfill rates exhibit a neutral variation (e.g., 0% changes) on average. The lowest trough of landfill rates was observed in 2016 (12% landfilled material less compared to 2014) which corresponded to a 4% increase of recycling rate for the same year.

Although recycling rates are generally increasing over the period of analysis (e.g., in between 2004 and 2020) (Figure 5) at a 4% average yearly rate, interannual variabilities are large ranging from -47% to +37% in between 2006/2008 and 2004/2006 respectively, and remained quasi-steady from 2018 onwards. These patterns indicate the need of improving recycling facilities and increasing the entire country capacity of waste treatment. In the final quarter of 2018, Malta launched a countrywide program for collecting organic waste from households. As part of this initiative, legislative changes were implemented in 2018 to establish a set timetable for household MSW collection by waste type, requiring households to dispose of waste in accordance with the designated schedule. In line with S.L.549.40, waste separation became enforceable by law for everyone since April 2023, including

businesses, governmental and non-governmental entities as well as private homes⁹. Nonetheless, during the first six months, between April and October 2023, the authorities conducted an educational campaign to familiarise the public with these new regulations.

Increased efforts to sensitize the Maltese population to waste separation at source have been carried on by the government. An interactive educational centre in Marsaskala is worth mentioning: Wasteserv's visitors' centre was transformed into an interactive activity place for children to have fun while learning about waste management and circular economy. Waste prevention programmes are also incentivised through the WASTE REGULATIONS (S.L. 549.63) transposing Directive 2008/98/EC, and the WASTE MANAGEMENT PLAN 2014-2020.

The European Commission has approved a series of proposals aimed at increasing the EU Member States' recycling and re-use rates of municipal waste by at least 60% in 2030, and 65% by 2035¹⁰. In line with these European requirements and the need to foster a culture of resource efficiency, Malta is committed to investing in necessary infrastructure. This infrastructure aims to promote the prevention and sustainable management of waste by means of¹¹:

- Maximising the resource value in waste through different management options;
- Innovating by designing waste prevention initiatives to lower Malta's per capita generation rate;
- Reforming the collection system to increase economies of scale, harmonise collection practices and modernise the collection fleet;
- Building the necessary waste management facilities to treat recyclable, organic and residual waste to achieve Malta's targets;
- Studying the feasibility of an enhanced producer responsibility framework to complement Malta's transition to a circular economy and reflect further on the true cost of waste management;
- Promoting further the involvement of the private sector in waste management.

With the development of the new MRF, a significant contribution to the objectives outlined above are expected. When completed, the MRF will form part of and interact

⁹ <https://era.org.mt/press-releases/mandatory-waste-separation-for-all-from-april/> Accessed on 13/06/2024.

¹⁰ https://environment.ec.europa.eu/topics/waste-and-recycling/waste-framework-directive_en accessed on 15/02/2024.

¹¹ [Long Term Waste Management Plan 2021 – 2030 - ERA](#) accessed on 15/02/2024.

with the other treatment facilities at the ECOHIVE Complex. For this reason, short distances are envisaged to be involved in the movements of materials between the waste management plants by offering adequate environmental benefits in terms of energy use, emissions to the atmosphere and noise generated during internal trips.

2.3.1 Demand

The demand for the project is driven by several factors, including the forecasted increase in waste production due to local development and population growth, the increased diversion of recyclable materials from landfills, and the need to continuously invest and upgrade the Nation's waste management facilities. The MRF will also generate economic benefits by creating jobs in waste management and the recycling industry by recovering materials for recycling while conserving energy and raw materials required for manufacturing new products.

In addition to meeting the forecasted increase in waste production, a waste characterisation exercise was carried out as part of this EIA. This characterisation was based on the tonnage of waste received at WasteServ facilities during the year 2019 and revealed that an amount of approximately 94,000 tonnes of municipal solid waste (circa 47% of 200,698 tonnes) is believed to be suitable as a feedstock for the MRF. The feedstock includes not only the waste from bring in sites and civic amenity sites, but also commercial & industrial (C&I) recyclable waste.

A review and determination of waste flow predictions was carried out to quantify the tonnage of different waste categories which will be arriving and processed at the new MRF by 2030. This study showed that the MRF suitable waste per capita is expected to increase by 3.7kg until 2030 together with an additional population of about 33,500 inhabitants. This results in an input to the MRF amounting to approximately 70,000 tonnes by 2030 (Figure 6). This input tonnage was estimated by assuming that:

- 50% of the recyclable content in the black bag will be diverted to the MRF due to proper sensibilization to the public for improving separation at source; and
- Reduction in feedstock due to the Beverage Container Refund Scheme (BCRS).

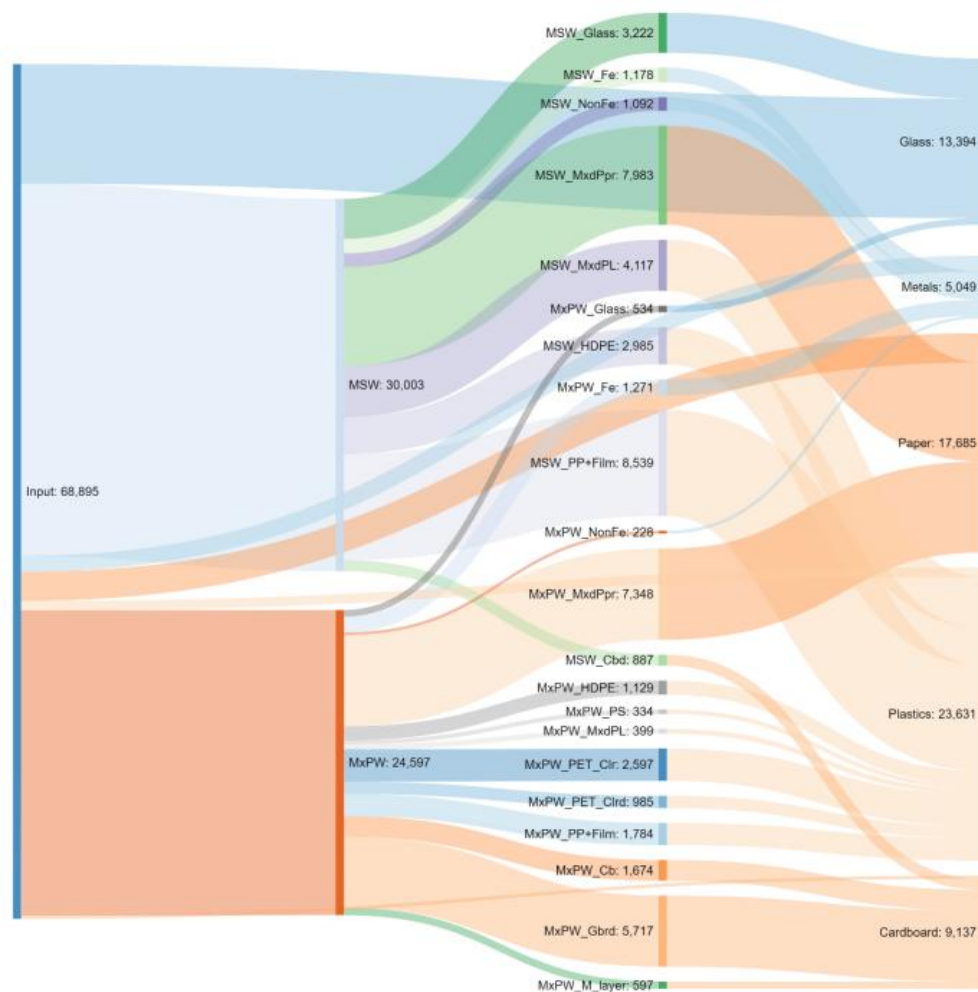


Figure 6: Tonnes of the different sources and components of the MRF input waste in 2030.

2.3.2 Local plan requisites

The coastal area at Naxxar is of high ecological, scientific, and scenic importance, protected by the Coastal Strategy Paper, which seeks to conserve and safeguard the natural and cultural values of the protected coastal areas. The proposed scheme location avoids Qalet Marku Bay and other sensitive areas to ensure preservation of coastal, transitional and land ecosystems. The newly proposed MRF will be part of and interact with the other waste treatment facilities at the ECOHIVE Complex while minimising land consumption of agricultural fields.

Significant improvements have been achieved by the Maltese government in terms of waste management in the recent years. In accordance with S.L. 549.63 and S.L. 549.40, since April 2023 the mandatory waste separation law applies to all individuals, businesses, and both governmental and non-governmental organizations. This legal

requirement prohibits the disposal of organic waste in regular black bags, mandating its proper disposal in designated organic waste bags. Similarly, recyclable materials like plastic, paper, and metals must be placed in grey or green bags. Glass collection is scheduled for municipal door-to-door pickups on the first and third Fridays of each month. Additionally, recycling points are available for the separate collection of plastic, paper, metal, and glass materials.

2.3.2.1 Long-Term Waste Management Plan 2021-2030 of the Maltese Islands
Malta's LONG-TERM WASTE MANAGEMENT PLAN (LTWMP) 2021-2030 aims to enhance resource recovery, reduce environmental impact, and promote sustainable waste management practices in the country. The plan highlights the country's challenges faced with high annual municipal waste generation per capita, predominantly with landfilling rates, and having the lowest recycling rate among EU.

The LTWMP strives to optimize the value of resources within waste through diverse management strategies. It aims to introduce innovative waste prevention initiatives to lower waste generation per person, revamp collection systems for improved efficiency, establish essential waste management facilities for recycling and treatment, explore enhanced producer responsibility frameworks, and engage the private sector in waste management. With a focus on these strategic goals, the plan underscores waste prevention as a key priority to enhance resource efficiency and minimize waste generation. Additionally, it concentrates on reforming waste collection systems to ensure their effectiveness and on optimizing waste management and resources to facilitate the transition towards a more resource-efficient and circular economy.

Ambitious targets are set for recycling certain materials. The plan aims to significantly boost recycling rates by implementing effective collection systems, raising public awareness on recycling practices, investing in infrastructure like MRFs, and fostering collaboration with stakeholders in the waste management sector.

2.3.2.2 Affected Area Policy

The location of the site falls under the provisions of the CENTRAL MALTA LOCAL PLAN, 2006 (CMLP). Policies of the CMLP which are relevant to the scheme are summaries in Table 2.

Table 2: Affected Areas

TITLE	REFERENCE	POLICY GIST:
Coast Road Alignment	NA06	NA06 proposes that the improvement of the Coast Road, between Baħar ic-Ċagħaq and Salina Bay, as indicated on the Naxxar Coast Transport Policy Map, should take the form of an on-line improvement rather than the construction of a new road as indicated in the current Structure Plan. ¹²
Protected Natural Coast	NA04	NA04 will not permit urban development along the open coastal area of Naxxar, between Għallis and Baħar ic-Ċagħaq, as designated in the Naxxar Coastal Policy Map. All efforts will be made in order to retain or reinstate these designated areas in their natural state. ¹³
Rural Environment – Protection of SACs, SSIs, AELs and AHLs	CG22	The proposed scheme is located within a rural/ODZ area and is a Listed Ecological Area/Site.
Protection of Sites of Archaeological Importance	CG23	Part of the proposed scheme is located within an area of Archaeological Importance on the Eastern side. This area includes archaeological feature number 26. This comprises Megalithic Remains from the Temple Period and is warranted Class B protection with an approximate 50m Buffer Zone.
Protection of Areas of Agricultural Value	CG24	The proposed scheme is located within an area of Agricultural Value

¹² <https://parlament.mt/media/100349/03434.pdf> - Partial Local Plan Review of the Central Malta Local Plan

¹³ <https://parlament.mt/media/100349/03434.pdf> - Partial Local Plan Review of the Central Malta Local Plan

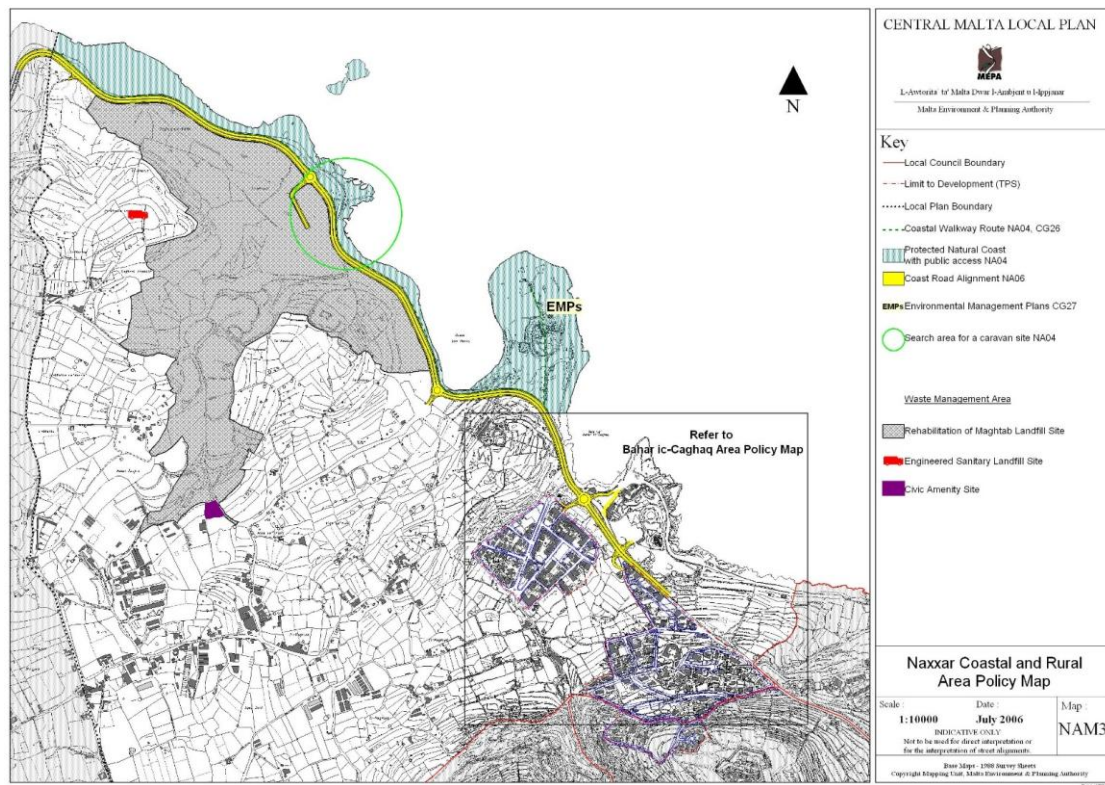


Figure 7: Naxxar Coastal and Rural Area Policy Map (CMLP, 2006)

2.3.3 Other Planning Developments in the Area

It is to be noted that several large-scale development projects are envisaged in the area of influence. Wasteserv Malta is currently driving the ECOHIVE project which represents a significant investment in waste management and sustainability. The proposed project is aimed at reducing the environmental impact of waste while making the most of its potential as a resource to meet the country's national recycling and landfilling targets. The ECOHIVE project is the largest ever investment in the waste management sector, driving Malta towards a circular economy. By processing waste in a sustainable and resource-efficient manner, ECOHIVE will transform waste into valuable resources, including energy and agricultural compost.

Wasteserv has been granted an outline development permit to construct and operate a Waste to Energy (WtE) plant at the ECOHIVE complex (PA3012/20). The project includes the drilling and laying of two HDPE pipes up to about 1km northeast from the shoreline just outside of the Qalet Marku inlet. These pipes shall be used to source the facility's cooling water and to discharge the residual warm water back into the sea. The WtE facility is planned for commissioning in 2024. Since the determination of the outline permit application, the applicant has obtained two separate full development permits to excavate the site (PA/08038/21) and construct the bunker structure (PA/06924/22). In conjunction, there is an ongoing screening process on PA/03422/22

which seeks to upgrade the existing road network within the ECOHIVE Complex to cater for the existing and future waste management operations envisaged on site.

Another plant envisaged within the complex is an Organic Processing Plant (OPP) which shall be used to process organic waste and produce biogas and agricultural compost. The investment is aimed at reducing the volume of biodegradable waste going to the landfill and obtaining valuable resources from waste that would have been otherwise landfilled. The OPP is expected to process about 74kT of organic waste annually.

The ECOHIVE Complex shall also house the Hygienics Thermal Treatment Facility (TTF) that will be designed to process hazardous waste such as clinical, abattoir and pharmaceutical waste streams, generating heat energy in the process. This facility is expected to replace the existing thermal treatment facility in Marsa.

Moreover, the Enemalta terminal station for the Maltese Interconnector 2 (IC2) will be located in the Magħtab area. This new electricity interconnector is designed to meet the future electrical demand of the country while simultaneously helping in reducing the atmospheric emissions currently generated by the existing natural gas and diesel oil power stations at Delimara. The IC2 project will connect the TERN 220kV substation in Contrada Camillà, Ragusa (Sicily, Italy) to the Magħtab terminal station. The cable link will have a rating of 245kV and will be designed to operate in parallel with the existing link to maximize the power transfer between the two networks. No permanent above-ground structures will be constructed in Malta, and Horizontal Directional Drilling techniques will be adopted to lay cables offshore to minimize environmental impacts at the seafloor.

2.4 Physical characteristics and land use requirements

2.4.1 General Characteristics

The MRF is being designed to process approximately 70kT of co-mingled recyclables annually. The MRF is intended to process a Dry Mixed Recycling (DMR) feedstock (containing paper, plastics, cardboard) through an automated process, leading to the refinement of the material stream and the extraction of specific recyclable materials. The investment in this facility is expected to result in high-quality recycled materials.

In general, the process of waste treatment begins with waste separation at source (typically in grey/green bags) in households and businesses ultimately leading to various forms of collection regimes. Refuse collection vehicles arrive at the ECOHIVE complex and deliver the material to Wasteserv Malta. Material streams are fed into the process through a bag splitter by loading shovels. Through a process of size segregation, magnetic filtering, ballistic separators, and optical sorters, the feedstock is processed and separated in various stages. At each stage, clean products are

extracted from the dry mix. A final screening by manual pickers ensures a higher grade of purity of the final product. Products include plastic film, mixed paper, newspapers and pamphlets, HDPE, PET, mixed plastics, residue, ferrous and non-ferrous metals. Balers and a compactor are provided to size these products using a large ram to compress the material, so it is densified before exportation.

The site identified for the construction of the new MRF within the ECOHIVE Complex offers environmental and management benefits, but also challenges for designing a functional layout of the building. In fact, the site is about 21,373m² (Figure 8), a footprint which is significantly smaller than MRFs in Europe typically requiring 55,000m² of land. Nonetheless, since the site is characterized by a topographic gradient (Figure 9) of about 11% (e.g., slope of 18m difference in ground elevation across circa 160m length) it is possible to design a facility across varying vertical heights.



Figure 8: Indicative Site Dimensions for the Construction of the New MRF.

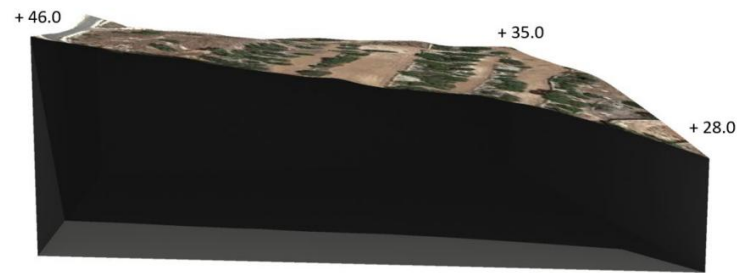


Figure 9: Indicative Ground Level Elevations of the Site for the Construction of the New MRF.

Taking into account the above-mentioned site constraints, the new MRF was designed by staggering and stacking the plant so that the building does not need to be defined as one whole volume. On the contrary, the massing of the MRF is split into smaller volumes hosting a different section of the process without compromising the engineering requirements.

The visual impacts of what are typically described as “ugly but necessary” waste infrastructures were minimized by ensuring a smooth operation with an architectural shift of public perception. In this project, the standard use of concrete and steel is reinterpreted in the different volumes created, pairing these cold materials with translucent polycarbonate, stone cladding and an injection of greenery and open space as illustrated in Figure 10.



Figure 10: 3D Rendering of the New MRF Layout.

The shed-type structure adopted for the MRF was conceptualised with the twofold objective of housing the plant and machinery necessary for the operation, and accommodating more plants and processes than people due to the low manual

requirements to operate the facility. Environmental benefits are also achieved by minimising visual impacts, land consumption, safeguarding protected areas, optimizing processes while reducing emissions in the atmosphere.

2.4.2 Construction Phase

A Construction Management Plan (CMP) will be drafted before commencement of construction works once the EPC Contractor is chosen. The following construction details present a typical schedule of activities for a plant similar to the one being proposed.

The staff requirements during the construction phase will vary depending on the works at the time. The average number of workers during construction is envisaged to be around 30 to 40.

Safety and maintenance strategy for workers employed and equipment deployed is envisaged to be planned, preventative and lean reliability centred.

Electrical power will be supplied throughout the construction phases and sourced from the existing distribution system within the ECOHIVE Complex. Similarly, water will be provided through a supply pipe prior to commencement of works whereas a number of portable toilets will be installed and regularly serviced for the workers' need on-site. Stormwater will be collected and channelized to the WasteServ existing network by means of connection pipes.

Construction works should be completed within a period of 19 months. The construction works are phased as follows in the next chapters.

2.4.2.1 Phase 1: Site Clearing and Preparation

Once the necessary planning permits are obtained, the site will undergo preparation. A variety of machinery will be brought on-site according to the specific construction phase. The machineries required include, but are not limited to: excavators, dumper trucks, backhoe loaders, concrete pumps and mixers, tower and mobile cranes, asphaltting machines and rollers. Maintenance of machinery is not expected to take place on-site albeit some emergency repairs could possibly take place. Refuelling of vehicles, through the use of mobile fuel tankers, which are on long term on-site may however be necessary. Precautionary measures need to be in place to prevent spillage and ground contamination.

Electrical power will be supplied by means of a cable connecting the site to the existing infrastructure. The existing distribution network is designed to deliver the required electrical power for the construction phase of the MRF building. Additional power could be provided by portable generators, if necessary.

Soil removal will be secured from the respective authorities and be accompanied by regular archaeological monitoring. Any archaeological findings will be reported accordingly to the Superintendence of Cultural Heritage and as per standard protocols established by the same Authority.

As soon as it is ensured that there are no remains of archaeological importance which need to be preserved, hoarding will be added around the site, the vegetation found within the construction area will be removed and/or redistributed, loose material will be cleared, and excavation works will begin.

2.4.2.2 Phase 2: Excavation and Building Foundation

Once excavations are carried out and archaeological findings (if any) are relocated, the foundation of the building will be laid and lower-level walls will be constructed at various points.

In order to reduce the release of dust to the environment, precautionary measures aimed at containing dust dispersion in the atmosphere will be installed and will employ various modes of filtration systems (dry, wet, etc.).

2.4.2.3 Phase 3: Backfilling

Further excavation and movement of backfill to be utilised in relevant areas may be required. Engineering works of site with backfilling up to the projected elevations is likely to take place.

Excess of backfilling material which will not be utilised for this purpose will be either removed from the site, or reused at subsequent stage if technically feasible. However, at this phase it is not likely to forecast with adequate accuracy the amount of material which can be reused or landfilled.

2.4.2.4 Phase 4: Landscaping

This phase involves formalisation of landscaped areas with transplanted elements, inclusive of further hoarding.

The area will be then landscaped with transplanted vegetation. The recommended species for transplanting are *Ceratonia siliqua* (Carob) and *Olea europaea* (Olive). Transplanting may also be feasible for *Pistacia lentiscus* (Lentisk).

2.4.2.5 Phase 5: Structure Build Up

Prior to commencement of work, such a project would require considerable spatial requirements both for on-site personnel supervising the works as well as storage and assembly zones and parking of vehicles. It is expected that a considerable area outside the MRF site will be necessary to provide sufficient space for these activities, however, the specifics can only be determined once the EPC Contractor is chosen. These areas should comprise of disturbed ground and are to be restored or rehabilitated to a

better state once works are completed. The use of areas within the confines of the ECOHIVE Complex will be given priority and highly encouraged.

Based on the experience from a similarly sized project, the following area prerequisites would be necessary for the construction of the structure of the MRF:

- Storage, which can also be off-site: 5,000m²;
- Pre-assembly area for piping or similar, which can also be off-site: 500m²;
- Lay-down/pre-assembly areas on-site: 1,000m²;
- Site offices and site huts, in site proximity: 500 m²;
- Site parking space: 1,000 m².

The structure hosting the new MRF will be developed over around 11,900m² with the baselevel of the building located at an approximate elevation of 10m below current ground level. A topographic gradient of about 11% forced the designers to take advantage of the stepping planes encouraging re-use of excavated material for compaction and space maximization (Figure 11). Spaces can be stacked vertically on top of each other, therefore minimizing footprint and maximizing space efficiency.

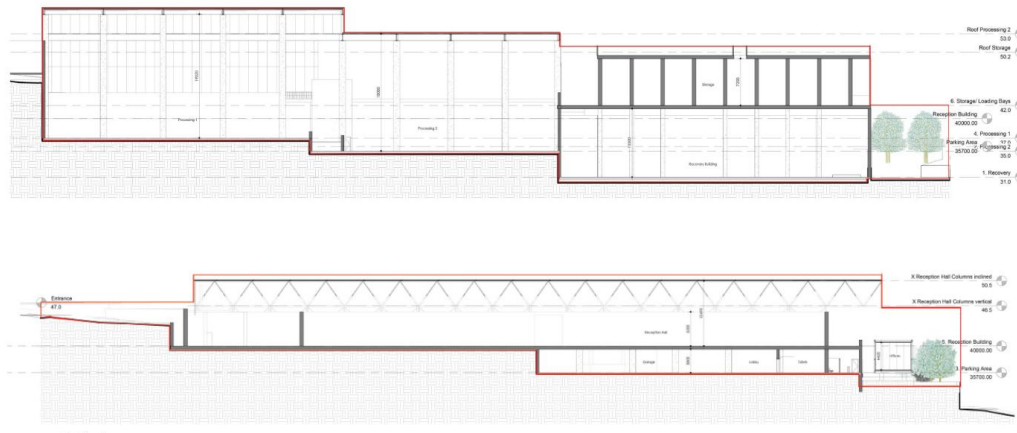


Figure 11: Representative Cross-Sections of the MRF Structure indicating Projected Ground Level Elevations of each Floor.

The staggering and stacking of the building imply that the MRF does not need to be defined as a whole single volume. On the contrary, the massing of the facility can be split into smaller volumes hosting different sections of the waste treatment process without compromising efficiency. From an architectural point of view, the splitting up of volumes leads to some benefits such as:

- Stacked volumes provide more external surface area (i.e., more façades) when compared to a single shed building. More surface area available is translated in the induction of more natural light while creating interesting façades.

Nonetheless, outdoor spaces can be formed in the negative spaces between the staggered volumes, providing greener views and more pleasant working environments for the plant employees.

- The staggered masses and inclusion of green areas in and around the plant reflect a drastic departure from the expected form of architecture of waste facilities. In fact, the staggered mass typology inferred more a cultural building as a campus, rather than an industrial site.

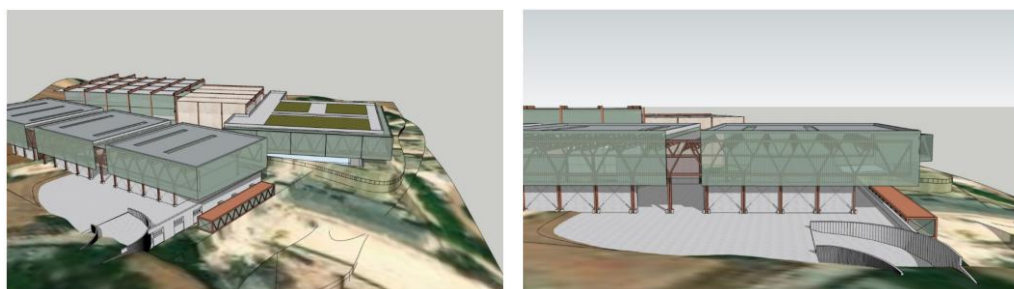


Figure 12: 3D Rendering of Representative MRF Façades.

2.4.3 Operational Phase

The proposed MRF is expected to have a minimum of 40 plant employees and an additional 10 to 15 administrative staff. It will also accommodate additional office staff not directly involved in MRF operations. The current premises do not have sufficient work accommodation within the complex at present. To facilitate an occupancy, the MRF will host facilities such as changing rooms, showers, canteens, toilets and open recreational areas for plant employees, whilst office employees will enjoy similar facilities with the addition of office spaces segregated from the day-to-day functions of the plant (although still connected). Both plant and office employees will have access to a common parking area.

Special emphasis has been dedicated to design the storage compartments fire safety measures to protect employees' health and safety welfare. Storage compartments are isolated, and are fire rated and equipped with fire extinguishing infrastructure. Should a fire break out in any of the compartments, the doors to the compartment will be shut to choke out the fire. Simultaneously, fire cannons or the sprinkler system will be activated to further extinguish the fire.

The raw waste materials to be processed by the MRF will consist of two main categories: Containers and Fibre. Table 3 provides a description of each item designed to be treated at the proposed MRF.

Table 3: Description of Categories of Raw Materials to be Treated at the MRF.

CATEGORY	ITEM	DESCRIPTION
CONTAINERS	Polyethylene and polypropylene	Polyethylene and polypropylene are two members of the polyolefin family. Polyethylene is a type of plastic which is manufactured using fossil fuels and can be used to make buckets, detergent bottles and plastic wrapping. High density polyethylene is typically used to make detergent bottles, milk bottles and some soft drink containers.
		Low Density Polyethylene (LDPE) is most used to make plastic film sold as cling film or shrink wrap.
		Polypropylene is typically used to make shampoo, detergent and medicine container lids and can also be used to make rope, carpet, clothing, and more.
	PET	Polyethylene terephthalate (PET) is a strong, and lightweight plastic mainly used to make soft drink bottles.
	Other Plastics	Typically include polystyrene (PS) and polyvinyl chloride (PVC). PVC is mainly used to manufacture pipes and window frames. Polystyrene is typically used to make packing pellets and foam boards. Polystyrene is also used to make yogurt pots and similar packaging.
	Metals	Ferrous and non-ferrous metals
FIBRE	Mixed Paper	Paper leaflets, newspapers, magazines, office papers, etc.
	Cardboard	Cardboard boxes of various sizes usually from packaging.
	Tetrapak	Milk cartons and similar.

The waste feedstock at the MRF shall be source separated in grey/green bags collected by Refuse Collection Vehicles (RCVs) from households and local business around the Maltese Islands, including waste from bring in sites and civic amenity sites. Both material streams are fed into the MRF through a bag splitter using loading shovels. The purpose of the bag splitter is to tear bags containing waste so they can be properly processed by the MRF.

Through size segregation, magnetic filtering, ballistic separators, and optical sorters, the waste feedstock is processed and separated in various stages. At each stage, clean products are extracted from the dry mix. A final screening by manual pickers ensures a higher grade of purity of the final product. Products from the Malta MRF would

include plastic film, mixed paper, newspapers and pamphlets, HDPE, PET, mixed plastics, residue, ferrous and non-ferrous metals. The volume of these products is reduced using balers and a compactor. Balers and compactors use a large ram to compress the material, thus densifying the material prior to export.

The MRF plant shall be subdivided into smaller areas where the three main stages of the waste treatment process shall take place (Figure 13):

- Reception hall;
- Processing area; and
- Recovery area.

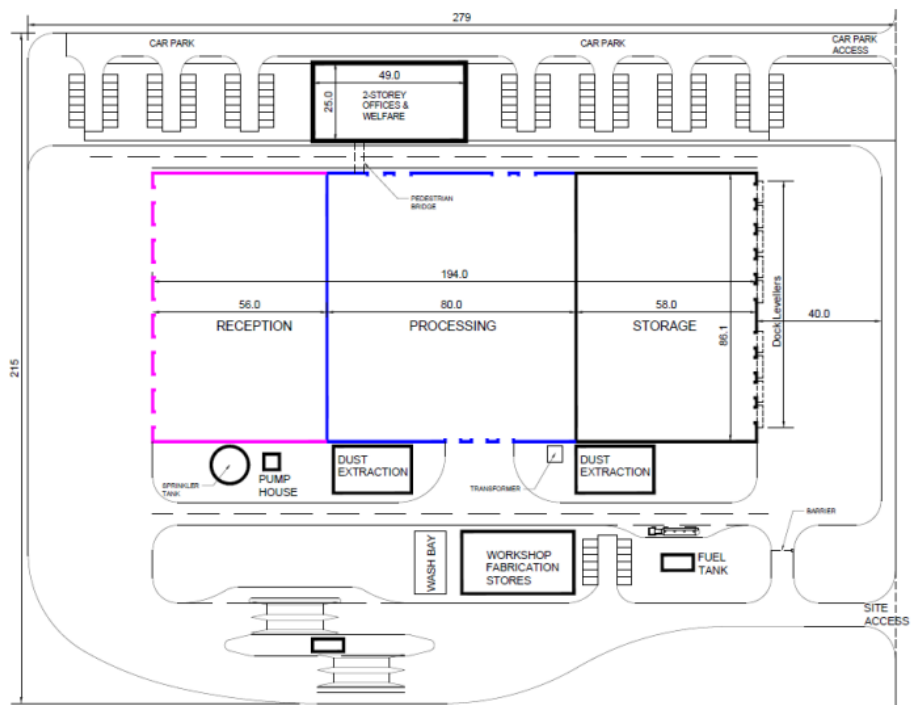


Figure 13: Site Plant exhibiting the location of the Three Waste Treatment Stages.

2.4.3.1 Reception of Waste

The entrance to the MRF facility will connect to the ECOHIVE complex's internal road network and to the maneuvering area of the reception hall. The vehicles making use of this entrance are RCV's (following the scheduled collection of waste in localities around Malta) and maintenance vehicles (large vans or similar). The expected quantity of RCVs is estimated in the region of 90 trips on Tuesday (Fibre collection day) and approximately 70 trips on Thursday (Containers collection day). A change in the national waste collection schedule must be undertaken to commence this operation.

Upon entering the facility, the RCVs are directed towards two weighbridges where their load will be recorded and then directed to enter the reception hall to deposit the waste. The maneuvering area has been sized to accommodate various RCVs side-by-side and in queue, to avoid back-tail of vehicles blocking the complex road network. After depositing the waste in the reception hall, the RCVs once again drive over the exit weighbridge, their weight recorded, and then exit the facility onto the ECOHIVE Complex.

The reception hall building envelope consists of 6m tall concrete push-walls around the perimeter of the footprint which is then capped off with a large-span ceiling that protects the space from the elements (Figure 14). After being deposited on the reception hall floor, front-loaders maneuver the waste against one side of the hall. The hall therefore serves as a bunker for the accumulation of waste deposited on the day (approximately 770 tonnes of Fibre on Tuesday and approximately 580 tonnes of Containers on Thursday).



Figure 14: General Photo of a Reception Hall pointing out Push-Walls.

When enough waste is accumulated, a material handler (a grab) picks up the accumulated waste and begins loading the feedstock into the feed to the bag splitter. Any large items (such as cardboard packaging) are separated from the rest of the feedstock and fed directly to the balers in the Recovery Hall via a conveyor.

2.4.3.2 Processing of Waste

Trommel screens, magnetic conveyor belts, eddy current separators, ballistic separators, optical sorters, and other sorting equipment are situated in the Processing

Hall of the facility. Waste passes through the bag splitter and then proceeds to a pre-sort area where manual workers initiate the sorting of materials before they enter automated mechanical sorting systems. Incorporating a pre-sort station before the automated systems enables the MRF to generate a higher quality end-product which is more valuable.

2.4.3.3 Recovery of Waste Streams

The final stage of processing is the recovery of “clean” waste streams and bailing the end-product for storage and eventual exportation. From the Processing building, several conveyors carrying the filtered waste streams are channeled through a final manual sort where plant workers pick items off the line and deposit them into their respective recovery bay (Figure 15). The deposited product is then shoveled onto a feeder to be compressed into bales of paper, or plastic, or other recovered waste stream (approximately 1.2m x 1.2m). The bales are then placed into one of several goods lifts and taken up to the storage level.

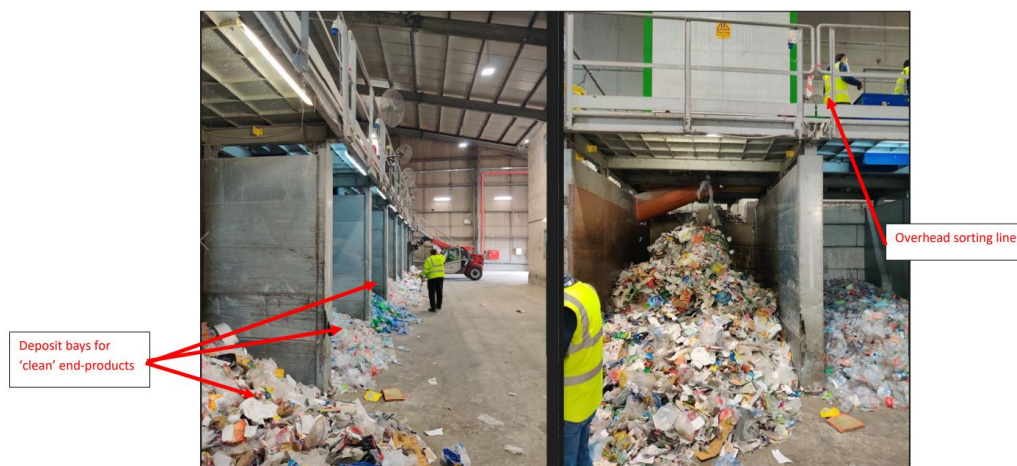


Figure 15: Representative Photo exhibiting Deposit Bays for “Clean” End-Products and Sorting Line.

The goal of the MRF is to extract an end-product that is as clean as possible (within economic feasibility) from the original Dry Mixed Recyclables, therefore, turning waste into a valuable resource. Until they can be sold on the market to a buyer, the bales (the end-product) must be stored at the facility until these are ready to be off-loaded. It is estimated that bales would be stored for approximately one week, although this figure will certainly fluctuate depending on market factors.

The vehicles entering the maneuvering area for goods transportation are hook loaders with empty 40ft containers. The projected number of hook-loaders to enter the facility every day is between 5 and 8, depending on market factors. The hook-loaders will be parked into the loading bays whilst the freight contractor loads up the bales directly from the front facing storage compartments. The storage area was designed such that

the freight workers may operate simultaneously and independently from the internal operations of the MRF. After the freight worker empties one storage compartment and moves onto the next, the facility's operators may open access to the empty storage compartment and re-stock the compartment without conflicting operations with the freight workers.

2.4.4 Decommissioning phase

The new MRF shall be designed with a lifetime of 20 years. Decommissioning of the facility must follow acceptable standards required for eliminating environmental and health hazards during site decommissioning and clean-up. These requirements include:

- Removal of structures on or beneath the ground;
- Disposal or secure isolation and/or treatment of contaminated equipment in-situ or off-site;
- Remediation of aesthetics (back-fillings, stained soil removal, waste disposals, etc.);
- Access controls for physical structures remaining on-site that are unsafe or hazardous to humans or animals;
- Remediation of aesthetically unacceptable portions of the site (filling of pits, removal of stained soil and odorous material, levelling of mounds, disposal of waste rock, etc.);
- Clean-up of the site to a level which will provide long-term environmental protection and will be safe for the intended future use;
- Submission to the applicable regulatory agency and other required jurisdictions of a report confirming that decommissioning and clean-up has been completed.

The area may be utilised by Wasteserv Malta for other waste management operations as deemed fit at that time of decommissioning. Any future use of the site shall be subject to any necessary assessment required at the time.

2.4.5 Project Management

2.4.5.1 Timescales and Phasing

It is estimated that around 50 persons will be employed to construct the proposed Scheme, although this will depend on how the Construction Management Plan is set out by the winning works contractor.

The construction target date for the Scheme is still unknown but the overall construction phase is not expected to take more than 19 months as per contract.

The construction project shall be phased. The Site will be cleared and prepared for the subsequent phases by setting up temporary offices and mobilising construction equipment on-site. Excavation up to 10m below current ground level will be followed by the laying of the building foundations. Once foundations are completed, the site will undergo backfilling up to the desired topographic level followed by landscaping activities. Finally, the site will be ready to accommodate the construction of the building which happens to be the longest phase of works on site.

The MRF shall be designed for an operational lifetime of 20 years.

2.4.6 Access, Transportation and related Infrastructure

Since the proposed MRF forms part of the ECOHIVE Complex, existing internal routes will be utilised for vehicular movements during the construction and operational stages of the project. Upon completion of works, access requirements are limited to authorised Wasteserv personnel and third-party RCVs with appropriate waste carrier permits.

The expected quantity of RCVs is estimated in the region of 90 trips on Tuesday (Fibre collection day) and approximately 70 trips on Thursday (Containers collection day). A change in the national waste collection schedule must be undertaken to commence this operation. The traffic influx towards the MRF is not likely to generate significant impacts on public and internal routes.

During the operation stage, the entrance of the MRF will be connected to the complex's internal road network (Figure 16), hence, public roads shall only be impacted to a minor extent. Once inside the ECOHIVE Complex, workers and truck drivers will be directed towards parking zones or to the manoeuvring area of the reception hall where the incoming waste will be stocked. Trucks will transport the recycled material off-site by making use of the same routes.

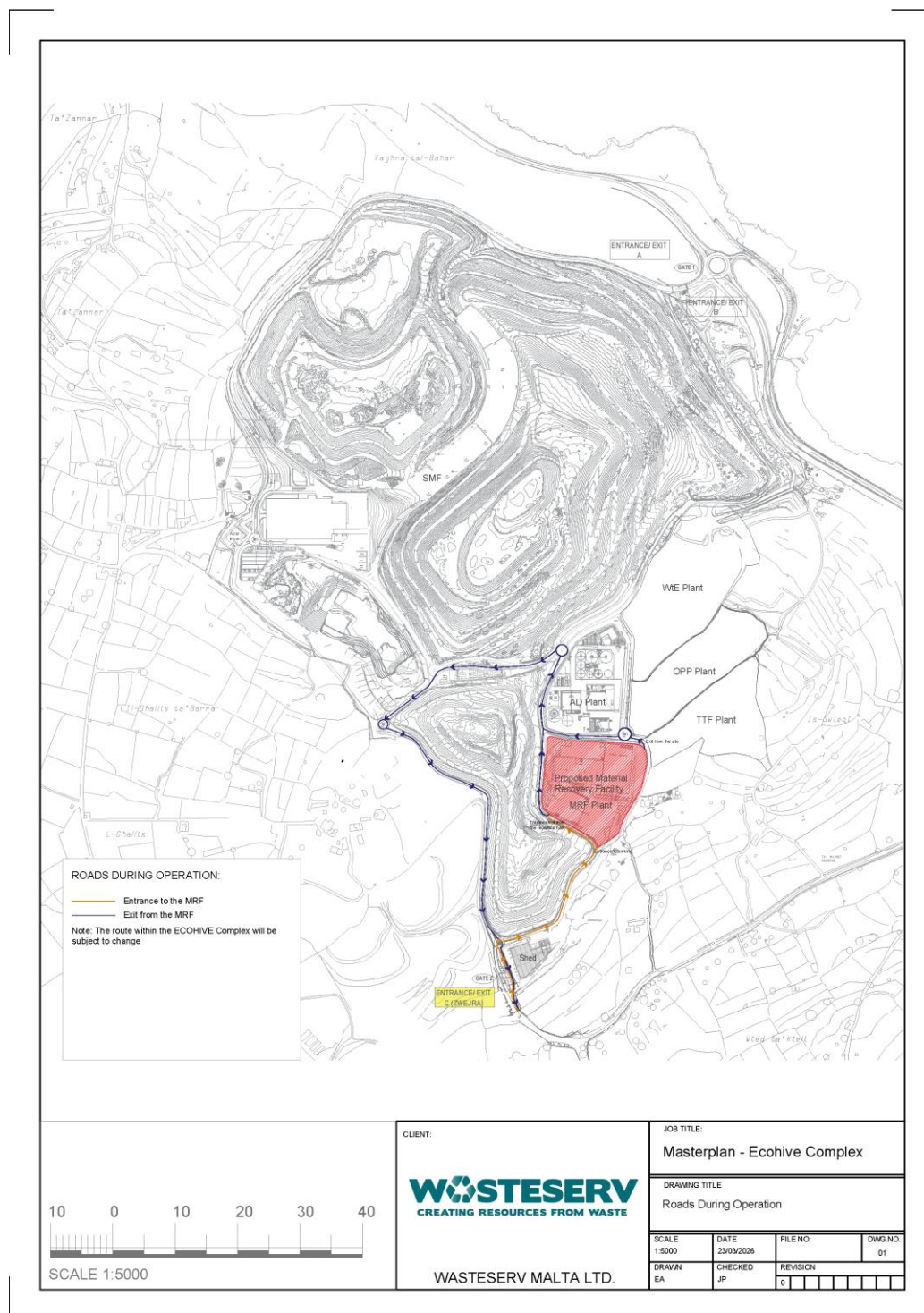


Figure 16: Maghtab Masterplan indicating Public and Internal Routes of the ECOHIVE Complex.

2.4.7 Sewerage, runoff management, energy, telecommunications, and ancillary infrastructure

2.4.7.1 Construction Phase

The ECOHIVE Complex is already connected to the necessary infrastructure and utilities. During the construction phase, a slight increase in discharges of water or wastewater is envisaged compared to the existing flow rates for mobile toilets and build-up of the MRF structure like concreting works. During the construction phase, all the generated wastewater streams will be collected and conveyed towards treatment plants.

2.4.7.2 Operational Phase

No discharge or flow of surface water or other substances sourced within the facility during its normal functioning is foreseen. The MRF is designed to operate without producing any run-off which can have negative impacts on the environment and surrounding ecosystems. The system is designed to retain all surface water run-offs and materials such as oils and lubricants, within its boundaries and prevent them from escaping into the surrounding environment. This helps to ensure that the system is environmentally friendly and sustainable over the long term. Household and sanitary wastewaters are discharged to the public sewer system.

Water reuse at ECOHIVE Complex is highly encouraged. An interconnected network of rainwater harvesting and water treatment systems ensures minimal supplies of water from external sources. Wastewater streams sourced with rainwater are collected and properly treated to provide high quality water within the Complex. The process flow diagram of water, drainage and sewage is shown in Figure 17.

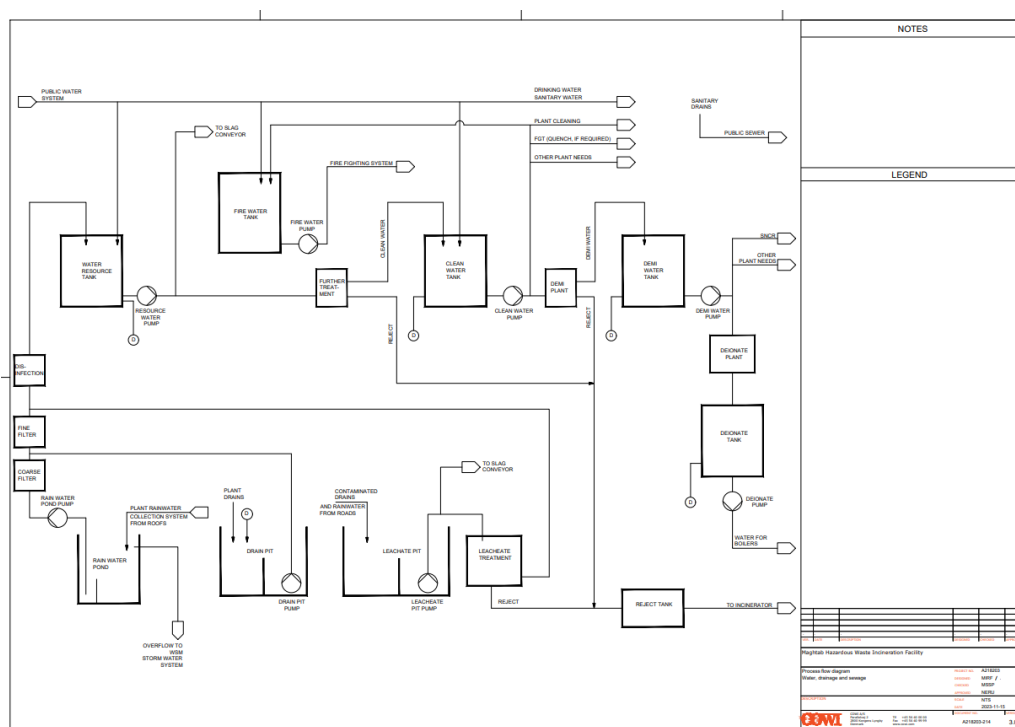


Figure 17: Process Flow Diagram of Water, Drainage and Sewage at the ECOHIVE Complex.

A leachate pit occupies a volume of 200m³ storing drain waters originated from the tank yard, the wet ash conveyor, the cleaning of floors in waste area, and the rainwater flowing through roads and parking areas. Prior to reuse, wastewater undergoes pre-treatment stages with focus on the removal of oils, heavy metals, particles, and microorganisms. Further treatment is applied once the leachate is pumped to the water resource tank while the reject stream is directed to the incinerator for final disposal.

The drain pit is 20m³ and collects all the drains from the boiler, e.g., drains from the water steam cycle and from the flash tank. The stored water is conditioned with NH₃ and NaOH, and contains magnetite and dirt from the boiler. Microfiltration, pH adjustment and disinfection are applied prior to consumption.

Rainwater falling on roofs is conveyed towards the 200m³ rainwater pit. Although cleaner than the previously described water sources, harvested rainfall passes through coarse and fine filtration for removing small particles. Upon disinfection, this water stream is pumped to the water resource tank for further treatment and final reuse. Excess of rainwater overflows towards the stormwater reservoir.

Potable water is produced in the demineralization plant. This treatment plant combines ultrafiltration, degassing and reverse osmosis processes to generate demineralized water suitable for human consumption. Depending on the inlet water

quality, from 10 to 25% of the inflow is rejected. The reject stream is disposed of in the wet slag conveyor.

The treated water streams are stored in separate tanks to accommodate various consumptions in line with their quality.

2.4.8 Waste management

The waste management facility in question is a state-of-the-art MRF that is designed to handle and process waste from various sources in a sustainable and environmentally responsible manner. Unlike traditional waste management facilities, this MRF is not expected to produce significant amounts of waste on its own, apart from minor quantities generated by its employees and during the construction phase.

The MRF is subject to stringent environmental and waste management regulations. The facility is designed to meet the highest standards of waste management and to minimize its environmental impact. This is achieved through a combination of advanced technologies and processes, as well as a strong focus on waste prevention, reduction, and recycling.

During the construction phase, the facility will implement a comprehensive waste management plan to minimize waste generation and ensure that any waste that is produced is recovered or disposed of in an environmentally responsible manner. This may include measures such as recycling construction materials, reducing packaging waste, and implementing a waste segregation system to ensure that different types of waste are recovered or disposed of properly.

Once the facility is operational, it will receive waste from various sources. The MRF will use advanced sorting technologies and processes to separate and process the waste, with a focus on maximizing recycling and minimizing waste disposal. The facility is expected to have a high recovery rate for recyclable materials which will be sorted and prepared for marketing to end-user manufacturers.

The MRF will also implement a comprehensive waste management plan for its own operations, with a focus on reducing waste generation and ensuring that any waste that is produced is recovered or disposed of in an environmentally responsible manner. This may include measures such as implementing a recycling program for employees, reducing paper use, and minimizing food waste.

In summary, the waste management facility in question is a modern and sustainable MRF that is designed to handle and process waste from various sources in a responsible and environmentally friendly manner. The facility is expected to have minimal waste generation of its own, and will implement comprehensive waste management plans during construction and operation to ensure that any waste that is produced is recovered or disposed of in an environmentally responsible manner.

2.4.8.1 Waste Management Regulations

The WASTE FRAMEWORK DIRECTIVE (2008/98/EC) provides a legal framework for waste management in the EU, including definitions of waste, hazardous waste, and recovery operations, as well as guidelines for waste prevention, reuse, and recycling. The national legislation S.L. 549.63 of 2011 (WASTE REGULATIONS) transposes the aforementioned directive, which provides a comprehensive strategy to manage waste through increased prevention, re-use, recycling and recovery schemes.

As part of EU Member States, Malta is committed to reach an overall recycling rate of 60% by 2030 while reducing landfilling. The construction of the new MRF is to be considered as a pillar to achieve this target.

2.4.8.2 Waste During Construction Activities

During the construction and excavation phase, waste will be generated. It is not expected that the Scheme will generate any electrical or electronic waste. If any, such waste will be recovered in line with the WEEE Directive 2012/19/EU as transposed into S.L. 549.89 of 2014 (WASTE MANAGEMENT [ELECTRICAL AND ELECTRONIC EQUIPMENT] REGULATIONS) and later amendments. Any batteries and accumulators will be recovered as per Directive 2006/66/EU, transposed into local legislation by S.L. 549.54 of 2010 (WASTE MANAGEMENT [WASTE BATTERIES AND ACCUMULATORS] REGULATIONS) and subsequent amendments.

The information regarding types and quantities of waste that are expected to be generated during the different construction phases of the project is summarised in Table 4. The quantities are listed in cubic meters (m³) for each type of work. Although the excavated material is envisaged to be reused for backfilling as much as technically and economical feasible, an excess of about 30,000m³ is foreseen to be generated and subsequently discarded.

Table 4: Volumes of excavated material and backfilling

WORK	UNIT	VOLUME
Total excavation	m ³	-51,462.87
Backfilling to projected Ground Level	m ³	21,576.68
Net cut/fill	m ³	-29,886.19

Ground contamination assessments and characterisation tests on the material to be excavated reveal that the Industrial limits stipulated in Decreto 152 of 2006 have not been exceeded. Consequently, the material excavated from the site is suitable for backfilling. Most sample results obtained are above certain Residential Limits of the Decreto and therefore the EPC contractor should not dispose of the excavated material indiscriminately in an authorised waste acceptance quarry. Material

excavated from sampling locations A1, D1 and F1 should be kept apart and reused as backfill on site or as landfill daily cover, due to the exceedances that have been noted. Only material excavated from sampling location J1 may be considered for disposal in an authorised quarry. Leachate results revealed full compliance with the EU limits stipulated in 2003/33/EC.

2.4.8.3 Waste During Operations

Minimal waste quantities shall be generated during the operation stage. Waste generated during the operational phase will be mostly limited to maintenance waste. The type and quantities of waste will depend on the maintenance work required, and is therefore unlikely to specify and quantify at this stage.

Small quantities of waste will also be generated from operators working within the Maghtab Offices. This waste will be of a domestic nature. The operators will be encouraged to implement the Four R Principle (Reduce, Reuse, Recover and Recycle) to limit the amount of domestic waste generated.

3.0 ASSESSMENT OF ALTERNATIVES

3.1 Alternative sites

In this section, the outcomes of an Alternative Site Assessment carried out to assess the suitability of various sites across Malta to accommodate the proposed MRF are summarised. The site suitability assessment was based on the filtering of technical, economic and environmental factors.

By taking into account the fact that the majority of WSM's operations in Malta are located at the Maghtab Environmental Complex (ECOHIVE Complex) and the Sant'Antnin Waste Treatment Plant (SAWTP), four areas were shortlisted for the proposed project, namely:

- Site 1: to the North East of the proposed WtE facility (Figure 18);
- Site 2: to the West of the Zwejra landfill (Figure 18);
- Site 3: to the East of the Zwejra landfill (Figure 18);
- Site 4: a direct replacement of the previous MRF facility at Sant' Antnin (Figure 19).



Figure 18: Three out of Four Alternative Location Sites Located in the Surroundings of the ECOHIVE Complex considered for the project



Figure 19: One out of Four Alternative Location Sites Located in Sant' Antnin Waste Treatment Plant (SAWTP)

Since Site 4 is already developed and has already accommodated another MRF which was destroyed by a fire in 2017, the Sant' Antnin Waste Treatment Plant (SAWTP) is fully compliant with policy designations regarding the development of a new MRF at SAWTP. Furthermore, the development of an MRF at Site 4 would not give rise to any significant adverse construction impacts associated with the take up of undisturbed land. Additionally, the existing traffic and pavement conditions within SAWTP are considered to be sufficient to accommodate the redevelopment of a new MRF at Site 4. However, the old MRF occupied a footprint of about 6,700m² which is way less than the minimum areal extension requirements established for an effective recycling standing at 10,000m². Given the site constraints, further expansions of the plant may be technically unfeasible. Opting for Site 4 would also mean that a huge portion of the Municipal Solid Waste generated in Malta would need to be directed towards this facility. Due to the site proximity to residential areas (circa 400m), the increase in traffic and scale of operations is foreseen as a major inconvenience to the surrounding resident population. Based on the above-mentioned limitations, Site 4 was deemed to be not suitable for the construction of a new MRF. In fact, the siting of the MRF within the ECOHIVE complex was already determined through the Malta's National Waste Management Plan for 2021-2030.

The outcome of the Alternative Site Assessment shows that major road works would be required to prepare Site 1 to host the MRF while taking over agricultural land.

Besides, the close proximity to residential areas and protected zones depicts Site 1 as unsuitable for this project. Both Site 2 and Site 3 are suitable to develop the new MRF. These sites are sufficiently located away from nearby residential areas, such that social inconveniences during construction and operational activities will be minimal and largely unnoticeable.

Since Site 3 is located closer to other waste treatment facilities at the ECOHIVE complex, Site 3 offers shorter distances for material movements between the facilities when compared to Site 2. Moreover, the location of Site 3 offers some environmental benefits in terms of energy use, emissions to the atmosphere and noise generated during the transportation of waste within the complex.

Building the MRF on Site 3 would also take up less agricultural land than Site 2. The current landform of Site 3 also provides better design possibilities to mitigate negative visual impacts. Site 3 is also located further away from known archaeological features than Site 2, although the possibility of uncovering any subsurface cultural heritage/archaeological features during excavation is equally possible at both sites.

3.2 Alternative Technologies

3.2.1 Construction phase

There are several ways to approach the construction phase of a MRF project depending on its size, location, and specific functionalities required. Common alternatives include a single building with co-located functions using precast concrete panels for quick installation and improved structural integrity, as well as insulated metal panel walls for excellent thermal insulation. For larger projects with multiple buildings, poured-in-place concrete foundations ensure stability, while steel framing offers high load capacity and easy expansion. Below-grade development can benefit from waterproof membranes to protect against water intrusion and proper drainage systems to prevent flooding. In multi-storey facilities, elevator shafts enhance vertical transportation, and robust roof structures support heavy loads and accommodate rooftop installations. Dock levellers, whether hydraulic or rubber systems, streamline container loading processes reducing physical strain on employees. Alternatively, roller doors and sliding gates provide secure seals and versatile loading configurations in facilities without dock levellers. These technologies cater to diverse MRF designs, offering tailored solutions to meet specific project requirements and ensure adaptability for future growth and changes.

A single building MRF with fire compartmentalization and dock levellers is considered optimal for this project due to its practicality and alignment with safety regulations. During construction, fire-rated walls and fire doors should be implemented to contain potential fires and limit their spread. Additionally, dock levellers should be utilized for efficient loading procedures, which minimize risks associated with manual handling of

containers. This approach ensures safety, efficiency, and compliance with existing guidelines. To adapt the project to the site's topography and layout, necessary modifications can be made while preserving the core principles of the single building design. Overall, this strategy balances innovation with conventional wisdom, resulting in a well-functioning MRF that meets both present and future needs.

3.2.2 Operational phase

Alternative technologies for the MRF include clean MRFs and dirty MRFs.

A dirty MRF accepts a mixed solid waste stream and then proceeds to separate out designated recyclable materials through a combination of manual and mechanical sorting. The sorted recyclable materials may undergo further processing required to meet technical specifications established by end-markets while the balance of the mixed waste stream is landfilled.

In Malta waste is separated at source from municipal solid waste, therefore, a clean MRF is proposed. Some advantages of clean MRFs include low technology requirements, job creation through manual pickers, community involvement in source separation, and strong buy-back markets for by-products.

Robotic units within worldwide MRFs demonstrate a progressive shift towards automation to optimize recycling processes, improve recovery rates, and address challenges such as labour shortages. However, these alternative technologies were ultimately discarded because robotization mechanisms remain in an early stage of development and have yet to prove themselves in real-world applications.

A Cost-Benefit Analysis was undertaken to identify pros and cons of each technology to operate the MRF at the desired throughput. However, it has to be noted that the final selection of the full series of technologies to be implemented for the recycling facility shall be addressed at procurement stage.

Alternative solution technologies to run the proposed MRF were investigated with the objective of optimizing process throughputs while maximizing quality and quantity of end-products. Different solutions were selected and filtered in compliance with the site-specific conditions and best technological advances. The selected technological solutions were further ranked through the assignment of a score to each feature while taking into consideration Health & Safety, technical, operability, commercial and financial factors. The final determination of the operating systems and recommended technological solutions to achieve high quality and quantity of recycled end-products was based on both a Cost-Benefit Analysis (CBA) and technical expertise. However, in some cases the choice of selecting a specific technology rather than another shall be addressed at procurement stage of the project.

Following the above methodology, it was determined that both a one line and a two lines option would be adequate to treat the desired capacity of 70,000 tonnes per year as feedstock to the waste treatment facility. This was based on a running period of the plant of 5 days per week with two shifts per day (or 16 hours/day) leading to a throughput of about 19.8 tonnes/hour of waste.

Different viable technical options for the prospective ECOHIVE MRF plant entailing varying operating regimes and levels of automation were analysed through a comparative analysis of the Prime Dynamic Cost based on a plant capacity of 70,000 tonnes when operated for 2 shifts. The CBA revealed that, among other options, a high degree of automation of the plant as well as high throughput incurs the lowest Prime Dynamic Cost mainly due to the incurrence of comparatively low O&M costs and sorting reject rate, thus contributing the most financially favourable option.

Among the storage options of waste input to the plant, the utilisation of a bunker was deemed too expensive and only effective at higher throughputs than those assessed for this facility; therefore, this alternative was discontinued for economic reasons. Although a flat floor is usually considered the best option for the waste reception area, the steep topographic gradient of the site would generate a split level between the delivery point and the reception area. A split level with a single bay was ultimately chosen as the preferred option.

Options for loading material into the plant included cranes, loading shovels, walking floor, and loading shovel and excavator. Cranes and walking floors were excluded due to their high cost while no significant advantages were forecasted for this type of operation. The use of a mobile plant in combination with a loading shovel and excavators is recommended due to the split level and loading arrangements of the plant.

The composition data suggests that poor quality material will need to be fully assessed before entering to the plant. This can be done in the delivery area but an inspection on a belt in a picking cabin would be ideal. Besides, a minimal check and the removal of residue WEE and/or metal is to be undertaken for reducing the costs of the pickers and the required space. Although the deployment of robots in pre-sort was considered, it was concluded that this technology is too premature to be adopted in line with the current best technological advances.

It is anticipated that a combination of disc screens or a trommel and ballistic separator is required. The different technologies have diverse benefits and constraints, and different types of screens will be required for various materials. There is no need to select a screening option at this stage since this should be assessed at the procurement stage.

Optical sorting on paper and plastics are cost effective at the estimated throughput. Although the analysis suggests not to fully rely on optical sorting, this is not recommended as manual pickers are more flexible. A more detailed assessment at procurement stage would be ideal to select the most feasible option in between optics and manual.

Initially, robotic sorting was considered but ultimately discarded because it remains in an early stage of development and has yet to prove itself in real-world applications. Although some organizations currently offer commercial units, they face challenges in operating environments. Potential benefits of this innovative technology include improvements in health and safety, but cost savings must be evaluated carefully considering the mass balance and picker numbers. Meanwhile, leaving room in the design for possible retrofitting at a later date ensures flexibility.

There is no real alternative to traditional conveyors to transport material around the plant. Some pneumatic/air systems will be used for air knives and dust control. The design of the conveyors will be reviewed to ensure they are fit for purpose particularly in terms of capacity, maintenance and access.

The storage of recycled material in open space is not recommended because it creates extra costs and environmental issues. The existence of multiple buildings within the same plant add cost in terms of capital and the operating costs of moving materials between different areas. According to the current market conditions, just in time storage would be challenging going forwards and hence excluded. Racked warehouse was also considered for reducing the space required, but it was discounted since this option is difficult to be applied from an operational perspective and not used in the recycling industry in general. It was finally determined that the material shall be stored in a single building on-site.

3.3 Alternative Layouts

In general, MRF layouts are categorized into linear, centralized and modular designs.

In a linear layout, the different stages of the recycling process are arranged in a straight line, allowing materials to flow through the facility sequentially from one end to the other. Located at one end of the facility, the receiving area is designed to store incoming waste where inspections can be carried out. On the other end of the facility, the storage area hosts end-products prior to sale or further treatment (if required). In between these two end-storage areas, the sorting and processing areas take place whereby the waste is checked and eventually separated, and then processed for recycling.

In a centralized layout, all processing equipment and operations are concentrated in a common area, with materials being transported to and from this central hub. Smaller

satellite stations or sorting areas may be distributed throughout the facility for initial sorting or temporary storage.

A modular layout consists of prefabricated or modular units that can be assembled or rearranged to accommodate changing processing needs or site constraints. This layout arrangement was chosen for the proposed MRF at the ECOHIVE Complex due to the site's spatial constraints. Moreover, special emphasis was dedicated to the compartmentalisation of each unit in order to comply with strict fire extinguishing measures.

3.4 Downscaling of the project or elimination of project components

One of the main challenges for the design of this MRF was to accommodate the project on a downscaled and non-optimally sized plot. The MRF plant as proposed has been optimised to make effective use of the site's spatial limitations whilst taking into account the facility's operational needs. Further downsizing of any of its components is not feasible, as it could negatively impact the overall performance of the recycling facility.

Any free space available on site shall be dedicated for accommodating future advances in waste recycling technologies. For instance, the MRF may be subject to increased robotization components which could require more space in the future. Such advancements and upgrades would be subjected to a new CBA to assess the costs of operation together with the reliability of the technologies being considered with respect to improving the quality of the end-product.

3.5 Zero Option (do-nothing scenario)

Current EU targets require that Malta achieves an overall recycling rate of 60% by 2030. Since 2013, Malta has not managed to attain its overall recycling target on waste management. This outcome was further exacerbated by the fire accident that occurred at the SAWTP in 2017. This demonstrates that Malta will continue to struggle to reach its' ever-ambitious recycling EU targets in the coming years if no further action is taken.

Therefore, from a National Waste Management perspective, the development of a new MRF is a mandatory requirement and the do-nothing option is counter to Malta's legal obligations towards the EU Council. The construction of a new MRF is also endorsed through the Long-Term Waste Management Plan 2021-2030 to meet a minimum of 60% of total MSW generated by weight by 2030. It is for this reason that a makeshift-temporary MRF line has been set up recently at the Malta North facility.

In summary, the do-nothing scenario is not favorable as the MRF project is vital to helping Malta increase the country's recycling rates and hence achieve the so sought after targets established by EU.

3.6 Hybrids/combination of the above

There are a number of hybrid or combined options for the above technologies. In fact, the project's CBA entailed a ranking system to identify the best technological set up for the new MRF. Notwithstanding the combined efforts undertaken through the CBA and the ranking method, the final sequence of technologies is still under preparation at the time this report is compiled and some of them can be addressed only at procurement stage.

The integration of waste management strategies that emphasize waste prevention, reduction, reuse, and recycling will be achieved through the design and implementation of advanced sorting and processing equipment, including optical sorting systems, magnetic separators, and eddy current separators. These technologies will enhance waste sorting and processing efficiency, reduce waste generation, and improve recycling rates, thereby minimizing the facility's environmental impact.

In addition to this, the MRF will prioritize energy efficiency by incorporating features such as LED lighting, high-efficiency heating and cooling systems, and renewable energy sources. This will help to reduce the facility's carbon footprint and minimize its impact on the environment.

Community engagement will be an essential component of the MRF's design and construction process. The facility will work closely with the local community to ensure that its needs are met, and that education and outreach programs are in place to promote waste reduction and recycling. The MRF will collaborate with local schools, businesses, and community organizations to promote sustainable waste management practices.

Lastly, the MRF will monitor and report on its environmental performance, including waste generation, recycling rates, energy usage, and water usage. This information will be made available to the public through annual sustainability reports, ensuring transparency and accountability. By prioritizing these elements, the MRF will be designed and built to minimize waste generation, improve recycling rates, and minimize its environmental impact.

4.0 A DESCRIPTION OF ASPECTS OF THE ENVIRONMENT LIKELY TO BE SIGNIFICANTLY AFFECTED BY THE PROPOSED PROJECT

The Area of Influence (AoI) for the terrestrial component of the study comprised of a 100m buffer zone around the proposed site for the development. The buffer zone is limited to terrestrial habitats and thus a sea cover use element was not relevant to the study. The AoI is mapped in Figure 20.



Figure 20: Area of Influence for the majority of the environmental studies

4.1 Land cover and land uses

4.1.1 Study Methodology

4.1.1.1 Preliminary Literature Review

A preliminary literature review focused on the existing information on historic land cover and land use studies within the Aol. A particularly important component during the review process was the analysis of satellite images on the *Google Earth* platform.

The preliminary literature review also included a review of the relevant national policy. The most important documents which were consulted included the STRATEGIC PLAN FOR THE ENVIRONMENT AND DEVELOPMENT (SPED, 2015) and the CENTRAL MALTA LOCAL PLAN (2006). This helped to provide a wider context for the proposed development.

4.1.1.2 Site Survey

A site walk-over survey, held on the 25th of August 2023 took into account all of the features and attributes which contribute towards the character of an area. It focused on the present use/s of the proposed Scheme site and surrounding area. Revisions to the draft map which had been designed during the initial literature review stage were made on site.

4.1.1.3 Secondary Literature Review

The map and general observations made during the site survey underwent a process of integration and analysis. Emphasis was placed on the assimilation and synthesis of information to be used to develop integrated descriptions of the area and its component landscape types and land uses. Geographic Information Systems (GIS) were used to create the land cover and land uses map.

4.1.1.4 Evaluation

An evaluation of the current land cover and land use categories was undertaken to assess and provide judgement related to the inherent sensitivity of the landscape. This included analysis based on the proximity of the different land uses to the Scheme. Current landscape condition (or quality) was based on qualitative judgements about the physical state of the landscape from visual, functional and ecological perspectives. It also reflected the state of repair of individual features and elements which make up the character of the area.

4.1.1.5 Impact Assessment Criteria

The qualitative assessment determines the potential impacts on the present land uses. The potential impacts that may arise from the Scheme could result in a restriction or limited accessibility to current land use activities, along with the permanent loss of certain land uses.

The tables presented in this section (Table 5 to Table 12) provide a definition for each of the criteria used in Table 64, which summarises the assessment of impacts on land use activities.

Table 5: Criteria for the duration of the impact

DURATION OF IMPACT	
LEVEL	DEFINITION
Permanent	Impact would still be detectable during the concerned phase.
Temporary	Impact would not persist through the whole duration of the concerned phase.

Table 6: Extent of Impact Criterion Description

EXTENT OF IMPACT	
LEVEL	DEFINITION
Widespread	Impact is expected to affect in the entire area of study and/or may extend beyond the boundaries of direct intervention into adjacent areas
Localised	Impact is expected to affect receptors in the immediate vicinity of its source

Table 7: Criteria for the probability of the impact occurring

PROBABILITY OF IMPACT OCCURRING	
LEVEL	DEFINITION
Inevitable	Level of certainty that impact will occur is greater than 90%
Likely	Level of certainty that impact will occur ranges between 50-90%
Unlikely	Level of certainty that impact will occur ranges between 30-50%
Remote	Level of certainty that impact will occur is below 30%

Table 8: Criteria for the nature of the impact

EFFECT OF IMPACT	
LEVEL	DEFINITION
Adverse	Land and/or sea uses would suffer consequences as a direct result of the proposed development.
Beneficial	Land and/or sea uses would benefit as a direct result of the proposed development.

Table 9: Criteria for the consequences of the impact

CONSEQUENCES OF THE IMPACT	
LEVEL	DEFINITION
Direct	Changes that result from direct cause-effect consequences of interactions between the result of action under consideration and the proposed project.
Indirect	Result from cause-effect consequences of interactions between the action under consideration and direct impacts.
Cumulative	Impacts resulting from an accumulation of the project impacts and other past, present or known planned developments, activities and land uses and with other relevant baseline situations.

Table 10: Criteria for the sensitivity & Severity of receptors to the impact

SEVERITY, SENSITIVITY & RESILIENCE OF RECEPTORS TO THE IMPACT	
LEVEL	DEFINITION
High	This action is a major contributor to the activities in the area of influence.
Medium	This action is a moderate contributor to the activities in the area of influence.
Low	This action is a minor contributor to the activities in the area of influence.

Table 11: Criteria for the reversibility of the impact

REVERSIBILITY OF IMPACT	
LEVEL	DEFINITION
Reversible	State of the activity/action is potentially expected to return to baseline background level following cessation of the source of impact.
Irreversible	Impact is expected to cause partial or total destruction of the action under consideration and a return of the state of the resource to baseline levels should be considered highly improbable.

Table 12: Criteria for the impact significance

IMPACT SIGNIFICANCE	
LEVEL	DEFINITION
Negligible	No significant impact.
Minor Significance	Low order impact and therefore likely to have little real effect on land/sea use. In the case of adverse impacts, mitigation is either easily achieved or little will be required, or both.
Moderate Significance	Impact on land/sea use is real but not substantial in relation to other impacts that might take effect within the bounds of those that could occur. In the case of adverse impacts, mitigation is both feasible and fairly easily possible.
Major Significance	Of the highest order possible within the bounds of impacts on land/sea use that could occur. In the case of adverse impacts, there is little or no possible mitigation that could offset the impact. A substantial change in the use, or intensity of use, of land/sea including, or in its capacity to support existing uses.

4.1.2 Baseline data

The site currently comprises agricultural land with low-lying trees and remnants of local maquis/advanced garigue community. The site contains shallow terraced fields separated by rubble walls, some of which are in a degraded state. These walls are protected under the RUBBLE WALLS AND RURAL STRUCTURES REGULATIONS (S.L.552.01). The fields slope downwards towards the coastal area of Qalet Marku.

To the north-west and west lie the engineered Ghallis and ta' Żwejra landfill sites, respectively. To the North, 100 meters away, lies the recently constructed Anaerobic Digestion Plant. To the East, the landscape is composed of agricultural land subdivided into small parcels by rubble walls. A paved access road runs along the south and west of the Scheme providing access to both the site and the landfill. A dirt track provides access from the road to the Scheme. A map

was created to depict the existing land cover and land uses within the Area of Interest (Figure 21).

4.1.2.1 Surrounding uses at the Aol

Figure 21 shows the current land cover and land uses within the Area of Interest. In Figure 22 to Figure 31 photographic evidence of each observed land use/cover observed during the site visit. The subsequent sections describe the observed categories.



Figure 21: land uses in the study area (based on walkover survey held on the 25th of august 2023)

ECOHIVE Complex

The Complex can be accessed from two entrances, one at the North gate and another at the South which lies to the South West of the Area of Interest. Access into the site is restricted to registered waste carriers and permitted vehicles.

Vehicle use of the Wasteserv site is currently intensive, as the site contains various complexes where the storage and processing of various waste streams is carried out. The use of the main landfill (known as 'Ghallis') will, in the near future, be discontinued and a landscaping plan put in place. In its stead, plans for the expansion of the Complex are in place which include the Materials Recovery Facility covered by this report, as well as a new Waste-to-Energy plant, engineered landfill, Organic Processing Plant and Thermal Treatment Facility.



Figure 22: ECOHIVE complex adjacent to the proposed site (25th August 2023)



Figure 23: Anaerobic digesters adjacent to the proposed site (25th August 2023)

Access Road

The ECOHIVE complex can be accessed through a newly-tarmacked private access road. The road is flanked with a gutter and a perimeter of limestone boulders to the West, delineating the divide between the road and the landfill site.



Figure 24: Tarmacked road access to ECOHIVE complex (25th August 2023)

Dirt Path

The Scheme site is currently accessible via an unsurfaced dirt path, which winds across a number of fields which currently cover the main land use of the site.



Figure 25: Dirt road access to the proposed site (25th August 2023)

Landfill

Ta' Żwejra landfill lies to the West of the proposed site. This landfill was in operation primarily between 2004 and 2006 as Malta's first engineered landfill. Operations within this area of the Wasteserv Complex have since ceased, and municipal or mixed waste is now landfilled in the adjacent site further North, known as Għallis.



Figure 26: LANDFILL SITE TO THE WEST OF THE PROPOSED SITE (25TH AUGUST 2023)

Agricultural Land

The agricultural land which makes up the area of the site itself consists of predominantly bare fields bordered by what appear to be planted or severely limited remnants of maquis species. The borders of the rubble walls which delineate each field contained the remnants of plant species typical of disturbed ground.



Figure 27: Bare fields flanked with maquis species (25th August 2023)



Figure 28: A typical bare field close-up (25th August 2023)

Tree Plantations

There are trees present on site, bordering the bare agricultural land. The species present are for the most part indigenous species typical of Maltese maquis habitat. They are arranged as dense patches which extend considerably downhill in parallel strips, with fields in between each patch of vegetation. The mature trees are interspersed with low-lying bushes and wild plants typical of disturbed habitats.



Figure 29: Dense patches of indigenous species (25th August 2023)

The perimeter of the existing Anaerobic Digester Plant is landscaped with various species, including indigenous species such as carob and olive trees.



Figure 30: Landscaped area around the existing anaerobic digester plant (23rd August 2023)

Degraded Agricultural Land

Two extensive patches of degraded land were observed on site, one to the North East and one to the South East of the proposed site. The former appeared to be exposed bedrock following

the removal of the soil layer (Figure 31), while the latter is a field containing an extensive amount of fine gravel material.



Figure 31: Exposed bedrock to the North-East of the site (23rd August 2023)

4.2 Landscape Character and Visual Amenity

4.2.1 Study Methodology

The Zone of Theoretical Visual Influence (ZTVI) within a 3.0km radius from the Scheme was delineated using ArcGIS Software, as depicted in Figure 32. The ZTVI was established based on the highest structure on site, which stands at +57.1m above mean sea level (amsl). This software delineates an area where a human observer (sensitive receptor) would have a line of sight to the highest point of the proposed development. The basemap utilized integrates a Digital Terrain Model (DTM) for the Maltese Islands with a 1m resolution, accounting for topographical elevations while excluding surface obstacles such as trees, buildings, and other visual obstructions.

The receptors identified along the selected viewpoints include:

- Residents with views of the Scheme from their homes or residences;
- Pedestrians on streets and roads offering views of the Scheme;
- Passengers and drivers on roads with visibility of the Scheme;
- Farmers tending to their fields.

Given the popularity of the Coast Road area and its coastal surroundings, it is anticipated that thousands of sensitive receptors will view the proposed development daily.

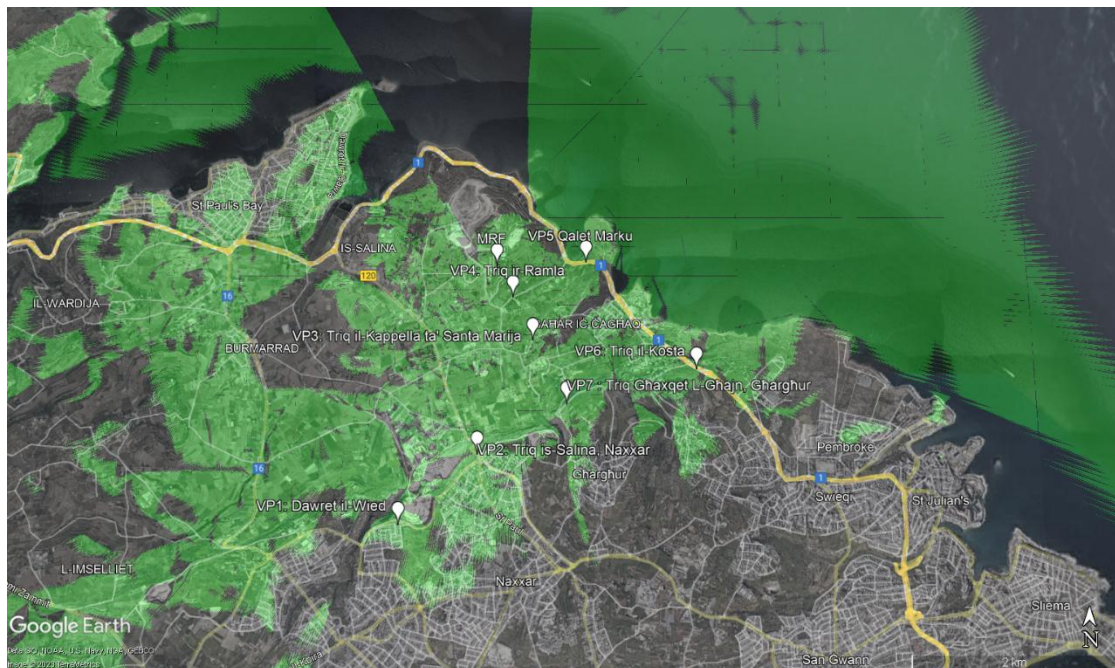


Figure 32: Viewshed Analysis (in Green) showing the selected Viewpoint Locations

The chosen viewpoints also align with those used for the visual and landscape assessment of the Organic Processing Plant (OPP) proposed within the ECOHIVE Complex in close proximity to the Scheme site. Consequently, the same seven baseline viewpoints depicted in Figure 32 were utilized to evaluate the cumulative impacts of all proposed waste management infrastructure in the vicinity. Each photograph, captured at a height of 1.8m above ground level with a horizontal angular field of view of 39.60°, was taken on October 29th, 2022, between 10:00hrs and 11:45hrs. Each viewpoint is object of analysis to evaluate its unique characteristics and the key visual elements contributing to the site's visual identity. The chosen ViewPoints (VP) are hereunder listed:

- VP1: Triq Dawret il-Wied, Mosta
- VP2: Triq is-Salina, San Pawl tat-Tarġa
- VP3: Triq il-Kappella ta' Santa Marija, Magħtab
- VP4: Triq ir-Ramla, Magħtab
- VP5: Qalet Marku, Naxxar
- VP6: Triq il-Kosta, St Andrew's
- VP7: Triq Għaxqet l-Għajn, Għarghur

The comprehensive landscape and visual impact assessment followed the GUIDELINES FOR LANDSCAPE AND VISUAL IMPACT ASSESSMENT (The Landscape Institute and IEMA, 2013). The assessment focused on how changes in the landscape, including the loss of existing elements or introduction of new ones, could impact the surroundings of these sensitive receptors.

Baseline photos were taken according to the ERA Terms of Reference and the aforementioned guidelines. The expert created photomontages illustrating the proposed development's appearance from each viewpoint. The visual impact assessment was based on these photomontages, which included nearby facilities under construction or still in the permitting stage to evaluate cumulative impacts.

The desk study incorporated a review of the following literature:

- A review of the features present within satellite images (aerial photographs) of the area to analyse land use trends;
- Reference to land use maps presented in the PDS and EIA;
- Research on previous environmental and planning studies undertaken in the area, historic maps and legislation and policy documents.

The analysis involved:

- A review of the LANDSCAPE ASSESSMENT STUDY OF MALTESE ISLANDS REPORT, the CENTRAL MALTA LOCAL PLAN (CMLP), and the STRATEGIC PLAN FOR ENVIRONMENT AND DEVELOPMENT (SPED),
- Identification of the key landscape elements in the area.
- Conducting a field survey and taking photos from selected viewpoints.
- Identification of sensitive receptors, such as physical landscape elements directly affected by development.
- Assessment of the condition and value of the existing landscape.

A 3D model of the proposed development using 3D software (3D Studios Max), based on scaled plans and drawings submitted by the project architects was used for the photomontages. Materials and lighting were applied to the model to obtain photo-realistic renders. Virtual cameras were set up on the 3D software to replicate the same field of view and lens properties as recorded when the original baseline photos were taken, and positioned using coordinates equivalent to those taken on site, with camera angles and heights set accordingly.

After rendering the model, a 2D image was created to replicate the position of the scheme with respect to the location of the baseline viewpoints. This image was then imported into a 2D photo editor, layered on top of the baseline viewpoint photo, and alpha channels were used to replace the background of the object with the photo of the site. The model was positioned in the photo using reference geographical points, and hidden parts of the structure were erased to fit the object in the environment of the photo. Finally, additional effects and colour correction were used to blend the object with the photo.

4.2.1.1 Impact Assessment Criteria

For each potential impact, the following information has been provided:

- Description of impact
- Policy importance of impact (Local, National, International)
- Extent of effect
- Duration of impact (temporary/permanent)
- Adverse or beneficial impact
- Reversible/irreversible impact
- Sensitivity of receptors
- Probability of impact occurring (certain/likely/uncertain/unlikely/remote); and
- Scope for mitigation/enhancement (very good/good/none)

Based on the above criteria, a summary of the significance of the impact was judged in terms of whether the impact is considered not significant, of minor significance, or of major significance:

- **Not significant:** the proposed development is not expected to give rise to any effects on the existing landscape and visual amenity of the area within the AoI.
- **Minor adverse:** the Scheme is envisaged to have an adverse impact on the landscape and visual amenity and the relevant receptors in the AoI. The degree of impact is minimal in scale and is not likely to cause any complaints.
- **Moderate adverse:** the Scheme is envisaged to adversely impact the landscape and visual amenity of the area and the relevant receptors in the AoI. The degree of impact is noticeable but not excessive, thus potentially inducing some complaints. Some work is required to improve the proposal and integrate it within the proposed development.
- **Major adverse:** the Scheme will severely affect the landscape and visual amenity of the area and the relevant receptors in the AoI. The degree of impact is significant and excessive, with severe disturbances to visual amenity being predicted. Major planning and works are required to reinvigorate the visual amenity of the area.
- **Minor beneficial:** the Scheme is envisaged to partially improve the landscape and visual amenity of the area within the AoI to a minimal extent.
- **Moderate beneficial:** the Scheme is envisaged to positively improve the landscape and visual amenity of the area within the AoI when compared to the current scenario.
- **Major beneficial:** the Scheme is envisaged to considerably improve the landscape and visual amenity of the area within the AoI, such that all sensitive receptors would be able to notice the improvements from the current scenario.

This assessment considers the proposed development in its entirety, thus including construction phases, operational phases and all ancillary operations. The assessment of the significance of the impact of the proposed development is also justified in detail.

The Visual Amenity Impact Assessment also takes into consideration any committed development within the Area of Influence or Viewshed that is likely to cause residual effects on the quality of the visual amenity of the Application Site (without and with the proposed development).

The impacts on the quality of the visual amenity of the proposed site as viewed from the approved viewpoint and an assessment of the effects of such changes on the previously identified sensitive receptors of the visual amenity are incorporated within the report. The predicted magnitude of the effects on the sensitive receptors are also justified. The sensitivity of the visual receptors depends primarily on the location and context of the viewpoint, the strategic relevance and importance of the view and the expectations of the receptor based on the activities being carried out in the area.

4.2.2 Baseline data

Two extensive landscape evaluations have been previously submitted for the ECOHIVE complex area, covering the Organic Processing Plant (OPP), the Thermal Treatment Facility (TTF) and the Waste to Energy (WtE) facility.

The Structure Plan of the Maltese islands defines landscape as the *"visual aesthetic component of the surrounding environment, as perceived and interpreted through the sense of sight"*¹⁴. The Landscape Assessment Study of the Maltese Islands¹⁵ divides the islands into 61 landscape character units, each with distinct features confined to a specific area of land. With reference to Figure 34, the landscape units within the Scheme's area of influence are listed and described in Table 13.

Table 13: Landscape Units

SITE	GENERAL FEATURES	ENHANCING FEATURES	DETRACTING FEATURES
M9, M57, M58 St' Paul's Bay – Bugibba-Qawra	Formerly agricultural, now a densely built tourist area between St. Paul's Bay and Salina Bay. It features tall holiday flats, restaurants, and hotels, making it highly urbanized. The core area is less developed and visually hidden by taller buildings.	The entire coastline, especially the northeastern tip, is experiencing rapid development. However, the area near Il-Maħruq and Il-Ponta tal-Qawra remains relatively unspoiled. The promenade and colorful boats add vibrancy, while the villas in the north offer a break from mass tourism.	The area faces issues like excessive development, disorganized layout, and low-quality architecture. Construction debris litters the coast, dominated by unattractive structures and cluttered skylines. Traffic, waste, and pollution further degrade the area's appeal.

¹⁴ Landscape Assessment Study of Maltese Islands (MEPA).

¹⁵ <https://era.org.mt/wp-content/uploads/2019/05/LandscapeAssessment-MalteseIslands-MEPA-2004.pdf> (Accessed on 10/04/2024).

M14 Magħtab	This flat area near the eastern coast combines agriculture, garrigue, and scattered buildings. It's bordered by the coastal road, a key link between north and south, and is home to many farms and industrial units.	The area is dotted with churches, chapels, coastal towers, and historical sites, adding character when seen up close. Though not prominent, archaeological remains are present. Well-kept farmland and carob tree groves enhance the area's positive attributes.	The Magħtab waste disposal site dominates the area, visually impacting it and emitting unpleasant odors. Industrial activities, farms, concrete processing plants, and quarries further degrade the scenery. Additionally, scattered tipping and the Magħtab Earth Station's contrast contribute to the negative visual impact.
M21/M22 Għargħur – San Ġwann hinterland	An elevated area with a dramatic north-western escarpment merging into Baħar ic-Ċagħaq. Għargħur and Madliena are the main settlements, surrounded by picturesque valleys. Moderate slopes are developed with dwellings, while San Gwann is mostly flat with former quarries. The area features transmission towers and valleys draining towards Baħar ic-Cagħaq and St. Julians.	Għargħur is surrounded by beautiful scenery and historic buildings, including military fortifications, caves, chapels, and country houses. Terraced fields with large carob trees adorn the valley sides intersecting the great fault escarpment. Additionally, there are archaeological sites in the area, best appreciated up close.	New developments at the edge of Għargħur and Madliena starkly contrast with the rural valleys. Dereliction occurs in rural and newly constructed areas, with little amenity. Industrial plants, storage depots, greenhouse complexes, and former quarries exist in the area, impacting the scenery.

M58 North-Eastern rocky coast	Stretching from Buġibba to Tigne Point, this low-lying coast features shallow bays, some ending in sandy beaches. The area around Pembroke-St. Julians-Sliema is heavily developed, while the Baħar iċ-Ċaġħaq stretch remains largely free from permanent residential settlements. Natural coastal rock formations vary from rugged to smooth.	The undeveloped coast, including Qawra and Sliema, remains pleasant, offering a break from nearby development. The bays are splendid with colorful underwater features and marine activity. Upgraded promenades, coastal parks, and facilities enhance the area, but some beach facilities limit public enjoyment. Historic features have suffered from surrounding development. Recent coastal projects and landscaping are of higher quality than the early 1990s development.	The extensive development at Sliema, St. Julians, and Paceville detracts from the coastal stretch, with construction sites obstructing public access and beach facilities becoming eyesores. Coastal areas are marred by construction debris, littering, and degrading features like the nearby landfill and caravan sites.
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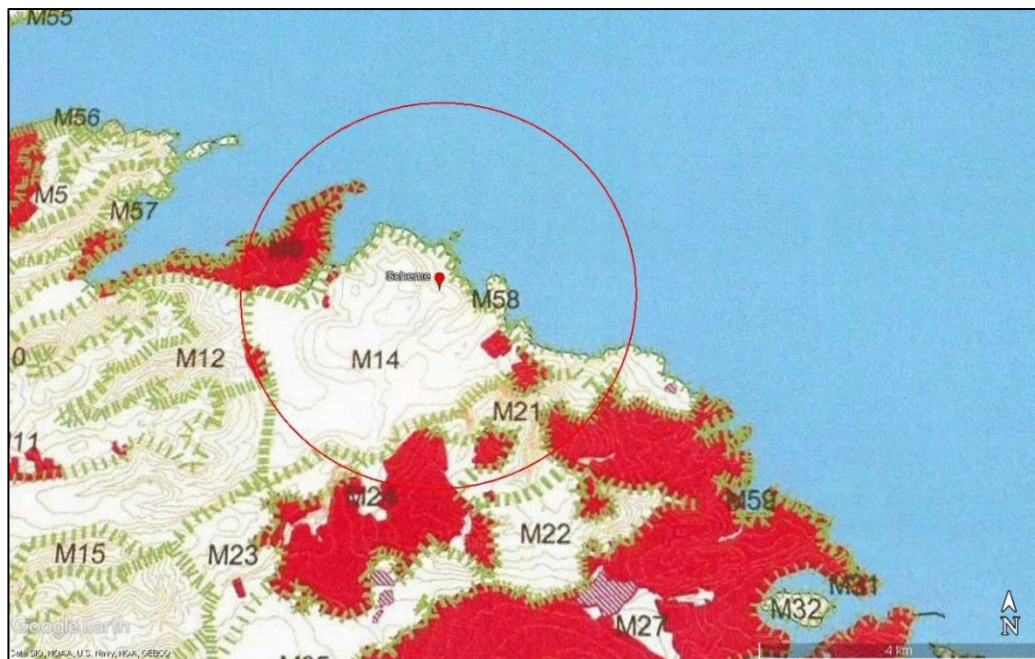


Figure 33: landscape character areas within 3km from the ECOHIVE complex

Of particular note is the identification of Areas of High Landscape Sensitivity (AHLs) under CG22 in the CMLP (Figure 34). According to CG22, developments situated within AHLs must comply with the provisions detailed in MEPA's Supplementary Guidance document titled 'LANDSCAPE ASSESSMENT STUDY OF THE MALTESE ISLANDS'. There is a general

presumption against development on sites listed within the Local Plan as AHLs, especially on crests, fault sides, valleys, and coastal edges. Additionally, activities with the potential to introduce pollution or damage risks to AHLs are discouraged. These designated sites also include buffer zones to regulate development near AHLs. MEPA will assess developments affecting AHLs in accordance with the requirements outlined in the aforementioned documents.

Although the Scheme site itself is not situated within an Area of High Landscape Sensitivity, some viewpoints are located within these designated AHLs.

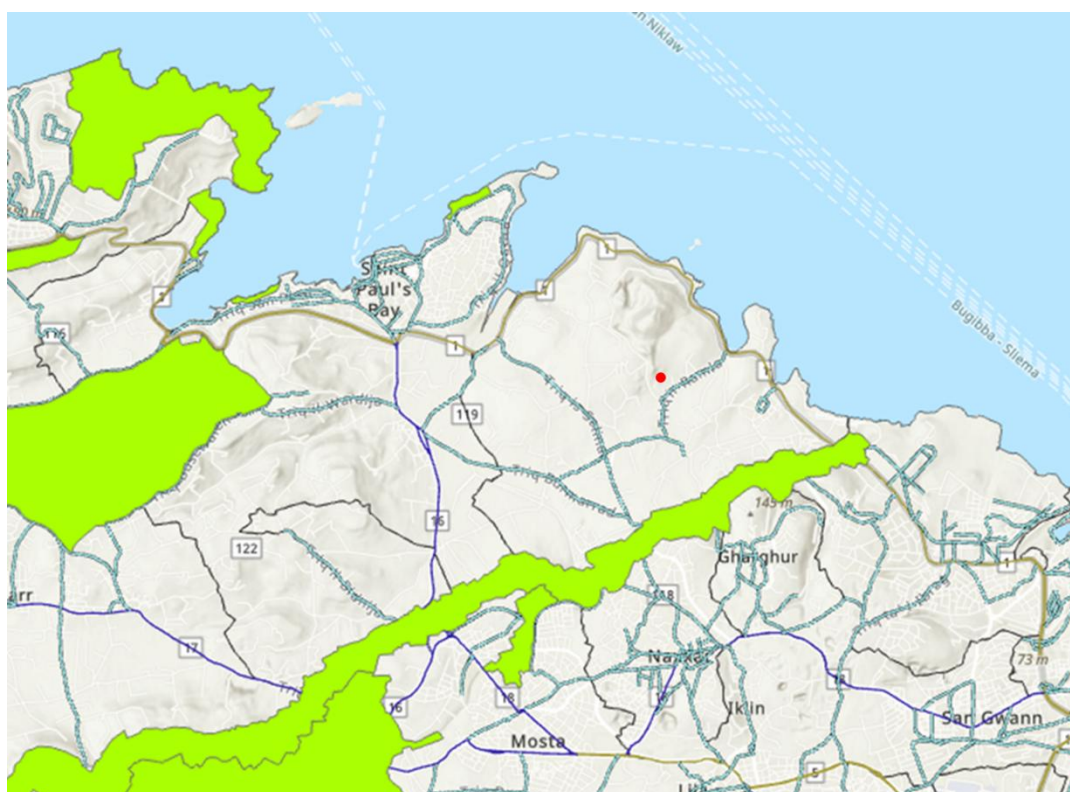


Figure 34: Areas of High Landscape Sensitivity (AHLs) (Green) around the scheme site (red circle) (Source: PA Mapserver, 2024)

The potential visual receptors that may be impacted by the proposed development are:

- Motorists and passengers traveling in vehicles and other forms of transportation along nearby roads.
- Residents residing within the ZTVI of the Scheme site, particularly those in high-altitude areas such as Għargħur, San Pawl tat-Tarġa, Madliena, and the nearby Magħtab hamlet. The impact may also affect short-stay tourists staying in nearby guest-houses and hotels.

- Swimmers, divers, fishermen, vessel users/owners, and visitors at the Bahar iç-Çaghaq area.

The degree of exposure to the potential impacts from the proposed development varies among the identified receptors within the ZTVI. This exposure is influenced by the strategic location of the receptor in relation to the proposed Scheme and the duration of the impact on the receptor. Receptors that are not fixed, such as motorists, passengers, and pedestrians, are less exposed to visual amenity impacts compared to workers, residents, and frequent visitors to the area.

4.3 Geology, Geomorphology, Hydrogeology and Soils

4.3.1 Study Methodology

The assessment of the geological, geomorphological, hydrogeological, and soil features within the Aol (approximately 500-600m radius) of the proposed MRF was conducted (Figure 35). Special attention was paid to the downstream part of the water catchment basin encompassing the site for the hydrological and hydrogeological components of the study.

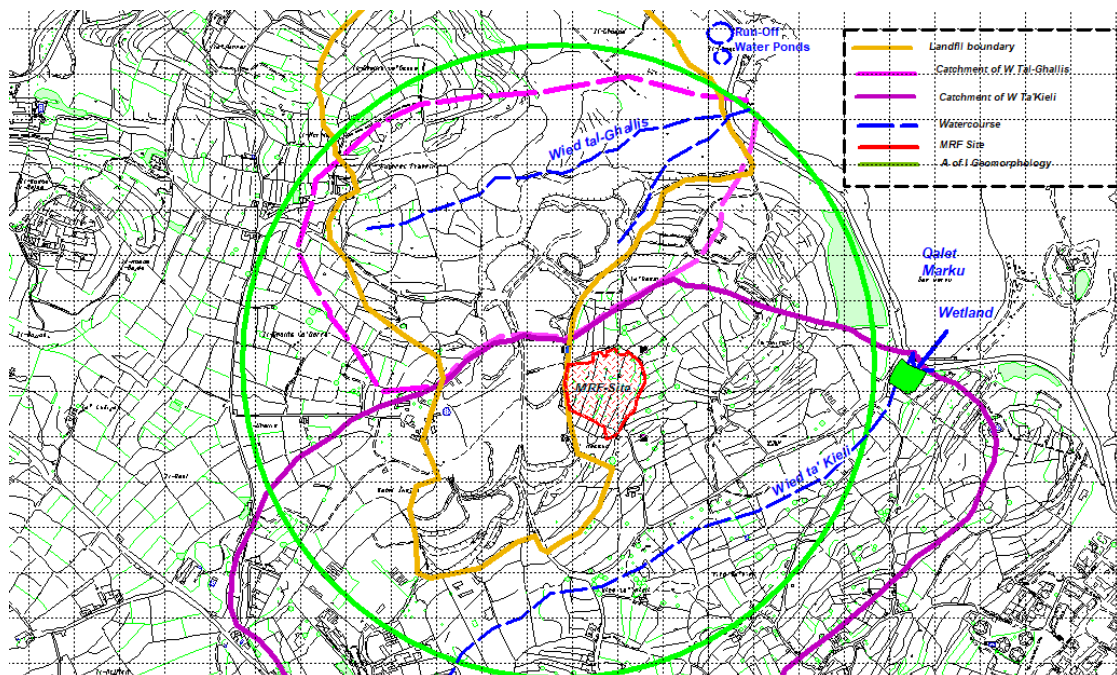


Figure 35: Map of the site and its environs showing area of influence for geomorphology, hydrogeology, geology and soils

There is no well-defined watercourse and the run-off generated on the Magħtab–Għallis slopes will be discharged down the Għallis slopes to Wied ta' Kieli as well as along the coastline in a diffuse manner.

A literature review was undertaken, and the following relevant reports were identified:

- Previous studies in connection with the construction of the Coast Road;
- Geological map of the Maltese Islands (Continental Shelf Department, 2022);
- EIA related to Waste to Energy (WtE) facility.

A field survey was conducted to determine the geology, geomorphology, and soils of the site. Additionally, ground contamination analysis was carried out in December

2023, involving the sampling of soil and rock cores from four exploratory boreholes. Three soil and rock samples were collected from each of the four areas (A, D, J, and F) at different depths to assess ground contamination (Figure 36).

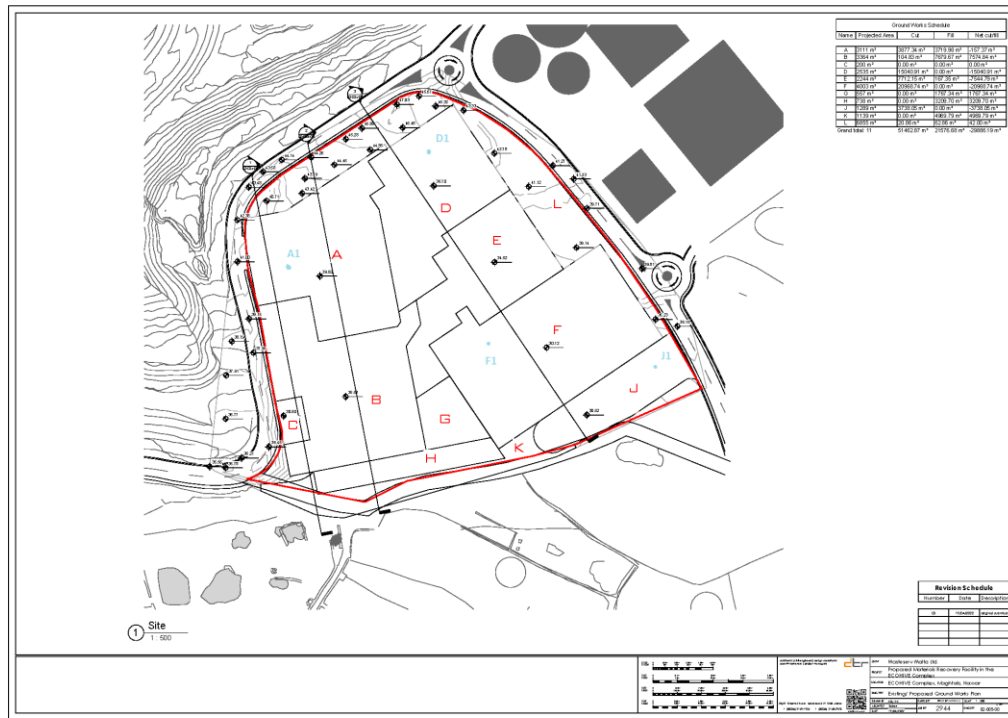


Figure 36: Map of the MRF site showing the location of the boreholes at Area A, Area D, Area F and Area J

Three soil and rock samples were collected from areas A, D, J and F (Figure 36) at the following depths from ground level:

- Sample No.1: <0.5m
- Sample No.2: 1.5/2.5m
- Sample No.3: 5.5m

Protocols for core samples preservation are provided in Table 14.

Table 14: Soil and rock sampling protocol at the MRF site undertaken in December 2023

AREA	DEPTH 1 (S)	DEPTH 2 (M)	DEPTH 3 (D)	NO OF SAMPLES	PROFILE 2	PROFILE 3
Area A (A1)	<0.5m	1.5m	NA	2	2x 500g PET jar	1x 500g PET jar 2x 500g glass jar 2x Vials – fill only 1/10 of the capacity volume
Area D (D1)	<0.5m	2.5m	5.5m	2	2x 500g PET jar	1x 500g PET jar 2x 500g glass jar 2x Vials – fill only 1/10 of the capacity volume
Area F (F1)	<0.5m	2.5m	5.5m	2	2x 500g PET jar	1x 500g PET jar 2x 500g glass jar 2x Vials – fill only 1/10 of the capacity volume
Area J (J1)	<0.5m	2.5m	5.5m	2	2x 500g PET jar	1x 500g PET jar 2x 500g glass jar 2x Vials – fill only 1/10 of the capacity volume

In order to assess the ground stability of the site bearing the projected structural loads, geotechnical analysis undertaken on the adjacent WtE scheme were deemed suitable for the MRF Scheme. Geotechnical investigations were carried out in compliance with the following standardized tests:

- BS 5930: 2015; Code of practice for geological site investigations;
- BS-EN 1997:2004 Geotechnical design- PART 1 General rules;
- BS EN 1997 - 2: 2007 Geotechnical Design – Part 2: Ground investigation and testing;
- Uniaxial compressive strength tests shall be undertaken were done according to BS 5930 and ISRM suggested methods.

Guidance on applicable legislation safeguarding hydrogeomorphological conditions was provided by:

- The Water Framework Directive;
- Marine Strategy Framework Directive and related instruments;

- Standards related to chemical analysis of groundwater and seawater;
- Standards related to waste classification outline in Appendix 2 of the ERA terms of reference;
- “DECRETO LEGISLATIVO 3 aprile 2006, n. 152 Norme in materia ambientale. (GU Serie Generale n.88 del 14-04-2006 - Suppl. Ordinario n. 96)”;
- Cap 549 Environment Protection Act;
- Cap 236 Fertile Soil Preservation Act;
- S.L. 236.01 List of Places where Fertile Soil may be deposited Notice; and
- S.L. 236.02 Preservation of Fertile Soil Regulations.

4.3.1.1 Impact Assessment Criteria

For each of the identified potential impacts, the following information will be provided:

- Description of impact;
- Policy importance of impact (Local, National, International);
- Extent of effect;
- Duration of impact (temporary / permanent);
- Adverse or beneficial impact;
- Reversible / irreversible impact;
- Sensitivity of receptors;
- Probability of impact occurring (certain, likely, uncertain, unlikely, remote); and
- Scope for mitigation / enhancement (very good, good, none).

Based on the above criteria, a summary of the significance of the impact will be put forward in terms of whether the impact is considered not significant, of minor significance, of moderate significance, or of major significance:

- **Not significant:** little or no change to the geological, geomorphological and hydrogeological regime;
- **Minor significance:** changes to the geological, geomorphological and hydrogeological regime that may affect neighbouring properties but which may be offset by mitigation measures;
- **Moderate Significance:** changed to the geological regime that may be partly offset by mitigation measures (if negative) or may be partly enhanced by mitigation measures (if positive);
- **Major significance:** changes to the geological, geomorphological and hydrological regime that may affect neighbouring properties and which may not be offset by mitigation measures (if negative) or may be enhanced by mitigation measures (if positive).

4.3.2 Description of the area of influence

The ground investigation involved a field survey undertaken on 27 and 26 November 2022. Data collected during this survey has been utilised to assess the quality of the stone material that shall be extracted from the MRF site.

Geotechnical testing results suggest that the top layers (Lower Globigerina Limestone) are stronger than the deeper beds (Lower Coralline Limestone).

- Top layers – Lower Globigerina Limestone (Approximate) average strength= 13Mpa
- Deeper beds –Lower Coralline Limestone (Approximate) average strength= 7Mpa
- High water content in both rock units

The subsurface is the lateral continuation of the rock beds from the WtE facility and the MRF site next to it.

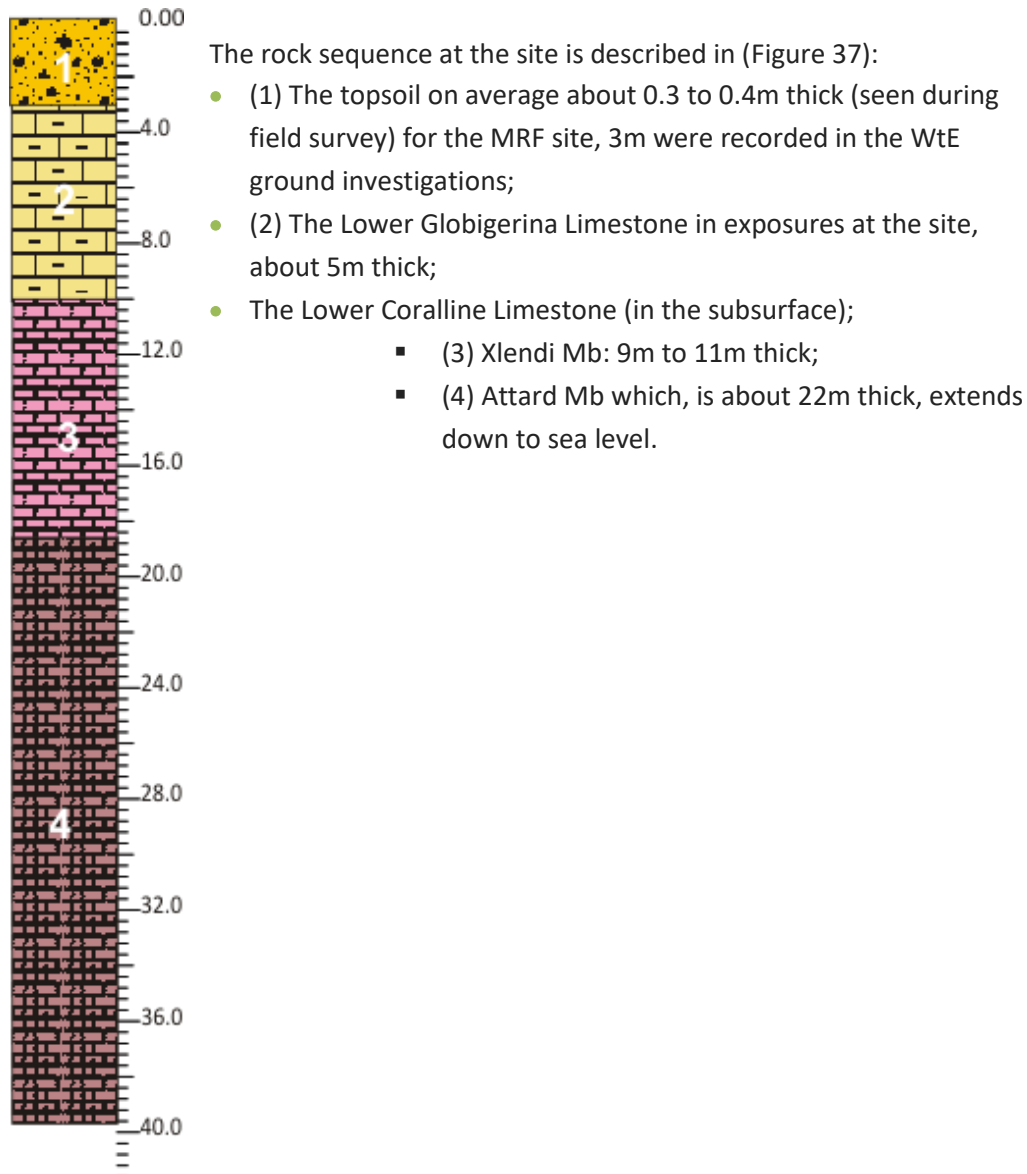


Figure 37: General lithologic column of the surface and subsurface geology at il-Ghallis and Maghtab
1: Top soil; 2: Lower Globigerina Limestone; 3: Lower Coralline Limestone-Xlendi Mb; 4: Lower Coralline Limestone –Attard Mb

The area under investigation is a low and broad spur of agricultural land situated at the foot of the landfill hill, which gradually rises from approximately 40m to 60m above sea level and eventually reaches a height of 100m. The proposed MRF site will be developed on the Lower Globigerina Limestone. The Lower Coralline Limestone (Xlendi Mb and Attard Mb) exhibits weathering primarily through dissolution, as it is composed almost entirely of Calcium Carbonate. Consequently, no substantial soil thickness forms on this rock formation. This type of limestone pavement is commonly

referred to as "Xaghra." In other areas, exposures of the Xlendi Mb are typically bare. The soil covering rock exposures of the Xlendi Mb below the site must have been transported from elsewhere.

The geomorphological features that once could be seen in the Study Area are listed below and depicted in Figure 38.

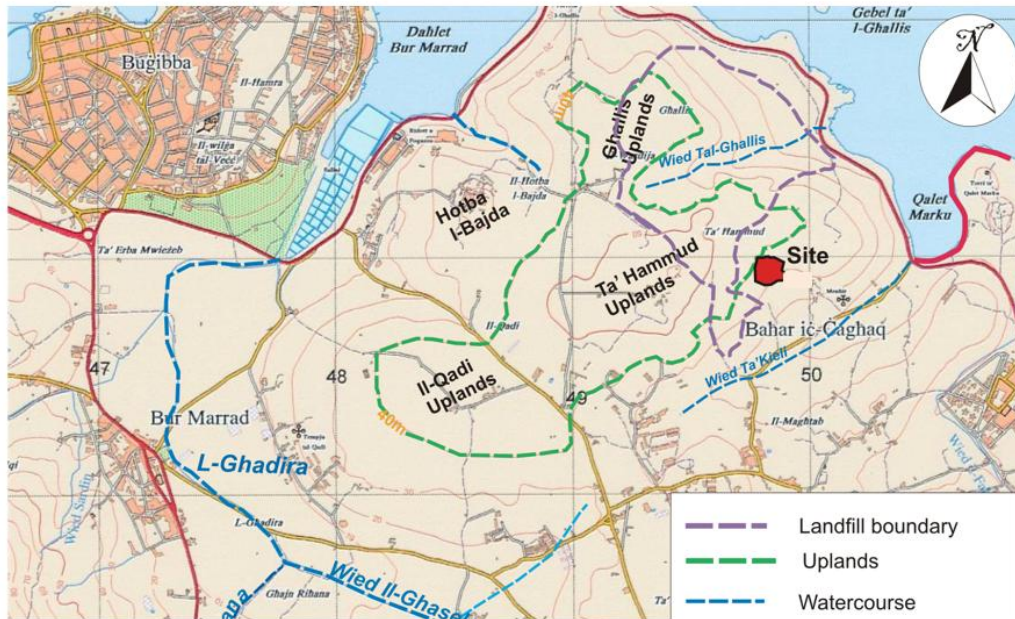


Figure 38: Map showing area of influence for geomorphology. For scale grid squares measure 1000m by 1000m

Most of the above listed features are now buried beneath the Maghtab and Ghallis Landfill and what remains are:

- Wied Ta Kieli: a primarily agricultural tenement parcelled into terraced fields. No watercourse is developed except at the coastline.
- The eastern slopes of Ta'Hammud Uplands: the upper sector of these rounded slopes is terraced and covered by a topsoil while the lower part which exposes Lower Coralline Limestone constitutes mainly a limestone pavement as inland exposures of Lower Coralline Limestone, being a pure limestone, are barren and form a limestone pavement locally known as Xaghra.
- The Qalet Marku and Ghallis Coastline is set on the Xlendi mb of the lower coralline limestone formation. The coastal belt that forms a corridor between the Coast Road and the coastline is characterised by its serrated character and

rugged marine karst landscape forming a dense network of rock pools up to about 5m in diameter. It is a rugged bare shore platform with scattered ponds best represented by Ġhadira s-Safra. Shallow embayments form the offshore extension of the valleys mainly represented by Baħar iċ-Ċagħaq and Qalet Marku.

Owing to the high resistance to erosion of the limestone exposures along the coastline, only a small pocket cobble beach is developed at Qalet Marku.

In structural geological terms these uplands are known as the Ġhallis high as despite their location on the hanging wall of the Victoria Lines Fault, the Lower Coralline Limestone rises way above sea level. The high is dissected by a radial drainage system of which, Wied ta' Kieli and Wied tal-Ġhallis are the most relevant to this report.

The site is located next to broad spur roughly oriented North South and forms part of the Ġhallis structural high. This high is marked by a well-developed Lower Coralline Limestone with a reduced thickness of the Globigerina Limestone. Past ground investigations at the WtE facility, now under construction, has revealed that the Lower Globigerina Limestone is about 17m to 22m thick.

The proposed site is set on a number of terraced fields underlain by Lower Globigerina Limestone. The soil associated with such a geomorphological setting is the L-Inglin man-made complex associated with terraced slopes exposing Lower Globigerina Limestone (Figure 34).

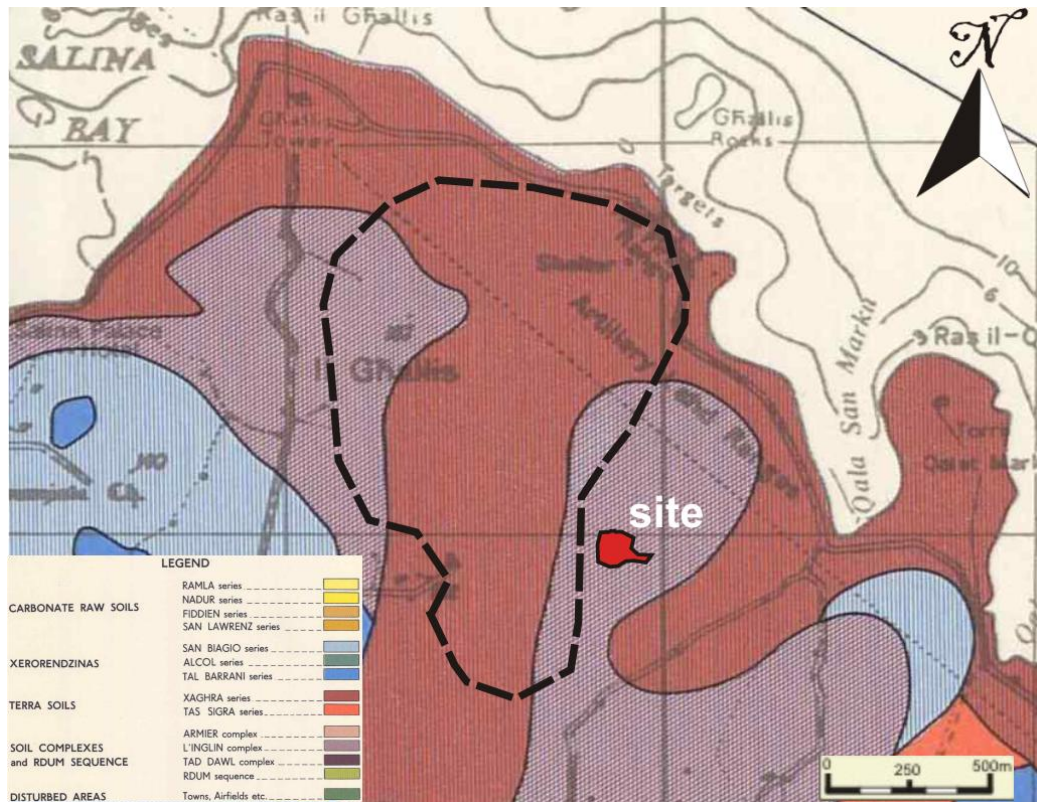


Figure 39: Soil map of the environs of the site from Lang (1962). Black line indicates the approximate extent of the land fill

A typical profile of the soil that has been exposed at the site during the archaeological survey is shown in Figure 40.



Figure 40: Photograph of a typical soil profile at the OPP site about 0.4m thick

The field survey and geological map of the site have revealed that there are no impermeable beds, such as marl or clay, above sea level within the site or its catchment area. As a result, no perched aquifer has developed beneath the site. The only aquifer present beneath the site is the mean sea level water table, which lies approximately 30 to 45 meters below ground level. This mean sea level water table represents the closest hydrogeological feature to the site.

The hydrogeological and hydrological features close to the site are shown in (Figure 42) and are listed below:

- Wied tal-Għallis: a shallow valley covered by landfill and limestone pavement in which no watercourse is developed suggesting scarce run-off events;
- Wied ta'Kieli drainage system which discharges into Qalet Marku;
- The catchment of the site. The site lies partly within the catchment of Wied ta'Kieli about 15% of the area within the catchment of Wied Tal-Għallis and approximately 15% is diffuse;
- The catchment of the site is represented by its boundary and has an area of approximately 21,373m²;
- The Mean Sea Level Aquifer represented by Lower Coralline Limestone;
- Water Services Corporation (WSC) and private boreholes;
- Wetlands.

The mean sea level water body is a lens-shaped water body reaching some 2.5m above sea level in central Malta and thins out to zero thickness at the coastline (Figure 41).

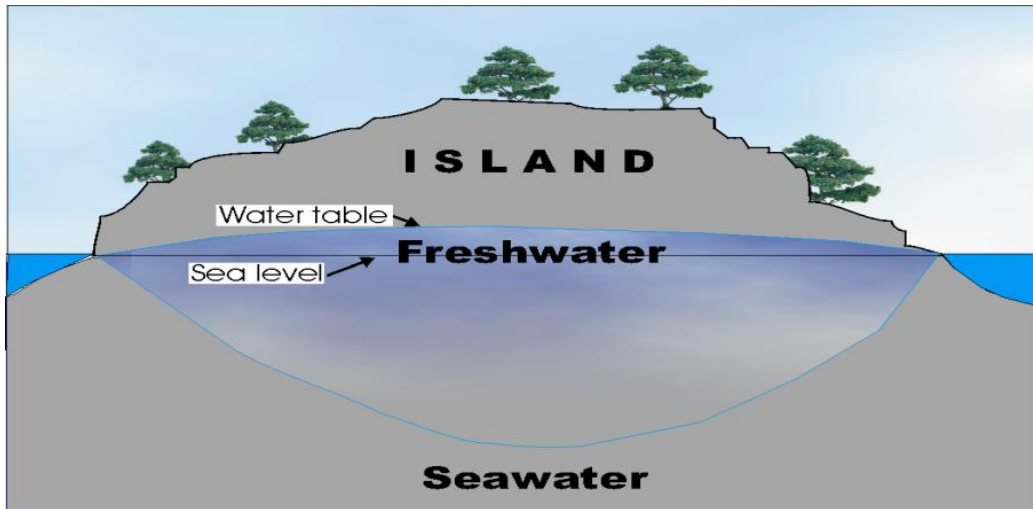


Figure 41: Schematic representation of the mean sea level aquifer developed beneath an island

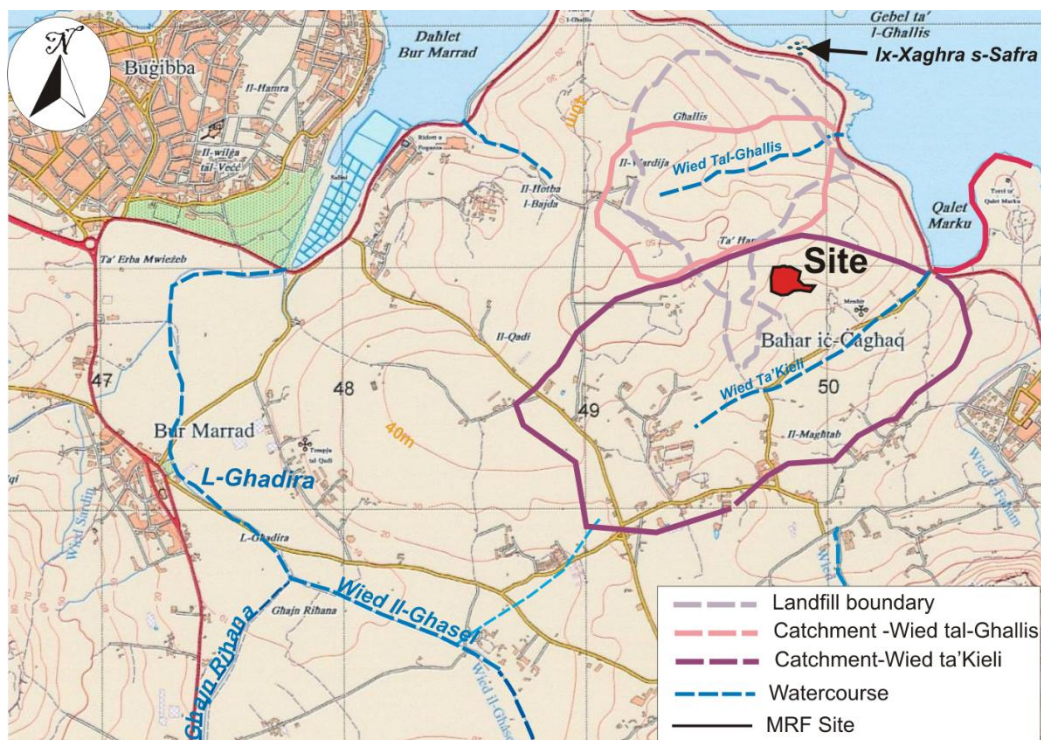


Figure 42: Map showing hydrological features including the catchments of Wied tal-Ghallis and Wied ta'Kieli

4.4 Water bodies

4.4.1 Study Methodology

Similarly to the Geology Technical Study, the AoI for Water Bodies is of 500-600m around the facility (Figure 35). Previous studies in connection of the construction of the Coast Road next to the site were consulted especially with regards to the protected areas. Other studies undertaken are related to the water quality of the groundwater beneath the Magħtab and Għallis Landfills.

During the ground investigation for the Water Bodies Report two (2) groundwater samples were collected as described in Chapter 4.3.1. The two groundwater samples collected from the MRF site were analysed for the chemicals listed in the table below.

Table 15: List of Analytes of Water Samples Laboratory Analysis

CHEMICAL PARAMETER	CHEMICAL PARAMETER	CHEMICAL PARAMETER
Metals	Carcinogenic Chlorinated	PAHs
Arsenic	Aliphatic Compounds	<i>Benzo(a)anthracene</i>
Chromium	<i>Chloromethane</i>	<i>Benzo(a)pyrene</i>
Iron	<i>Trichloromethane</i>	<i>Benzo(b)fluoranthene</i>
Nickel	<i>Vinyl chloride</i>	<i>Benzo(k)fluoranthene</i>
Lead	<i>1,2-Dichloroethane</i>	<i>Benzo(g,h,i)perylene</i>
Copper	<i>1,1-Dichloroethylene</i>	<i>Chrysene</i>
Zinc	<i>1,1,2-Trichloroethane</i>	<i>Dibenzo(a,h)anthracene</i>
Inorganic Pollutants	<i>1,2,3-trichloropropane</i>	<i>Fluoranthene</i>
<i>Fluorides</i>	<i>Tetrachloroethylene</i>	<i>Indeno(1,2,3-c,d)pyrene</i>
<i>Sulphates</i>	<i>Hexachlorobutadiene</i>	<i>Pyrene</i>
	<i>Sum Organohalogens</i>	<i>Naphthalene (C10)</i>
Aromatic Organic Compounds		
<i>Benzene</i>	Carcinogenic Halogenated Aliphatic Compounds	Sum polycyclic aromatic Hydrocarbons
<i>Ethylbenzene</i>		<i>hydrocarbons</i>
<i>Toluene</i>	<i>Tribromomethane (Bromoform)</i>	<i>Total hydrocarbons</i>
<i>Styrene</i>	<i>1,2-Dibromoethane</i>	
<i>Para- Xylene</i>	<i>Dibromochloromethane</i>	
<i>Tetrachloroethylene</i>	<i>Bromodichloromethane</i>	

The principal guidance for this study shall be the:

- Water Framework Directive (2000/60/EC), transposed into *Maltese* legislation as Legal Notice 194 of 2004 (Water Policy Framework Regulations, 2004);

- Strategic Plan for Environment and Development (SPED) drawn in 2015 to replace the Structure Plan for the Maltese Islands drawn up in 1990;
- The EU Marine Strategy Framework Directive (2008/56/EC) – MSFD, published in June 2008, establishes a framework for community action in the field of marine environmental policy. Marine Strategy Framework Directive and related instruments);
- Standards related to chemical analysis of groundwater and seawater;
- Standards related to waste classification.

4.4.1.1 Impact Assessment Criteria

This section includes, for each potential impact the following information:

- Description of impact;
- Policy importance of impact (Local, National, International);
- Extent of effect; and duration of impact (temporary/permanent);
- Adverse or beneficial impact and reversible/irreversible impact;
- Sensitivity of receptor (residential dwelling, business outlets, etc.);
- Probability of impact occurring (certain, likely, uncertain, unlikely, remote); and
- Scope for mitigation/enhancement (very good, good, none).

Based on the above criteria, a summary of the significance of the impact will be considered:

- **Negligible** – little or no change to the hydrologic regime or geological / geomorphological regime;
- **Minor**: Minor change to the hydrological / geological / geomorphological regime with a lot of scope for mitigation;
- **Moderate significance** -change to the geological/ hydrological/hydrogeological regimes with scope for mitigation;
- **Major significance** change to the geological/ hydrological/hydrogeological regimes with little or no scope for mitigation

The significance of likely impacts on the geo-environment are listed the tables below.

Table 16: Significance of likely impacts on Hydrology/hydrogeology

SIGNIFICANCE OF LIKELY IMPACTS ON HYDROLOGY/HYDROGEOLOGY (FRAMEWORK DIRECTIVE 2000/60/EC)	
LEVEL OF SIGNIFICANCE	CRITERION
Major	Contamination of the aquifer with liquid fuels. Liquid fuels are very hard to remove from the pores of the aquifer

Major	Alteration of the hydrological regime by increase or decrease of run-off which do not reflect the seasonal changes in the hydrological cycle leading to loss in infiltration and percolation of groundwater (Framework Directive 2000/60/EC)
Major	Alteration of the hydrological regime of the catchment basin leading to increase of run-off and accelerated hill slope erosion –silting of watercourse
Major	Destruction of karst features that promote percolation of run-off
Moderate	Alteration of the hydrological regime of the catchment basin leading to increase of run-off with opportunity for mitigation of likely impacts
Minor	Development involving minor changes in run-off of a catchment
Insignificant	Development that requires no excavation and/or paving. Excavation may reduce run-off while paving has the opposite effect.

ADVERSE/BENEFICIAL -- HYDROLOGY/HYDROGEOLOGY

ASSESSMENT	CRITERION
Highly beneficial	Developments that will protect or enhance watercourses and catchment basins
Neutral-No positive or negative impact	Developments that do not involve any changes in the hydrological cycle
Adverse	All developments that involve paving of any type are adverse even though they might be small e.g. excavation for a garage or basement which might seem to be insignificant. The cumulative effect of the construction of a new neighbourhood will lead to flooding in the lower reaches of the watercourse

SIGNIFICANCE OF LIKELY IMPACTS ON WATER QUALITY (FRAMEWORK DIRECTIVE 2000/60/EC)

LEVEL OF SIGNIFICANCE	CRITERION
Major	Alteration of the run-off characteristics leading to contamination of surface or groundwater eg major oil spills –contamination with organo- metallic compounds such as pesticides, nitrate contamination or contamination involving any other poisonous substance
Major	Irreversible contamination of the aquifer
Moderate	Contamination with scope for mitigation

minor	Contamination of groundwater by minor spillages with scope for easy mitigation
Negligible	Developments where no kind of contaminant is handled

ADVERSE/BENEFICIAL - WATER QUALITY	
ASSESSMENT	CRITERION
Highly beneficial	Developments for the treatment of run-off or groundwater
Beneficial	Natural Processes that are intended to purify run-off or groundwater such as reed beds.
Neutral	i) Developments that require the catchment of water and recirculation such as turf grass cultivation with underlying membrane to catch excess irrigation water to be recycled. ii) Spillage of freshwater say from a water bowser
Adverse	All spillages/leakages change the quality of groundwater normally by contaminating it and therefore are adverse

4.4.2 Description of the results

The hydrological features in the environs of the site are:

- The Catchment of Wied Ta' Kieli, the catchment in which the site is located
- Downstream catchment of the site
- Coastal Waters
- The mean sea level aquifer
- Private and public water boreholes
- Wetlands

The catchment area downstream of the site represents the region where any surface discharges from the site will flow until they are eventually discharged at the coastline. Similarly, surface discharges from the landfill that fall within the catchment of Wied ta'Kieli will also be discharged at Qalet Marku.

It is important to note that the prevailing wind direction in the Maltese Islands is predominantly from the northwest. As a result, any discharges at the coastline would be driven by longshore currents towards Qalet Marku, rather than towards Salina Bay.

The Maghtab Ghallis Landfill site (which encompasses the Scheme) is underlain by the Lower Coralline Limestone which constitutes the Mean Sea Level Aquifer but it does not lie within the boundary of the water protection zone (Figure 43).

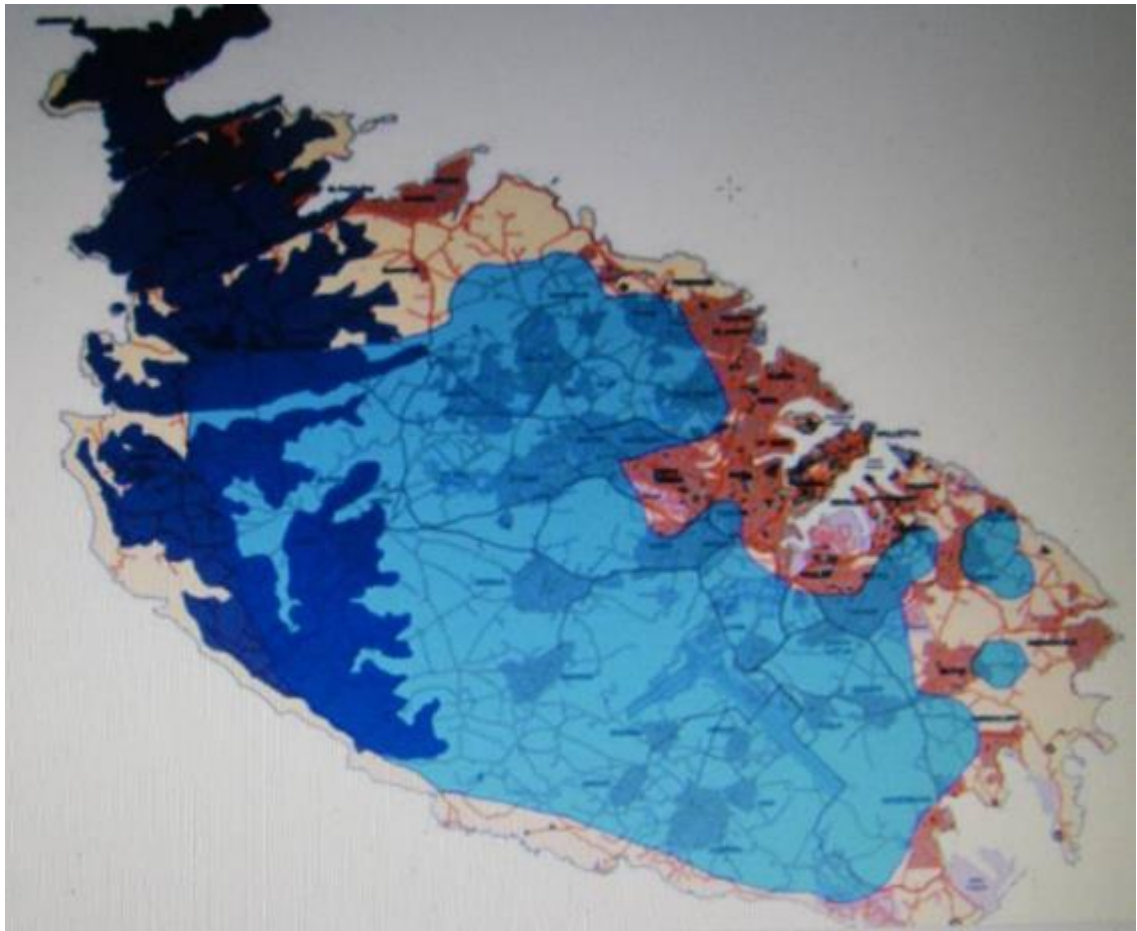


Figure 43: Map showing the water protection zone extending over the island

The site falls within the catchment of Wied ta Kieli (Figure 44). The watershed of this watercourse passes just north of the site as shown in the map. The hydrogeological and hydrological features close to the site are listed below:

- Wied ta Kieli: a shallow valley covered by landfill and limestone pavement in which no watercourse is developed suggesting scarce run-off episodes.
- The Mean Sea Level Aquifer (MSLA)
- Water reservoirs

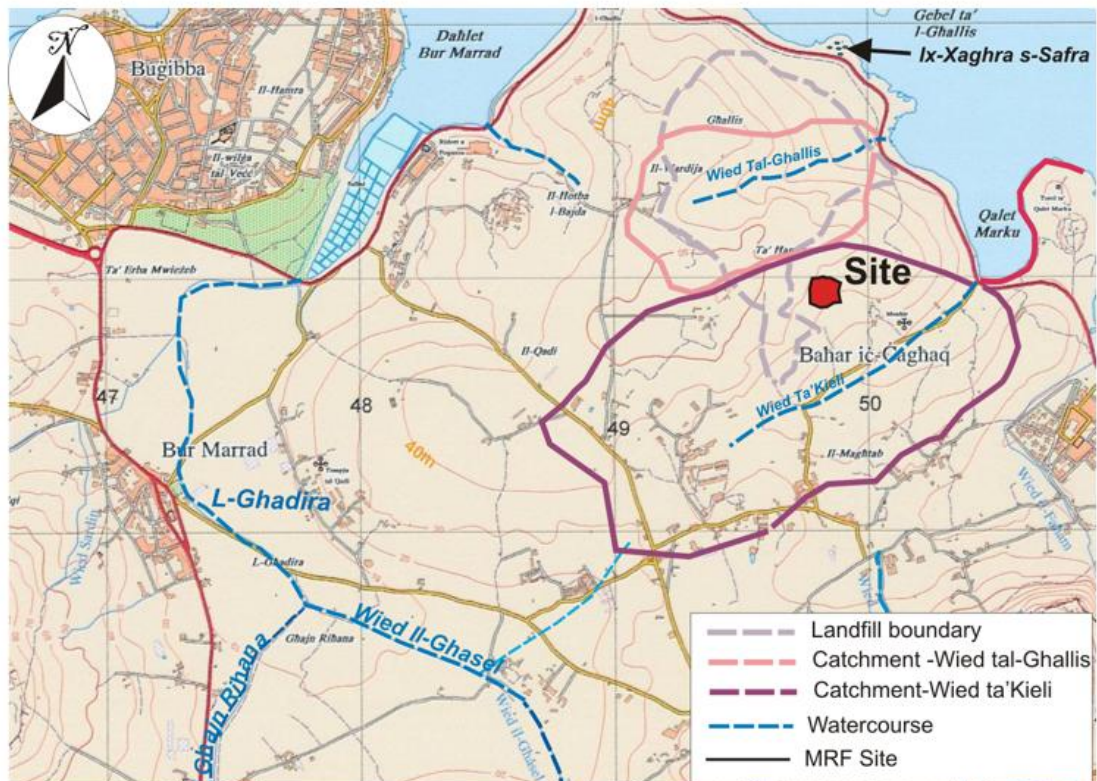


Figure 44: Map showing the catchments of Wied tal-Ghallis and Wied ta'Kieli

Field survey as well as the geological map of the site has revealed that at the site or within its catchment, there are no impermeable beds above sea level such as the Blue Clay formation. Therefore, no perched aquifer is developed beneath the site. The only aquifer beneath the site that may be developed is the Mean Sea Level Aquifer, which lies some 30m to 40m below ground level. This also represents the hydrogeological feature closest to the site.

Laboratory analysis was carried out to assess the qualitative status of the underlying Mean Sea Level Aquifer. Groundwater laboratory test results were compared with the thresholds established by the Italian D.Lgs. 152/06 and revealed the exceedance of three compounds (i.e., iron, one hydrocarbon analyte and sulphate). The Expert associates the presence of the first two pollutants to historical contamination likely sourced upstream the study area. No direct impacts linked to waste treatment operations were inferred. High sulphate content is likely linked to seawater intrusion mechanisms due to the vicinity of the Scheme to the coastline.

4.5 Ecology – Terrestrial

4.5.1 Methodology

This study focuses on the existing ecology present within the project footprint and surrounding areas. The Consultant first carried out a thorough literature review of readily available data and previous studies in the Area of Influence (AoI). This involved a review of readily available data and previous research studies carried out for the AoI.

The AoI for the terrestrial component of the study comprised of a 100m buffer zone around the proposed MRF Scheme.

Subsequently, the Consultant conducted a broad-brush terrestrial survey within the AoI in August 2023 and January 2024. The Consultant recorded the vegetation assemblages and any faunal species encountered during the survey. The baseline survey also included a survey of all species present within the site and buffer zone, including their scientific and vernacular name to identify species protected in line with the TREES AND WOODLANDS PROTECTION REGULATIONS (S.L.549.123) and the FLORA, FAUNA, AND NATURAL HABITATS PROTECTION REGULATIONS (S.L.549.44). Photographic evidence was collected during the field survey, including aerial drone shots.

The report details the conservation status and ecological condition of the area and the state of health of its habitats, species and ecological features. All protected, endangered, rare, unique, endemic, high-quality, keystone, invasive/deleterious, or otherwise important species, habitats, ecological assemblages, and ecological conditions found in the area under study were also studied.

4.5.1.1 Impact assessment criteria

The Consultant evaluated the potential impacts arising from the construction and operation of the proposed Scheme on the local terrestrial ecology. The potential impacts also provided a basis for comparison between the existing conditions and the new conditions established during the operation of the Scheme.

The following information have been provided for each of the identified impacts:

- Project phase (construction or operational phase)
- Policy importance
- Extent of effect (local, national or international)
- Duration (temporary or permanent)
- Type (beneficial or adverse)
- Reversibility (reversible or irreversible)
- Sensitivity of receptors (high, medium or low)
- Probability of occurrence (certain, likely, uncertain, unlikely or remote)
- Scope for mitigation or enhancement (very good, good or none)

Based on the above criteria, the Consultants assessed the significance level of each of the identified impacts. Different criteria were used for the different components of the study, as summarised in Table 17 to Table 25.

Table 17: Duration of Impact Criterion Description

DURATION OF IMPACT	
Permanent	Impact would still be detectable following decommissioning of project
Temporary	Impact would persist throughout the phase of project under consideration only

Table 18: Extent of Impact Criterion Description

EXTENT OF IMPACT	
Widespread	Impact is expected to affect in the entire area of study and/or may extend beyond the boundaries of direct intervention into adjacent areas
Localised	Impact is expected to affect receptors in the immediate vicinity of its source

Table 19: Consequences of Impact Criterion Description

CONSEQUENCES OF IMPACT	
Direct	Changes that result from the cause-effect consequences of interactions between the environment and project activities
Indirect	Changes that result from cause-effect consequences of interactions between the environment and direct impacts
Cumulative	The cumulative consequences of ecological impact refer to the gradual and long-term effects that result from the combined impact of various ecological disturbances or stressors on an ecosystem over time.

Table 20: Effect of Impact Criterion Description

EFFECT OF IMPACT	
Adverse	A negative effect on the sustainability of the resource under consideration, which are distinguishable from background fluctuations
Beneficial	A positive effect on the sustainability of the resource under consideration, which are distinguishable from background fluctuations

Table 21: Reversibility of Impact Criterion Description

REVERSIBILITY OF IMPACT	
Reversible	The state of the resource is expected to return to baseline state following cessation of the source of impact
Irreversible	The state of the resource is not expected to return to baseline state following cessation of the source of impact

Table 22: Sensitivity of Resources to Impact Criterion Description

SENSITIVITY AND RESILIENCE OF RESOURCES TO IMPACT	
High	The resource under consideration is highly susceptible to a detectable deviation from the background state and its general dynamics
Moderate	The resource under consideration is vulnerable but able to tolerate a degree of detectable deviation from the background state and its general dynamics
Low	The resource under consideration is highly tolerant to a detectable deviation from the background state and its general dynamics

Table 23: Probability of Impact Occurring Criterion Description

PROBABILITY OF IMPACT OCCURRING	
Inevitable	Impact will occur irrespective of any mitigation measures taken
Likely	Impact may occur despite the implementation of mitigation measures
Unlikely	Impact would only occur in cases of major mitigation failure
Remote	Impact would only occur in exceptional circumstances
Uncertain	Probability of impact cannot be predicted reliably due to missing information or unknown factors

Table 24: Impact Significance Criterion Description

IMPACT SIGNIFICANCE	
Major	The effect on the existing state of the feature under consideration will lead to a high or large-scale change in its resilience
Moderate	The effect of the existing state of the feature under consideration will lead to an observable but contextually restricted change, which is sufficiently important for its long-term resilience
Minor	The effect on the existing state of the feature under consideration will lead to no, low or small-scale change that will not alter its resilience

Table 25: Residual Impact Significance Criterion Description

RESIDUAL IMPACT SIGNIFICANCE	
Major	The effect on the existing state of the feature under consideration will lead to a high or large-scale change in its resilience after application of mitigation measures (if any) and impact cessation
Moderate	The effect of the existing state of the feature under consideration will lead to an observable but contextually restricted change, which is sufficiently important for its long-term resilience after application of mitigation measures (if any) and impact cessation
Minor	The effect on the existing state of the feature under consideration will lead to low or small-scale change that will not alter its resilience after application of mitigation measures (if any) and impact cessation
Negligible	The effect on the existing state of the feature under consideration will lead to no significant change that will alter its resilience after application of mitigation measures (if any) and impact cessation

4.5.2 Baseline study

The area which will host the new MRF is mostly rural in character, dominated primarily by the engineered landfills and waste management operations conducted by Wasteserv. The site currently comprises agricultural land, a dense cover of low-lying trees and remnants of local maquis/advanced garigue community.

The ecological features surrounding the site area include small pockets of afforested areas, coastal garigue, and other natural communities similar to garigue, steppe, and degraded areas. Although the scheme site and buffer do not directly overlap with any protected areas, several terrestrial, avian, and marine Natura 2000 sites are located within walking distance of the proposed development.

The area of influence and its surroundings were assessed through a desktop review of local plans, legislations, and policy documents. The Central Malta Local Plan (Malta Environment and Planning Authority, 2006) shows that the scheme site is located within an Ecological Area (CG22) and surrounded by Agricultural Areas (CG24) awaiting classification of agricultural value (Figure 45). Two Sites of Scientific Importance (CG22) are nearby, with one located outside the scheme's AoI and the other near the ECOHIVE Complex. The coastal stretch of Qalet San Marku is protected as a "Protected Natural Coast with public access" (NA04), but it is sufficiently detached from the scheme and not considered within the assessment.

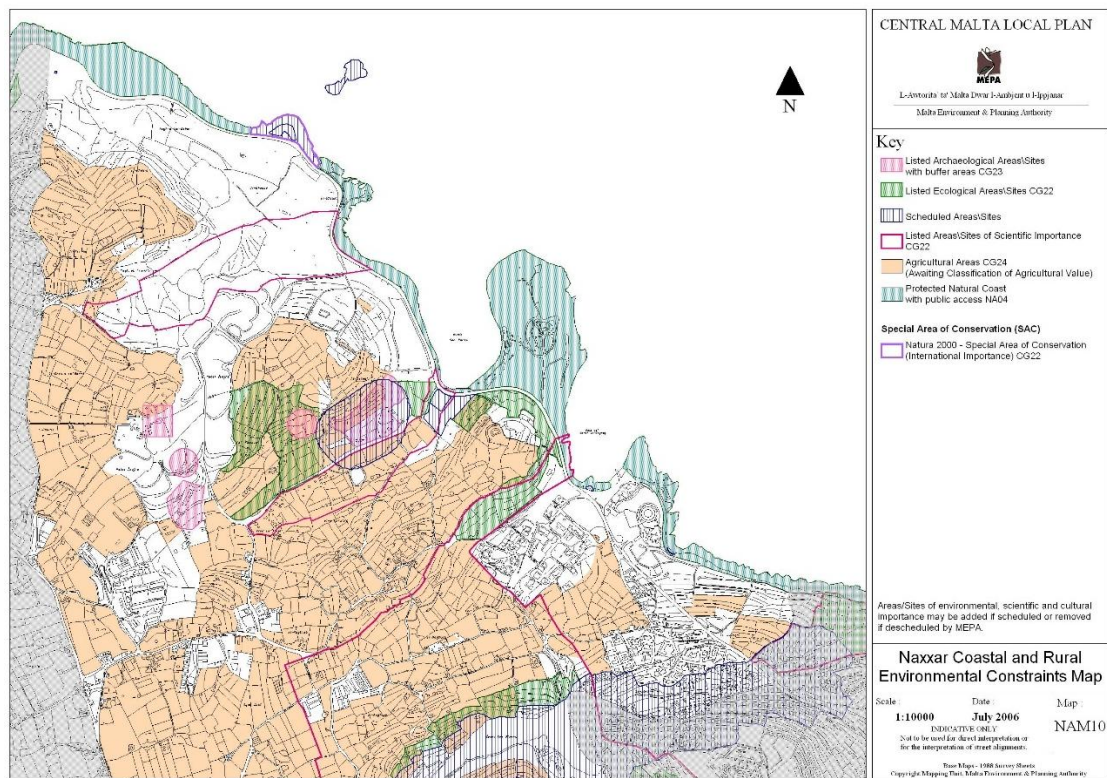


Figure 45: Naxxar coastal and rural environmental constraints map (Central Malta Local Plan, 2006)

In Figure 46, there are seven Areas of Ecological Importance (AEI) marked as A to G that intersect with both the Aol and the scheme site at various points. These AEIs were identified through the North Harbor Local Plan (NHLP) survey in 1996 and have been used to designate protection areas in the Local Plans of 2006.

Site A, characterized by dense vegetation of maquis-like shrubs and trees intermingled with agricultural land, is granted a level 4 degree of environmental protection. Both the scheme site and the majority of the Aol fall within Site A's boundaries. The remaining six designated sites are located in the vicinity of the scheme site, but due to their considerable distance from the scheme and access roads, it is unlikely that the scheme will have any significant impacts on these sites.

Site B, which is located to the north of the scheme site covers a significantly larger tract of land and is designated as a level 3 degree of environmental protection. This area mostly comprises of sections of the Ghallis engineered landfill, but the lower sections closest to the shoreline includes a rocky steppe community dominated by the invasion of the *Agave* spp. plants. These plants were introduced to the area in the mid-20th century and propagated at alarming rates, causing a widespread and characteristic distribution of the species. The coastal stretch leading to the Ghallis Tower comprises of a narrow strip of mature trees (mostly tamarisk trees) and shrubs of prickly pear (*Opuntia ficus indica*).

Site C acts as a buffer for Site D, which comprises of a coastal wetland, better known as I-Ghadira is-Safra u l-Iskolla tal-Ghallis, which is also designated as a Natura 2000 site

(MT0000008). These two sites are assigned a level 3 and level 1 degree of protection, respectively. Further details on the coastal wetland of I-Għadira is-Safra u l-Iskolla tal-Għallis is provided in the following sections of the report.

Site E is a large tract of coastal garigue and is given a level 4 degree of protection. This is flanked by Site G, entailing the continuation of the coastal garigue observed at Site E and is therefore granted the same level of protection. Site F on the other hand, is located further inland and comprises of a typical garigue habitat, which is significantly less exposed to invasion from *Agave* spp. and other anthropogenic impacts when compared to other garigue AEIs described in this section.

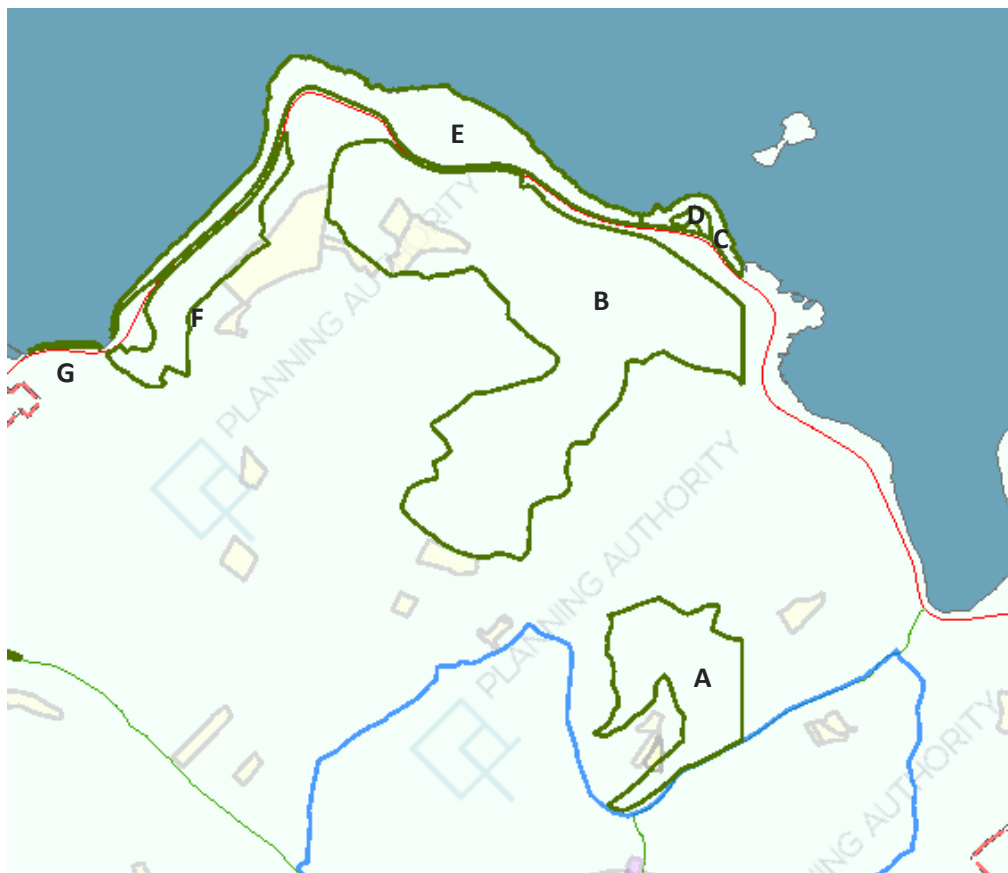


Figure 46: Areas of Ecological Importance (A-G) around the site are marked with a green outline (PA Geoserver)

The SPED (Strategic Plan for Environment and Development) issued by the Planning Authority in 2015 outlines Malta's strategic vision on planning, environmental, economic, and social matters to address sustainable management of land and sea resources and environmental protection. Several thematic objectives in the SPED are directly relevant to the project and its impact on biodiversity:

- Socio-Economic Development Objective 1: Manage available land and sea resources sustainably to meet socio-economic needs while protecting the environment and limiting land take-up in rural areas.

- Socio-Economic Development Objective 7: Promote efficient use of resources like stone, water, and soil, and manage waste to safeguard natural processes and minimize impacts on cultural heritage, landscape, and human health.
- Socio-Economic Development Objective 8: Safeguard and enhance biodiversity, cultural heritage, geology, and geomorphology.
- Rural Objective 3: Guide development in rural areas away from protected and high landscape sensitivity areas, preferably on previously developed land or existing buildings, while enhancing the rural environment.

The proposed development is inconsistent with the SPED's Socio-Economic Development Objective 7, which aims to control the location of development to prevent soil sealing and erosion, and protect agricultural land. It is also inconsistent with Rural Objective 1, which seeks to protect good quality agricultural land from development.

However, the centralization of waste management in Malta brings operational advantages in terms of logistics and transportation. Additionally, grouping similar developments may reduce environmental impacts by concentrating effects in one location rather than spreading them across multiple areas. Furthermore, the MRF project helps Malta achieve improved recycling rates, reducing pressure on landfilling and the need for additional land for future landfills.

The S.L. 549.44 (repealing the Flora, Fauna and Natural Habitats Protection Regulations, 2006 [LN 311 of 2006]) establishes a National Ecological Network of special areas of conservation having National or International Importance. The Legal Notice transposes the obligations of the Habitats Directive, establishing a European Network of Special Areas of Conservation (Natura 2000) composed of sites with natural habitat types and species. The notice includes several schedules that outline criteria for selecting sites, species of community and national importance, and provisions for identification and monitoring. There are no Special Areas of Conservation within the scheme site or its Area of Interest, but the closest protected areas under the Natura 2000 framework are shown in Figure 47.

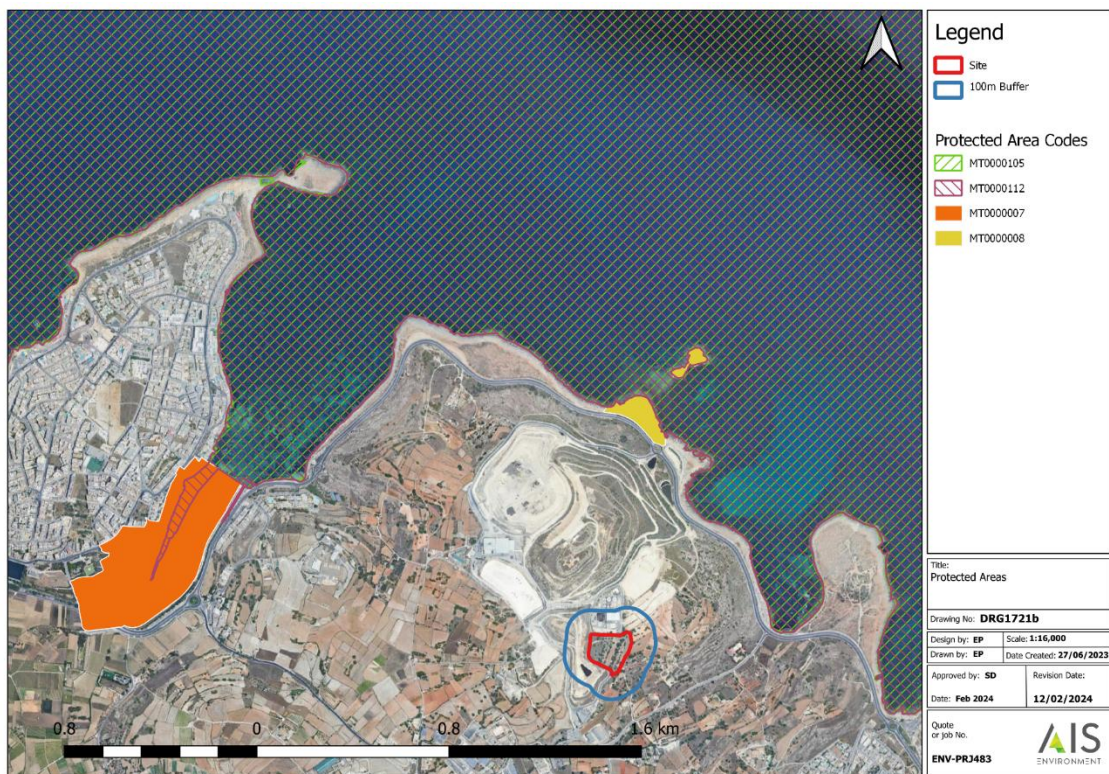


Figure 47: Sites protected within the Natura 2000 framework in close proximity to the site and Aol

The S.L.549.123 (Trees and Woodlands Protection Regulations) safeguards trees and woodlands in Malta by regulating activities that may impact them. It identifies protected areas and species, categorizing them into distinct schedules based on their level of protection. The legislation includes:

- First Schedule Part A: Table 1 lists trees protected in all locations in Malta, while Table 2 lists species protected within specific areas such as protected areas, ODZ, green areas, natural or rural/green enclaves in urban areas, or urban public open spaces.
- Second Schedule: Lists invasive, alien, or environmentally incompatible species.
- Third Schedule: Specifies fees for registration and permit applications.
- Fourth Schedule: Outlines penalties for contravening these regulations.

The scope of Ta' Hammud vegetation report II (AGL Design Landscape Architects, 2018) was to identify, map and assess the status of trees likely affected by the proposed development. The consultants conducted a site survey in the winter of 2017, which was a follow-up to a similar exercise in 2012. The report highlights the differences between the two studies and provides a detailed description of the trees found within the Area of Interest. The survey identified a variety of native trees, including *Ceratonia siliqua* (Carob), *Olea europaea* (Olive), *Pinus halepensis* (Aleppo Pines), and *Pistacia lentiscus* (Lentisk), which are protected within protected areas and ODZ. Any works involving protected plant species must be permitted in advance by ERA in accordance with the relevant regulations. The report also provides recommendations for best practices if the existing trees are considered for transplanting,

particularly the Carob and Olive trees, and potentially the Lentisk shrubs. The resulting map of existing trees is shown in



Figure 48: Results Of Vegetation Study Presented In Ta' Hammud Report (2017)

Wasteserv Malta commissioned a third-party consultant to conduct a Terrestrial Ecology Baseline Study (Doublet & Zammit, 2022) for several proposed developments within the ECOHIVE complex, including the Materials Recovery Facility, Organic Waste Processing Plant, Thermal Treatment Facility, storage area, and access road. The study aimed to assess the potential impacts of these schemes on protected sites, natural ecosystems, habitats, and species.

The report assessed the schemes' footprints and identified ecological receptors, discussing the perceived impacts, proposing mitigation measures, and outlining residual impacts and compensatory measures. The assessment was conducted in accordance with the Environment and Resources Authority's Terms of Reference for a Terrestrial Ecology Baseline Study, issued in July 2022.

The study recorded a diverse range of flora and fauna within the scheme site and surrounding areas. The report concluded that the proposed developments are likely to have cumulative impacts, primarily due to habitat loss and reduced food availability for protected species during construction, and continued impacts during the operational phase. The illumination of the site and surrounding area may also contribute to additional impacts.

Figure 49 and Figure 50 present the habitats and tree species recorded during the assessment.



Figure 49: Habitat Map of the AOI (Source: Baseline Study..., Doublet And Zammit, 2022)

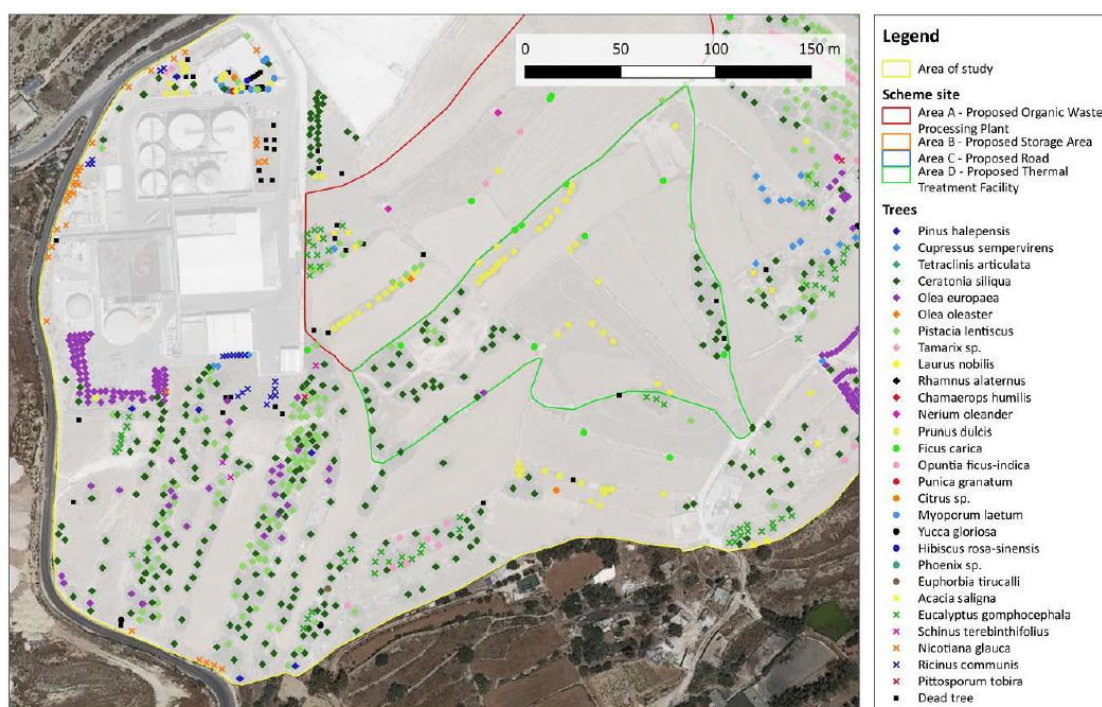


Figure 50: Trees in the AOI (Source: Baseline Study..., Doublet and Zammit, 2022)

4.5.2.1 Site survey

A terrestrial survey was conducted within the Area of Influence (AoI) in August 2023 and January 2024. The main ecological components of the scheme site and surrounding AOI include:

- The Žvejra landfill border, hosting ruderal and opportunistic species.
- Soft landscaping around the existing bio-digester plant complex.
- Small patches of mature invasive species to the North of the site.
- A considerable area of disturbed ground to the North-East of the site.
- The scheme site and a considerable area to the South-East, comprising remnants of maquis communities bordering bare or fallow fields.

Inside the ECOHIVE Complex, ecological landscape dynamics are significantly influenced by ongoing waste management operations. The area is characterized by dense populations of various species, including *Glebionis coronaria* (White wall-rocket), *Avena sterilis* (Sterile oat), *Arundo donax* (Greater reed), *Diplotaxis tenuifolia* (Perennial wall-rocket), *Borago officinalis* (Borage), *Foeniculum vulgare* (Common fennel), and *Ricinus communis* (Caster oil plant). These species cover the large heaps of the Žvejra landfill to the South-West of the site. The observed species generally hold little ecological importance, while some are considered invasive.



Figure 51: Opportunistic species covering the Southern heaps of the Žvejra landfill



Figure 52: Patches of Opportunistic Species Covering the Western Heaps of Inert Material and the Adjacent Abandoned Fields

The ECOHIVE Complex is surrounded by soft landscaping which incorporates some notable tree species, including a predominance of *Olea europea* (Olive trees) and scattered *Ceratonia siliqua* (Carob trees). A number of invasive species have naturally colonized the spaces in between the native trees.



Figure 53: Soft landscaping, predominantly olive trees around the existing biodigester plant (Taken August 2023)

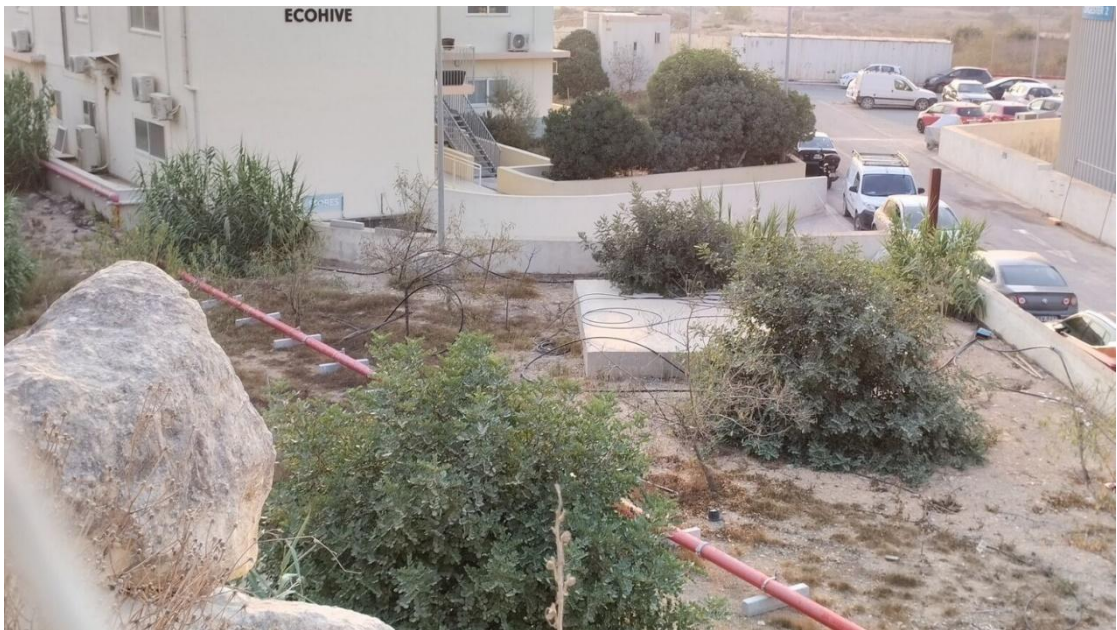


Figure 54: Soft landscaping, predominantly carob trees, around the existing biodigester plant (Taken August 2023)

Between the proposed site and the ECOHIVE Complex lies a narrow plot of land which is currently dominated by invasive species such as *Arundo donax*. The Eastern border of this area, which is delineated by a shallow rubble wall, contains some specimens of native species such as *Pinus halepensis* (Aleppo pine) and *Ceratonia siliqua* (Carob trees).



Figure 55: Narrow strip of land surrounding the existing Biodigester plant dominated by the invasive *Arundo Donax* (taken January 2024)



Figure 56: Eastern border of the natural area adjacent to the biodigester plant containing native species (Taken January 2024)

Adjacent to the aforementioned area, to the South (within the proposed scheme boundary) is a small patch of mature *Eucalyptus gomphocephala* (Tuart tree), which is listed within the ERA ANNEX II – INDICATIVE LIST OF ALIEN SPECIES THAT SHOULD NOT BE PLANTED IN RURAL AREAS, with the exception of eucalyptus trees intended for use in apiculture.



Figure 57: Small patch of mature Tuart trees South of the existing biodigester plant (Taken January 2024)

To the North-East of the proposed site lies a large area of severely degraded land. The area appears to have been excavated and cleared of any soil or vegetation. The resulting landscape remains as an expanse of exposed bedrock. The motive and entity responsible for this clearing is not known.



Figure 58: Degraded land North East of the proposed site (Taken January 2024)

The agricultural land within the AoI is encircled by low-lying rubble walls. The conservation and maintenance of these rubble walls is governed by LEGAL NOTICE 426 OF 2007 – RUBBLE WALLS AND RURAL STRUCTURES (CONSERVATION AND MANAGEMENT), due to their historical and environmental importance. Rubble walls contribute to soil retention against surface water runoff and provide shelter for small mammals, reptiles, and invertebrates that use the agricultural land as their habitat.

The majority of the rubble walls observed within the buffer zone were quite degraded, with the exception of the boundary wall south of the existing biodigester plant. Vegetation species observed along the rubble walls include *Ferula communis* (Common fennel), *Sonchus oleraceus* (Crown daisy), *Asparagus aphyllus* (Mediterranean Asparagus), and monocot grasses such as *Piptatherum miliaceum* (Smilgrass).



Figure 59: Vegetation assemblages on degraded rubble walls and rubble structures



Figure 60: Fallow agricultural land encircled by degraded rubble walls within the AoI

The site boundary and the East-South-East area of the AoI are characterized by fallow fields bordered by corridors of advanced maquis communities. The maquis assemblages are primarily composed of *Olea europaea* (Olive trees), *Ceratonia siliqua* (Carob trees), and *Pistacia lentiscus* (Lentisc).

In the summer months, the fallow fields were bare. However, in January, the area was characterized by fast-growing grasses and flowering plants in the open areas. More specialized assemblages colonized the maquis and rubble wall borders, forming scattered patches where conditions were more sheltered.



Figure 61: Bare land bordered by maquis communities including carob and olive trees (Taken August 2023)



Figure 62: Fallow fields colonised by grasses and flowering plants bordered by maquis communities (Taken January 2024)



Figure 63: Fallow fields colonised by grasses and flowering plants bordered by maquis communities 2 (Taken January 2024)



Figure 64: Lentisc shrubs within the maquis communities (Taken January 2024)



Figure 65: Opportunistic *Portulaca* species colonising fallow fields (Taken January 2024)



Figure 66: *Ferula Communis* (Wild fennel) stands present at maquis borders (Taken January 2024)



Figure 67: Asphodel stands observed in sheltered areas (Taken January 2024)

Based on the broad-brush survey within the Aol, a list of floral species encountered is provided in Table 26. However, no fauna species were directly observed during the survey.

Previous studies with seasonal sampling have recorded the presence of several mammalian, reptile, and insect species in the area, including the Algerian Hedgehog (*Atelerix algirus*), the Western whip snake (*Coluber viridflavivorus*), the Leopard snake (*Elaphe situla*), the Moorish wall gecko (*Tarentola mauritanica*), and the Oscillated skink (*Chalcides ocellatus*).

The presence of avian species has been assessed and presented in a separate chapter of the EIA. Additionally, the presence of bats cannot be excluded, as the old dilapidated farmland buildings in the vicinity of the Aol can provide attractive roosting sites, and the maquis and agricultural land may offer foraging opportunities. While no roosts are publicly documented within the Aol at the time of writing, previous studies have recorded the presence of four bat species using the general area as feeding or commuting grounds.

Table 26: List of vegetative species encountered on site

SPECIES NAME	ENGLISH NAME	PROTECTION	TYPICAL HABITAT IN AOl	APPROX QUANTITY
<i>Antirrhinum tortuosum</i>	Greater snapdragon	None	Agricultural land & disturbed areas	Several
<i>Arundo donax</i>	Greater reed	None	Agricultural land & disturbed areas	Several
<i>Asparagus aphyllus</i>	Mediterranean asparagus	None	Agricultural land, disturbed areas & maquis	Several
<i>Asphodelus aestivus</i>	Summer asphodel	None	Maquis areas	Several
<i>Avena sterilis</i>	Sterile oat	None	Agricultural land, disturbed areas	Several
<i>Borago officinalis</i>	Borage	None	Disturbed areas & agricultural land	Several
<i>Bromus spp.</i>	Brome grass	None	Agricultural land, disturbed areas	Several
<i>Capparis orientalis</i>	Caper bush	Schedule VIII of S.L. 549.44	Soft landscaped areas	Scattered individuals
<i>Ceratonia siliqua</i>	Carob tree	Schedule I Part A Table 2 S.L.549.123	Maquis	162
<i>Conyza bonariensis</i>	Hairy Fleabane	None	Soft landscaped area	Few individuals
<i>Cupressus sempervirens</i>	Cypress tree	Schedule I Part A Table 2 S.L.549.123	Soft landscaped areas	1
<i>Diplotaxis tenuifolia</i>	Perennial wall rocket	None	Agricultural land & disturbed areas	Several

<i>Dittrichia viscosa</i>	False yellowhead	None	Agricultural land & disturbed areas	Several
<i>Ecbalium elaterium</i>	Squirting cucumber	None	Agricultural land & disturbed areas	Several
<i>Eucalyptus gomphocephala</i>	Tuart tree	None (not located in public urban space or used for beekeeping)	Agricultural land	12
<i>Foeniculum vulgare</i>	Common fennel	None	Disturbed areas, agricultural land & maquis	Several
<i>Galactites tomentosa</i>	Mediterranean thistle	None	Agricultural land & disturbed areas	Several
<i>Glebionis coronaria</i>	Crown daisy	None	Agricultural land & disturbed areas	Several
<i>Ipomoea alba</i>	Moonflower vine	None	Soft landscaping areas	Scattered individuals
<i>Lavatera arborea</i>	Mallow tree	None	Disturbed areas, & soft landscaped areas	Several
<i>Lonicera implexa</i>	Evergreen honeysuckle	None	Agricultural land	Scattered individuals
<i>Mercurialis annua</i>	Annual mercury	None	Soft landscaped areas & disturbed areas	Several
<i>Nicotiana glauca</i>	Tree tobacco	Schedule II (invasive) S.L. 549.123	Disturbed area & soft landscaped areas	5
<i>Olea europaea</i>	Olive tree	Schedule I Part A Table 2 S.L. 549.123	Maquis	24
<i>Oxalis pes-caprae</i>	Bermuda buttercup	None	Disturbed areas, Agricultural land	Several
<i>Pinus halepensis</i>	Aleppo pine tree	Schedule I Part A Table 2 S.L.549.123	Soft landscaped areas, Maquis	9
<i>Piptatherum miliaceum</i>	Smilgrass	None	Agricultural land, disturbed areas	Several
<i>Pistacia lentiscus</i>	Lentisk tree	Schedule I Part A Table 2 S.L. 549.123	Maquis	48
<i>Pittisporum tobira</i>	Japanese mock orange	None	Soft landscaped areas	Scattered individuals
<i>Plantago spp.</i>	Plantain	None	Disturbed areas	Several
<i>Portulaca spp.</i>	Purslane	None	Agricultural land	Several
<i>Ricinus communis</i>	Castor oil tree	Schedule II (invasive) S.L. 549.123	Disturbed areas	Several
<i>Sulla coronaria</i>	Sulla	None	Agricultural land	Several

<i>Sonchus oleraceus</i>	Sow thistle	None	Disturbed areas & garigue	Several
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Table 27: Protected Tree Species within the AoI

SPECIES NAME	ENGLISH NAME	PROTECTION	TYPICAL HABITAT IN AoI	AMOUNT IN AOI
<i>Capparis orientalis</i>	Caper bush	Schedule VIII of S.L. 549.44	Soft landscaped areas	Scattered individuals
<i>Ceratonia siliqua</i>	Carob tree	Schedule I Part A Table 2 S.L.549.123	Maquis	162
<i>Cupressus sempervirens</i>	Cypress tree	Schedule I Part A Table 2 S.L.549.123	Soft landscaped areas	1
<i>Olea europaea</i>	Olive tree	Schedule I Part A Table 2 S.L. 549.123	Maquis	24
<i>Pinus halepensis</i>	Aleppo pine tree	Schedule I Part A Table 2 S.L.549.123	Soft landscaped area, Maquis	9
<i>Pistacia lentiscus</i>	Lentisk tree	Schedule I Part A Table 2 S.L. 549.123	Maquis	48
Total protected trees affected by the proposed development				244



Figure 68: Terrestrial Ecology Map showing Habitats and Land Uses within the scheme's AoI

4.6 Ecology – Avifauna

4.6.1 Methodology

The technical study on avifauna focuses on the populations of wild birds, particularly protected species and species with conservation concerns, as relevant sensitive receptors.

The Area of Influence (Aoi) for the avifauna assessment of the terrestrial part of the proposed development, referred to as Aoi-1, consists of the actual site area of the proposed MRF development and a 0.1 km buffer zone around this area. Additionally, the assessment of potential impacts on avifauna in the wider area, caused by light pollution from the planned development, is evaluated within a 5.0 km buffer around the site area of the proposed development, referred to as Aoi-2 (Figure 69).

The assessment of potential impacts on avifauna receptors in the identified Aois was performed through a literature review. The main references considered include:

- Malta Breeding Bird Atlas 2008 (BirdLife Malta, 2009)
- Malta Breeding Bird Atlas 2018 (Epsilon, 2019)
- The Breeding Birds of Malta (Sultana et al., 2011)
- Malta Marine Important Bird Areas (IBA) Inventory Report (BirdLife Malta, 2015)
- Marine Strategy Framework Directive (MSFD) initial assessment report, seabirds (Borg et al., 2013)
- MSFD second assessment report (ERA, 2020)
- BirdLife International (2020) International Union for the Conservation of Nature (IUCN) Red List for birds (<http://www.birdlife.org>)
- Bird species of Annex I of the Birds Directive (2009/147/EC)
- Draft Guidelines for the Reduction of Light Pollution in the Maltese Islands (Environment and Resources Authority, 2020)

The Natura 2000 sites that are either situated within or partially overlapping with the Aoi-2 are:

- SAC L-Għadira s-Safra (MT0000008)
- SAC Is-Salini (MT0000007)
- SAC Żona fil-Baħar bejn il-Ponta ta' San Dimitri (Għawdex) u il-Qaliet (MT0000105)
- Marine SPA Żona fil-Baħar madwar Għawdex (MT0000112)

The report details the conservation status of the relevant bird species within the Aois and in the above-mentioned Natura 2000 sites. A comprehensive analysis of all bird species likely affected by the development of the new MRF can be accessed through the main technical study.

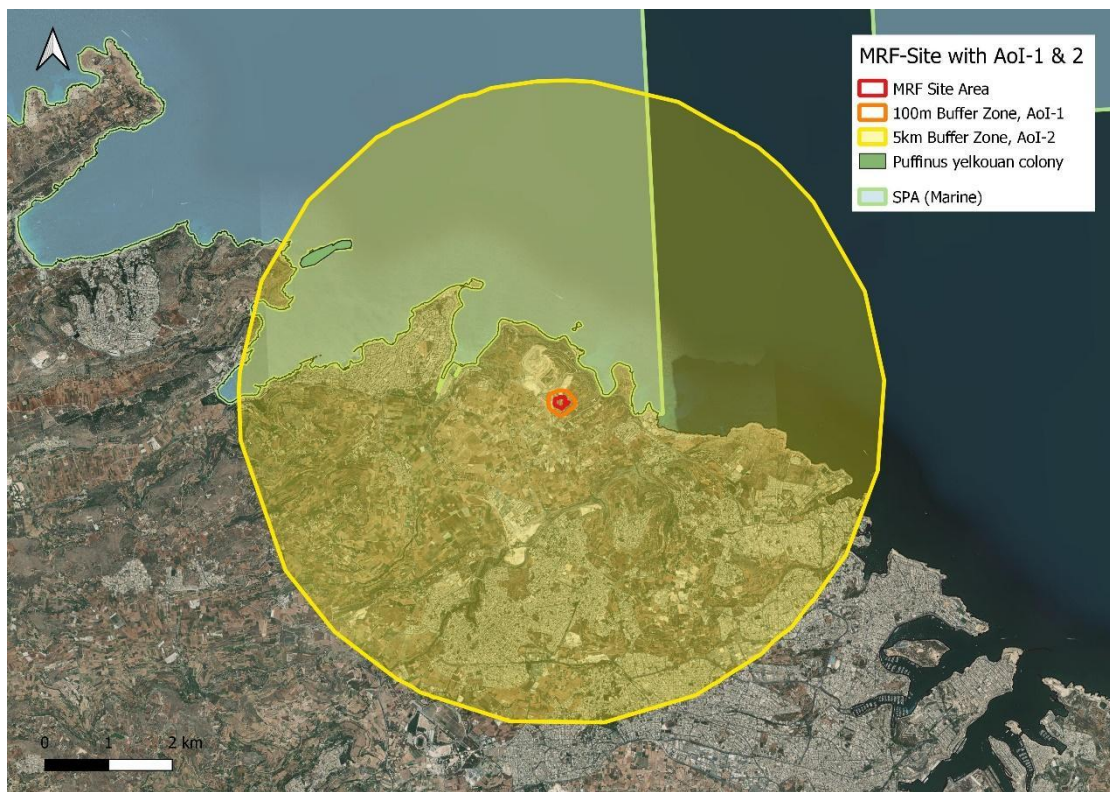


Figure 69: Proposed MRF Site with Aols relevant to Ecology - Avifauna

4.6.1.1 Impact Assessment Criteria

The following information will be provided for each of the identified impacts:

- Project phase (construction or operational phase)
- Policy importance
- Extent of effect (local, national or international)
- Duration (temporary or permanent)
- Type (beneficial or adverse)
- Reversibility (reversible or irreversible)
- Sensitivity of receptors (high, medium or low)
- Probability of occurrence (certain, likely, uncertain, unlikely or remote)
- Scope for mitigation or enhancement (very good, good or none)

Based on the above criteria, the Consultants shall assess the significance level of each of the identified impacts. Different criteria shall be used for the different components of the study, as summarised in Table 28.

Table 28: Significance level descriptions

STUDY COMPONENT	SIGNIFICANCE LEVEL	DESCRIPTION
Avian	Not significant	The proposal will not affect any keystone and/or protected species and/or habitats
	Minor	The project will affect only a few of the affect any keystone and/or protected species and/or habitats
	Moderate	The Scheme will affect a proportion of the keystone and/or protected species and/or habitats
	Major	The development will affect all or most of keystone and/or protected species and/or habitats

4.6.2 Baseline study

The Maltese Islands are home to a diverse range of bird species, with over 400 species recorded within their FMZ (25 NM). Of these, around 200 species occur regularly, with up to 48 species recorded breeding on the islands. Three pelagic seabird species, listed under Annex I of the EU Birds Directive, hold significant breeding populations in the Maltese Islands.

The 5.0 km buffer zone around the proposed development, AoI-2, overlaps with five protected sites within the Natura 2000 network, including SAC Pembroke, SAC Is-Salini, SAC L-Għadira s-Safra u l-Iskoll tal-Għallis, SAC Żona fil-Baħar bejn il-Ponta ta' San Dimitri (Għawdex) u il-Qaliet, and SPA Żona fil-Baħar madwar Għawdex.

The avifauna baseline study aims to identify the bird species expected to occur in the AoIs, including in the potentially impacted protected areas, to inform conservation efforts.

4.6.2.1 Breeding land birds within the terrestrial part, AoI-1

Five bird species have been reported as confirmed, probably, or possibly breeding within the AoI-1 (Table 29) according to the Malta Breeding Bird Atlas 2008 and 2018, considering the breeding seasons 2008, 2017 and 2018. Two of the four species regularly choose anthropogenic structures as nest sites.

Table 29: List of breeding bird species in the AoI-1 and their status

SPECIES	BREEDING STATUS IN TERRESTRIAL AoI	ABUNDANCE STATUS	TREND IN MALTA	TREND IN EUROPE	CONSERVATION STATUS	ANNEX I (EU BIRDS DIRECTIVE)
Common Swift <i>A. apus</i>	Probable	Scarce	Increasing	Stable	Least Concern	No

Blue Rock Thrush <i>Monticola solitarius</i>	Possible	Frequent	Stable	Unknown	Least Concern	No
Sardinian Warbler <i>Curruca melanocephala</i>	Probable	Common	Decreasing	Stable	Least Concern	No
Zitting Cisticola <i>Cisticola juncidis</i>	Probable	Abundant	Stable	Increasing	Least Concern	No
Spanish Sparrow <i>Passer hispaniolensis</i>	Confirmed	Abundant	Stable	Decreasing	Least Concern	No

4.6.2.2 Breeding seabirds making use of Aol-2

Three pelagic seabird species from the order *Procellariiformes*, namely the Yelkouan Shearwater (*Puffinus yelkouan*), Scopoli's Shearwater (*Calonectris diomedea*), and Mediterranean Storm-petrel (*Hydrobates pelagicus melitensis*), nest on the Maltese Islands and inhabit Maltese waters in significant population numbers from a global and European perspective. All three species are listed in Annex I of the EU Birds Directive.

One of these species, the Yelkouan Shearwater, is listed as Vulnerable on the IUCN Redlist and holds a breeding colony within the Aol-2. The designation of the marine SPA Żona fil-baħar madwar Għawdex (MT0000112), which partially overlaps with the Aol-2, was triggered by two of these species: the Yelkouan Shearwater and the Scopoli's Shearwater.

In addition to these three procellariiform seabird species, Malta also hosts a breeding population of the Yellow-legged Gull (*Larus michahellis*), which is not listed in Annex I of the EU Birds Directive.

Scopoli's Shearwater *Calonectris diomedea* – Least Concern, Annex I

The Scopoli's Shearwater is a seabird species listed as Least Concern by the IUCN and under Annex I of the EU Birds Directive. It is endemic to the Mediterranean basin, with major colonies in the Central Mediterranean. The global population size is estimated to be between 285,000 and 446,000 mature individuals, showing a decreasing trend. The Maltese population is estimated to be around 1.6-1.9% of the global breeding population, with a decreasing trend.

The species is strictly pelagic, foraging frequently together in large numbers on shoaling fish and squid. During the breeding period, Scopoli's Shearwaters congregate in large flocks, sitting on the water's surface exhibiting 'rafting' behaviour within a 4km radius in front of the colonies. GPS-tracking of individuals from Maltese colonies during the chick-rearing period shows that Scopoli's Shearwaters utilize at-sea areas in the Maltese EEZ, including the marine part of the Aol-2.

The species is highly susceptible to plastic ingestion and entanglement, and as long-lived, top-level predators, they are known to bio-accumulate pollutants with potentially detrimental impacts on physiology and reproduction.

Yelkouan Shearwater *Puffinus yelkouan* – Vulnerable, Annex I

The Yelkouan Shearwater is a Vulnerable species listed under Annex I of the EU Birds Directive. It is endemic to the Mediterranean basin and has a global population size estimated to be 15,337-30,519 pairs, roughly equating to 46,000-92,000 individuals. The global population trend is decreasing, but the Maltese population is stable, with an estimated 1,795-2,635 breeding pairs, roughly equating to 10% of the global breeding population.

The species is highly susceptible to by-catch, light pollution, plastic ingestion, entanglement, and bio-accumulation of pollutants. The largest Yelkouan Shearwater colony in Malta is situated at Irdum tal-Madonna (MT0000009), and the closest colony to the proposed development is on Selmunett surrounded by SAC (MT0000105), within the 5km buffer area of the proposed MRF (Aol-2).

Yelkouan Shearwaters are strictly pelagic, foraging frequently together in flocks on shoaling fish and squid. They congregate in flocks exhibiting rafting behaviour within a 7 km radius in front of the colonies in the evenings. GPS-tracking data suggests that Yelkouan Shearwaters forage predominantly in waters further offshore and partially outside Maltese waters. The species is one of the trigger species for the designation of the relevant marine SPAs at hand, with 3,270-4,650 individuals making regular use of the SPA MT0000112 during the reproductive season as foraging ground and rafting areas in front of the colonies.

Mediterranean Storm-petrel *Hydrobates pelagicus melitensis* – Least Concern, Annex I

The Mediterranean Storm-petrel (*H. p. melitensis*) is a subspecies of the European Storm-petrel, endemic to the Mediterranean basin. It is listed under Annex I of the EU Birds Directive and is considered Least Concern by the IUCN. The global population size is estimated to be 430,000-519,999 mature individuals, with the Mediterranean subspecies accounting for 2-3% of this total.

The closest breeding colony to the proposed development is Irdum tal-Madonna (MT0000009), which is not expected to be directly impacted. The Maltese population is estimated to be around 8,500-15,200 pairs, roughly 7% of the global population and at least 56% of the Mediterranean subspecies.

The species is found in the Maltese EEZ year-round and in the colonies from February to October. It is more commonly seen in Maltese waters during the breeding season, particularly southeast and south of Malta. Adults and fledglings are sensitive to light pollution.

The species is known to make use of the entire Maltese EEZ, as well as areas further offshore between Malta and Libya. While not a trigger species for the designation of the marine SPA MT0000112, Storm-petrels are commonly found in this area, including the marine part of the Aol-2, particularly during the breeding season.

Yellow-legged Gull *Larus michahellis* – Least Concern

The Yellow-legged Gull (*Larus michahellis*) is listed as Least Concern by the IUCN with an increasing population trend. The global population numbers are unknown, but the European population is estimated to be 409,000-534,000 pairs, equivalent to 819,000-1,070,000 mature individuals, with an increasing trend.

The latest assessment of the Maltese YLG population for Malta's Article 12 reporting to the EU lists 250 breeding pairs for the Maltese islands with an increasing trend. The largest colony, with 202 ± 24 apparently occupied nests (5-year mean), is located on Filfla. Smaller colonies at Ta' Ċenċ, Dingli, and Wardija might have expanded in recent years. The species has also established new breeding locations such as Comino, Għarb, and within Aol-2 on Selmunett (surrounded by MT0000105) recently, so the actual number of breeding pairs might exceed 300 pairs.

Western to Central Mediterranean populations are mainly sedentary and dispersive, but some populations are partially migratory. In the Maltese Islands, a large number of non-breeders are present year-round. Ring recoveries show that birds ringed on Filfla as chicks utilize other locations in Malta and abroad, mainly Sicily and Southern Italy.

Yellow-legged Gulls are highly opportunistic feeders and benefit from human activities such as fishing, discard from fisheries, food-waste, open landfills, aquaculture, and agriculture. In the Maltese islands, they occur in their highest densities and largest abundances in harbour areas, around the largest colony (Filfla), around areas with large aquaculture facilities, especially tuna pens such as those in the vicinity of St Paul's Island and the wider area off Selmun. Large numbers of feeding flocks can be observed in the Aol-2 next to the proposed development at the Magħtab landfill year-round, as well as in adjacent areas in the Aol-2 on land (SACs MT0000007, MT0000008, MT0000105) and at sea (SPA MT0000112).

4.6.2.3 Other avian species expected to occur in the Aols

For a detailed list of species expected to make use of the Aols kindly refer to the Avifauna Technical Study.

4.7 Agricultural Land

4.7.1 Methodology

A desktop analysis of available on-line sources was undertaken with the twofold objective of identifying the type of crops cultivated within the study area and the type of soil characterizing the potential crop yield.

Satellite images (e.g., orthophotos from Natura 2000 viewer, PA Geoserver, Google Earth) were collected to infer seasonal patterns of agricultural practices. Furthermore, historical land-use maps were consulted for providing a classification of soil types useful to the assessment of the minimal crop yield surrounding the Scheme.

Finally, a site inspection has been carried out by the Expert for assessing the current soil conditions and the potential impacts which may arise following the construction of the new MRF.

4.7.1.1 Impact Assessment Criteria

This section will include, for each potential impact, the following information:

- Description of impact
- Policy importance of impact (Local, National, International)
- Extent of effect
- Duration of impact (temporary/permanent)
- Adverse or beneficial impact
- Reversible/irreversible impact
- Sensitivity of receptors
- Probability of impact occurring (certain/likely/uncertain/unlikely/remote); and
- Scope for mitigation/enhancement (very good/good/none)

A summary of the significance of the impact will be put forward, as follows:

- **Not significant:** the proposed intervention is likely to have no effect on the surrounding agricultural land;
- **Minor significance:** the Scheme shall alter the use and/or value attributed to the area by the agricultural land;
- **Moderate Significance:** the impact on agricultural land is real but not substantial in relation to other impacts that might take effect within the bounds of those that could occur. In the case of adverse impacts, mitigation is both feasible and fairly easily possible;
- **Major significance:** the proposed project will affect the agricultural land in ways that would require major changes. In this eventuality, mitigation measures shall be proposed.

4.7.2 Baseline survey

The Magħtab area features an undulating Globigerina Limestone landscape, typical of northern Malta, with mainly brownish soils and limited depth. According to the WRBS classification system (MAL SIS, 2003), this location consists of Regosols (RG), a group of soils with minimal development in virtually unaltered parent material, as shown in Figure 70. The landscape is characterized by lower shallow moderate terraces on Globigerina limestone (GTm), as depicted in Figure 71.

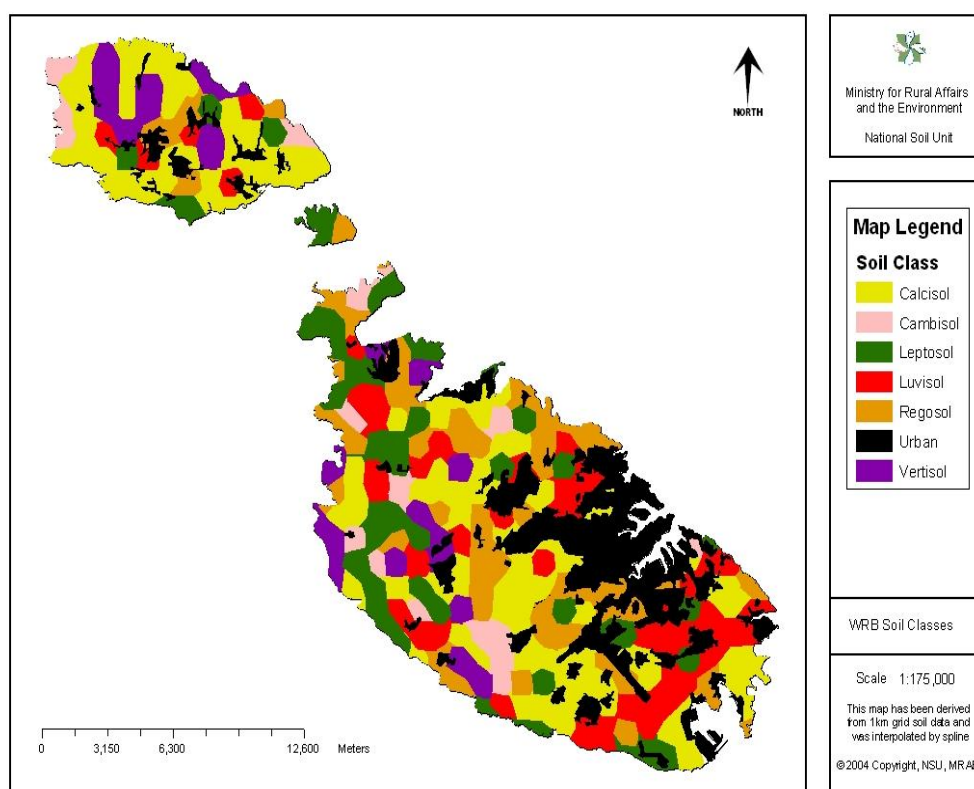


Figure 70: MAL SIS Soil Classes (Source: MAL SIS)

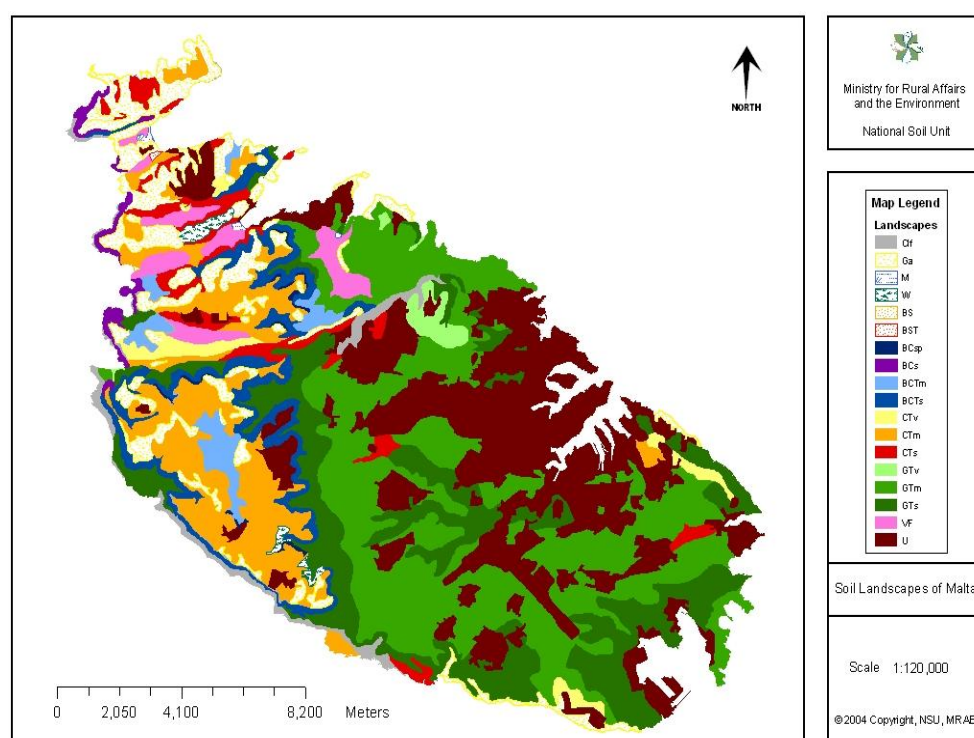


Figure 71: MAL SIS Soil Landscapes (Source: MAL SIS)

Regosols are characterized by shallow, medium- to fine-textured, unconsolidated parent material, which may be of alluvial origin and lack significant soil horizons. They often show accumulations of calcium carbonate or gypsum in hot, dry climatic zones. From an agricultural perspective, Regosols are weakly developed mineral soils with limited surface horizons, making them sensitive to drought due to their low water-holding capacity and higher permeability to water.

Figure 72 shows the type of top soil found within the Aol. In 1960, Lang's survey classified these soils as the Inglin Complex soils using the Kubierna classification system. These soils are pale brown to red, shallow to moderately deep, and resemble the Xaghra Xaghra soil series but are more disturbed. The Inglin Complex soils are typical anthropogenic soils with rubble content, broken rock surfaces, and a lack of natural horizons, making them highly variable due to disturbance and mixing during formation. The soil structure can be weakly developed, leading to low fertility, and crops grown on these soils can be prone to pests, diseases, erosion, and drought.



Figure 72: Top Soil Type within the Aol

The Magħtab Area is a narrow agricultural zone situated between the landfill complex and the coastline garigue. The majority of the fields in this area are terraced, unirrigated, and can only produce one dry crop due to the limited soil depth and sea spray influence. The agricultural practices in the area have consistently been dryland farming, with cereals, especially wheat, being the primary crop due to the soil type, climate, and lack of rainfall storage. Historical records indicate that this area was used for cereal cultivation, with no evidence of vegetable,

viticulture, or fruit tree cultivation. The area's agriculture is primarily dictated by the scarcity of water, with no irrigation available, limiting the crops to cereals in years with adequate rainfall. The proximity to the sea further complicates the success of dryland cereal production. The distribution of wasteland in the area corresponds to the exposure of Lower Coralline rocks and the degree of exposure to northerly winds. The less exposed inland depression at Magħtab has facilitated better farming practices.

The lack of water, combined with the high occurrence of winds and sunshine, creates a significant evapotranspiration factor, limiting the crop options. The cultivation of cereals, wheat, and barley has been one of the few viable options for agriculture in this region. However, the success of cereal cultivation depends on adequate rainfall during the growth season. Changing precipitation, temperature, and evapotranspiration are likely to have a significant impact on crop production in areas already prone to heat and drought stress, making the Magħtab Area a typical dryland agricultural system with continuous climatic and economic uncertainty. The evaluation of surrounding fields shows that fields with sufficient soil depth are still being cultivated, while shallower fields are abandoned. Notably, carob trees are found along the rubble walls of abandoned fields, indicating the impact of northerly winds, with the trees being smaller on the northern side and more abundant on the southern side. These trees have been present for a long time and indicate the area's historical agricultural practices.

4.8 Archaeology & cultural heritage

4.8.1 Methodology

The Area of Influence (Aoi) for the study comprises the immediate footprint of the new MRF, together with a 100m buffer zone around the proposed site. This area consists of exposed Lower Coralline and Globigerina Limestone rocky outcrops between cultivated terraced fields lying across gently sloping hills.

The methodology employed for the assessment of the cultural heritage in this area first involved a desktop study. This stage included a thorough review of published literature and previous reports carried out in the area. A number of publicly accessible sources of primary and synthesised information were consulted, including:

- National heritage datasets including the National Inventory for Malta and Scheduling (HS) constraints available on the Planning Authority (PA) Geoportal;
- Relevant mapping including survey maps and Local Plans;
- Relevant documentary sources, including Museum Annual Reports (MAR) and grey literature.

Furthermore, The Scheme area was surveyed on the 10th August 2023. The aim of the inspection was to systematically identify and record any cultural/historical features visible in the landscape and identify potential for unknown cultural heritage assets. A photographic record using a Canon EOS 1100D camera with EF-S 18-55mm zoom lens and a DJI Mini 2 Drone was made for each area visited and any identified cultural heritage assets.

4.8.1.1 Policy Considerations

The management and protection of cultural heritage is legally covered by the CULTURAL HERITAGE ACT 2002.

Cultural heritage is defined as "movable or immovable objects of artistic, architectural, historical, archaeological, ethnographic, palaeontological and geological importance and includes information or data relative to cultural heritage pertaining to Malta or to any other country. This includes archaeological, palaeontological or geological sites and deposits, landscapes, groups of buildings, as well as scientific collections, collections of art objects, manuscripts, books, published material, archives, audio-visual material and reproductions of any of the preceding, or collections of historical value, as well as intangible cultural assets comprising arts, traditions, customs and skills employed in the performing arts, in applied arts and in crafts and other intangible assets which have a historical, artistic or ethnographic value (Part 1.2)

Part 3 of the Act states that "an object shall not be deemed to form part of the cultural heritage unless it has existed in Malta, including the territorial waters thereof, or in any other country, for fifty years, or unless it is an object of cultural, artistic, historical, ethnographic, scientific or industrial value, even if contemporary, that is worth preserving".

The Maghtab Landfill area, within the Naxxar Council boundaries, also falls under THE CENTRAL MALTA LOCAL PLAN (CMLP 12.1.3), classified as Rural/ODZ Area with an existing Landfill site and an Engineered Sanitary Landfill site towards the main transport Network route (arterial) CG38, a Heritage trails and Walkway route CG26 and the Coastal Area NA04 (Map SE1 and NAM3 on PA Local Plan Details).

The policy map CV1, identifies listed Areas of Scientific and Ecological Importance (CG22), a protected Natural Coast with public access towards North and a Protected Area of Hydrological Importance towards South, while the Naxxar Coastal and Rural Environment Constrains Map NAM10, within the Naxxar Local Plan, shows listed archaeological areas/sites with buffer areas, listed ecological sites, scheduled areas, protected natural coast with public access and listed areas/sites of scientific importance.

4.8.1.2 Impact Assessment Criteria

The following information will be provided for each of the identified impacts:

- Project Phase (construction or operational phase)
- Policy importance
- Extent of effect (local, national or international)
- Duration (temporary or permanent)
- Type (beneficial or adverse)
- Reversibility (reversible or irreversible)
- Sensitivity of receptors (high, medium or low)
- Probability of occurrence (certain, likely, uncertain, unlikely or remote)
- Scope for mitigation or enhancement (very good, good or none)

Based on the above criteria, the assessed the significance level of each of the identified impacts:

- **Not significant:** An impact capable of measurement but without noticeable consequences
- **Minor significance:** An impact which causes changes in the character of the environment which are no significant or profound and do no directly impact or affect existing cultural heritage.
- **Moderate significance:** A moderate impact arises where a change to the site is proposed which though noticeable, is not such that the cultural integrity of the site is compromised, and which is reversible. This arises where a particular site or feature can be incorporated into the development without damage and that all procedures used to facilitate this are reversible.
- **Major significance:** Applies where mitigation would be unlikely to remove adverse effects. Reversed for adverse effects only – these effects arise where an archaeological site is completely and irreversibly destroyed by the proposed development.

4.8.2 Baseline study

The passage of time and intensification of land uses have made it challenging to reconstruct the coastal landscape in prehistoric times. The prehistoric landscape of Malta was likely drastically different than it is today, with numerous significant changes occurring over the millennia.

Archaeological indicators, such as cart ruts and Garum production sites, suggest that modern sea levels are higher than those of prehistoric periods. Sea level change has also significantly altered the prehistoric landscape of the Malta-Sicily Channel, with Malta being connected to Italy via a land-bridge during the Last Glacial Maximum but becoming isolated around 14500 years BP due to sea level rise. The discovery of a submerged monolith within the Sicily Channel dated to the Mesolithic Period further demonstrates the impact of sea level change in the area.

In the Magħtab area, riverine sedimentation has significantly impacted the coastline since prehistory, with the Modern Burmarrad plain forming over time, replacing a once much larger Salina Bay. This larger inlet was likely an important port in ancient times, as indicated by the presence of several remaining dolmens (Bronze Age megalithic burials) and cart ruts, which are thought to date to the prehistoric period. The area was also an important centre of activity during the Temple Period, as evidenced by the Tal-Qadi megalithic temple and the discovery of several important cultural artifacts, including an ancient carved representation of the night sky.

The Salina Bay area is thought to have been an important port in antiquity, with historical documents demonstrating the use of Malta's natural harbours during the mid-first century BC. The use of the harbours and the Phoenicians is linked, with Diodorus Siculus stating that Malta "possesses many harbours which offer exceptional advantages" and that the prosperity of the islands' inhabitants is due to the fact that Malta is "well supplied with harbours". The prevalence of ancient shipwrecks, anchors, and pottery scatters on the seabed further attests to the ancient use of Salina Bay as a harbour.

The Magħtab area contains notable traces of activity from antiquity, including surface stone quarries and many rock-cut chamber tombs and catacombs, which are often related, with rock-cut tombs being excavated in the sides of quarries. The quarries are difficult to date directly, but the Salina catacombs are known to date to the Late Roman and Byzantine periods (between the third and 6th centuries AD). Traces of activity from the medieval period are scarce, with the closest evidence coming from the San Brincat (Għargħur) troglodytic settlement, which is thought to have possibly been a centre of medieval Siculo-Greek monasticism.

During the late medieval and early modern periods, numerous attacks were made on Malta by North African corsairs, rendering the coastline largely bereft of settlements. As a result, the low-lying coastline around Il-Magħtab and the sheltered bay of Salina saw a drastic increase in the investment in coastal defences, particularly by the Knights of St. John. Many of these survive, including the Għallis Tower, at the tip of the promontory, opposite Qawra, the Għallis Battery, the Qalet Marku Battery, as well as the Ximenes Redoubt and the associated rock-hewn mortar (fougasse).

The Salina area also played an increasing importance in the local economy as the salt panning industry was expanded under the Knights of St. John, with significant investment in the salt panning facilities by the Knights, which are in use till this day. Following the takeover of the Maltese Islands by the French and subsequently the British, the area retained its defensive importance, with several new defences being built in the area during the Second World War and others, including the Għallis Battery, being reinforced and augmented with modern anti-aircraft weaponry. A bomb shelter was also excavated in the Salina hamlet.

Archaeological artefacts or deposits recorded were identified as far as possible and their conservation importance given with reference to appropriate legislation, standards and guidance. These included the Structure Plan for the Maltese Islands, the SPED, the Cultural Heritage Act, 2002, as well as international conventions / treaties / standards applicable in Malta.

The results of the survey were mapped through GIS tools and catalogued following standard systems. Details, including descriptions of the cultural heritage features in the area, are available in Figure 73 to Figure 77.

The 100m buffer zone around the Aol encompasses two scheduled cultural heritage features, located North and N-West to the Wasteserv main Entrance, namely a pottery scatter discovered during archaeological monitor not yet published (SCH site code: NXR2014) and a Megalithic alignment (SCH site code: QLT1935), scheduled as Class B Taz Zebugija megalithic remains, recorded by MARs (MAR 1927-8:3-4; MAR 1935-6:18). These reports describe the surviving remains as a small dolmen still standing, along with another that has been displaced and scattered in the vicinity. Additional megalithic remains were noted as being dispersed across the surrounding fields, often reused within rubble walls and other later structures. Consequently, although their locations are recorded in the National Inventory of the Cultural Heritage of the Maltese Islands (GIS Interface), their integrity has been significantly compromised by human activities over the centuries. Nevertheless, in order to properly understand their significance and function, these prehistoric remains should not be considered in isolation, but rather as components of a broader system of prehistoric burial sites.

Table 30: List of scheduled Sites within Aol buffer zone

Property address	Category	SCH site code and Feature Type	Degree of protection	Reference to figure 7
Tul il-Kosta Naxxar	Archaeology	NXR2014 - Pottery scatter	N/A	1
Taz Zebugija, Naxxar	Archaeology	QLT1935 - Megalithic ruins	B	2

It's therefore worth to mention another important prehistoric site known in the vicinity, the Class A scheduled Ta'Hammud megalithic dolmens, which are located approximately 350m from the eastern boundary of the site, 250m East of the AoI including the 100m buffer zone, down a minor road (Triq ir-Ramla) leading from the coastal road at Qalet Marku. A total of four dolmens, interpreted as burial chambers, are preserved *in situ*. One of these retains its capstone (measuring approximately 2.4 × 1.2 m), which rests on small megalithic boulders about 0.50 m above the bedrock surface. Two further dolmens are collapsed, one with its capstone lying directly on the exposed rock. The fourth dolmen has been reused over time as a bird-shooting blind and retains this adapted form.

No pottery or cultural material was noted during the landscape assessment at the location and surrounding areas. The various Cultural Heritage features found within the 100m buffer zone have been noted in the following table and maps:

Table 31: List of cultural features within AOI

FEATURE	TPOLOGY	FUNCTION	STATE OF CONSERVATION
A	Vernacular – dry stone Hut	Agricultural/Hunting	Fair/Good
B	Vernacular – dry stone Hut	Agricultural	Fair/Good
C	Vernacular – dry stone Enclosures	Agricultural	Fair/Good
D	Vernacular – dry stone Hut	Agricultural	Fair/Good

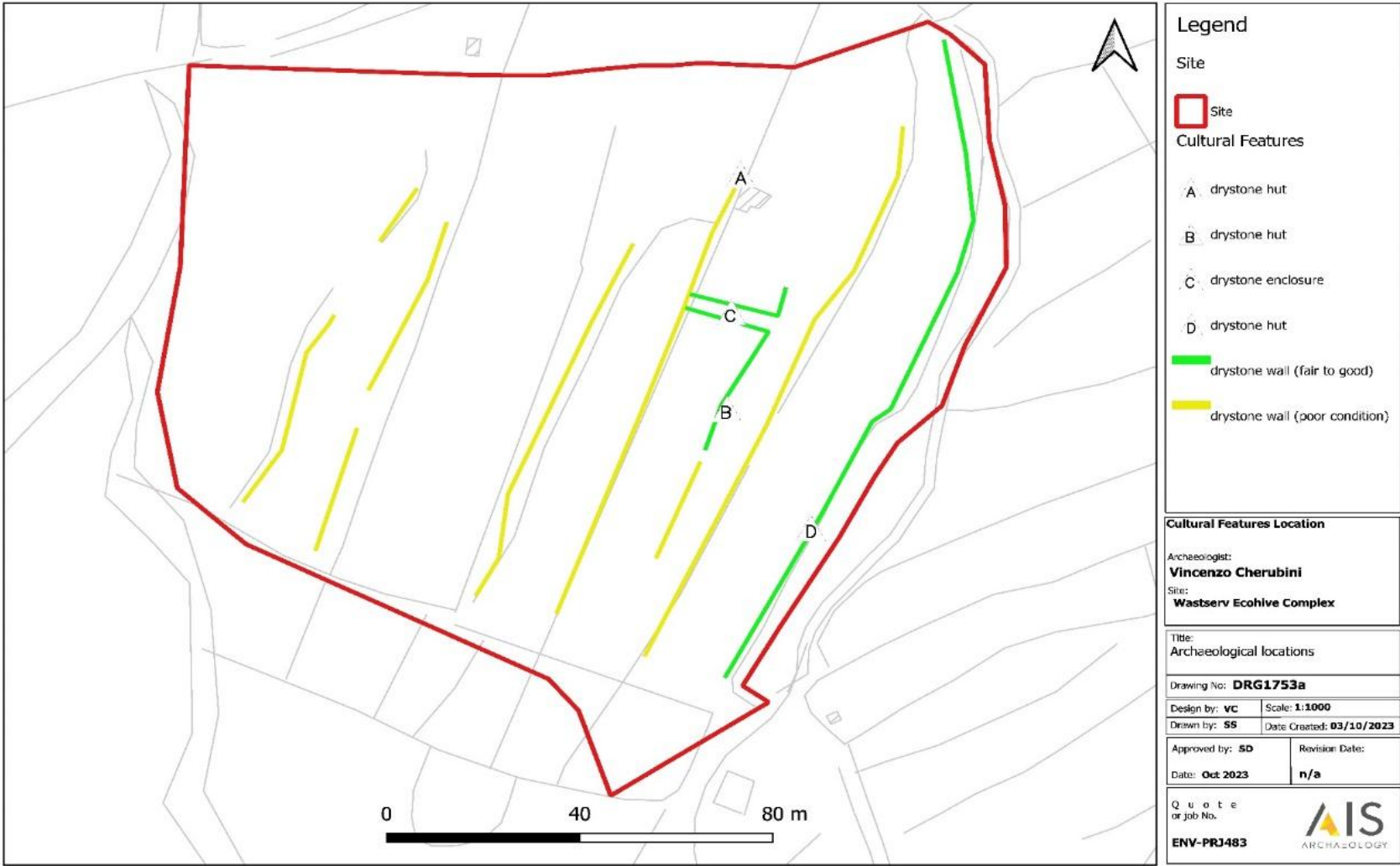


Figure 73: Location and States of Cultural Features identified within AoI

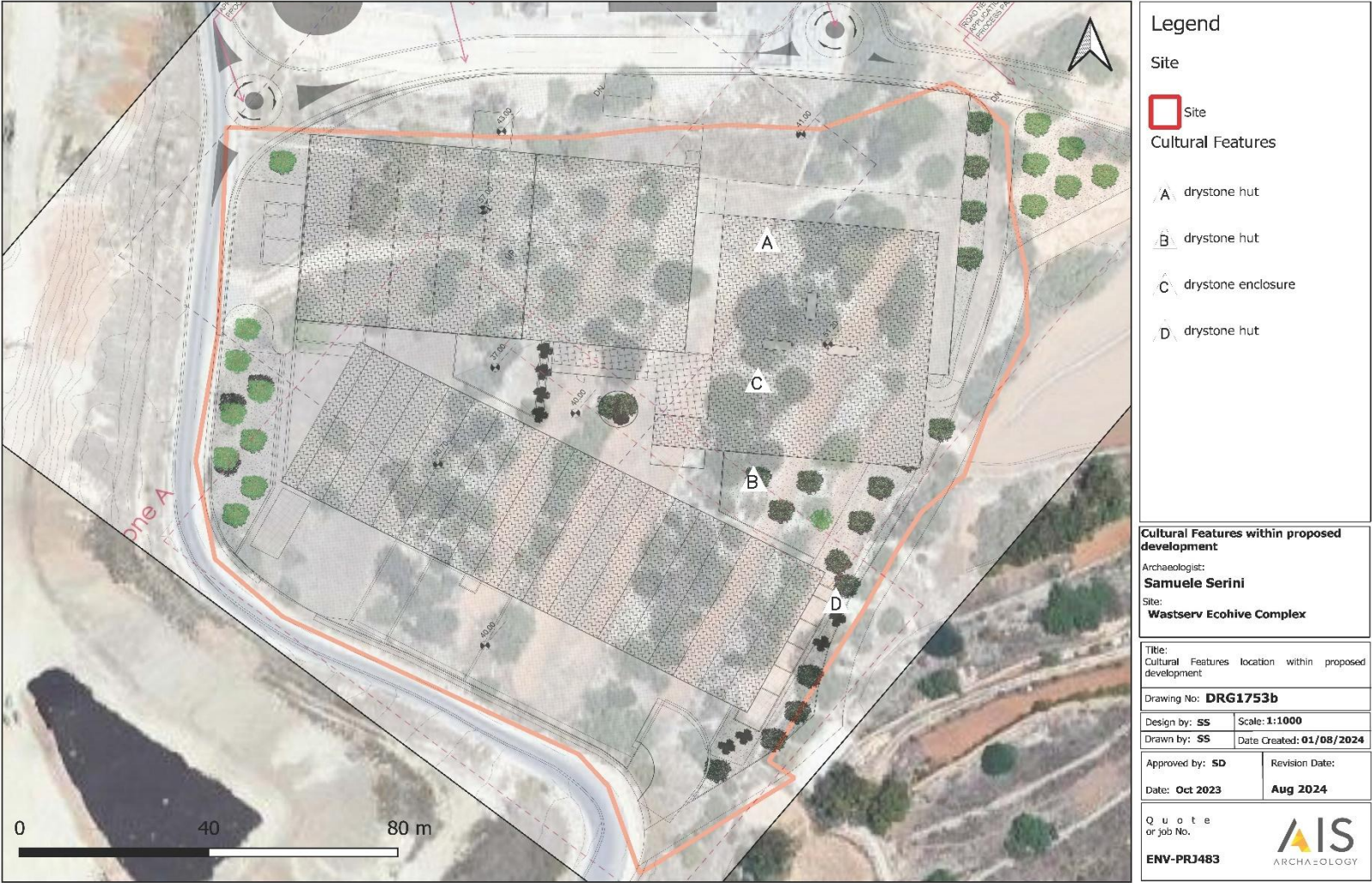


Figure 74: Location of cultural features within proposed development

Archaeological Characteristics	
	
Conditions	Degree of Protection
Fair/Good. Abandoned. Some parts partially collapsed	Legal Notice 160 of 1997 prohibits dismantling of such walls except by permission from the competent authority
State of Security	Proposed Utilization
N/A	N/A
Basic Bibliography	
N/A	
Compiled by:	Checked by:
Samuele Serini	Vincenzo Cherubini
Date: 13/10/2023	Date: 13/10/2023

Figure 75: Archeological Characteristics of Protected Walls

Archaeological Characteristics

Conditions Fair/Good. Abandoned	Degree of Protection Legal Notice 160 of 1997 prohibits dismantling of such walls except by permission from the competent authority
State of Security N/A	Proposed Utilization N/A
Basic Bibliography Din l-Art Helwa: Abandoned rural buildings available at https://dinlarthelwa.org/heritage-sites/managed-heritage-sites/	
Compiled by: Samuele Serini Date: 13/10/2023	Checked by: Vincenzo Cherubini Date: 13/10/2023

Figure 76: Archeological Characteristics of Abandoned Rural Buildings

Archaeological Characteristics	
	
Conditions Some abandoned, some partly collapsed, other repaired and rebuilt.	Degree of Protection Legal Notice 160 of 1997 prohibits dismantling of such walls except by permission from the competent authority
State of Security N/A	Proposed Utilization N/A
Basic Bibliography N/A	
Compiled by: Samuele Serini Date: 13/10/2023	Checked by: Vincenzo Cherubini Date: 13/10/2023

Figure 77: Archeological Characteristics of Rubble Walls

4.9 Noise & Vibrations

4.9.1 Methodology

The assessment methodology for the Noise & Vibrations technical study is summarized as follows:

- The baseline sound levels measured for the EIA of the Maghtab Waste to Energy Facility would be utilised as the basis of the assessment.
- A qualitative (high-level) construction noise assessment would be undertaken, with reference to BS 5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise*.
- Noise levels from the operation of the Scheme would be predicted at the nearest human and ecological receptors using the proprietary software-based noise model, CadnaA®, and the calculation algorithms contained in ISO9613-2 Acoustics – *Attenuation of sound during propagation outdoors – Part 2 General method of calculation*.
- The predicted noise levels at the human receptors would be compared to the measured background levels and assessed in accordance with British Standard 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound*.
- The predicted noise levels at the ecological receptors would be assessed in accordance with the absolute limits contained in AQTAG09 Guidance on the effects of industrial noise on wildlife.

The assessment results would determine whether noise mitigation measures are needed to minimize the identified impacts. If necessary, these measures would be incorporated into the assessment.

Additionally, a cumulative assessment was conducted to evaluate the combined effect of construction and operational noise from nearby proposed developments on the nearest human and ecological receptors.

4.9.1.1 Guidance and Standards

The construction noise levels have been predicted in conjunction with the most appropriate guidance, in this case calculation algorithms contained in BS 5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise*.

As previously stated, the predicted noise levels have then been assessed in conjunction with the absolute limits contained in AQTAG09 Guidance on the effects of industrial noise on wildlife.

Construction noise levels have been calculated in accordance with BS 5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise*. This standard sets out a methodology for predicting noise levels arising from a wide

variety of open site activities and contains tables of sound power levels generated by a wide variety of mobile and fixed plant equipment.

Noise levels generated by open site construction operations and experienced at local receptors will depend upon a number of variables. The most significant of which are likely to be the amount of noise generated by plant and equipment being used during the construction phases, generally expressed as a sound power level:

- The periods of operation of the plant, known as the “on-time”;
- The distance between the noise source and the receptor, known as the “stand-off”;
- The attenuation due to ground absorption or barrier screening effects;
- Reflections of noise due to the presence of hard vertical faces such as walls.

BS 5228-1 provides several examples of acceptable noise limits for construction or demolition activities. Since baseline noise data is available for this assessment, the ABC method will be used to determine the threshold noise levels at the receptor locations.

The ABC method involves the following steps:

- Establish the existing ambient noise level at each receptor location.
- Round the measured ambient noise level to the nearest whole 5 dB(A).
- Determine the threshold noise value for each receptor from Table E.1 in BS 5228-1. This threshold represents the $L_{Aeq,T}$ noise level that should not be exceeded by operations at the site.

The threshold noise levels for a potentially significant effect, as determined using the ABC method, are detailed in Table 32.

Table 32: Construction Noise Residential Receptors – Example Threshold Values

ASSESSMENT CATEGORY AND THRESHOLD VALUE PERIOD	THRESHOLD VALUE IN DECIBELS (dB)		
	CATEGORY A ^{A)}	CATEGORY B ^{B)}	CATEGORY C ^{C)}
Night-time (23:00 – 07:00)	45	50	55
Evenings and weekends ^{D)}	55	60	65
Daytime (07:00-19:00) and Saturdays (07:00-13:00)	65	70	75

- A) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values.
- B) Category B: threshold values to use when the ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.
- C) Category C: threshold values to use when the ambient noise levels (when rounded to the nearest 5dB) are higher than category A values.
- D) 19:00-23:00 weekdays, 13:00-23:00 Saturdays and 07:00-23:00 Sundays.

British Standard 4142:2014+A1:2019 (BS4142) is used to assess the potential adverse impact of industrial and commercial sounds on nearby noise-sensitive locations within the existing sound environment. The standard provides a method for rating and assessing the impact of sounds with specific characteristics, such as tonality, impulsivity, and intermittency.

To account for these characteristics, penalties are applied based on their perceptibility. For tonality, a correction of 0, 2, 4, or 6 dB is added, depending on the level of tonality. For impulsivity, a correction of 0, 3, 6, or 9 dB is added, depending on the level of impulsivity. If the sound contains neither tonal nor impulsive characteristics, a penalty of 3 dB is added. Additionally, if the sound has identifiable operational and non-operational periods, a further penalty of 3 dB may be applied.

The assessment of impact involves comparing the sound rating level (the specific sound level plus any penalties) to the measured representative background sound level outside the noise-sensitive location. The context of the existing sound environment is then considered to assess the potential impact.

The standard provides guidance on the interpretation of the results, including the magnitude of the impact and the likelihood of adverse impacts such as annoyance and sleep disturbance. It also outlines considerations for the context of the potential impact, including existing residual sound levels, location, and absolute sound levels.

Furthermore, BS4142 provides guidance on the application of penalties to account for the subjective prominence of the sound characteristics at the noise-sensitive locations. This includes corrections for tonality, impulsivity, intermittency, and other sound characteristics that are readily distinctive against the residual acoustic environment.

The Air Quality Technical Advisory Group 09 (ATAG09) provides guidance on the effects of industrial noise on wildlife. This guidance aims to assist planning and licensing officials in assessing the potential impacts of industrial noise on designated species and habitats. The Habitats Directive (92/43/EEC) sets specific noise levels for industrial activities, which are considered unlikely to have adverse impacts on designated species if they do not exceed the levels in Table 33. If noise levels are exceeded, a more detailed assessment is required to determine potential impacts on wildlife.

Table 33: Specific Noise Levels at Habitat / Nest Sites

PARAMETER	NOISE LEVEL, dB
L _{Aeq} , 1hr	55
L _{Amax}	80

The noise levels generated by the Scheme's operation were predicted using the ISO 9613-2:1996 framework. This method considers the distance between sound sources and receptors, as well as the amount of sound absorption by the atmosphere. Additionally, it assumes that the wind direction aids the propagation of sound from the source to the receiver, which is referred to as downwind propagation.

4.9.1.2 Receptor Sensitivity

The level of significance is determined in relation to the magnitude of impact together with the sensitivity of the receptor. Different noise-sensitive receptors (NSRs) can be classified in levels of sensitivity: High, Medium, Low and negligible as described in Table 34 below.

Table 34: Level of Sensitivity associated with Various NSRs

SENSITIVITY	DESCRIPTION OF NSRs
High	Residential properties (night-time), Schools and healthcare building (daytime)
Medium	Residential properties (daytime), SAC, SPA, SSSI (or similar areas of special interest)
Low	Offices and other non-noise producing employment areas
Negligible	Industrial areas

The HABITATS DIRECTIVE (92/43/EEC) specifies that, where specific noise from industry, measured at the habitat/nest site is below the levels in Table 34, it is considered unlikely that it will have an adverse impact on designated species. Where noise levels are exceeded, more detailed assessment may be required. For the purposes of this assessment, the AQTAG daytime limit of 55 dB L_{Aeq}, 1 hr will be used. Although a detailed analysis of the maxima sound pressure levels in terms of L_{Amax,F} is outside of the cope of this assessment, it is considered that the maxima event levels are unlikely to be exceeded at the receptor locations as a result of construction noise, based on the standoff distances and the construction activities involved.

Table 35: Specific Noise Level Limits at Ecological Habitats

PARAMETER	NOISE LEVEL, dB
L _{Aeq} , 1hr	55
L _{Amax}	80

Based on the above guidance limits, the impact magnitude of the proposed development during the construction phase is defined in Table 36 and Table 37.

Table 36: Impact Magnitude - AQTAG

MAGNITUDE	DESCRIPTION
Major	Limit value exceeded by more than 5dB
Moderate	Limit value exceeded between 3.0 and 4.9dB
Minor	Limit value exceeded between 1.0 and 2.9dB
Negligible	Limit value exceeded between 0.1 and 0.9dB

Table 37: Impact Magnitude – existing Ambient levels

MAGNITUDE	DESCRIPTION
Major	Greater than 10 dB L _{Aeq} change in sound level at a noise-sensitive receptor
Moderate	A 5 to 9.9 dB L _{Aeq} change in sound level at a noise-sensitive receptor
Minor	A 3 to 4.9 dB L _{Aeq} change in sound level at a noise sensitive receptor
Negligible	Less than 2.9 dB L _{Aeq} change in sound level at a noise-sensitive receptor (inaudible change under normal conditions)

The different levels of effect relating the magnitude of impact with a medium sensitivity for ecological receptors are defined in Table 38.

Table 38: Level of Effect

MAGNITUDE OF ADVERSE IMPACT	LEVEL OF EFFECT RELATIVE TO ECOLOGICAL RECEPTOR OF MEDIUM SENSITIVITY
Major	Substantial
Moderate	Moderate
Minor	Minor
Negligible/no change	Minor/Neutral

Note: Effects of 'moderate' significance or greater are defined as significant with regards to the EIA Regulations 2017.

4.9.2 Baseline Sound Survey

The assessment is based on the fixed noise limit guidelines established for the identified ecological receptors. For additional context, reference is made to a previous baseline sound survey for the Maghtab Waste to Energy facility carried out in early 2020, which describes the existing sound climate about the development area (document Ref: PA/03012/20 VERSION 1, dated 15/05/2020).

Baseline sound measurements were undertaken during both daytime and night-time periods at four locations as indicated in Figure 78.

- P1: Next to two residential units along the northernmost part of Triq ir-Ramla (representative of NSR01);
- P2: Next to residential units along the southernmost part of Triq ir-Ramla (representative of NSR02);
- P3: Inside Salini nature reserve, also to include Hotel Salini (representative of NSR04);
- P4: Next to a popular bathing area just off Tul il-Kosta (representative of NSR03).

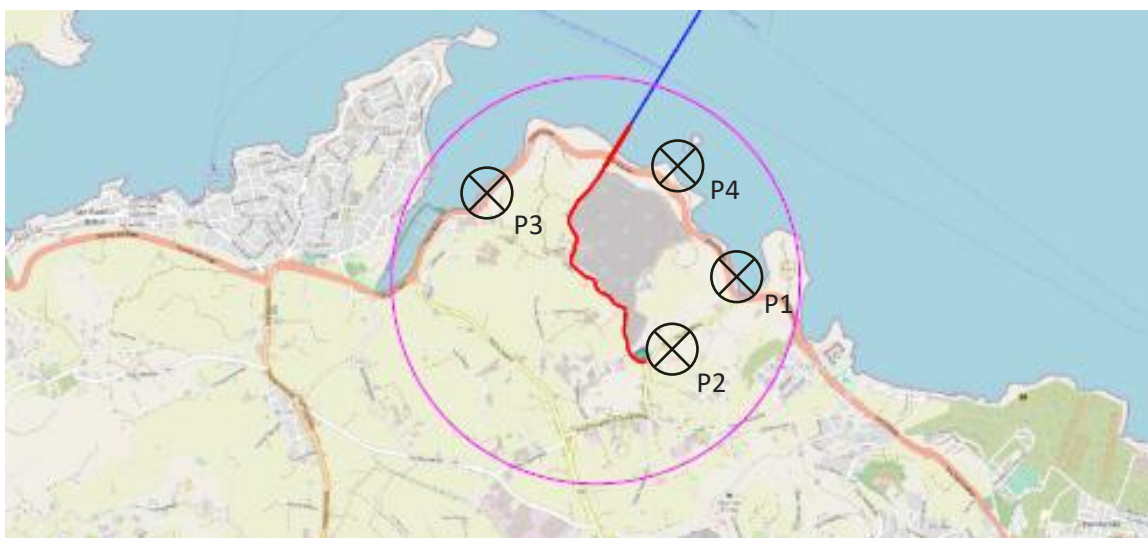


Figure 78: Noise Monitoring Locations

The results of the sound survey are summarised in Table 39 including the median background sound level (L_{A90}), median L_{A10} and the ambient noise level (L_{Aeq}) and the highest L_{AFmax} values. The daytime period is taken between 07:00 and 23:00 hours and the night-time between 23:00 and 07:00 hours

Table 39: Sound Survey Summary

LOCATION	TIME PERIOD	L_{Aeq}	L_{A90}	L_{A10}	L_{AFmax}
P1 (NSR01)	Daytime	58.9	41.3	60.1	83.6
	Night-time	46.9	35.9	40.8	75.7
P2 (NSR02)	Daytime	70.0	47.7	72.0	95.5
	Night-time	54.7	36.9	45.9	80.6
P3 (NSR04)	Daytime	71.7	55.7	75.3	90.1
	Night-time	66.3	42.1	66.2	86.5
P4 (NSR03)	Daytime	57.7	54.1	58.8	84.4

Measurement location P4 is representative of the prevailing sound climate at the identified ecological receptors and has been considered most relevant to this assessment in context. The measured daytime level has been summarised as 58 dB $L_{Aeq,16\text{ hour}}$ rounded to the nearest decibel.

4.10 Infrastructure & Utilities

4.10.1 Methodology

The methodology was composed of four main elements:

1. A preliminary desktop study to familiarise oneself with the study area;
2. A site survey;
3. A secondary literature review to combine the findings of the initial research and site observations;
4. Final evaluation of the current situation.

Initially, a comprehensive literature review was conducted to determine the existing infrastructure and utilities within the project location and its surrounding area. Data was collected from various third-party utility providers and satellite imagery from sources such as Landsat/Copernicus (Google Earth). The findings from the desktop study were then confirmed through a field survey conducted in August 2023, which also included the collection of photographic evidence.

Upon completion of these two components, the Consultant used Geographic Information Systems (GIS) tools to map the existing infrastructure and utilities, as well as any proposed changes if applicable.

4.10.1.1 Impact Significance Criteria

The potential impacts that may arise from the Scheme include the potential physical damage on the existing infrastructure and utilities and service interruptions during the proposed works (construction phase). The operations of the MRF are also expected to increase loads on both the national electricity grid and the water/sewage system.

The tables below (Table 40 to

Table 48: Criteria for the overall impact significance

Table 48) provide a definition for each of the criteria used, which summarises the assessment of impacts on infrastructure and utilities.

Table 40: Criteria for the sensitivity of resources to impact

SENSITIVITY OF RECEPTORS TO IMPACT	
LEVEL	DEFINITION
High	The receptors which will be highly sensitive to the impact and consequently impacted to a major degree.

Medium	The receptors which will be moderately sensitive to the impact and consequently impacted to a moderate degree.
Low	The receptors which will be minimally sensitive to the impact and consequently impacted to a minor degree.

Table 41: Criteria for the consequences of impact

CONSEQUENCES OF IMPACT	
LEVEL	DEFINITION
Direct	Changes that result from direct cause-effect consequences of interactions between the result of action under consideration and the proposed project.
Indirect	Result from cause-effect consequences of interactions between the action under consideration and indirect impacts.
Cumulative	Result from cause-effect consequences of interactions between the action under consideration and other related projects.

Table 42: Criteria for the effect of impact

EFFECT OF IMPACT	
LEVEL	DEFINITION
Adverse	Infrastructure and utilities would suffer consequences as a direct result of the proposed development.
Beneficial	Infrastructure and utilities would benefit as a direct result of the proposed development.

Table 43: Criteria for the severity of impact

SEVERITY OF IMPACT	
LEVEL	DEFINITION
High	This action is a major contributor to the infrastructure and utilities in the area of influence.
Medium	This action is a moderate contributor to the infrastructure and utilities in the area of influence.
Low	This action is a minor contributor to the infrastructure and utilities in the area of influence.

Table 44: Criteria for the physical extent of the impact

PHYSICAL EXTENT OF IMPACT	
LEVEL	DEFINITION
Local	Impact would affect the areas in the nearby surroundings.
National	Impact would affect Malta on a national scale.
International	Impact would affect Malta and/or other countries.

Table 45: Duration of impact

DURATION OF IMPACT	
LEVEL	DEFINITION
Permanent	Impact would still be detectable after the concerned phase.
Temporary	Impact would not persist through the whole duration of the concerned phase.

Table 46: Criteria for the reversibility of the impact

REVERSIBILITY OF IMPACT	
LEVEL	DEFINITION
Reversible	State of the activity/action is potentially expected to return to baseline background level following cessation of the source of impact.
Irreversible	Impact is expected to cause partial or total destruction of the action under consideration and a return of the state of the resource to baseline levels should be considered highly improbable.

Table 47: Criteria for the probability of impact occurring

PROBABILITY OF IMPACT OCCURRING	
LEVEL	DEFINITION
Inevitable	Level of certainty that impact will occur is greater than 90%
Likely	Level of certainty that impact will occur ranges between 50-90%

Unlikely	Level of certainty that impact will occur ranges between 30-50%
Remote	Level of certainty that impact will occur is below 30%

Table 48: Criteria for the overall impact significance

IMPACT SIGNIFICANCE	
LEVEL	DEFINITION
Not significant	Negligible significance.
Minor significance	Low order impact and therefore likely to have little real effect on infrastructure and utilities. In the case of adverse impacts, mitigation is either easily achieved or little will be required, or both.
Moderate significance	Impact on infrastructure and utilities is real but not substantial in relation to other impacts that might take effect within the bounds of those that could occur. In the case of adverse impacts, mitigation is both feasible and fairly easily possible.
Major significance	Of the highest order possible within the bounds of impacts on infrastructure and utilities that could occur. In the case of adverse impacts, there is little or no possible mitigation that could offset the impact.

4.10.2 Existing infrastructure & utilities on site

Table 49 and Figure 79 to Figure 83 below provide an outline of the existing infrastructure and utilities present within the Aol.

Table 49: Existing infrastructures and utilities – Onshore

FEATURE NAME	FEATURE TYPE	OWNER
Approved 2nd Interconnector (IC2) cable	Underground cable	Interconnect Malta Enemalta
Street lighting	Underground cables, street lamps	Wasteserv Malta
Street infrastructure	Crash barriers, pavements, fencing	Wasteserv Malta
Fire management infrastructure	Pipes to supply fire-hydrants with fluids	Wasteserv Malta

Figure 79 to Figure 83 provide photographic evidence of the infrastructure and utilities observed during the site survey held on the 25th August 2023.



Figure 79: Pavement along the internal access road within the ECOHIVE Complex (25th August 2023)

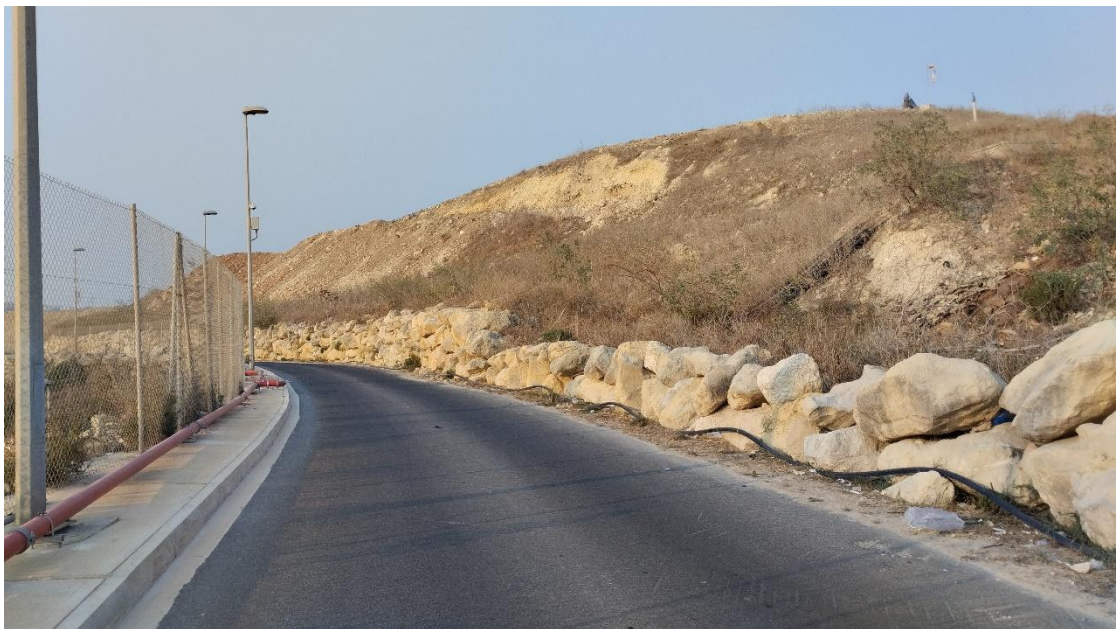


Figure 80: Street lights along the internal access road within the ECOHIVE complex (25th August 2023)



Figure 81: Fencing and fire hydrant within the ECOHIVE complex (25th August 2023)

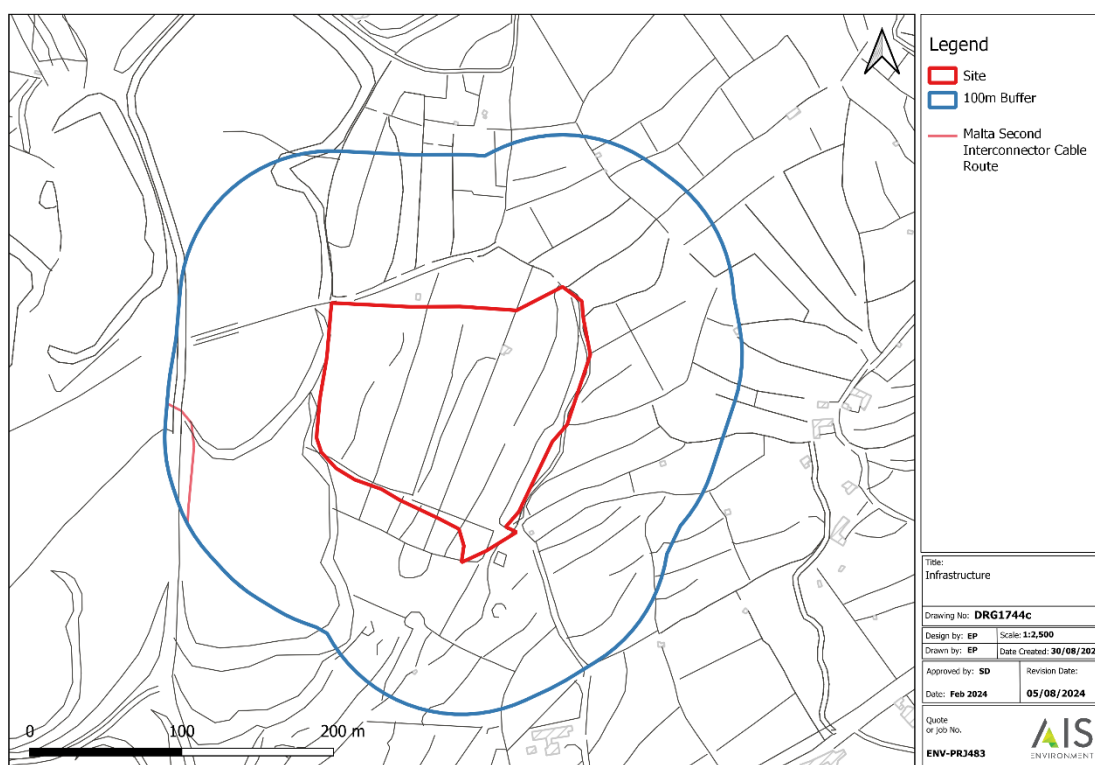


Figure 82: Planned infrastructure within the AOI

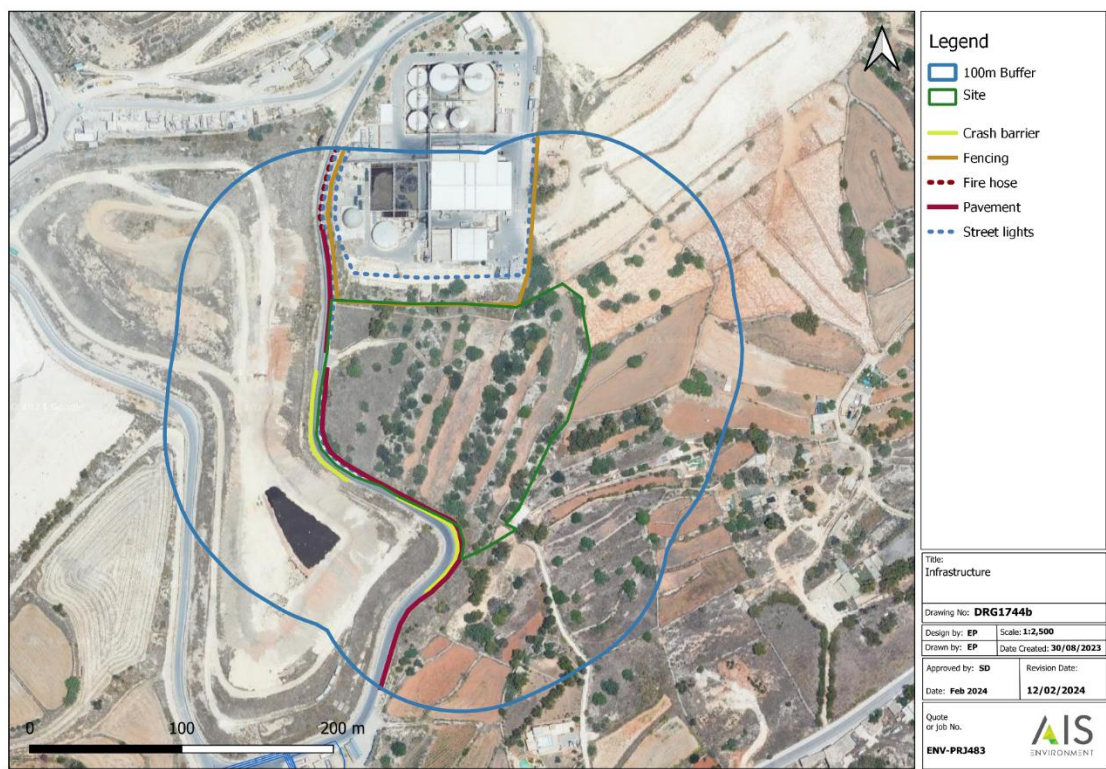


Figure 83: Overview of the existing utilities within the AoI

5.0 ASSESSMENT OF ENVIRONMENTAL IMPACTS AND RISKS

5.1 Land cover and land uses

5.1.1 Construction Phase

The proposed development will result in a permanent shift in land use within the footprint of the new complex. The current 21,373m² footprint area, comprising indigenous tree plantations, rubble walls, and agricultural land, will be permanently converted to commercial land. This change is deemed to have a major adverse impact. To address this, the development plan includes a back-filled landscaped area that will retain a portion of the original trees to mitigate the impact on the tree plantation.

During the construction phase, additional land may be temporarily utilized for storing excavated materials, providing access for construction vehicles, washing facilities, and amenities for construction personnel. These activities are expected to have temporary, reversible, and minor adverse effects, provided that appropriate mitigation measures are implemented.

Within the 100m buffer zone, the agricultural land, trees, and tarmacked access road may experience temporary dust generation during construction, especially during the initial excavation and backfill stages. Dust deposition on crops could potentially reduce yields and impact soil pH if significant amounts accumulate. However, this impact can be managed through the use of suitable site hoarding, making it temporary, reversible, and of minor significance.

5.1.2 Operational Phase

The operational phase will only give rise to further land use impacts in the event of incidents such as fuel spills, fires, water leaks causing flooding or other extreme events. For this reason, the potential impacts are considered of remote probability, but potentially moderate significance, which will be reduced to minor residual significance if the appropriate Emergency Response Plan is in place.

5.2 Landscape Character and Visual Amenity

5.2.1 Construction phase

Construction activities will be highly noticeable from all seven viewpoints, with varying degrees of impact on the visual landscape quality. The presence of large cranes, excavation equipment, fencing, and stockpiles may significantly degrade the visual landscape, particularly at viewpoints close to the construction site, such as VP3 and

VP4. The impact is expected to range from moderate to major adverse, depending on the location of the viewpoint and any obstructive elements that may mitigate the visual impact.

The visibility of construction activities is heightened at viewpoints with closer proximity to the site, especially when these activities interfere with the skyline. This is particularly true for VP3 and VP4, where observers have a clear view of the construction activities, and for VP1 and VP7, which offer a clear view of the site and any intersecting machinery or equipment. The variety and quantity of receptors at these viewpoints amplify the impact of the construction activities to major adverse on the overall visual amenity.

At Viewpoints 2 (Figure 85), 5 (Figure 88), and 6 (Figure 89), the construction activities will be less visible due to the rugged terrain of the landfill, which naturally masks the view, and the partial shielding provided by surrounding walls, dense vegetation, or nearby structures. However, the construction activities will still be noticeable and are defined as moderate adverse.

When assessing landscape impacts, it is important to consider the sensitivity of the viewpoints under examination. Although the Scheme site is not located in an Area of High Landscape Sensitivity, Viewpoints 1 (Figure 84), 2, 6, and 7 (Figure 90) are within such designated areas according to the CENTRAL MALTA LOCAL PLAN, CG22. The potential occurrence of simultaneous construction activities alongside the works on the WtE, TTF and OPP facilities will continue to diminish the landscape quality of the region by encroaching upon agricultural land parcels near the landfill. Consequently, the construction-related impacts on the landscape are anticipated to be significantly adverse for these four viewpoints.

The immediate landscape vistas at Viewpoints 3 (Figure 86) and 4 (Figure 87) will be dominated by the presence of construction machinery, potential dispersal of dust, and the influence of non-visual landscape attributes, including noise and vibrations. Similarly, at Viewpoint 5, the construction activities will be highly visible to the thousands of individuals traveling along Triq il-Kosta daily. The combined effect of simultaneous construction at all three waste management facilities cannot be overlooked, resulting in significant adverse effects also observed from these three viewpoints.

Given the frequent visitation by a large number of individuals to these viewpoints, the resultant impact is substantial, affecting a considerable segment of the population.



Figure 84: Viewpoint 1 - Triq Dawret Il-Wied, Mosta



Figure 85: Viewpoint 2 – Triq is-Salina, San Pawl Tat-Targa



Figure 86: Viewpoint 3 – Triq il-kappella ta' Santa Marija, Maghtab



Figure 87: Viewpoint 4 – Triq Ir-Ramla, Maghtab



Figure 88: Viewpoint 5 – Triq il-Kosta, Qalet Marku



Figure 89: Viewpoint 6 – Triq il-Kosta, St Andrew's



Figure 90: Viewpoint 7 – Triq Ghaxqet Il-Ghajn, Gharghur

5.2.2 Operational phase

The proposed Material Recovery Facility (MRF) building will have a significant visual impact on the surrounding landscape, with the extent of impact varying depending on the observer's vantage point and the presence of intervening elements. The MRF's sheer scale and massing will be prominent when viewed in isolation, but its impact will be subdued when juxtaposed against the adjacent Waste-to-Energy (WtE) and Organic Processing Plant (OPP) facilities.

From Viewpoints 1 (Figure 91) and 2 (Figure 92), the MRF will have a minor adverse impact, as it will be partially obscured by the topographical contours of the Ta' Żwejra landfill and will blend reasonably well with the existing and planned ECOHIVE infrastructure.

Viewpoint 3 (Figure 93) will offer a close-up encounter with the MRF, but it will appear seamlessly integrated with the surrounding WSM facilities, resulting in a moderate visual impact. The MRF's horizontal footprint and partial elevation surpass that of the existing AD plant, completely obscuring it from view. However, placed against the backdrop of various existing and planned waste management facilities, the MRF appears seamlessly integrated into the ECOHIVE Complex, without causing major visual disruptions. While the loss of trees and vegetation is noticeable when comparing the photomontage to the baseline photograph, its visual impact remains

moderate in significance due to the broader context of the surrounding industrial infrastructure.

Viewpoint 4 (Figure 94) will feature a significant adverse impact, as the MRF will eclipse the existing AD plant and landfill, contrasting with the rural landscape features in the foreground. Viewpoint 5 (Figure 95) will offer a prominent view of the MRF, OPP, TTF and WtE facilities, contributing to an industrial landscape and resulting in a major adverse impact.

Viewpoint 6 (Figure 96) will provide a partially obstructed view of the MRF, which will integrate into the surroundings without disrupting the skyline, leading to a moderately adverse impact. Efforts should be undertaken to reduce the colour contrast between the MRF's greyish façade and the earth-toned surroundings, particularly the landfill and adjacent fields, to better blend the structure into the natural environment at Viewpoint 6. This adjustment aims to mitigate the moderately adverse visual impact, minimizing disruption to the vista along this road segment.

Viewpoint 7 (Figure 97) offers a panoramic view of the ECOHIVE complex, including the MRF, AD, TTF, OPP, and WtE facilities. The MRF stands out prominently due to its size and massing, but it does not pierce the skyline thanks to the expansive backdrop of the landfill. The grey façade of the MRF contrasts with the earth-toned surroundings, requiring a harmonious colour scheme to blend it into the environment. Despite this, the MRF's presence is still majorly adverse, but thoughtful design adjustments could further mitigate its visual impact on this coastal viewpoint.

When assessing the landscape impacts of the MRF, it is crucial to consider the sensitivity of the viewpoints being analysed. While the Scheme site itself is not within an Area of High Landscape Sensitivity, Viewpoints 1, 2, 6, and 7 are designated as such according to the CENTRAL MALTA LOCAL PLAN, CG22. The concurrent presence of multiple waste management facilities will further degrade the landscape quality observed from these viewpoints, encroaching upon agricultural land adjacent to the landfill. Consequently, operational landscape impacts on the MRF are expected to be major adverse from these four viewpoints.

Viewpoints 3 and 4 will prominently feature the MRF building, while Viewpoint 5 will be conspicuous to daily commuters along Triq il-Kosta. The collective impact of concurrent construction activities at all three waste management facilities will lead to significant adverse effects noted from these three viewpoints.

The operational phase of the MRF may introduce concerns regarding light pollution during nighttime hours. However, the impact assessment cautiously categorizes these concerns as minor adverse, since the facility's operational hours are not anticipated to extend beyond 16 hours daily. Effective mitigation strategies will be implemented to minimize the impact. For instance, appropriate light fixtures will be designed to

minimize light pollution and its associated impacts, thereby ensuring the new development operates harmoniously within its nocturnal environment.



Figure 91: Cumulative view showing photomontage of MRF, TTF, WtE and OPP plant only at viewpoint 1



Figure 92: Cumulative view showing photomontage of MRF, TTF, WtE and OPP plant only at viewpoint 2



Figure 93: Cumulative view showing photomontage of MRF, TTF, WtE and OPP plant only at viewpoint3



Figure 94: Cumulative view showing photomontage of MRF, TTF, WtE and OPP plant only at viewpoint4



Figure 95: Cumulative view showing photomontage of MRF, TTF, WtE and OPP plant only at viewpoint5



Figure 96: Cumulative view showing photomontage of MRF, TTF, WtE and OPP plant only at viewpoint6



Figure 97: Cumulative view showing photomontage of MRF, TTF, WtE and OPP plant only at viewpoint7

5.3 Geology, geomorphology, hydrogeology and soils

5.3.1 Construction phase

To assess the probable geo-environmental impact of the project, the following steps were taken:

- Identification of construction site activities that may potentially impact geo-environmental resources – the permanent loss of rock and the lack of stability of the walls during excavation works are classified as major adverse impacts
- Evaluation of the probable geo-environmental impact of each activity – the degradation and destruction of surface features is classified as moderate adverse. The loss of soils is classified as a minor adverse impact
- Suggestion of measures for mitigating such impact

The site works involved during the construction phase of the proposed project that may negatively affect the existing hydrogeomorphological conditions of the area include:

- Demolition of existing structures, excavation of rock, and construction of proposed structures, which may release fines to the environment through wind or runoff – a minor adverse impact

- Storage of excavated stone material and soil, which may release fines to the environment on windy or rainy days – a minor adverse impact
- Storage of contaminating substances, which should not be handled on site – a minor adverse impact
- Use of heavy machinery and heavy vehicles, which may generate dust with negative impacts on runoff and coastal waters – a minor adverse impact
- Paving of the site, which will render it impermeable and generate runoff, leading to loss of recharge to the Mean Sea Level Aquifer – a moderate adverse impact
- Application of pesticides and fertilizers for landscaped area maintenance, which may have a negative impact on the Mean Sea Level Aquifer during site operation – a minor adverse impact

Chemical studies on the Mean Sea Level Aquifer have not identified pesticide contamination but have revealed high contents of nitrate.

Ground contamination analysis indicate that none of the samples exceed the limits stipulated in the Decreto 152 of 2006 for Commercial & Industrial Limits. Consequently, the material excavated from the MRF site is suitable for backfilling on site. The Residential Limits of the Decreto were also evaluated to assess the possibility of transferring the material offsite in an authorised waste acceptance quarry. Most sample results obtained are above certain Residential Limits of the Decreto and therefore the EPC contractor should not dispose of the excavated material indiscriminately in an authorised waste acceptance quarry. Material excavated from A1, D1 and F1 should be kept apart and reused as backfill on site, due to the exceedances that have been noted. Only material excavated from J1 may be considered for disposal in an authorised quarry.

The results obtained also indicate that the material to be excavated from the site is considered Non-Hazardous and therefore can be classified as EWC 17 05 04. When comparing the leachate results to the EU Council Directive 2003/33/EC Annex, it is also evident that none of the samples exceed the threshold limit values. Consequently the impact is classified as minor adverse.

5.3.2 Operational phase

The geo-environmental impacts of various developments are significant and can have far-reaching consequences. The removal or degradation of sites of scientific importance, such as those protected by Rural Conservation Policies RCO11 and RCO12, poses a high risk and cannot be mitigated. On the other hand, projects that protect or enhance these sites, such as nature trails or geological parks, can have a highly beneficial effect.

Moreover, all developments that involve paving, regardless of their scale, can have moderate adverse impacts. For example, excavation for underground floors might seem insignificant, but the cumulative effect of such constructions can lead to flooding in the lower reaches of watercourses. Therefore, it is crucial to consider the cumulative effects of these developments to mitigate their adverse impacts on the geo-environment.

Spillages from a major incident during the loading/unloading and transport during the operation of the proposed MRF may also lead to ground and coastal water contamination. This impact is classified as moderate adverse.

5.4 Water bodies

5.4.1 Construction phase

Groundwater contamination results taken from the site were compared to the Limits defined in Decreto 152 of 2006. Exceedances were noted at J1W1 for the concentration of Iron, Sulphate and Tetrachloroethylene. Similarly, sulphate and tetrachloroethylene thresholds were also exceeded at A1W1.

Although Iron and Tetrachloroethylene are not frequently observed in Maltese groundwater bodies, they have been detected and reported in Malta's 3rd River Basin Management Plan. Historic landfill leachate may have contributed to such results due to the improper disposal of lead-containing materials, corroding materials and other forms of industrial wastes in the landfill.

On the other hand, sulphate is frequently encountered at high levels in mean-sea level and coastal aquifers. This is primarily attributed to sea-water intrusion into the aquifer, however anthropogenic sources such as fertiliser use and wastewater/leachate discharges may also be attributed.

The works on site are unlikely to generate any direct impact on the results of the groundwater contamination tests taken from the underlying groundwater body. Excavation works will be limited to the first few metres below existing topographical levels. Once operational, the entire site shall be rendered impermeable to prohibit the percolation of any hazardous liquids which may escape into the groundwater.

Nevertheless potential risks include contamination of the Mean Sea Level Aquifer, degradation of coastal waters, and loss of runoff. To assess these impacts, a comprehensive evaluation was conducted, involving the identification of construction site activities that may affect geo-environmental resources, the evaluation of the probable geo-environmental impact of each activity, and the suggestion of measures to mitigate such impacts.

During the construction phase of the project, several site works are envisioned. These include the demolition of existing structures, excavation of rock, construction of new structures, storage of excavated stone material and soil, storage of contaminating substances, use of heavy machinery and vehicles, paving of the site, and maintenance activities such as the application of pesticides and fertilizers. These impacts are classified as moderate adverse. Each of these activities poses environmental risks, including the release of fines to the environment through wind or runoff, potential contamination of the Mean Sea Level Aquifer, and degradation of coastal waters.

To minimize these impacts, several measures can be taken. For instance, dust-suppression techniques such as the use of silt fences, collection of fine particulates, covering of stored materials, and controlled water-spraying of active areas can help reduce wind-blown dispersion. Additionally, heavy machinery and vehicles should be used in a way that minimizes dust generation, and pesticides and fertilizers should not be handled on site to prevent contamination of the Mean Sea Level Aquifer.

5.4.2 Operational phase

During the operational phase of the MRF, there is a risk of accidental leakage or discharges that could potentially contaminate the coastline. The impacts from leaks or spillages is classified as minor adverse. Regular inspections of effluent discharges can help mitigate such incidents.

The development may lead to significant runoff and negligible aquifer recharge, which could exacerbate saltwater intrusion into the Mean Sea Level Aquifer and negatively impact nearby terrestrial water bodies. However, since there are no pumping wells in the area, there is no risk of water intrusion.

The site under consideration is relatively small, accounting for only 0.011% of the total potential recharge area of the Maltese Islands. Uncontaminated runoff water collected from the site can be used for irrigation purposes, which will indirectly contribute to the recharge of the aquifer and compensate for the lack of direct aquifer recharge due to the site's impermeable surface.

The use of pesticides and fertilisers in the proposed landscaping areas also pose hydrological risks, particularly downstream of the site. The impact is classified as moderate adverse.

5.5 Ecology – Terrestrial

5.5.1 Construction phase

During the construction phase of the project, the removal and re-distribution of vegetation is envisaged, leading to a major adverse impact. This activity will require the clearing of the site from any trees and vegetation located within the site

boundaries. The project will impact approximately 244 individual protected tree species, which are comprised predominantly by Carob trees (162), followed by Lentisk trees (48), Olive trees (24), Aleppo pines (9) and Cypress trees (1). Some individuals of the Caper bush may also be affected. Several other species may also be impacted. For further information, refer to the list of species provided in Table 26.

Where deemed possible, mature trees will be relocated to the perimeter of the site, which will feature a landscaping scheme of circa 2690sqm. The landscaping scheme as currently proposed features 37 trees and shrubs, as described in Table 46.

Table 50: Proposed Landscaping plan tree species

SCIENTIFIC NAME	ENGLISH NAME	QUANTITY
<i>Olea europaea</i>	Olive tree	14
<i>Ceratonia siliqua</i>	Carob tree	14
<i>Tamarix africana</i>	African tamarisk	3
<i>Laurus nobilis</i>	Bay laurel	2
<i>Rosmarinus officinalis prostratus</i>	Rosemary	4
Total individual trees/shrubs		37

The decision to relocate or remove trees will be made based on the soil depth, which will be confirmed at the start of the excavation phase. If the soil depth is too shallow to remove the full root ball without damage, the trees will be removed and not transplanted due to the low chance of survival. Adequate compensation will be provided as advised by the Environment and Resources Authority (ERA) within the planned planting scheme or in the near vicinity of the site. The compensation will include planting a cohort of species typical of the ecosystems expected within maquis habitats.

During excavations, additional indirect impacts may occur, including significant dust, light at night and noise generation. These impacts are classified as minor adverse and they can be mitigated by using site hoarding around the perimeter of the planned

excavation area, employing wheel-washing facilities, and wetting down any exposed stockpiles.

Surface runoff generated from the construction and excavation site, has the potential to act as a vector for a range of physicochemical contaminants, thereby exerting both acute and chronic impacts on adjacent marine ecosystems. The impact is classified as minor adverse. During precipitation events, overland flow may mobilize elevated loads of suspended sediments, increasing turbidity and total suspended solids (TSS) in receiving coastal waters. This can reduce light penetration, impairing photosynthetic efficiency in primary producers such as phytoplankton, seagrass meadows (e.g., *Posidonia oceanica*), and benthic macroalgae.

Sediment deposition may also result in smothering of benthic habitats, leading to hypoxic or anoxic microenvironments that adversely affect infaunal and epifaunal communities. In addition, runoff may contain hydrocarbons, heavy metals (e.g., lead, zinc, copper), nutrients (notably nitrogen and phosphorus), and alkaline particulates from concrete works, potentially altering seawater chemistry and contributing to eutrophication. Such nutrient enrichment can stimulate algal blooms, with subsequent decomposition processes reducing dissolved oxygen concentrations and causing localized eutrophic or hypoxic conditions. The cumulative effect of these stressors may lead to shifts in community structure, loss of sensitive or keystone species, and a decline in overall marine biodiversity.

5.5.2 Operational phase

The operational phase of the project will have two primary impacts on the surrounding area: noise and atmospheric emissions from increased vehicular traffic and increased lighting in previously dark areas. These minor adverse impacts will persist throughout the duration of the works.

The increased vehicular traffic will lead to the deposition of particulate matter and gases related to combustion. However, the expected traffic frequencies will be comparable to the current traffic levels within the wider ECOHIVE Complex.

To mitigate the impacts of increased lighting, measures such as sensor-operated lights, down-turned light fixtures, and other measures outlined in the GUIDELINES FOR ECOLOGICALLY RESPONSIBLE LIGHTING¹⁶ will be implemented to the extent possible. These measures will aim to minimize the potential light spillover into adjacent agricultural areas.

¹⁶ Source: <https://birdlifemalta.org/wp-content/uploads/2020/07/Guidelines-for-Ecologically-Responsible-Lighting.pdf>

5.6 Ecology – Avifauna

5.6.1 Construction phase

The proposed development will result in a localised loss of potential breeding habitat for up to 4 terrestrial songbird species within the Aol-1. The construction phase will disturb or destroy breeding territories of the Sardinian Warbler, Zitting Cisticola, and Blue Rock Thrush, potentially leading to reproductive failure. Foraging areas and potential colonial nest sites of the Spanish Sparrow will also be reduced temporarily.

The construction phase will cause habitat loss and disturbance, potentially affecting foraging areas for other breeding, wintering, and/or staging species in the Aol-1. These moderate adverse impacts will be localized and short-term, but may still have effects on local breeders of common species.

The constriction of the MRF facilities, including the increase in heavy traffic along the access roads will generate elevated noise levels and vibrations, which will caused moderate adverse impacts on the avifauna in the footprint and Aol-1 locally and temporarily (by disturbance, disruption of signalling etc.).

Artificial light at night (ALAN) will also have a moderate negative impact on seabirds. Adults from all three procellariiform species nesting on the Maltese Islands avoid approaching breeding areas under high levels of illumination and may desert colonies as a result. ALAN can cause the stranding of seabird fledglings on their first flight out of the colony, which may be injured or killed by collisions with manmade structures.

The proposed development is not situated within the immediate line of sight of any seabird nest sites, but a Yelkouan Shearwater colony is located within the 5.0 km buffer zone Aol-2. Night-time construction activities during the reproductive season (February to July) may have significant impacts on this colony, affecting 45-70 breeding pairs.

Additionally, ALAN can have negative consequences on nocturnally migrating birds, attracting, disorienting, and grounding them if construction work or operations are carried out at night during spring or autumn migration with no mitigation measures in place.

5.6.2 Operational phase

The proposed MRF development, situated in an ODZ, will have a profound and lasting impact on the local avifauna. The permanent reduction of breeding habitat within the development's footprint, as well as the disturbance, noise, and habitat alteration in the surrounding Aol-1 and along access roads, will result in the loss of several breeding pairs of species such as *C. melanocephala*, *C. juncidis*, and *M. solitarius*. Additionally, the development will lead to a reduction in foraging and roosting habitat, as well as

potential nesting sites, for a population of up to a few tens of breeding pairs of *P. hispaniolensis*. This impact is assessed as moderate adverse.

This localized, permanent habitat loss and disturbance will also destroy foraging areas for other breeding, wintering, and/or staging bird species that make use of the development's footprint and buffer zone. However, the overall numbers of birds impacted are not expected to reach levels of significance when considering the local, national, EU, or international populations of the species utilizing the area. As such, no significant impacts on avifauna are anticipated within the development's footprint and buffer zone (Aol-1) during standard operations.

While the proposed development itself is not situated within the immediate line of sight of any seabird nest sites, a significant colony of *P. yelkouan*, holding 45-70 breeding pairs, is located on Saint Paul's Island surrounded by SAC (MT0000105) within the 5.0 km buffer zone Aol-2. This is of particular concern, as the additional sky glow from ALAN emitted by the MRF during operation, especially if night-time activities or 24/7 illumination are involved, can have a profound and permanent major impact on this seabird colony.

The negative effects of ALAN are not limited to seabirds, as it is also known to have devastating consequences on nocturnally migrating birds in general. Bright lights have a tendency to attract, disorient, and ground birds actively migrating at night. If the MRF carries out night-time operations or remains lit-up during the spring and autumn migration periods without proper mitigation measures, it is highly likely to have a major adverse impact on the nocturnally migrating birds passing through the Aol-2 buffer zone.

On a more positive note, the waste separation, treatment, and recycling processes within the proposed MRF, if carried out appropriately, can have several indirect moderate beneficial impacts on avifauna compared to the current situation of the open landfill at Magħtab. By reducing the amount of plastic waste that is openly accessible to birds and that can be blown or washed into the sea, the MRF can help decrease the number of birds suffering from entanglement and/or ingestion of macro-plastics, as well as the amount of micro-plastics ingested by avifauna, either directly or indirectly through the food chain.

Furthermore, the MRF's plastic recycling facilities, in conjunction with the Waste to Energy plant and Composting plant, can contribute to the future reduction of greenhouse gas emissions, particularly methane, which is a potent greenhouse gas leaking from the open landfill at Magħtab. This reduction in greenhouse gas emissions can have a moderate positive impact on biodiversity, including avifaunal communities, by mitigating the effects of climate change.

The operation of the MRF involves the manipulation, preparation, and transport of material destined for recycling, which may result in limited losses of material to the environment if not properly managed, with potentially detrimental effects on living organisms, including avifauna. However, the facility will operate within a controlled and regulated framework incorporating appropriate infrastructure and operational procedures to minimise such risks. Overall, the proposed MRF is expected to deliver a moderate beneficial impact on avifauna compared to the current open landfill scenario, as it will facilitate improved waste management practices.

Additionally, the transporting, manipulating, and storing of flammable material in large quantities at the MRF imposes significant fire hazard risks, a major adverse impact. Some types of plastics are known to produce toxic fumes when burning, as evidenced by the previous MRF fire in Malta, which released a plume of toxic fumes and residues into the environment, with short- and long-term negative impacts. In the event of a fire at the proposed MRF, the plume of the blaze and the runoff from firefighting water could release toxins into the environment, with detrimental effects on living organisms, including avifauna.

5.7 Agricultural Land

5.7.1 Construction phase

The proposed development is expected to give rise to the permanent take up of agricultural land which is classified as a major adverse impact. This is not expected to lead to the adaptation of surrounding farming practices for maximizing agricultural production due to the marginality of the land. The land is unsuitable for agriculture because of soil characteristics and limited water availability, leading to increased risks of land abandonment.

During the construction phase, the following measures should be implemented to mitigate environmental impacts:

- Control of all road runoff to prevent erosion and other ecosystem impacts due to deforestation and desertification, which are major anthropogenic sources of carbon dioxide.
- Agricultural activities in the area are not expected to involve chemical inputs, but if irrigation is necessary, appropriate measures should be taken to prevent groundwater pollution and soil structure damage.

5.7.2 Operational phase

The operational phase of the development is not expected to lead to the adoption of genetically engineered crops or the use of chemical inputs, given the marginal productivity of fodder crops and the government's stance on GMOs. The land

management approach of continuous cereal cropping and conventional tillage will determine the presence of organic residues on the soil surface and conditions for crop emergence and growth.

The agricultural land in the Maghtab site is predominantly used for dryland production of fodder or hay crops, with low-to-moderate intensity traditional farming practices and low-to-moderate yields. The area is primarily suitable for dry farming due to the lack of water, prevalence of winds, and soil type.

In summary, the proposed development in the Maghtab site will not significantly impact the agricultural practices in the area, given the marginality of the land for agriculture. However, the permanent loss of agricultural land is considered a major adverse impact. The construction and operational phases will require measures to prevent environmental impacts, including controlling road runoff, preventing water table pollution, and managing soil erosion. The land use approach in the area will continue to be suitable for dry farming, with low-to-moderate yields and traditional farming practices.

5.8 Archaeology & cultural heritage

5.8.1 Construction phase

The construction phase of the project involves the development of agricultural parcels of land comprising terraced fields with agricultural structures such as rubble/dry-stone walls and dry-stone huts. The potential of damaging cultural and/or archaeological features below the ground is also relatively high, and therefore the impact is also classified as major adverse during excavation works on site.

The presence of megalithic remains in the vicinity of the proposed scheme suggests that the area was inhabited since prehistoric times, with the landscape undergoing agricultural changes. The rural landscape, despite past landfill use, will be significantly impacted by the development, but there will be no direct impact on the 'Taž-Žebbuġija' Megaliths located 100m away and Ta' Hammud Megalithic dolmens located around 350m away from the proposed development. However, the grade of protection assigned to the area around it is still flagged as a potential archaeological zone. The dry-stone huts within the AoI are at risk of major adverse impact or damage, and they are considered a subject of architectural, cultural, and ethnic value.

5.8.2 Operational phase

The project will continue to have minimal or no direct impact on the known cultural features present at the limit of the AoI. However, the project will need to adhere to local and international legislations and other relevant documents related to the protection of cultural heritage. The 'Taž-Žebbuġija' Megaliths, located at the Eastern limit of the AoI, and Ta' Hammud Megalithic dolmens will not be directly impacted by

the project's operation. The dry-stone huts within the Aol, which are still well preserved, should be considered a subject of architectural, cultural, and ethnic value, and their stability and integrity should not be endangered during the project's operation. The Planning Authority is declared in the law as the competent authority responsible for the administration and implementation of these regulations.

5.9 Noise & Vibration

5.9.1 Construction phase

The impact magnitude, in the worst-case scenario, is minor adverse at approximately 100m from each boundary of the site, and the calculation assumptions tend towards a worst-case scenario. However, to further reduce the potential for adverse noise impacts, the following construction mitigation measures are recommended as good practice, to be implemented where appropriate:

- Consideration will be given to noise emissions when selecting plant and equipment to be used on site.
- All equipment should be maintained in good working order and fitted with the appropriate silencers, mufflers, or acoustic covers where applicable.
- Stationary noise sources will be sited as far away as reasonably possible from noise-sensitive receptors, and where necessary and appropriate, acoustic barriers will be used to screen them.
- The movement of vehicles to and from the site will be controlled, and employees will be instructed to ensure compliance with any noise control measures adopted.

There are many strategies to reduce construction noise by limiting activities that would result in predicted noise levels being reduced. Any such measures should be considered adequate, and the mitigation adopted should not be limited to the measures proposed.

5.9.2 Operational phase

For the closest residential receptors (approx. 400m away from the site), the operational rating level from the plant and on-site vehicle movements has been predicted to be below or equal to the daytime and night-time background sound levels, resulting in no significant effect. Similarly, for the closest ecological receptors (about 100m away), no significant effect has been determined. Therefore, no additional mitigation measures are considered necessary, and no residual effects are predicted.

For further information on cumulative noise impacts, kindly refer to the Noise Technical Study. During construction works the cumulative noise level is classified as

minor adverse at all noise sensitive receptors. On the other hand, the cumulative noise impact during operational activities is classified as minor to moderate adverse at NSR01.

5.10 Infrastructure & Utilities

5.10.1 Construction phase

During the construction phase of the proposed MRF, accidental damages may occur to the pre-existing infrastructure and utilities present within close proximity of the site development. No infrastructure or utilities are located directly within the development's footprint.

The proposed route for the second interconnector passes along the edge of a 100-meter buffer zone to the west of the project site. The construction of the second interconnector is expected to start in 2026 and be completed by 2028. A landfill pile is located between the project site and the interconnector route, which reduces the likelihood of any significant impact of the project's construction on the interconnector within the buffer zone. The project's construction vehicles will enter the site from the southern gate, where work on the second interconnector is also planned. The necessary precautions have already been put in place to safeguard the interconnector from construction vehicles and other potential hazards. As a result, no additional measures are needed due to the planned development at this project site and the impact is classified as not significant.

The proposed development of the project site involves the use of agricultural land that does not have any existing infrastructure. However, there are several utility features present within the buffer area, such as pavements, crash barriers, fire hydrants, street lamps, and fencing owned by Wasteserv Malta. These utilities are located on the access road used by construction vehicles and surround the buildings adjacent to the site. Some of these items require repairs and replacement. The risk of damaging such utilities is high and therefore the impact is classified as moderate adverse. Before the commencement of construction, the selected contractor must coordinate with Wasteserv Malta to determine which infrastructure should be retained to avoid accidental damage to functioning utilities by large construction vehicles. Additionally, indirect impacts may occur due to dust generated by construction operations. In the event of accidental damage to the infrastructure, the contractor must report the damage to Wasteserv Malta and the operators to coordinate a timely repair at the contractor's expense. Although the impact is known and can be prevented through discussions and consultations, it is considered adverse and of minor significance.

During the construction phase of the project, connections will be established between the proposed development and the pre-existing water and electricity amenities within the ECOHIVE complex. This may result in temporary disruptions to the water and/or

electricity supply in the complex. However, since these interruptions are expected to be localized and temporary in nature, the impact is classified as adverse but of minor significance.

To determine the presence of any utility infrastructure within the proposed site and its 100-meter buffer, the project team contacted companies responsible for telecommunications, sewers, potable water systems, and power supply. The only exception was Enemalta, which owns the second interconnector cable. All other entities confirmed that no infrastructure is located within the development site or its boundary, indicating no anticipated impacts related to utility infrastructure.

5.10.2 Operational phase

The implementation of the Scheme will increase ECOHIVE's capacity to process source-separated recyclable waste streams, contributing significantly to Malta's national recycling goals. Consequently, the complex will see an increase in traffic flow to and from the site. However, this heightened activity is not projected to have any adverse effects on the surrounding public infrastructure and utilities.

The operation of the MRF within the proposed site will necessitate new connections to Malta's national grid system. The project is envisaged to include a dedicated switch gear and transformer to ensure a steady supply to the site. The development will inevitably increase the load on the national grid. However, particularly following the implementation of the second interconnector, this impact is considered to be negligible when compared to the national demand and is well within the capacity of the national grid. Furthermore, due to the close proximity of the site to the Enemalta Maghtab Terminal substation, additional electrical infrastructure connecting the site to the proposed grid will be minimal.

The operation of the MRF will necessitate new connections to the sewage and potable water systems. The current Masterplan envisages connections between the plants and existing cesspits available within the ECOHIVE complex intended for the collection of domestic and effluent waste water. These cesspits will be emptied periodically by bowzers and transferred between the plants or discharged into the public sewer. Eventually, the sewage system will be connected to the national sewage infrastructure. The impact of the new scheme on the existing public sewer is considered adverse but of minor significance due to the provision of substantial water treatment infrastructure planned for within the ECOHIVE complex which will minimise the outflow of effluent into the public system.

5.11 Climate Change and Climate Change Adaptation

Greenhouse gases (GHGs) are a group of gases in the Earth's atmosphere that absorb and trap infrared radiation, thereby causing the Earth's surface temperature to rise above the freezing point. The most significant GHGs are water vapor, carbon dioxide,

methane, and ozone. These gases are naturally occurring, and without them, the Earth's surface temperature would be about -18°C instead of the current average of about 15°C.

The natural levels of GHGs are essential for the survival and flourishing of life on Earth. For example, water vapor is the most abundant GHG and plays a crucial role in the Earth's hydrological cycle, including precipitation, evaporation, and transpiration. Carbon dioxide, on the other hand, is an essential component of the carbon cycle and is involved in photosynthesis, which is the process by which plants and other organisms produce food.

However, over the past few centuries, human activities have significantly increased the concentration of GHGs in the atmosphere. The burning of fossil fuels, deforestation, and industrial processes have released massive amounts of CO₂, methane, and other GHGs into the atmosphere, leading to a rapid increase in global temperatures. In fact, ice core samples taken in 2007 revealed that the levels of CO₂ and methane have increased by 36% and 148%, respectively, since 1750 ¹⁷.

The increase in CO₂ levels is mainly due to the burning of fossil fuels such as coal, oil, and natural gas. The use of these fuels for transportation, electricity generation, and other purposes has led to a significant increase in CO₂ emissions. Deforestation, on the other hand, reduces the number of trees that absorb CO₂ during photosynthesis, leading to even higher concentrations of CO₂ in the atmosphere.

The consequences of these elevated GHG concentrations are severe and far-reaching. Climate Change is leading to rising sea levels, more frequent and intense heatwaves, droughts, floods, and extreme weather events. These changes are already having significant impacts on ecosystems, economies, and human health, and the situation is expected to worsen in the coming decades unless action is taken to reduce GHG emissions.

5.11.1 Impacts on Climate Change

The construction of the new MRF can have cumulative consequences on Climate Change. The direct construction impacts of such a project are minor and temporary in nature but involve energy-intensive interventions that inevitably lead to the release of greenhouse gas (GHG) emissions. These interventions include the extraction and production of construction materials, the manufacture of raw materials and machinery, the transportation of these materials, and the operation of machinery during construction.

¹⁷ EPA (2007). "Recent Climate Change: Atmosphere Changes". United States Environmental Protection Agency Climate Change Science Program. Archived from the original on 10 May 2009. Retrieved 21 April 2009.[gg](#)

An increase in GHG emissions cumulatively contributes to accelerating Climate Change effects, including sea ice decline, sea level rise, extreme weather conditions, ecosystem changes, and reduced crop production:

- **Sea ice decline, sea level rise and retreat of glaciers** – global warming causes the shrinking and thinning of ice which melt and cause the sea level to rise.
- **Extreme weather conditions** – heat waves, droughts and monsoons.
- **Ecosystem changes** – earlier timing of spring events, poleward migration of arctic species, expansion of deserts, and a reduction in ocean oxygen levels and an increase in acidity affecting coral reefs, fisheries and protected species.
- **Crop production** – carrying capacity of the biosphere to produce.

The construction of the MRF can also have indirect impacts on Climate Change. The loss of rural land by cemented surfaces leads to a reduction in effective precipitation naturally recharging the underlying groundwater body, with consequent increase in run-off water volumes. By coupling this minor adverse impact with increased rainfall intensity in shorter time frames (extreme weather events), the risk of flooding exacerbated by CC impacts should not be overlooked.

Despite these impacts, the construction of a new MRF can yield minor beneficial impacts on Climate Change. Recycling materials at the MRF will reduce the need for raw materials, lower energy consumption, and decrease GHG emissions associated with manufacturing new products. Additionally, by diverting waste from landfills, the MRF helps reduce methane emissions and minimizes the environmental impact of waste disposal, contributing to overall Climate Change mitigation efforts.

To ensure sustainable development, the construction of the new MRF must be carefully considered and appropriate measures must be taken to mitigate its negative impacts on Climate Change. This can include the installation of Sustainable Urban Drainage Systems (SUDSs) to increase groundwater recharge while reducing run-off volumes.

5.11.2 Adaptability to Climate Change

The adaptability of the proposed MRF to future effects of Climate Change can be evaluated by considering its potential impact on Malta's waste management and the country's ability to increase recycling rates. The recycling of materials at the MRF reduces the need for raw material extraction and manufacturing, leading to a significant decrease in energy consumption and greenhouse gas emissions. This helps to mitigate the overall impact of Climate Change by lowering the carbon footprint of waste management operations.

By diverting waste from landfills, the MRF helps reduce methane emissions, a potent greenhouse gas. Methane is produced when organic waste decomposes in anaerobic

conditions, such as those found in landfills. Redirecting waste to the MRF for recycling and recovery can substantially lower these methane emissions, contributing to Climate Change mitigation.

The MRF can also play a role in enhancing the country's resilience to the impacts of extreme weather events, which are expected to increase in frequency and intensity due to Climate Change. By ensuring the proper management and recovery of materials, the MRF can help minimize the environmental impact of disasters, such as flooding or storms, on waste systems.

The MRF's focus on recycling and material recovery aligns with the principles of a circular economy, where waste is minimized, and resources are reused and recycled. This approach helps reduce the reliance on virgin materials, conserve natural resources, and promote sustainable waste management practices, all of which contribute to Climate Change adaptation. By integrating the MRF into a country's waste management system, local authorities can enhance the overall adaptability and resilience of their communities to the impacts of Climate Change.

5.12 Environmental Risk

Any relevant risks, including major accident scenarios like contamination to Mean Sea Level Aquifer or the sea, emissions, explosions, fires, blasts, flooding and major spillages, which could originate during the excavation, construction, operational and decommissioning phases of the proposed Scheme are assessed in this chapter. The assessment includes a quantification of the risk magnitude and probability, and the relevant risk analysis vis-à-vis the aforementioned scenarios.

Potential risk scenarios can be classified as:

- One-time risks
- Recurrent risks during operational phase of the project; and
- Risks associated with extreme or exceptional events (ex: effect of earthquakes or other natural disasters on the project).

The preliminary environmental risk assessment identifies thirteen potential environmental threats or sources of contamination identified throughout the duration of this EIA, as listed in Table 51.

Table 51: Identified environmental risks

ENVIRONMENTAL RISK		PROJECT PHASE		
TYPE	RISK	CONSTRUCTION (INC. EXCAVATION)	OPERATIONAL	DECOMMISSIONING
One-time Risk	Contamination of geological layers through spillage of oils or fuels	✓	✓	✓
	Contamination of the Malta Mean Sea Level Aquifer through spillage of oil or fuels	✓	✓	✓
	Contamination of the marine environment through spillage of oil, chemicals or fuels	✓	✓	✓
	Generation of dust from works which may affect surrounding sensitive receptors	✓		✓
	Rock/soil instability which could impact nearby ecological/agricultural features of land uses	✓		
	Spillage of excavated material during transportation	✓	✓	✓
	Dust emissions from transportation of waste rock material	✓		✓
	Loss of protected endemic vegetation species	✓		
Exceptional Risks	Instability of the facility, due to earthquakes	✓	✓	
	Damage to surrounding environment from explosion/fire	✓	✓	✓

5.12.1 Criteria used to assess environmental risks

The impacts on the environmental receptors were addressed independently to determine the Potential Source of Contamination (PSC), keeping in mind the pathway status. The effects of the various impacts identified were evaluated against the criteria listed in Table 52.

Table 52: Criteria used to assess environmental risks

CRITERION	DESCRIPTION	
Impact	Adverse	Overall negative impact
	Neutral	Neither positive nor negative impact
	Beneficial	Overall positive impact
Geographical extent of impact	Local	Within the confines of the peninsula
	National	Offshore within Maltese territorial waters
	Transboundary	Offshore outside Maltese territorial waters
Duration of impact	Short-term	Impact extends over a brief period
	Medium-term	Impact extends over one phase
	Long-term	Impact extends indefinitely
Type of effect	Temporary	Impact effects cease after activities are halted
	Permanent	Impact effects are felt after activities are halted

5.12.2 Environmental Risk Evaluation

The environmental risk was determined in a qualitative manner, which involved the computation of the impact magnitude (Table 53) on the environment and the corresponding probability of occurrence (Table 54). The risk matrix is shown in Table 55 and the final risk assessment shown in Table 56.

Table 53: Parameters used to assess the risk magnitude

MAGNITUDE	EFFECT ON THE ENVIRONMENT
Insignificant	No discernible impact or measurable impairment, for example, not exceeding published guideline values for "normal" or "background" levels.
Minor	Minor effects on biological or physical environment. Minor short-, medium-term damage to a localised area or that ceases once the event is over.
Moderate	Measurable impairment on biological or physical environment but not affecting ecosystem function. Short-, medium-term impacts, where the ecosystem will recover quickly and without intervention.
Major	Serious environmental effects with some impairment of ecosystem function. Relatively widespread medium-, long-term impacts, requiring remediation, where ecosystem will recover over time once clean-up has been completed.
Severe	Very serious environmental effects with significant impairment of ecosystem function. Long term, widespread effects. Remediation required.

Table 54: Parameters used to assess the risk probability

PROBABILITY	DESCRIPTION
Almost certain	The event is expected to occur in most circumstances /commonly repeating / occurs weekly
Likely	The event will probably occur in most circumstances / known to occur / occurs monthly
Possible	The event might occur, say yearly / has a 1 in 20 chance of occurring
Unlikely	The event could occur at some time, say once in every 10 years / say 1 in 100 chance of occurring
Rare	Event may only occur in only exceptional circumstances / less than a 1% chance of occurring

Table 55: Risk assessment matrix

		MAGNITUDE				
		Insignificant	Minor	Moderate	Major	Severe
Probability	Almost certain	Med	Med	High	High	High
	Likely	Med	Med	Med	High	High
	Possible	Low	Med	Med	High	High
	Unlikely	Low	Low	Med	Med	High
	Rare	Low	Low	Med	Med	High

Table 56: Environmental risk assessment

PSC/ENVIRONMENTAL THREAT	RISK DESCRIPTION	PATHWAY STATUS	RECEPTOR	PSC EVALUATION										EVALUATION OF RISK													
				IMPACT			EXTENT			TERM			EFFECT		MAGNITUDE					PROBABILITY					RISK		
				Adverse	Neutral	Beneficial	Local	National	Transboundary	Short	Medium	Long	Temporary	Permanent	Severe	Major	Moderate	Minor	Insignificant	Almost certain	Likely	Possible	Unlikely	Rare	Low	Moderate	High
One-time environmental risks																											
Oils/fuels used on site during excavation, construction and/or potentially maintenance works during operations	Contamination of geological layers through spillage of oils or fuels	Horizontal/vertical percolation into geological layers	Aquifer system	✓			✓				✓			✓				✓				✓		✓			
	Contamination of the Malta Mean Sea Level Aquifer through spillage of oil or fuels	Horizontal/vertical percolation through geological layers and into the groundwater body	Groundwater body	✓			✓				✓			✓				✓					✓	✓			
	Contamination of the marine environment through spillage of oil, chemicals or fuels	Horizontal/vertical movement to the sea	Marine environment	✓			✓	✓			✓			✓				✓				✓		✓			
Excavation and construction works	Generation of dust from works which may affect surrounding sensitive receptors	Rock/soil excavation	Surrounding areas and uses	✓			✓			✓			✓					✓			✓			✓			
	Rock/soil instability which could impact nearby ecological/agricultural features of land uses	Excavation works potentially causing rockslides	Surrounding areas and uses	✓			✓				✓			✓		✓							✓		✓		
Vehicular transportation of waste material	Spillage of excavated material during transportation	Material dropping off the truck	Surrounding land uses	✓			✓	✓		✓			✓					✓			✓			✓			
	Dust emissions from transportation of waste rock material	Fine particles disperse in the air from the moving truck if not appropriately covered	Surrounding areas and uses	✓			✓			✓			✓					✓						✓			
Exceptional environmental risks																											
Natural earthquake	Instability of the structure, including machineries, due to earthquakes	Direct physical damage to machineries or building structure	Surrounding areas and uses; Malta waste management sector	✓			✓	✓				✓		✓		✓							✓		✓		
Explosion/jet fire	Damage to surrounding environment from explosion/fire at the facility	Flammable cloud engulfing an ignition source before it is diluted below its flammable limits	Personnel, surrounding areas, cliffs, ecology and uses; Malta waste management sector	✓			✓	✓				✓		✓		✓							✓		✓		
Flooding due to extreme weather events	Physical damage to the facility	Anthropogenic third-party interventions	Building structure and operation	✓				✓			✓		✓			✓							✓		✓		

5.13 Effects on human populations

As outlined in the previous chapters, the MRF project may lead to various environmental impacts which in turn could affect human populations in several ways. The below table summarises these potential effects:

Table 57: Summary of the effects on human populations

CAUSE	EFFECT	IMPACT
Effects of construction activities	Generation of dust	Reduced air quality for nearby residents, most notably individuals who suffer from respiratory conditions.
	Noise and vibration	A minor increase in noise is expected which may affect ECOHIVE personnel and surrounding residential receptors.
Effects during the operational phase of the project	Air quality & climate change	The potential for the facility to increase the country's recycling rates would reduce the overall GHGs emitted on a national scale. This is likely to reduce the impacts on climate change.
	National waste management sector	The construction of a new MRF will help the country to meet the European waste recycling targets.

5.14 Cumulative impacts

The simultaneous development and operation of the proposed waste management facilities at ECOHIVE complex i.e. Waste-to-Energy, Organic Processing Plant, Materials Recovery Facility and Thermal Treatment Facility may lead to certain cumulative environmental impacts which are described in further detail below.

5.14.1 Land cover and land uses

The proposed developments within the ECOHIVE complex are expected to result in major adverse cumulative impacts on surrounding agricultural land and ecosystems, mainly used for dryland farming and small-scale livestock production.

5.14.2 Landscape Character & Visual Amenity

Construction activities from multiple construction sites at ECOHIVE complex are expected to give rise to adverse visual and landscape impacts across all seven viewpoints, although the significance of these impacts will vary depending on proximity to the site, visibility, and the sensitivity of the surrounding landscape. Construction plant, cranes, excavation works, stockpiles and temporary site infrastructure will be the principal sources of visual intrusion. The greatest impacts are anticipated at VP1, VP3, VP4 and VP7, where construction activities will be clearly visible and, in some cases, affect the skyline, resulting in major adverse visual effects. At VP2, VP5 and VP6, the visual impact will be reduced by screening provided by landform, vegetation and surrounding structures, although moderate adverse effects are still expected. Landscape impacts are further amplified by the presence of concurrent construction activities associated with the nearby Waste-to-Energy (WtE), Organic Processing Plant (OPP) and TTF facilities, particularly within Areas of High Landscape Sensitivity, resulting in an overall significant adverse impact on landscape character during the construction phase.

The waste management facilities within the ECOHIVE Complex are expected to result in major visual and landscape impacts across the seven viewpoints, due to the sheer scale and intensification of industrial buildings within a previously undeveloped area. Landscape impacts are expected to remain major adverse, particularly within designated Areas of High Landscape Sensitivity. The use of an appropriate façade colour and carefully designed lighting will help reduce visual contrast and minimise nighttime light pollution.

5.14.3 Geology, Geomorphology, Hydrogeology and Soils

The construction and operation of the proposed MRF, when considered alongside other planned waste management developments within the ECOHIVE complex, are expected to contribute cumulatively to environmental impacts on soil, geology, and hydrogeology.

The loss of rock strata proposed at the MRF site, mirror those of other ongoing or proposed developments within the complex, thereby compounding effects such as localised erosion, sedimentation, dust dispersion, and loss of agricultural topsoil. Dust dispersion from such works is expected to yield major adverse impacts. Though individually manageable, the collective disturbance from multiple facilities increases the risk of degradation to

surrounding land and nearby agricultural fields, particularly through nutrient depletion, reduced soil productivity, and minor sedimentation of watercourses. The stability of the construction pit is also to be monitored as the cumulative impact from all the construction activity taking place simultaneously in the area may lead to moderate adverse impacts. Accidental spillages during transportation or storage of hazardous substances from the various construction sites may also lead to major adverse geological impacts. The deviation of C&D waste from landfill is a beneficial cumulative impact.

5.14.4 Water bodies

About 5% of the total area of Wied Ta' Kieli water catchment basin will be converted from agricultural to industrial area following the full development of the ECOHIVE Complex, which includes the proposed MRF. Although rainwater will be harvested and reused to the extent possible, the capacity of the storage tanks and water treatment facilities may be exceeded during intense storm events, and hence, discharged into the environment. In this chapter, the impact of flooding is assessed by considering the worst-case scenario where no rainfall is harvested.

The cumulative impact of increased runoff volumes induced by the impermeabilization of land was assessed as part of this study and compared to current flood discharge values. This land use scenario at the catchment level leads to an increase in the CN value from 78 to 82. According to Table 58, the full development of the ECOHIVE Complex is likely to generate more than 27.17 m³/s at the outlet of the catchment basin for rainfall events of high probability of occurrence. Increased runoff rates decrease with less likely probabilities of rainfall depths occurrence.

Therefore, the resulting impact of land impermeabilization on runoff flow rates is likely to be moderate adverse generating flash floods.

Table 58: Comparative analysis of runoff rates between current and future development scenarios

	Q(T = 5 YEARS)	Q(T = 50 YEARS)	Q(T = 200 YEARS)
No development or current scenario	3.45 m ³ /s	13.82 m ³ /s	21.62 m ³ /s
Full development of the ECOHIVE Complex	5.63 m ³ /s	18.25 m ³ /s	27.17 m ³ /s
Percentage of increase	63%	32%	26%

5.14.5 Ecology

The proposed developments at ECOHIVE contribute to the fragmentation of agricultural land within the general area, which is being taken up by a series of projects not solely related to waste management but also other government initiatives, such as the development of a second interconnector and ancillary facilities. Fragmentation of agricultural land limits natural ecological processes, particularly for species with wide foraging and general

commuting ranges such as bats and birds. Limiting the agricultural land available to accommodate these species' ranges limits in turn their ability and opportunity to breed successfully, thus capping the population sizes of any resident populations through limited resources both of the available land itself and the services it provides - feeding, watering, roosting, breeding and safe commuting opportunities to name a few.

The onset of continuous construction activities within a previously dark, quiet area of agricultural land indubitably negatively impacted and continues to deter mobile species such as reptiles, birds and bats, which likely will move away from the area and resort to the use of the remaining parcels of agricultural for their roosting, feeding and breeding activities. While agricultural land is not considered to be a protected habitat, it is well-documented that these species make frequent use of this land, particularly where agricultural parcels contain mature trees of various native species, as was the case in the proposed site and the surrounding developments within the ECOHIVE. The cumulative impact of consecutive developments within an area is the subsequent displacement of these species. This impact can be partially mitigated by streamlining the various developments within the complex and avoid sensitive periods particularly for bat and bird species, where feasible.

The displacement of these species into neighbouring agricultural parcels, which over time are made sparser by pockets of development, will inevitably lead to an increased incidence of mortalities through vehicle collisions with protected species, as these will be forced to use increasingly urbanised areas bordered by roads. While this impact is difficult to quantify, road kill and injury reports are undoubtedly on the rise.

ECOHIVE facility design allows for an improved traffic flow of all vehicles related to waste-management in an area which is relatively detached from residential development, thus displacing these impacts away from sensitive receptors. The siting of all developments in close vicinity to other waste management facilities within the ECOHIVE will further streamline operations and minimise land allocation for ancillary facilities, as these can be shared.

5.14.6 Agricultural land

Land around the site is mostly used for dryland agriculture and small-scale livestock production (poultry, rabbits, cattle, pigs, and horses). Irrigated land is found further out, toward Wardija and Gharghur. Livestock are raised intensively in indoor settings, limiting their exposure to air pollutants. Crops are mostly cereals grown for fodder, and environmental factors such as wind direction, terrain, vegetation barriers, and crop type all influence pollutant deposition. While vegetation can act as a filter for particulate matter, long-term effects on crops and soil are difficult to predict without local research.

These crops, due to their narrow leaves and short growth cycle, are less likely to be significantly affected by dust emissions during construction and atmospheric emissions from operation. Vegetation type and structure play a crucial role in capturing airborne particles. Small leaves and dense canopies are more effective at reducing airborne dust, highlighting the importance of surrounding crop types and their management.

Although lodging due to wind and uneven seeding could increase exposure, local environmental conditions such as high vapour pressure deficit and soil moisture deficit help reduce the overall impact. Most of the harvested crop in this area is likely used for bedding rather than fodder, further lowering the risk of pollutant-related damage.

Nevertheless, the proposed development of the MRF in conjunction with the other projects at ECOHIVE complex will result in the irreversible loss of agricultural land, including topsoil and rubble walls as well as the fragmentation of agricultural land. This is expected to give rise to moderate adverse cumulative impacts that contribute to a broader pattern of habitat and ecosystem loss in the Maghtab area, which may lead to increased surface temperatures, flood risk, and environmental degradation.

While some agricultural and ecological impacts are expected from noise pollution, the pollutant-related impacts from the proposed facilities are moderate and generally minor adverse if mitigation measures are implemented. Continuous monitoring during early operational stages is recommended to ensure no unforeseen effects arise.

5.14.7 Archaeology & Cultural Heritage

Given the importance of the cultural landscape, the potential cumulative impacts on known cultural heritage sites within and adjacent to the Aol must be taken into account.

The area of Maghtab is already severely affected by the visual impact of the waste disposal site and other industrial activities. The proposed development and the simultaneous operation of other waste management facilities proposed at ECOHIVE complex, will cause a further deterioration of the cultural landscape and the context associated with the cultural heritage assets identified in this study. As a result, the cumulative impacts are expected to be major adverse.

5.14.8 Noise & Vibrations

A cumulative assessment has been undertaken to determine whether the noise generated by construction and operational noise from all of the proposed and permitted developments in the near vicinity of the Scheme would have a cumulative impact at the nearest human and ecological receptors.

Where applicable the predicted construction noise levels from the projects considered at the relevant NSR have been logarithmically added together to determine the total cumulative construction noise level as shown in Table 59 below.

Table 59: Total Cumulative Construction Noise Level, dB

NOISE SENSITIVE RECEPTOR	PROJECT CONSIDERED AND PREDICTED NOISE LEVEL, L_{Aeq} , 1-HOUR	
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	MAGHTAB WASTE TO ENERGY FACILITY	IC2 DEVELOPMENT	MAGHTAB MATERIAL RECOVERY FACILITY (THE SCHEME)	MAGHTAB THERMAL TREATMENT FACILITY	TOTAL CUMULATIVE LEVEL, dB $L_{Aeq, 1-HOUR}$
NSR01 - Residential Property to the south-east of the Site	43	-	52	52	55
NSR02 - Residential Property to the south of the Site	41	-	54	54	57
NSR03 - Beach area and Nature Reserve located to the north-east of the Site	45	50	35	35	51
NSR04 - Nature Reserve and Hotel Salini to the north-west of the Site	18	-	25	25	28

The total cumulative construction noise level has been compared to the relevant noise limits at each NSR as shown in Table 60.

Table 60: Cumulative Construction Noise Assessment, dB

NOISE SENSITIVE RECEPTOR	TOTAL CUMULATIVE LEVEL, dB $L_{Aeq, 1-HOUR}$	RELEVANT NOISE LIMIT, $L_{Aeq, 1-HOUR}$	DIFFERENCE
NSR01 - Residential Property to the south-east of the Site	55	65 – Category A threshold level from BS5228.	-10
NSR02 - Residential Property to the south of the Site	57	65 – Category A threshold level from BS5228.	-8
NSR03 - Beach area and Nature Reserve located to the north-east of the Site	51	55 – AQTAG09	-4
NSR04 - Nature Reserve and Hotel Salini to the north-west of the Site	28	55 – AQTAG09	-27

The calculated cumulative noise level from construction operations are below the relevant noise limits at all the NSRs considered.

It can be determined that the cumulative level of effect from construction noise would be, in the worst-case *minor*. Where the level of effect is minor, the impact is not significant.

Where applicable the predicted operational specific noise levels (excluding penalties) from the projects considered at the relevant NSR have been logarithmically added to together to determine the total cumulative operational noise level as shown in Table 61.

Table 61: Total Cumulative Operational Noise Level, dB

NOISE SENSITIVE RECEPTOR	ASSESSMENT PERIOD	PROJECT CONSIDERED AND PREDICTED SPECIFIC NOISE LEVEL, LAEQ, 1-HOUR				
		MAGHTAB WASTE TO ENERGY FACILITY	MAGHTAB MATERIAL RECOVERY FACILITY (THE SCHEME)	OPP DEVELOPMENT	MAGHTAB THERMAL TREATMENT FACILITY	TOTAL CUMULATIVE LEVEL, dB L _{AEQ, 1-HOUR}
NSR01	Daytime	32	38	32	36	41
	Night-time	33	35	31	34	40
NSR02	Daytime	28	38	26	32	40
	Night-time	29	32	26	31	36
NSR03	Daytime	36	27	39	32	41
	Night-time	33	25	39	32	41
NSR04	Daytime	14	21	25	19	27
	Night-time	12	18	24	18	26

An assessment of the cumulative operational sound on the closest residential receptors and beach area has been undertaken with reference to BS4142:2014+A1:2019, whereby the sound sources under investigation are compared to existing background sound levels. This assessment has been based on the results of the daytime and night-time baseline noise survey. It has been assumed the beach area will only be utilised in the daytime; a night-time assessment has not been undertaken at this receptor.

With regards to the rating penalties to be applied it is considered that these would mirror those applied within the operational assessment of the Scheme (i.e., +3dB during the daytime for intermittent HGV movements) and no penalties during the night-time.

Based on the above, the cumulative operational assessment for human receptors is shown in Table 62.

Table 62: BS4142:2014+A1:2019 Cumulative Operational Assessment for Human Receptors, dB

ASSESSMENT LOCATION	ASSESSMENT PERIOD	CUMULATIVE SPECIFIC SOUND LEVEL, L_{Aeq}	CUMULATIVE RATING LEVEL, $L_{Ar,T}$	BACKGROUND SOUND LEVEL, L_{A90}	DIFFERENCE
NSR01	Daytime	41	44	41	+3
	Night-time	40	40	36	+4
NSR02	Daytime	40	43	48	-5
	Night-time	36	36	37	-1
NSR03	Daytime	41	44	54	-8

It can be seen from Table 62 that the cumulative rating level at closest residential receptors due to the operation of all the development considered, has been predicted to be below the representative background sound levels at NSR02 and NSR03.

It can be determined that the cumulative level of effect from operational noise at NSR02 and NSR03 would be, in the worst-case *minor*. Where the level of effect is minor, the impact is not significant.

At NSR01 during the daytime, Table 62 indicates that the cumulative rating level is +3dB above the background sound level, it can be determined that the cumulative level of effect from operational noise at NSR01 during the daytime would be minor, where the level of effect is minor, the impact is not significant.

It can also be determined that the cumulative level of effect from operational noise at NSR01 during the night-time is equal to +4dB. The cumulative level of effect from operational noise at NSR01 during the night-time would be *moderate*; where the level of effect is *moderate*, the impact is not defined as significant.

However, with regards to context, the following must be noted:

- The cumulative assessment has considered a worst-case scenario where all the of the developments considered are operating simultaneously with downwind propagation between each source (development) and the receptors.
- If the predicted cumulative specific level (40dB) is logarithmically added to the measured ambient night-time noise level at NSR01 (47dB), the total level would be 48dB, which would not be an audible change¹⁸.

¹⁸ In conjunction with the general principle of acoustics, the minimum dB change audible to the human ear is considered to be +/-3dB

- Accounting for the attenuation provided by a partially open window of 13dB¹⁹ the resultant internal level would be 28dB which is below the internal limit of 30dB for sleep disturbance contained in the World Health Organisation (WHO), *Guidelines for Community Noise Document* (1999)²⁰.

With reference to all of the above, it is considered that once context is taken into account there would not be a significant noise impact from cumulative operational noise at NSR01 during the night-time.

The assessment of cumulative operational sound at NSR03 and NSR04 have been assessed against the guidance levels outlined in AQTAG09.

Table 63: Cumulative Operational Assessment Ecological Receptors

LOCATION	ASSESSMENT PERIOD	CUMULATIVE PREDICTED SPECIFIC LEVEL, DB L _{AEQ,T}	AQTAG09 NOISE LIMIT, DB L _{AEQ,T}	DIFFERENCE, DB
NSR03	Daytime	41	55	-14
	Night-time	41		-14
NSR04	Daytime	27		-28
	Night-time	26		-29

It can be seen from Table 63 that the cumulative specific level at NSR03 and NSR04 due to the operational of all the developments considered has been predicted to be below the AQTAG09 limit.

It can be determined that the cumulative level of effect from operational noise would be, in the worst-case *minor*. Where the level of effect is minor, the impact is not significant.

5.14.9 Infrastructure & Utilities

The integration of multiple waste management facilities with the broader ECOHIVE complex will require the establishment of new tie-in points to connect to existing infrastructure and utility networks. While this may introduce additional loads and operational stresses on shared systems, these impacts are anticipated to be minor and manageable.

To ensure seamless integration and minimise potential disruptions, coordinated discussions will be undertaken between the project proponents, relevant stakeholders, and third-party

¹⁹ Section G1 of BS8233: *Guidance on sound insulation and noise reduction for buildings*, states that if partially open windows were relied upon for background ventilation, the sound insulation would be reduced by approximately 15dB.

²⁰ Also referenced in the WHO *Night Noise Guidelines for Europe* document.

utility and service providers. This collaborative approach will support the development of suitable technical solutions and ensure that the project can be implemented with minimal interference to existing operations.

The introduction of new waste management facilities will strengthen Malta's overall waste management infrastructure. This enhancement is expected to generate positive cumulative effects by increasing national self-sufficiency and reducing reliance on landfilling practices.

5.15 Decommissioning phase

The proposed MRF shall be operating for a period of 20 years. Upon completion of its life cycle, the facility may be terminated instigating decommissioning. The planning for decommission shall begin from the design stage and continue throughout the lifetime of the facility.

In order to minimize potential environmental impacts rising from the decommissioning of the MRF, the planning shall include but not be limited to the following:

- Preparation of an initial decommissioning plan;
- Collection of relevant information and data to facilitate future decommissioning;
- Selection of decommissioning strategy;
- Characterization of the facility;
- Preparation of a final decommissioning plan;
- Estimation of costs;
- Identification of the provision of financial resources for the decommissioning project;
- Submission of the plan to the regulatory body for review and approval;
- Public consultation in accordance with national requirements;
- Consideration of clean up, removal and disposal of materials.

Decommissioning options suitable for the proposed MRF shall include:

- Facility mothballing: its termination involves preserving building structures and machinery in a condition suitable for potential reuse upon reactivation. During this process, government agencies will oversee and regulate access to the industrial site to ensure compliance with relevant regulations. Additionally, contamination at the site will be addressed through rehabilitation and treatment measures.
- Partial facility decommissioning: this approach can be applied in the following scenarios: when a specific section or part of the facility is to be closed, when the facility is extensive and complex, or when the financial and environmental costs of complete decommissioning are prohibitively high. This method involves retaining certain structures and machinery in a state suitable for future reuse, while also addressing environmental contamination and monitoring access to the site in accordance with applicable regulations.

- Complete site decommissioning: it refers to the comprehensive shutdown of an industrial site, encompassing all necessary principles and regulations to safeguard human health and safety, and mitigate environmental risks. This process aims to eliminate or minimize potential hazards associated with the facility's operations and ensure that the site is suitable for future use or redevelopment.

6.0 SUMMARY OF IMPACTS

6.1 Land cover and land use

Table 64: Summary of impacts table - land use

IMPACT TYPE AND SOURCE			IMPACT RECEPTOR		EFFECT AND SCALE							PROBABILITY OF IMPACT OCCURRING	OVERALL IMPACT SIGNIFICANCE	PROPOSED MITIGATION MEASURES	RESIDUAL IMPACT SIGNIFICANCE
IMPACT TYPE	SPECIFIC INTERVENTION LEADING TO IMPACT	PROJECT PHASE	RECEPTOR TYPE	SENSITIVITY & RESILIENCE TOWARDS IMPACT	DIRECT/INDIRECT/CUMULATIVE	EFFECT OF IMPACT BENEFICIAL/ADVERSE	SEVERITY	PHYSICAL/GEOGRAPHIC EXTENT OF IMPACT	SHORT/MEDIUM / LONG TERM	DURATION OF IMPACT TEMPORARY / PERMANENT	REVERSIBLE/IRREVERSIBLE				
Change of land use	Construction of the site	Construction and Operations	Existing agricultural land, practices, and ecological components	High	Direct	Adverse	High	Site	Long term	Permanent	Irreversible	Inevitable	Major	Minimise construction spillover effects and take up of land for temporary storage areas. Include a landscaping element in project design	Major
Dust emissions	Excavation works	Construction	Access roads, adjacent fields and trees	High	Direct	Adverse	Medium	Local surrounding area	Short	Temporary	Reversible	Likely	Minor	Following L.N. 340 of 2022, site hoarding/wetting of working areas, construction monitoring	Negligible
Trampling of vegetation, spills	Spill-over effects of construction works	Construction	Access roads, adjacent fields and trees	High	Indirect	Adverse	Low	Local surrounding area	Short	Temporary	Reversible	Likely	Minor	Following L.N. 340 of 2022, Construction monitoring, restoring natural areas, compensating loss of species & communication with nearby owners	Negligible

Increased pollution	Use of construction vehicles, Increased flow of waste carriers	Construction and Operations	Surrounding agricultural land	High	Direct	Adverse	Medium	Local surrounding area	Medium	Long term	Permanent	Irreversible	Moderate	Minimising vehicle idling times, spill trays underneath construction equipment, Planting of windbreaker species adjacent to access road	Minor
Extreme events	Oil leaks/ spills, accidents, flooding, fires, site failure etc.	Construction and Operations	Existing roads and adjacent tree plantations and agricultural land	High	Direct	Adverse	High	Local surrounding area	Medium	Temporary	Reversible	Remote	Moderate	Emergency Response Plan and prevention practices in place before start of operations	Minor

6.2 Landscape Character and Visual Amenity

Table 65: Summary of impacts table - Landscape

IMPACT TYPE AND SOURCE			IMPACT RECEPTOR		EFFECT AND SCALE							PROBABILITY OF IMPACT OCCURRING	OVERALL IMPACT SIGNIFICANCE	PROPOSED MITIGATION MEASURES	RESIDUAL IMPACT SIGNIFICANCE	OTHER REQUIREMENTS
IMPACT TYPE	SPECIFIC INTERVENTION LEADING TO IMPACT	PROJECT PHASE	RECEPTOR TYPE	SENSITIVITY & RESILIENCE TOWARDS IMPACT	DIRECT/INDIRECT/CUMULATIVE	BENEFICIAL/ADVERSE	SEVERITY	PHYSICAL/ GEOGRAPHIC EXTENT OF IMPACT	SHORT/ MEDIUM/ LONG TERM	TEMPORARY/ PERMANENT	REVERSIBLE/ IRREVERSIBLE					
Deterioration of the landscape value during construction works at VP1 to VP7	Presence of construction and excavation machinery, cranes; dust; noise; vibration and associated works	Construction & Excavation	Landscape elements	High	Direct	Adverse	Medium	Site and immediate surroundings	Medium	Temporary	Irreversible	Certain	Major	Adherence to Construction Site Regulations S.L.623.08 to reduce visual and landscape inconveniences such as dust dispersion, noise & vibration	Moderate	N/A
Reduced visual amenity during construction works at VP1, VP3, VP4, & VP7	Presence of construction and excavation machinery, cranes; dust; noise; vibration and associated works	Construction & Excavation	Residents, Farmers, Workers, Motorists, Passengers, Recreational activities: campers, joggers, cyclist, casual strollers	High	Direct	Adverse	Medium	Site and immediate surroundings	Medium	Temporary	Irreversible	Certain	Major		Moderate	N/A
Reduced visual amenity during construction works at VP2, VP5 & VP6		Construction & Excavation		High	Direct	Adverse	Medium	Site and immediate surroundings	Medium	Temporary	Irreversible	Certain	Moderate		Minor	N/A
Deterioration of the landscape value during operations at VP1 to VP7	Presence of MRF Building at ECOHIVE complex and take up of agricultural land	Construction & Excavation	Landscape elements	High	Direct	Adverse	Medium	Site and immediate surroundings	Medium	Permanent	Irreversible	Certain	Major	Earth-toned colours which blend with the surroundings should be used on the building façade.	Major (slight reduction)	N/A
Reduced visual amenity during operations at VP4, VP5 & VP7	Presence of MRF Building at ECOHIVE complex and take up of agricultural land	Operation	Residents, Farmers, Workers, Motorists, Passengers,	High	Direct	Adverse	Medium	Site and immediate surroundings	Long	Permanent	Irreversible	Certain	Major		Major (slight reduction)	N/A
Reduced visual amenity during operations at VP3 & VP6		Operation	Recreational activities: campers, joggers, cyclist, casual strollers	High	Direct	Adverse	Medium	Site and immediate surroundings	Long	Permanent	Irreversible	Certain	Moderate		Moderate (slight reduction)	N/A
Reduced visual amenity during operations at VP1 & VP2		Operation		High	Direct	Adverse	Medium	Site and immediate surroundings	Long	Permanent	Irreversible	Certain	Minor		Minor (slight reduction)	N/A

Sustained light pollution at VP1 to VP7	External lighting	Operation	Residents & nearby fauna	High	Direct	Adverse	High	Site and immediate surroundings	Long	Temporary	Reversible	Unlikely	Minor	Strategic placement of external light systems; Shielded and downward lights to avoid residual light pollution.	Negligible	N/A
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6.3 Geology, Geomorphology, Hydrogeology and Soils

Table 66: Summary of impacts table - geology

Impact Type and Source			Impact Receptor		Effect and Scale							Probability of Impact Occurring (Inevitable/ Likely/ Unlikely/ Remote/ Uncertain)	Overall Impact Significance	Proposed Mitigation Measures	Residual Impact Significance	Other Requirements
Impact Type	Specific Intervention Leading to Impact	Project Phase	Receptor Type	Sensitivity & Resilience Towards Impact	Direct/ Indirect / Cumulative	Beneficial/ Adverse	Severity	Physical/ Geographic Extent of Impact	Short/ Medium/ Long Term	Temporary/ Permanent	Reversible/ Irreversible					
Geology: loss of rock strata	Excavation	Construction	Mineral resources	Low	Direct and cumulative	Adverse	High	Localised	Long term	Permanent	Irreversible	Inevitable	Major	Reuse and recycle	Moderate	
Geomorphology: degradation /destruction of surface features	Excavation	Construction	Landscape	Low	Direct and cumulative	Adverse	High	Localised	Long term	Permanent	Irreversible	Inevitable	Moderate	Partial reintegration through soft landscaping	Minor	
Dust Emissions from demolition, excavation of rock, construction of structures, storage of materials and soil, and the use of heavy machinery and vehicles.	Excavation	Construction	Landscape	Low	Direct and cumulative	Adverse	Moderate	Localised	Short term	Temporary	Reversible	Unlikely	Minor	Haulage of excavated material in covered trucks. Use water or pre-soaking to control dust. Remove accumulations of dust on surfaces. Use barriers to contain dust emissions. Dust extraction and recovery of dust from equipment.	Minor	
Loss of soils	Excavation	Construction	Agriculture and landscape	High	Direct and cumulative	Adverse	High	Localised	Long term	Permanent	Reversible	Inevitable	Minor	Reuse and recycle	Minor	
Stability of the walls of the excavation	Excavation	Construction	Operatives and 3 rd party property	High	Direct	Adverse	High	Localised	Short term	Temporary	Reversible	Uncertain	Major	Monitor closely during excavation and stabilize if necessary	Minor	
Dust Generation from construction site activities that may influence the surrounding water bodies	Excavation	Construction	Rock pools and coastal waters	High	Direct	Adverse	Low	Localised	Short term	Temporary	Reversible	Remote	Minor	There should be no stacked excavation material that could be washed away by run-off during the rainy season	Minor	
Silting	Excavation	Construction	coastal waters	High	Direct	Adverse	Low	Localised	Short term	Temporary	Reversible	Remote	Minor	Contain, slow, or filter sediment before it spreads. Use localized silt traps, fences or channels to reduce the impact.	Minor	

Contamination of rock to be excavated from the site for potential backfilling or dumping	Excavation	Construction	Mineral resource	High	Direct	Adverse	Low	Localised	Short term	Temporary	Reversible	Likely	Minor	Material to be excavated from A1, D1 and F1 should be kept apart and reused as backfill on site due to exceedances noted. Only material excavated from the area around J1 may be considered for recovery in an authorized quarry.	Minor	
Spillage due to a major incident during loading/unloading and transport by run-off	Operation of the MRF plant	Operation	Groundwater and coastal waters	Low	Direct	Adverse	Moderate	Localised	Short term	Temporary	Reversible	Unlikely	Moderate	Care during operation of the plant-employ experienced operatives	Minor	
Seawater intrusion due to loss of recharge of aquifer from the paving of the site, generating additional runoff	MRF Plant	Operation	Groundwater	Low	Direct	Adverse	High	Localised	Long term	Temporary	Reversible	Unlikely	Moderate	Groundwater beneath the site is brackish. The paved area compared to the potential recharge area is relatively small. Use of 2 nd class water for irrigation may indirectly mitigate recharge.	Minor	
Application of pesitcides and fertilizer for landscaped area maintenance	MRF Plant	Operation	Groundwater, coastal waters & soil	Low	Direct	Adverse	Moderate	Localised	Long term	Temporary	Reversible	Unlikely	Minor	Use environmentally friendly chemicals and biological control treatment methods. Use chemicals in limited quantities to prevent excessive leaching or runoff.	Minor	

6.4 Water bodies

Table 67: Summary of impacts table – water bodies

Impact Type and Source			Impact Receptor		Effect and Scale							Probability of Impact Occurring (Inevitable/Likely/Unlikely/Remote/Uncertain)	Overall Impact Significance	Proposed Mitigation Measures	Residual Impact Significance	Other Requirements
Impact Type	Specific Intervention Leading to Impact	Project Phase	Receptor Type	Sensitivity & Resilience Towards Impact	Direct/Indirect / Cumulative	Beneficial/Adverse	Severity	Physical/Geographic Extent of Impact	Short/Medium/Long Term	Temporary/Permanent	Reversible/Irreversible					
Dust emissions	Excavation	Construction	Runoff and seawater	Low	Direct	Adverse	Moderate	Catchment	Short term	Temporary	Reversible	Likely	Moderate	Cart excavation material away as soon as it is generated for reuse or disposal depending on outcome of contamination study	Minor	
Dust emissions	Storage of Excavation material	Construction	Runoff and seawater	Low	Direct	Adverse	Moderate	Catchment	Short term	Temporary	Reversible	Likely	Moderate	Dust-suppression measures may be considered to minimize wind-blown dispersion. These include use of silt fences, collection of fine particulates generated during any on-site working of stone, covering of stored material, and controlled water-spraying of active areas	Minor	
Contamination of runoff and groundwater	Storage of recyclable waste and rejects	Construction	Runoff and groundwater	Low	Direct	Adverse	High	Subsurface and Catchment downstream of the site	Long term	Temporary	Reversible	Unlikely	Moderate	Run-off system collection and adequate discharge in compliance with applicable legislation.	Minor	
Spillage of sewer and other fluids produced during the operation of the MRF plant and transport by run-off.	Operation of the MRF plant	Operation	Groundwater and coastal waters	Low	Direct	Adverse	Moderate	Downstream catchment of the site and coastal waters	Short term	Temporary	Reversible	Unlikely	Minor	No hazardous substances should be stored on site	Minor	

Spillage due to a major incident during loading/unloading and transport by run-off	Operation of the MRF plant	Operation	Ground water and coastal waters	Low	Direct	Adverse	moderate	Downstream catchment of the site and coastal waters	Short term	Temporary	Reversible	Unlikely	Minor	Care during operation of the plant-employ experienced operatives. Handling area shall be impermeable	Minor	
Use of Pesticides and fertilisers	Landscape areas	Operation	Ground water and runoff	high	Direct	Adverse	moderate	Downstream catchment of the site and groundwater	Short term	Temporary	Reversible	Unlikely	Moderate	Use of environment friendly pesticides and fertilizers in the appropriate amounts	Minor	

6.5 Ecology - Terrestrial

Table 68: Summary of Impacts – Terrestrial ecology

Impact Type and Source			Impact Receptor		Effect and Scale							Probability of impact occurring (inevitable/likely/unlikely/remote/uncertain)	Overall impact significance	Proposed mitigation measures	Residual impact significance	Other requirements
Impact type	Specific intervention leading to impact	Project phase	Receptor type	Sensitivity & resilience towards impact	Direct/indirect/cumulative	Beneficial/adverse	Severity	Physical/geographic extent of impact	Short/medium/long term	Temporary/permanent	Reversible/irreversible					
Destruction of habitats and species (circa 244 individuals)	Excavation, backfilling	Construction	Vegetation & Fauna	High	Direct	Adverse	High	Localised	Long-term	Permanent	Irreversible	Inevitable	Major	Transplanting trees where possible, compensatory planting as an alternative. Monitoring construction activities to minimise avoidable impacts	Moderate	N/A
Dust generation	Excavation, backfilling, building construction	Construction	Vegetation & Fauna	Moderate	Direct	Adverse	Moderate	Localised	Short-term	Temporary	Reversible	Likely	Minor	Dust suppression techniques, controlled storage and transport of materials, regular clearing of affected areas, construction monitoring	Negligible	N/A
Runoff spreading particles & contaminants to sea	Excavation, backfilling, building construction	Construction	Marine life	Moderate	Direct	Adverse	Moderate	Localised	Short-term	Temporary	Reversible	Likely	Minor	Site containment measures to prevent rainwater discharge from the site with high turbidity and/or contamination (chemical bunding and waste handling)	Negligible	N/A

Light & Noise	Excavation, backfilling, building construction	Construction	Fauna	High	Direct	Adverse	Moderate	Local and near vicinity	Short-term	Temporary	Reversible	Likely	Minor	Works will be limited to daylight hours. Use of lighting for safety reasons should be limited to downward facing, shielded and low-frequency lights. Equipment well maintained to avoid excessive noise.	Negligible	N/A
Light, Air Pollution & Noise	Operation of the MRF	Operation	Vegetation & Fauna	High	Direct	Adverse	Moderate	Local and near vicinity	Long-term	Permanent	Irreversible	Likely	Minor	Minimising noise spillover by using BAT and keeping apertures shut during operational hours. Ensure equipment is well-maintained and within national emission limits. Limit night-time lighting to the bare minimum and use of down-facing lights.	Negligible	N/A

6.6 Ecology - Avifauna

Table 69: Summary of impacts Table - Avifauna

Impact Type and Source			Impact Receptor		Effect & Scale							Probability of Impact Occurring	Overall Impact Significance	Proposed Mitigation Measures	Residual Impact Significance	Other Requirements
Impact Type	Specific Intervention Leading to Impact	Project Phase	Receptor Type	Sensitivity & Resilience toward Impact	Direct/Indirect/Cumulative	Beneficial / Adverse	Severity	Physical/Geographic Extent of Impact	Short-/Medium-/Long-term	Temporary/Permanent	Reversible / Irreversible					
Loss of habitat for terrestrial avian species	Destruction of (disused) agricultural land in ODZ	Construction	Terrestrial avian species	High & Low	Direct	Adverse	Low	Local in footprint and Aol-1	Long-term	Permanent	Reversible	Inevitable	Moderate	Keep trampling and spillover effects into the adjacent rural areas from the construction works contained to the works area. Apply landscaping	Minor	N/A
Noise, vibration, and light pollution negatively affecting terrestrial avian assemblages in Aol-1	Construction activities, operation	Construction	Terrestrial avian species	Moderate & Moderate	Direct	Adverse	Low	Local, in footprint and Aol-1	Short term	Temporary	Reversible	High	Moderate	Limit night-time activities, reduce light pollution, avoid (if possible) sensitive periods	Minor	N/A
Light pollution negatively impacting nocturnally migrating birds	Lighting during construction	Construction	Nocturnally migrating birds	Moderate & Moderate	Direct	Adverse	Low	Broad (Aol-1 and Aol-2)	Short-term	Temporary	Reversible	High	Moderate	Limit night-time activities, reduce light pollution, avoid (if possible) sensitive periods	Minor	N/A

Colony disturbance grounding of seabird fledgling, associated induced mortality caused by ALAN	Lighting during construction and operation	Construction, operation	Procellariiform seabirds, specifically <i>P. yelkouan</i>	High & Low	Direct	Adverse	High	Broad (Aol-2)	Short-term, potentially long term	Temporary, potentially permanent	Reversible	High	Major	Limit night-time activities, reduce light pollution, avoid (if possible) sensitive periods.	Minor	Strictly follow guidelines for the reduction of light pollution
Loss of habitat for terrestrial avian species	Destruction of (disused) agricultural land in ODZ	Operation	Terrestrial avian species	High & Low	Direct	Adverse	High	Local in footprint and Aol-1	Long-term	Permanent	Irreversible	Inevitable	Moderate	Breeding and foraging habitat loss is minimised through landscaping and compensated with nesting installations.	Minor	N/A
Exposure of (marine) avifauna to macro-/microplastics, other harmful substances	Spills, leakage of material from MRF into the environment during standard operations including transport or during accidents	Operation	Marine avian species and others	High & Low	Direct	Beneficial (as compared to current open landfill situation)	high	Broad (Aol-2 and beyond)	Long term	Permanent	Reversible	Inevitable	Moderate	N/A	Moderate	N/A
Contribution or otherwise to climate change, impacting biodiversity	Reduction in methane from open landfill, reduction in CO2	Operation	Biotic and abiotic environment	Moderate & Moderate	Indirect/Cumulative	Beneficial	Moderate	Very broad	Long-term	Permanent	Reversible, with difficulty	High	Moderate	N/A	Moderate	N/A
Risk of fire at the MRF from storing and processing large amounts of flammable material	Toxins in the plume and runoff from firefighting water released into environment harmful for avifauna	Operation	Avian species and other taxa (including humans) in the Aols	High and low	Indirect	Adverse	High	Broad (Aol-2)	Short-term, potentially long term	Temporary, potentially permanent	Reversible, with difficulty	Low	Major	Implementation of highest standards for fire prevention and response, catchment facilities for fire-fighter water runoff	Minor	N/A

6.7 Agricultural Land

Table 70: Summary of Impacts Table – Agriculture

Impact Type and Source			Impact Receptor		Effect & Scale							Probability of Impact Occurring (Inevitable/ Likely/ Unlikely/ Remote/ Uncertain)	Overall Impact Significance	Proposed Mitigation Measures	Residual Impact Significance	Other Requirements
Impact Type	Specific Intervention Leading to Impact	Project Phase (Construction/ Operation/ Decommissioning)	Receptor Type	Sensitivity & Resilience toward Impact	Direct/ Indirect/ Cumulative	Beneficial / Adverse	Severity	Physical/ Geographic Extent of Impact	Short-/ Medium-/ Long-term	Temporary (Indicate Duration) / Permanent	Reversible (Indicate Ease of Reversibility)/ Irreversible					
Agriculture	Land taken up Wasteserv expansion	Construction & operation	Agricultural land	Moderate	Direct	Adverse	Major	Development area	Long-term	Permanent	Irreversible	Inevitable	Major	Adherence to PA and ERA conditions and instructions to protect surrounding areas	Major to moderate	None
Agriculture	Clearing and building	Construction	Agricultural land	High	Direct	Adverse	Major	Development area	Long-term	Permanent	Irreversible	Inevitable	Major	Adherence to PA and ERA conditions and instructions to protect surrounding areas	Moderate	None

6.8 Archaeology & Cultural Heritage

Table 71: Summary of impacts table – Archaeology & Cultural Heritage

Impact Type and Source			Impact Receptor		Effect & Scale							Probability of Impact Occurring (Inevitable/ Likely/ Unlikely/ Remote/ Uncertain)	Overall Impact Significance	Proposed Mitigation Measures	Residual Impact Significance	Other Requirements
Impact Type	Specific Intervention Leading to Impact	Project Phase (Construction/ Operation/ Decommissioning)	Receptor Type	Sensitivity & Resilience toward Impact	Direct/ Indirect/ Cumulative	Beneficial / Adverse	Severity	Physical/ Geographic Extent of Impact	Short-/ Medium-/ Long-term	Temporary (Indicate Duration) / Permanent	Reversible (Indicate Ease of Reversibility)/ Irreversible					
Loss of features and change in the context and cultural landscape	Excavation works – Superficial demolition/ dismantling of rural structures and dry-stone huts	Construction	Identified cultural features	High	Direct	Adverse	High	Limited	Long term	Permanent	Irreversible	Likely	Major	Relocation of significant features if technically possible and as instructed by the SCH.	Moderate	N/A
Potential damage to cultural and/or archaeological features below the ground:	Excavations works – Below the ground	Construction	Unknown potential archaeological features	High	Direct	Adverse	High	Limited	Long term	Permanent	Irreversible	Uncertain	Major	Constant monitoring and use of sensitive construction methods. Maintain a distance of 50m from listed features to ensure safety.	Moderate (depending on the outcome of the proposed interventions)	N/A
Potential damage to Scheduled sites	Excavations works	Construction	Taz-Żebbuġija Megaliths and Ta’ Hammud site	High	Indirect	Adverse	High	Limited	Medium	Temporary	Reversible	Unlikely	Negligible	Use of sensitive construction methods.	Negligible	N/A

Deterioratio n of the cultural landscape value	Presence of MRF Building at ECOHIVE Complex	Operation	Ta’ Hammud site, Taz- Zebbugija and surroundin gs	High	Direct	Adverse	High	Site and immediate surrounding s	Long term	Permanent	Irreversible	Certain	Major	Earth-toned colors should be used on the building façade and introduction of elements of landscaping to reduce the impact of the building	Major (slight reduction)	N/A
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6.9 Noise & Vibration

Table 72: Summary of impacts table – Noise & Vibration

IMPACT TYPE AND SOURCE			IMPACT RECEPTOR		EFFECT & SCALE							PROBABILITY OF IMPACT OCCURRING (INEVITABLE/ LIKELY/ UNLIKELY/ REMOTE/ UNCERTAIN)	OVERALL IMPACT SIGNIFICANCE	PROPOSED MITIGATION MEASURES	RESIDUAL IMPACT SIGNIFICANCE	OTHER REQUIREMENTS
IMPACT TYPE	SPECIFIC INTERVENTION LEADING TO IMPACT	PROJECT PHASE (CONSTRUCTION/ OPERATION/ DECOMMISSIONING)	RECEPTOR TYPE	SENSITIVITY & RESILIENCE TOWARD IMPACT	DIRECT/ INDIRECT/ CUMULATIVE	BENEFICIAL / ADVERSE	SEVERITY	PHYSICAL/ GEOGRAPHIC EXTENT OF IMPACT	SHORT-/ MEDIUM-/ LONG-TERM	TEMPORARY (INDICATE DURATION) / PERMANENT	REVERSIBLE (INDICATE EASE OF REVERSIBILITY)/ IRREVERSIBLE					
Noise	Site preparation	Construction	Residential /Human	Medium	Direct	Adverse	Low	Approx 100m from each boundary of the Site*	Short (19-months)	Temporary	Reversible (temporary noise)	Inevitable	Minor	Follow construction good practice	Not significant	N/A
Noise	Site preparation	Construction	Wildlife Habitat	Medium	Direct	Adverse	Low	Approx 300m from each boundary of the Site**	Short (19 months)	Temporary	Reversible (temporary noise)	Inevitable	Not significant	Follow construction good practice	Not significant	N/A
Noise	Operational Plant and On-site Vehicle Movements	Operation	Residential /Human	High – Night-time Medium - Daytime	Direct	Adverse	Low	Approx 400m from each boundary of the Site***	Long-term	Permanent	Irreversible	Inevitable	Not significant	No addition measures proposed other than those embedded into the scheme	Not significant	N/A
Noise	Operational Plant and On-site Vehicle Movements	Operation	Wildlife Habitat	Medium	Direct	Adverse	Low	Approx 100m from each boundary of the Site****	Long-term	Permanent	Irreversible	Inevitable	Not significant	No addition measures proposed other than those embedded into the scheme	Not significant	N/A

* At distances greater than 100m from the Site boundary the predicted construction noise level falls below the 65dB Construction Noise Limit Threshold for Human Receptors

** At distances greater than 300m from the Site boundary the predicted construction noise level falls below the 55dB AQTAG Limit for Ecological Receptors

*** Distance from boundary of the Site to the nearest human receptor (NSR01)

**** At distances greater than 100m from the Site boundary the predicted operational noise level falls below the 55dB AQTAG Limit for Ecological Receptors

6.10 Infrastructure & Utilities

Table 73: Summary of impacts table – Infrastructure & utilities

IMPACT TYPE AND SOURCE			IMPACT RECEPTOR		EFFECT AND SCALE							PROBABILITY OF IMPACT OCCURRING	OVERALL IMPACT SIGNIFICANCE	PROPOSED MITIGATION MEASURES	RESIDUAL IMPACT SIGNIFICANCE	OTHER REQUIREMENTS
IMPACT TYPE	SPECIFIC INTERVENTION LEADING TO IMPACT	PROJECT PHASE	RECEPTOR TYPE	SENSITIVITY & RESILIENCE TOWARDS IMPACT	DIRECT/ INDIRECT/ CUMULATIVE	BENEFICIAL/ ADVERSE	SEVERITY	PHYSICAL/ GEOGRAPHIC EXTENT OF IMPACT	SHORT/ MEDIUM/ LONG TERM	TEMPORARY/ PERMANENT	REVERSIBLE/ IRREVERSIBLE					
Potential interruptions of second interconnector cable	Dust-generating activities, traffic	Construction	National power supply	High	Direct & Indirect	Adverse	High	National	Medium	Temporary	Reversible	Remote	Negligible	N/A	Negligible	N/A
Damage to existing infrastructures/utilities	Mechanical damage	Construction	Existing infrastructure and utilities within the access route	High	Direct	Adverse	Low	Local	Short	Temporary	Reversible	Unlikely	Moderate	Liaison between WSM and contractor, Precautions taken	Minor	N/A
Damage to existing infrastructures /utilities	Dust-generating activities	Construction	Existing infrastructure and utilities within the buffer zone	Medium	Indirect	Adverse	Medium	Local	Short	Temporary	Reversible	Unlikely	Minor	Liaison between WSM and contractor, Dust-mitigation measures	Negligible	N/A
Interruptions to water and electricity supply	Connection of services to electricity grid & water network	Construction	Existing facilities within the ECOHIVE Complex	Medium	Direct	Adverse	Medium	Local	Short	Temporary	Reversible	Inevitable	Minor	Liaison between WSM and contractor	Negligible	N/A
Increase in Malta's waste recovery capacity	Operation of a new MRF	Operation	Existing waste recovery capacity	High	Direct	Beneficial	High	National	Long	Permanent	Irreversible	Inevitable	Major	N/A	Major	N/A
Increased load on national electricity grid	Operation of a new MRF	Operations	National electricity grid	Low	Cumulative	Adverse	Low	National	Long-term	Permanent	Irreversible	Inevitable	Negligible	Direct liaison between WSM and Enemalta regarding the connections and loads	Negligible	N/A
Increased load on national potable water and sewage systems	Operation of a new MRF	Operations	National sewage and potable water network	Low	Cumulative	Adverse	Low	National	Long-term	Permanent	Irreversible	Inevitable	Minor	Direct liaison between WSM and Water Services Corporation regarding connections and loads	Negligible	N/A

6.11Climate change and climate adaptation

Table 74: Summary of expected impacts – climate change & adaptation

Impact Type and Source			Impact Receptor		Effect and Scale							Probability of Impact Occurring	Overall Impact Significance	Proposed Mitigation Measures	Residual Impact Significance	Other Requirements
Impact Type	Specific Intervention Leading to Impact	Project Phase	Receptor Type	Sensitivity Towards Impact	Direct/ Indirect/ Cumulative	Beneficial/ Adverse	Severity	Physical/ Geographic Extent of Impact	Short/ Medium/ Long Term	Temporary/ Permanent	Reversible/ Irreversible					
Release of GHG emissions from construction machinery, equipment, transportation of raw materials, extraction and production of materials	Works on site	Construction	Climate	High	Direct	Adverse	Medium	Global	Short	Temporary	Reversible	Likely	Minor	Turn off idle engines, optimise transportation and site logistics	Negligible	N/A
Reduced groundwater recharge & flooding	Urbanisation in a rural area	Operational	Climate	High	Indirect	Adverse	Medium	Local	Medium	Permanent	Irreversible	Unlikely	Minor	Rainwater harvesting systems and flood control mechanisms	Negligible	N/A
Reduced GHG emissions from operations due to improved recycling performance	Recycling and diversion from landfills	Operational	Climate	High	Direct	Beneficial	Medium	Global	Long	Permanent	Reversible	Likely	Minor	N/A	Minor	N/A

6.12Cumulative impacts

Table 75: Cumulative impacts

Impact Type and Source			Impact Receptor		Effect and Scale							Probability of impact occurring (Inevitable/ Likely/ Unlikely/ Remote/ Uncertain)	Overall Impact Significance	Proposed Mitigation Measures	Residual Impact Significance	Other Requirements
Impact Type	Specific Intervention Leading to Impact	Project Phase	Receptor Type	Sensitivity & Resilience Towards Impact	Direct/ Indirect/ Cumulative	Beneficial/ Adverse	Severity	Physical/ Geographic Extent of Impact	Short/ Medium/ Long Term	Temporary/ Permanent	Reversible/ Irreversible					
Change of land use & loss of natural land including flora (trees), fauna and habitats	Construction of the site	Construction	Existing agricultural land and ecological components	High	Direct	Adverse	High	Site	Long term	Permanent	Irreversible	Inevitable	Major	Implement the landscaping element proposed in the project design.	Major	Change of land use
Deterioration of the landscape value during construction works at VP1 to VP7	Presence of construction and excavation machinery, cranes; dust; noise; vibration and associated works	Construction & Excavation	Landscape elements	High	Direct	Adverse	Medium	Site and immediate surroundings	Medium	Temporary	Irreversible	Certain	Major	Adherence to Construction Site Regulations S.L.623.08 to reduce visual and landscape inconveniences such as dust dispersion, noise & vibration	Moderate	N/A
Reduced visual amenity during construction works at VP1, VP3, VP4, & VP7	Presence of construction and excavation machinery, cranes; dust; noise; vibration and associated works	Construction & Excavation	Residents, Farmers, Workers, Motorists, Passengers, Recreational activities: campers, joggers, cyclist, casual strollers	High	Direct	Adverse	Medium	Site and immediate surroundings	Medium	Temporary	Irreversible	Certain	Major		Moderate	N/A
Reduced visual amenity during construction works at VP2, VP5 & VP6		Construction & Excavation		High	Direct	Adverse	Medium	Site and immediate surroundings	Medium	Temporary	Irreversible	Certain	Moderate		Minor	N/A

Deterioration of the landscape value during operations at VP1 to VP7	Presence of MRF Building at ECOHIVE complex and take up of agricultural land	Construction & Excavation	Landscape elements	High	Direct	Adverse	Medium	Site and immediate surroundings	Medium	Permanent	Irreversible	Certain	Major		Major (slight reduction)	N/A
Reduced visual amenity during operations at VP1 to VP7	Presence of MRF Building at ECOHIVE complex and take up of agricultural land	Operation	Residents, Farmers, Workers, Motorists, Passengers, Recreational activities: campers, joggers, cyclist, casual strollers	High	Direct	Adverse	Medium	Site and immediate surroundings	Long	Permanent	Irreversible	Certain	Major	Earth-toned colours which blend with the surroundings should be used on the building façade.	Major (slight reduction)	N/A
Sustained light pollution at VP1 to VP7	External lighting	Operation	Residents & nearby fauna	High	Direct	Adverse	High	Site and immediate surroundings	Long	Temporary	Reversible	Unlikely	Minor	Strategic placement of external light systems; Shielded and downward lights to avoid residual light pollution.	Negligible	N/A
Loss of rock strata & soil	Excavation	Construction	Mineral resources	Low	Direct and cumulative	Adverse	High	Localised	Long term	Permanent	Irreversible	Inevitable	Moderate	Reuse or recycle excavated waste	Minor	-
Dust dispersion	Excavation and building structure	Construction	Landscape and human health	Low	Direct	Adverse	High	Widespread	Short term	Temporary	Reversible	Likely	Major	Site hoarding, dust suppression techniques, silt traps, etc.	Minor	There should be no stocked material that could be washed away by run-off during the rainy season
Stability of construction pit	Building structure	Construction	Operatives and third parties' property	High	Direct	Adverse	High	Localised	Long term	Temporary	Reversible	Uncertain	Moderate	Monitor closely during excavation and stabilize if necessary. Silt traps to improve sediment control	Negligible	Monitoring structure settlements by competent geologist or geotechnical engineer
Spillages	Incident during transportation or storage of hazardous substances from construction sites and other facilities	Construction	Geological strata, soils, and watercourses	High	Direct	Adverse	High	Widespread	Long term	Temporary	Reversible	Likely	Major	Spill kits, hazardous substance storage areas, bunding systems, oil-water interceptors.	Minor	An emergency plan should be followed
Flooding	Paving agricultural areas – increase of runoff flow rates	Operation	Water Catchment	Moderate	Indirect and cumulative	Adverse	Moderate	Widespread (catchment)	Short	Temporary	Reversible	Likely	Moderate	The sought mitigation measures result unfeasible.	Moderate	-

Fragmentation of agricultural land	Construction of new facility within agricultural land	Construction	Flora & Fauna	High Sensitivity, Low Resilience	Direct	Adverse	Moderate	Site and General Vicinity	Long-term	Permanent	Irreversible	Inevitable	Moderate	N/A	Moderate	N/A
Loss of agricultural land and foraging areas	Construction of new facility within agricultural land	Construction	Flora & Fauna	High Sensitivity, Low Resilience	Direct	Adverse	Moderate	Site	Long-term	Permanent	Irreversible	Inevitable	Moderate	Minimise construction spillover effects into adjacent land due to temporary storage areas	Moderate	N/A
Continuous disturbance within dark / quiet agricultural areas	Noise-generating construction activities	Construction	Fauna	High Sensitivity, Moderate Resilience	Direct	Adverse	High	Site and General Vicinity	Cumulatively long-term, Short-term for site	Temporary	Reversible	Inevitable	Moderate	Streamlining of construction activities between sites, avoiding sensitive periods for bird and bat species	Minor	N/A
Deviation of C&D Waste from Inert Landfills	Excavation and Backfilling	Construction	National Waste Management	High sensitivity, Low Resilience	Direct	Beneficial	N/A	National	Long-term	Permanent	Irreversible	Inevitable	Minor	Mitigation is inherent of project design	Minor	N/A
Expanded capacity for recycling & reduction of landfilling practices	Increased national capacity for waste treatment	Operations	National Waste Management	High Sensitivity, Low Resilience	Direct	Beneficial	N/A	National	Long-term	Permanent	Irreversible	Inevitable	Moderate	N/A	Moderate	N/A
Emissions from WtE and TTF stacks	Hazardous waste incineration plant and the emissions from the waste plants	Operation	R27 (Agricultural land)	High	Direct	Adverse	High	Immediate surroundings	Long-term	Temporary combustion phases	Reversible with some difficulty	Remote	Minor	Monitoring of the pollutants levels around the Scheme to ensure that they are within limits, and periodic monitoring and maintenance of the abatement technologies	Minor (slight reduction)	N/A
Odour and atmospheric emissions from the storage and transport of waste	New waste plants proposed at ECOHIVE, particularly those handling organic wastes	Operation	Employees & Residents in Maghtab area	High	Direct	Adverse	High	Immediate surroundings	Long term	Permanent	Reversible with some difficulty	Likely	Moderate	Use of best available techniques to minimise odour and atmospheric releases from the handling, storage and transport of such waste	Minor	N/A
Loss of features and change in the context and cultural landscape	Excavation works – Superficial demolition/dismantling of rural structures	Construction	Identified cultural features (A,B and rubble walls)	High	Direct	Adverse	High	Limited	Long term	Permanent	Irreversible	Likely	Major	Integration or Relocation of significant features if technically possible	Moderate (depending on the outcome of proposed mitigation strategies)	N/A

Cumulative noise impact	Operational Plant and On-site Vehicle Movements	Operation	Residential/Human	High – Night-time Medium - Daytime	Direct	Adverse	Low	Approx 400m from each boundary of the Site	Long-term	Permanent	Irreversible	Inevitable	Minor	No additional measures proposed other than those embedded into the scheme and with reference to BAT.	Negligible	Operational Plant and On-site Vehicle Movements
Cumulative noise impact	Operational Plant and On-site Vehicle Movements	Operation	Avifauna	High – Night-time Medium - Daytime	Direct	Adverse	Low	Approx 400m from each boundary of the Site	Long-term	Permanent	Irreversible	Inevitable	Negligible	No additional measures proposed other than those embedded into the scheme and with reference to BAT.	Negligible	Operational Plant and On-site Vehicle Movements
Interruptions to water and electricity supply	Connection of services to electricity grid & water network	Construction	Existing facilities within the ECOHIVE complex	Medium	Direct	Adverse	Medium	Local	Short	Temporary	Reversible	Inevitable	Minor	Liaison between WSM and contractor	Negligible	N/A

7.0 MITIGATION MEASURES, RESIDUAL IMPACTS AND MONITORING PROGRAMME

7.1 Mitigation measures

7.1.1 Land cover and land uses

During the construction phase, the following mitigation measures will be put in place:

- Containing the construction footprint to the designated area only
- Use of equipment and methods that minimise the generation of dust
- Dust mitigation measures such as site hoarding with dust curtains in place around the trench, wetting of the working area, etc.
- Spill trays in place underneath any equipment that may cause oil leaks
- Restoring surrounding natural areas to their pre-existing condition
- Compensating for the loss of native trees
- Close communication with land-owners (such as farmers in the surrounding area) throughout the construction phase
- Adhering to all construction codes of best practice
- Emergency response plans in place for the prevention, containment and mitigation of any extreme events (flooding, heatwaves, oil spills etc).

All indirect impacts related to the construction phase will be reduced to minor significance should the aforementioned mitigation measures be in place.

7.1.2 Landscape Character and Visual Amenity

As part of the finishing works, the MRF building facades and structures must be painted using neutral earth-toned colours that harmonize with the natural aesthetics of the surrounding terrain. This measure is essential to mitigate the visual impact of the proposed development, facilitating seamless integration into the landscape.

The Contractor must strategically install all on-site light fixtures to pre-empt any potential complaints or adverse impacts on nearby residents and fauna. The selection of outdoor lighting systems by the Applicant should prioritize shielded fixtures directed downwards onto internal road areas. This precaution is crucial in minimizing spillover lighting effects that could otherwise result in undesirable glare and disturbances to the nightscape.

7.1.3 Geology, geomorphology, hydrogeology and soils

Subsurface investigation has revealed that the rock mass is dissected by fissures. Any excavation undertaken will lie in Lower Globigerina Limestone. All mineral resources, including soil, removed from the site during excavation and clearance works should be reused and/or recycled. Material to be excavated from A1, D1, and F1 should be kept apart

and reused as backfill on site due to ground contamination exceedances. Only material from the area around J1 may be considered for recovery in an authorised quarry.

Materials should be hauled in covered trucks. During such works, the use of water or pre-soaking is essential to control dust. Dust emissions can also be controlled with hoarding/barriers, and any accumulated dust on site and surroundings should be extracted and/or removed. No material stockpiles should be allowed to wash away with run-off during the wet season. Use of silt traps, fences or channels to mitigate against such impact is highly recommended.

Monitoring of the walls of the excavation as deepening proceeds is recommended. It is recommended to monitor the walls of the excavation, preferably by an experienced geologist due to presence of potentially unstable rock wedges or slabs created due to daylighting of particular joints as the excavation proceeds. This is required for health and safety reasons and to safeguard third party property on the margins of the site.

During the operational phase, the employees at the facility should be adequately trained and experience regarding the control of discharges from the plant. Regular checks and monitoring should be carried out. Use of second-class water for irrigation purposes is highly recommended as it may indirectly mitigate against groundwater recharge impacts caused by the paving of the facility. For landscape irrigation, all operators must be instructed to make use of environmentally friendly chemicals and biological control treatment methods to prevent excessive chemical leaching or runoff.

7.1.4 Water Bodies

In compliance with the EU WATER FRAMEWORK DIRECTIVE, any developments shall be designed with the aim of not negatively impacting the quantitative and qualitative status of the water bodies. The main environmental risk which requires the deployment of mitigation measures is wind-blown dispersion.

To minimize wind-blown dispersion and hence mitigate the negative impacts on the geo-environment, several dust-suppression measures can be considered:

- Carting excavation material and stockpiles as soon as possible
- Use of silt fences
- Dust suppression/collection of fine particulates generated during on-site working of stone
- Covering of stored material
- Controlled water-spraying of active areas.
- Run-off system collection and adequate discharge in compliance with applicable legislation
- Use of environmentally friendly pesticides and fertilisers for landscaping
- Training site employees to control discharges to sewer by preventing storage/mixing with hazardous substances stored on site

- Site handling areas should be impermeable to prevent leaching into groundwater in the event of major spillages during loading/unloading of waste

7.1.5 Ecology – Terrestrial

Ecological impacts during construction must be minimised through strict enforcement of site regulations (S.L. 522.09), including dust suppression, controlled storage and transport of materials, and restricted machinery movement. Protective practices include bunded chemical storage, proper waste handling, and avoiding trampling and storage in natural areas. Tree and habitat protection is ensured through phased and ecologically guided transplanting, using native species like *Olea europaea* and *Ceratonia siliqua*. Night works should be avoided to protect nocturnal fauna, and lighting is to be downward-facing. Regular environmental monitoring and well-maintained equipment will reduce risks of degradation and habitat disturbance.

7.1.6 Ecology – Avifauna

During construction, works should avoid the bird breeding season (March–August), minimise spillover effects into adjacent land, and limit dust, noise, and artificial light, especially at night. Native landscaping will help restore disturbed areas, while lighting must follow ERA's light pollution guidelines.

During the operational phase, habitat loss must be minimised through green landscaping and nest box installation. Sound barriers are recommended to reduce noise and light spill, while infrastructure should be in place to prevent pollution, manage stormwater, and contain accidental releases, particularly of plastic and toxic materials.

7.1.7 Agricultural Land

An inevitable loss of agricultural land has been forecasted by the Expert. Adherence to PA and ERA conditions and instructions to protect surrounding areas are to be effective to prevent further impacts arising from this development.

7.1.8 Archaeology & Cultural Heritage

According to the impact assessment, the proposed development will directly impact cultural or archaeological features in the area. To prevent any irreversible damage or loss, it is recommended to relocate these features within the development site, if possible.

Furthermore, due to the possibility of undiscovered cultural remains beneath the surface growth and underlying deposits, it is advisable to have an archaeological monitor present during any ground-disturbing works. This will ensure the preservation of any cultural features that may be uncovered during the development process.

Additionally, it is recommended to maintain a minimum distance of 50 meters from any listed cultural heritage interests during the works to ensure their safety and protection.

The consultant does not foresee any impacts on the surrounding archaeology during the projects operational phase.

7.1.9 Noise & vibration

The predicted 'high-level' noise impact from construction activities has been assessed as not significant. The impact magnitude, in the worst-case scenario, is considered minor, with the calculation assumptions tending towards a conservative, worst-case approach.

To further reduce the potential for adverse noise impacts, the following construction noise mitigation measures are recommended as good practice, to be implemented where appropriate:

- Equipment Selection: Consideration will be given to noise emissions when selecting plant and equipment to be used on site.
- Equipment Maintenance: All equipment should be maintained in good working order and fitted with the appropriate silencers, mufflers, or acoustic covers where applicable.
- Noise Source Positioning: Stationary noise sources will be sited as far away as reasonably possible from noise-sensitive receptors. Where necessary and appropriate, acoustic barriers will be used to screen these noise sources.
- Vehicle Movement Control: The movement of vehicles to and from the site will be controlled, and employees will be instructed to ensure compliance with any noise control measures adopted.

There are many strategies that can be employed to further reduce construction noise, such as the limitation of activities that would result in predicted noise levels being reduced. Any such measures should be considered adequate, and the mitigation adopted should not be limited to the measures proposed.

The implementation of these noise mitigation measures, along with the consideration of additional strategies, should help to effectively manage and minimize the potential for adverse noise impacts during the construction phase.

For the closest residential receptors, the operational rating level has been predicted to be below or equal to the daytime and night-time background sound levels. As a result, this assessment has determined that there will be no significant effect. For the closest ecological receptors, the assessment has also determined that no significant effect will occur.

Based on the above, no residual effects are predicted from the operational noise of the Scheme.

In summary, the noise impact assessment has concluded that the operational noise levels are expected to be within acceptable limits for both residential and ecological receptors. As a result, no further mitigation measures are required.

7.1.10 Infrastructure & Utilities

During the construction phase, a range of mitigation measures should be implemented to reduce the likelihood of adverse impacts upon the existing local infrastructures and utilities. Recommended mitigation measures include:

- Liaising with the operators of the existing infrastructure and utilities of the proposed work to open up communication channels.
- Taking extra precautions when working in close proximity to existing infrastructures and utilities to avoid accidental damage.
- Informing Wasteserv Malta of any accidental damage to existing infrastructure and utilities so that damages can be repaired at the expense of the Contractor.
- Site hoarding and other dust mitigation measures should be implemented as necessary to avoid indirect impacts from dust accumulation on existing infrastructure.

The consultant does not envisage the rising of any significant impacts during the operational phase.

7.2 Residual impacts

7.2.1 Land cover and land uses

The residual impacts to the land use and cover remain of major significance due to the change of use of workable agricultural land and tree plantations into commercial uses. However, all indirect impacts related to the construction phase will be reduced to minor or negligible significance should the listed mitigation measures be in place.

7.2.2 Landscape Character and Visual Amenity

Despite the Applicant's implementation of a monitoring program and mitigation measures, it is expected that some residual impacts will persist. The significance of the residual impact will vary from major to minor depending on the viewpoint locations. These are mainly due to the permanent nature of the building and the utilization of rural land in the vicinity. Residual impacts from light pollution are of negligible significance.

7.2.3 Geology, Geomorphology, Hydrogeology, Soils & Water Bodies

While a single development site may be considered to have little impact on the various components of the geo-environment, such as geology (including mineral resources), geomorphology, palaeontology, soils, hydrology, and hydrogeology, the residual impact is always present. Even the construction of a house or a larger development site, often accompanied by excavation for a basement, can lead to the following:

- Loss of mineral resource reserves (minor residual impact)
- Increase in waste dust/stone material (minor residual impact)
- Loss of geological strata (moderate residual impact)
- Loss of geomorphology (minor residual impact)

- Loss of soil (minor residual impact)
- Increase or decrease in runoff, depending on the availability of stormwater storage reservoirs (minor residual impact)
- Degradation of groundwater quality due to leakage from sewers or pollution of runoff (e.g., from traffic or acid rain) (minor residual impact)
- Loss of recharge to aquifers (minor residual impact)

These impacts, when considered individually for a single building or development site, may be very small and not cause a significant change to the geo-environment. However, when these impacts are collectively considered for a larger complex or a town, they can produce a significant and negative cumulative impact on the geo-environment, which is usually associated with the development of towns and large villages.

7.2.4 Water bodies

Although a development site may seem to have a minimal impact on each component of the geo-environment, including hydrological conditions, the residual impact is always present.

The construction of the MRF accompanied by excavation for a basement, will inevitably lead to:

- Increase in waste dust/stone material (minor residual impact)
- Increase or decrease in runoff, depending on the availability of stormwater storage reservoirs (minor residual impact)
- Loss of aquifer recharge (minor residual impact)
- Degradation of groundwater quality due to leakage from sewers or pollution of runoff (e.g., from traffic or acid rain) (minor residual impact)

These impacts, when considered individually for a single building or development site, may be very small and not cause a significant change to the geo-environment. However, when these impacts are collectively considered for a larger complex or a town, they can produce a significant and negative cumulative impact on the geo-environment, which is typically associated with the development of towns and large villages.

7.2.5 Ecology – Terrestrial

Despite the comprehensive adoption of mitigation measures, a number of unavoidable residual impacts are still expected to occur, including:

- Impact on Ecologically Sensitive Terrestrial Ecosystems: The construction site will still have a moderate residual impact on ecologically sensitive terrestrial ecosystems and assemblages within its footprint.
- Dust, Vibration, and Noise Impacts: Minimal levels of dust, vibration, and noise are expected to persist within the immediate terrestrial ecosystems abutting the construction site boundary. The residual impact is negligible.
- Night-Time Light: The construction site will still increase night-time light in previously dark agricultural areas in the surroundings. The residual impact is negligible.

7.2.6 Ecology – Avifauna

The proposed Materials Recovery Facility (MRF) development is expected to have minor adverse residual impacts on avifauna if mitigation measures are implemented. The key considerations include reducing the risk of materials ending up in the marine environment during standard operations and in the event of accidents, as well as minimizing light pollution from the MRF.

While the proposed development may have indirect moderate beneficial effects on avifauna in the wider area and in the longer run compared to the current situation where large proportions of material still end up in open landfills, the permanent destruction of habitat available for breeding and foraging as a result of the proposed development has negative minor adverse effects.

It is crucial to acknowledge that the MRF is not a standalone development in the area. It forms part of Wasteserv's larger ECOHIVE Complex, which includes a Waste to Energy (WtE) plant, an Organic Processing Plant (OPP), and a Thermal Treatment Facility (TTF). These facilities will be situated in direct vicinity of the MRF within the Aol-2. Additionally, construction works for the Second Sicily-Malta Interconnector are planned in the wider area, with the onshore cable route partially situated within the Aol-1. Cumulative effects can be expected both during the construction and operational phases of the ECOHIVE Project, originating from increased habitat loss and modification, disturbance (e.g., from noise, increased traffic in the area), and additive light pollution, among other factors.

7.2.7 Agricultural Land

The unique combination of location, aspect, topography, geology, and soil characteristics in this specific site has resulted in a state of limited agricultural potential, as the area seems unable to sustain crop production without sufficient rainfall. Therefore, it can be inferred that the proposed development is expected to result in the loss of some agricultural land, leading to a major to moderate residual impact. However, given the small size and low quality of the agricultural land involved, the impact is considered to be relatively limited in extent.

7.2.8 Archaeology & Cultural Heritage

The relocation of certain cultural heritage features which are present on site is a disruptive technical procedure that may be complex and requires stringent controls. Apart from potential damage caused during the relocation procedure, there is also the risk that the features cannot be technically relocated.

The presence of the Scheme along with the surrounding waste facilities will permanently alter and deteriorate the visual landscape of the site, leading to a major (slight reduction) residual impact.

7.2.9 Noise & vibration

The predicted noise impact from the construction of the Scheme, based on BS5228-1:2009+A1:2014, indicates that the noise levels are unlikely to generate an adverse impact. Consequently, no residual effect is currently anticipated.

The predicted noise impact from the operational noise of the Scheme, based on BS4142:2014+A1:2019, also suggests that the noise levels are unlikely to generate an adverse impact. Therefore, no residual effect is currently anticipated.

The predicted noise impact upon wildlife once the proposed development is operational has been evaluated based on the $L_{Aeq,1hr}$ 55dB limit. Since the noise prediction is below this limit for both daytime and night-time, it is believed that there will be no adverse impact on wildlife. Consequently, no residual effect is currently anticipated.

In summary, the noise impact assessments for both construction and operations, as well as the predicted impact on wildlife, indicate that the noise levels are unlikely to generate an adverse impact. Therefore, no residual effect is currently foreseen.

7.2.10 Infrastructure & Utilities

If the Contractor operates diligently, implements additional safety measures around the current infrastructure and utilities, and conducts any necessary repair work accurately in case of accidents, the Scheme should not cause any significant residual impacts. A minor residual impact is likely to ensue during works on existing infrastructure/utilities, as certain mechanical damage is unavoidable.

7.3 Monitoring programme

7.3.1 Land cover and land uses

It is recommended that general construction site monitoring is carried out during the construction phase. Such monitoring will ensure that the Contractor is abiding by the ENVIRONMENTAL CONSTRUCTION SITE REGULATIONS OF 2007 (S.L.552.09) to help keep the adverse impacts of the works to a minimum.

Monitoring during the operational phase is not deemed necessary.

7.3.2 Landscape Character and Visual Amenity

The Applicant should engage an environmental expert to monitor the works during the construction phase to ensure compliance with the ENVIRONMENTAL CONSTRUCTION SITE REGULATIONS OF 2007 (S.L.552.09). Attention should be given to the erection of appropriate site boundary walls, the mitigation of dust dispersion and the containment of stockpiles and machinery within the site boundaries. This will ensure that the Contractor manages the works effectively to reduce the visual impacts.

7.3.3 Geology, Geomorphology, Hydrogeology and Soils

It is recommended that general construction site monitoring is carried out during the construction phase. Such monitoring will ensure that the Contractor is abiding by the ENVIRONMENTAL CONSTRUCTION SITE REGULATIONS OF 2007 (S.L.552.09) to help keep the adverse impacts of the works to a minimum.

Monitoring during the operational phase is not deemed necessary by the Expert.

7.3.4 Water Bodies

Periodic checks of effluents, second-class water effluents, and other waste disposal systems would be crucial to ensure that no harmful substances are leaked into the ground.

Conducting groundwater analysis as part of the baseline study would establish a baseline water quality, which would then serve as a reference point for future monitoring of the water quality.

By regularly monitoring the effluents and groundwater, any potential contamination or degradation of the water resources can be promptly identified and addressed. The baseline water quality data obtained from the initial groundwater analysis would provide a benchmark against which future water quality can be compared, allowing for the detection of any changes or impacts that may arise from the construction and operation of the proposed project.

This proactive approach to monitoring and maintaining water quality would help safeguard the sensitive receptors, such as the Mean Sea Level Aquifer and coastal waters, from potential contamination or degradation. By implementing these measures, the project can minimize the risk of adverse impacts on the geo-environment and ensure the protection of critical water resources.

7.3.5 Ecology

Should the Scheme be permitted to proceed, a comprehensive monitoring program will be implemented during the construction phases to ensure compliance with environmental regulations and minimize potential impacts. The construction management plan prepared at the project planning phase will be updated by the chosen contractor to ensure that the best practicable environmental options are followed throughout the development process.

Periodic monitoring is recommended during the construction phase to verify that mitigation measures are in place and functioning as intended. This will help prevent any unwarranted impacts that may arise due to deviations from proposed working practices, which could have additional impacts beyond those originally predicted. All monitoring data will be presented to the relevant authorities at pre-agreed frequencies to ensure transparency and compliance with regulatory requirements.

A tree specialist is recommended to oversee and enact interventions directly related to the pruning or relocation of native tree species. All interventions related to protected native trees are subject to permits provided by the Environment and Resources Authority.

7.3.6 Agricultural Land

Given that land loss is regarded as an inevitable event during the construction of a new Materials Recovery Facility (MRF), the consultant does not perceive the necessity of monitoring agricultural fields as part of the monitoring programme.

7.3.7 Archaeology & Cultural heritage

Given the possibility of underlying cultural remains at undisturbed levels within the overgrowth and underlying deposits, it is crucial to have an archaeological monitor present during any ground disturbance works. This monitoring will ensure the preservation of any cultural features that may be discovered during the development process.

Overall, the role of an archaeological monitor is essential in ensuring the preservation and protection of cultural features during ground disturbance works, and their presence and vigilance can help prevent irreversible damage or loss to these valuable resources.

7.3.8 Noise & vibration

Due to the forecasted noise levels far below the applicable thresholds established by current legislations, the Expert does not envisage the need to install temporary or permanent monitoring stations.

7.3.9 Infrastructure & Utilities

In the event that the Contractor inadvertently damages the infrastructure and utilities during the construction phase, it is advisable to have a technically competent individual supervise the repair work. This will ensure that the repairs meet the required standards and that the damaged items are returned to their original state with minimal disruption.

However, monitoring of infrastructure and utilities is not necessary during the operational phase.

8.0 CONCLUSION

The proposed project involves the construction of a new Materials Recovery Facility (MRF) which aims to increase the recycling rates of the Maltese Islands. The MRF will be located within the ECOHIVE Complex where other waste treatment facilities are present. It is designed to operate in parallel with the existing waste treatment facilities, minimizing landfilling. The project will adhere to national and European technical standards throughout all stages of design, construction, and testing with special emphasis on fire protection measures.

Malta has been actively working towards improving overall recycling rates, intensifying public awareness, and reducing landfilled waste in line with European objectives. To achieve these goals, significant strides have already been made in improving the waste management sector. These include the planned Organic Processing Plant (OPP) and Thermal Treatment Facility (TTF) which are currently subject to planning permit procedures.

The MRF is considered a high-priority project in Malta's efforts to improve the countrywide waste management sector, meet environmental targets, and fulfil climate change obligations. It is specifically mentioned in the LONG-TERM WASTE MANAGEMENT PLAN 2021-203 as an important project for achieving the nation's long-term vision of recycling rates established by EU. The proposed MRF will not only meet the forecasted recycling rates but also significantly reduce landfilling rates, thus contributing to greenhouse gas emissions with limited methane generation from landfills.

However, it must be noted that the construction of a new MRF is expected to yield some adverse impacts on the environment. The project has been purposely designed to optimise the vehicular activities and to minimize impacts on terrestrial and marine features of ecological, cultural, infrastructural and social importance.

The development of a new Materials Recovery Facility (MRF) in Malta is expected to have certain environmental impacts that cannot be mitigated. One of the most notable concerns is the visual impact of the facility, which will be compounded by the presence of other waste treatment facilities in the area. This cumulative effect may significantly alter the aesthetic appeal of the landscape, potentially affecting the tourist and traditional visitor experience of this region.

Furthermore, the take-up of land for development is a critical issue that cannot be overlooked. The construction of the facility will lead to the irreversible loss of habitats and species while altering the use of the land, which was previously dedicated to agriculture. This change in land use may also pose risks to the future exploitation of underground resources, including mineral resources, and the status of the underlying groundwater body. The altered land use may also lead to reduced rainfall infiltration, resulting in increased run-off volumes and potentially causing flooding issues.

The cumulative impact of these environmental concerns underscores the need for careful planning of a monitoring scheme for identifying mitigation measures that can further reduce the negative effects of the MRF during its development. It is essential to strike a balance between the need for waste management infrastructure and the protection of the environment and the local ecosystem.

During operations no significant interventions are expected on a day-to-day basis, excluding when maintenance is required and/or to address emergency situations, such as the occurrence of a fire. Mitigation measures and adherence to legislation will ensure the sustainable operation of the waste treatment process throughout its lifetime.

In conclusion, the development of the new MRF is a vital project for Malta's waste management sector and efforts to improve recycling rates, minimize landfilling rates, and reduce GHGs emissions. It aligns with the country's environmental targets, climate change obligations, and long-term vision of carbon neutrality. The project holds significant potential for Malta's sustainable waste management future.

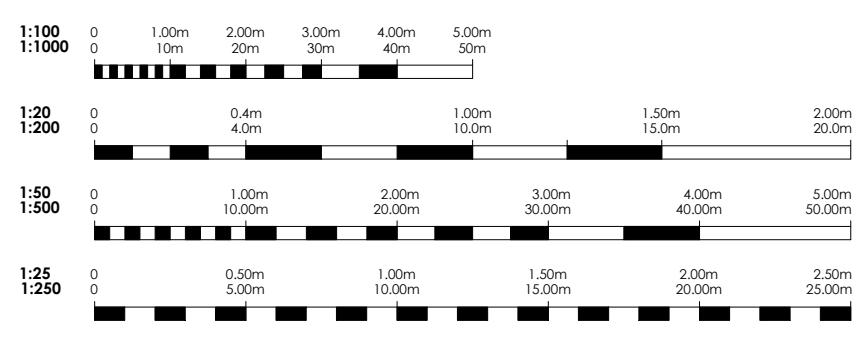
APPENDIX 1

HIGH-RESOLUTION DRAWINGS AND PLANS



2 Ecohive masterplan
1 : 2000

Revision Schedule		
Number	Date	Description



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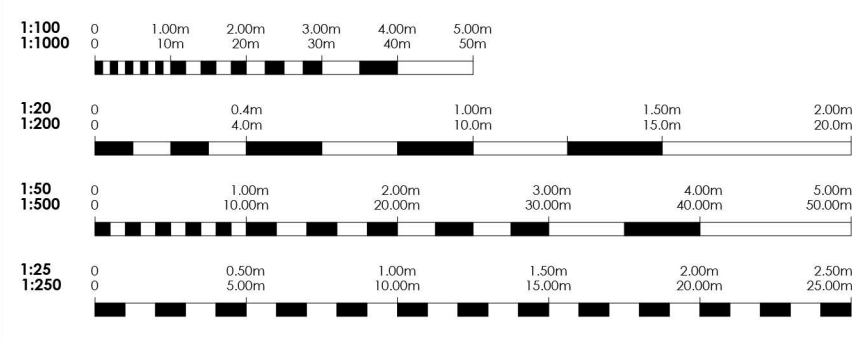


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PROJECT	Proposed Materials Recovery Facility in the ECOHIVE Complex		
LOCATION	ECOHIVE Complex, Magtab, Naxxar		
DWG TITLE	Existing Ecohive Masterplan		
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ARCHITECT	Robert Sant	JOB REF	2944
DATE	19/04/2022	SCALE	1 : 2000
		DWG REF	02-001-00



1 Proposed Ecohive Complex
1 : 2000

Revision Schedule		
Number	Date	Description



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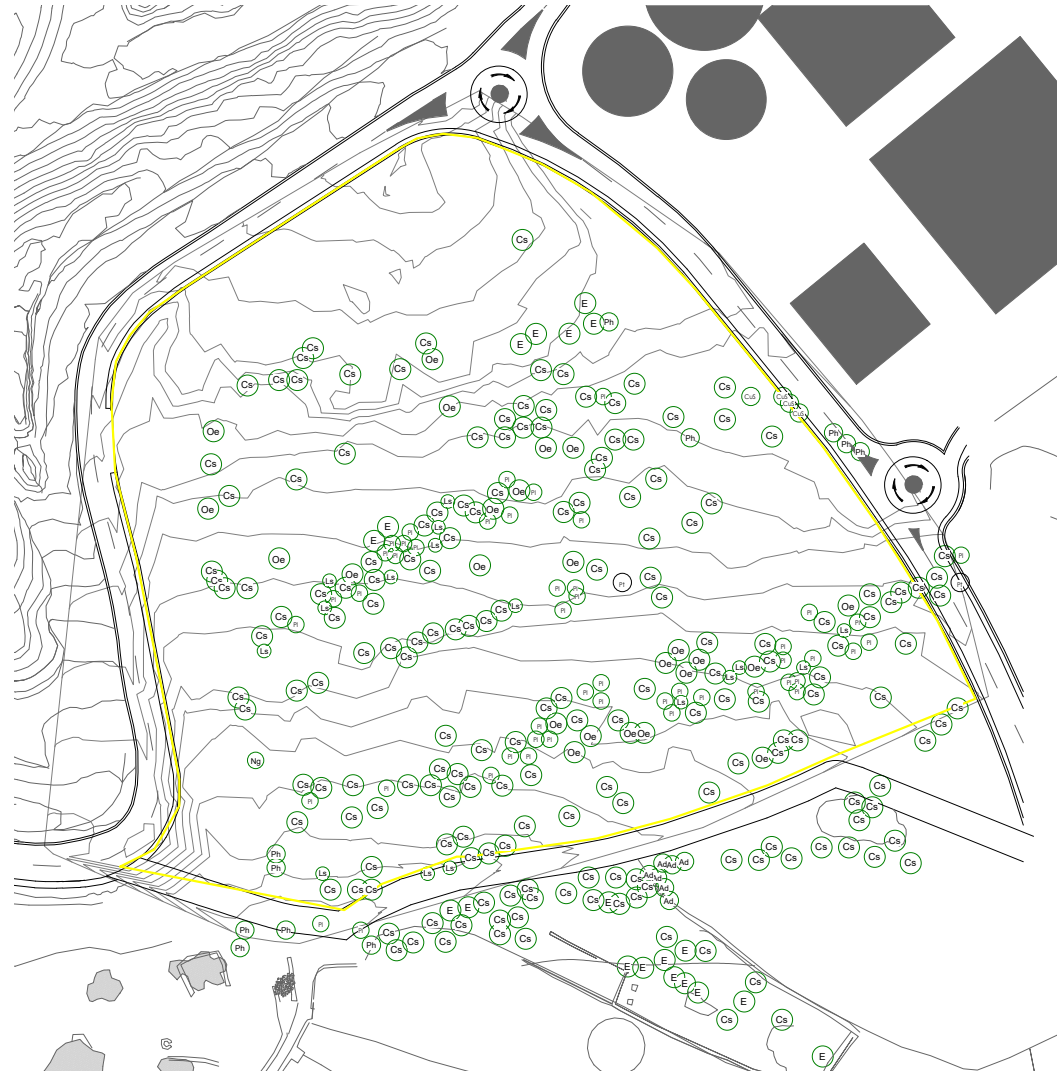
25/27, Carmel Street, Birkirkara BKR 1248, Malta
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CLIENT	Wasteserv Malta Ltd.		
PROJECT	Proposed Materials Recovery Facility in the ECOHIVE Complex		
LOCATION	ECOHIVE Complex, Magtab, Naxxar		
DWG TITLE	Proposed Ecohive Masterplan		
DRAWN BY	AD/ SN	PAPER SIZE	ISO-A1 (594 x 841mm)
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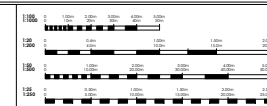
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Nb	Nicotiana glauca
Cs	Cerantia siliqua
Oe	Olea europaea
E	Eucalyptus sp.
Ph	Pinus halepensis
CuS	Cupressus sempervirens
Ls	Lonicera sp.
Pl	Pistacia terebinthus
Pl	Pistacia lentiscus

Legend- Landscaping
1 : 100



1 Existing Site- Landscaping
1 : 500

Revision Schedule		
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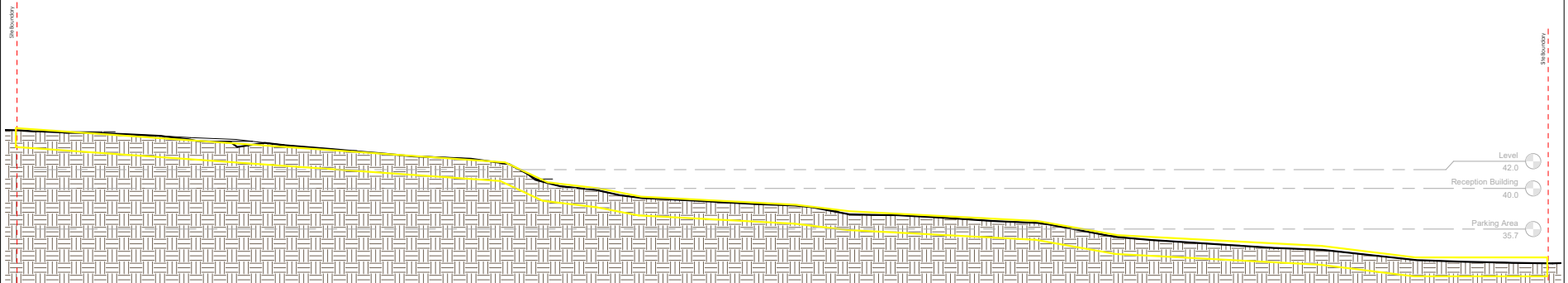


ecoarchitects | civil engineers | design consultants
sustainability | green infrastructure | landscape management

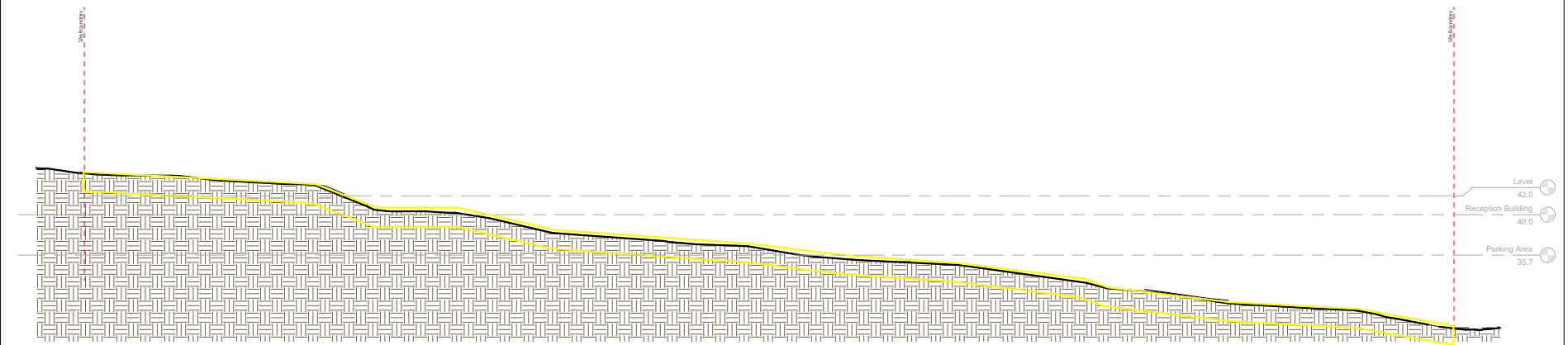
25/07, Cornhill Street, Bristol BS1 1TH, United Kingdom
T: 0117 325 2444 F: 0117 325 2445 E: info@ecoarchitects.co.uk



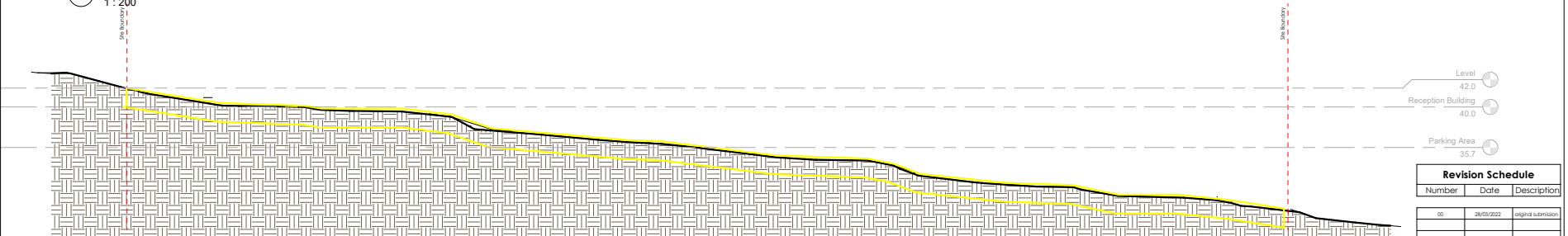
Wasteserv Malta Ltd.			
Proposed Materials Recovery Facility in the ECOHIVE Complex			
ECOHIVE Complex, Magħtab, Naxxar			
Existing Site			
Project No.	ASD 301	Scale	2944
Author	Richard Scott	Drawn By	02-003-00
Date	19/04/2022		



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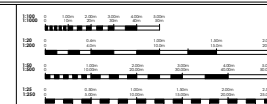


② Section B
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③ Section C
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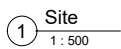


architects | civil engineers | design consultants
sustainability | environment | project management

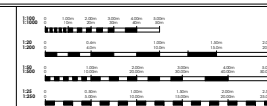
25/27, Cornhill Street, Block 408, 1246, Malacca
P: (603) 241 1104 F: (603) 241 48 2018



Client	Wasteserv Malacca Ltd.		
Project	Proposed Materials Recovery Facility in the ECOHIVE Complex		
Location	ECOHIVE Complex, Maghrib, Naxos		
Drawn By	Existing Sections		
Checked By	ASD	Drawn By	2944
Approved By	Richard Scott	Scale	1:200
Date	19/04/2022	Drawn By	02-004-00



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Number	Date	Description
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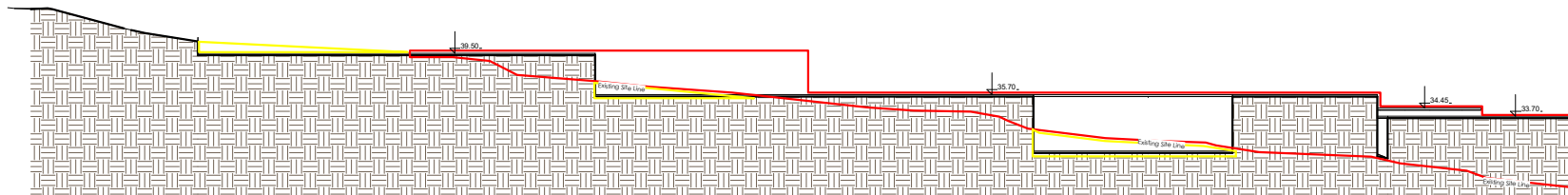


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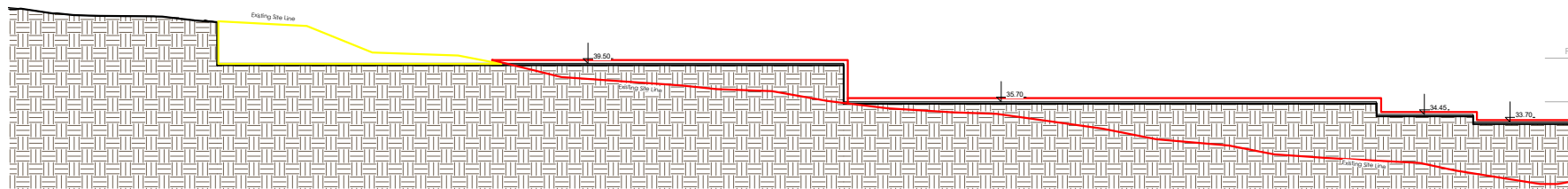
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☎ 00356 2149-1934 ☎ 00356 2148-2978

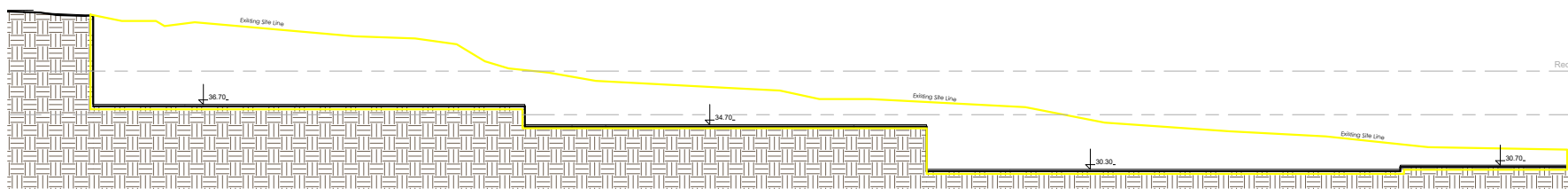
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PROJECT	Proposed Materials Recovery Facility in the ECOHIVE Complex		
LOCATION	ECOHIVE Complex, Maghlab, Naxxar		
DWG TITLE	Existing/ Proposed Ground Works Plan		
DESIGNED BY	ADG 305	PROPOSED SIZE	SCALE 1 : 200
CHECKED BY	ADG 305	DATE	17/04/2022
	250 000	2944	02-005-00



① Section A
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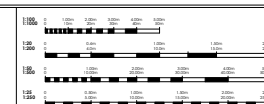


② Section B
1 : 200



③ Section C
1 : 200

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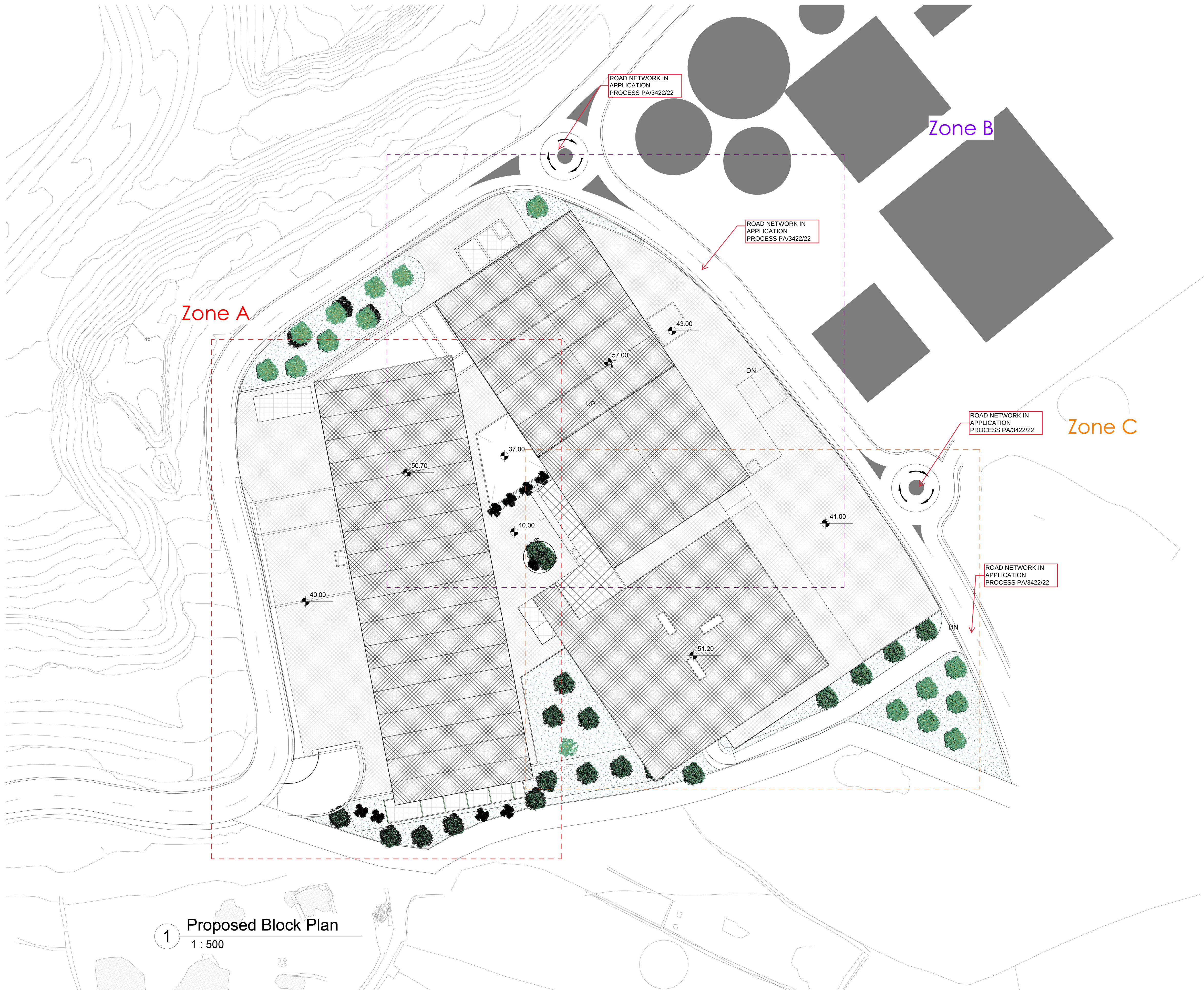


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specially licensed | project management

25/07, Cornhill Street, Block 408 1246, Malabo
P: (88324) 2149-1924 F: (88324) 2149-2010

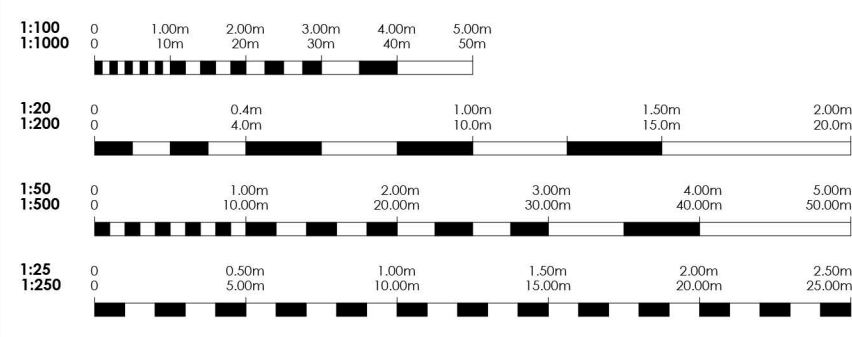


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Project	Proposed Materials Recovery Facility in the ECOHIVE Complex		
Location	ECOHIVE Complex, Maghtab, Naaxar		
Drawn By	ASD	Drawn Date	29/04/2022
Checked By	Richard Scott	Checked Date	29/04/2022
Scale	1:200	Sheet No.	2944
			02-005a-00



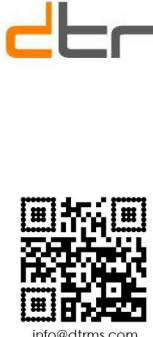
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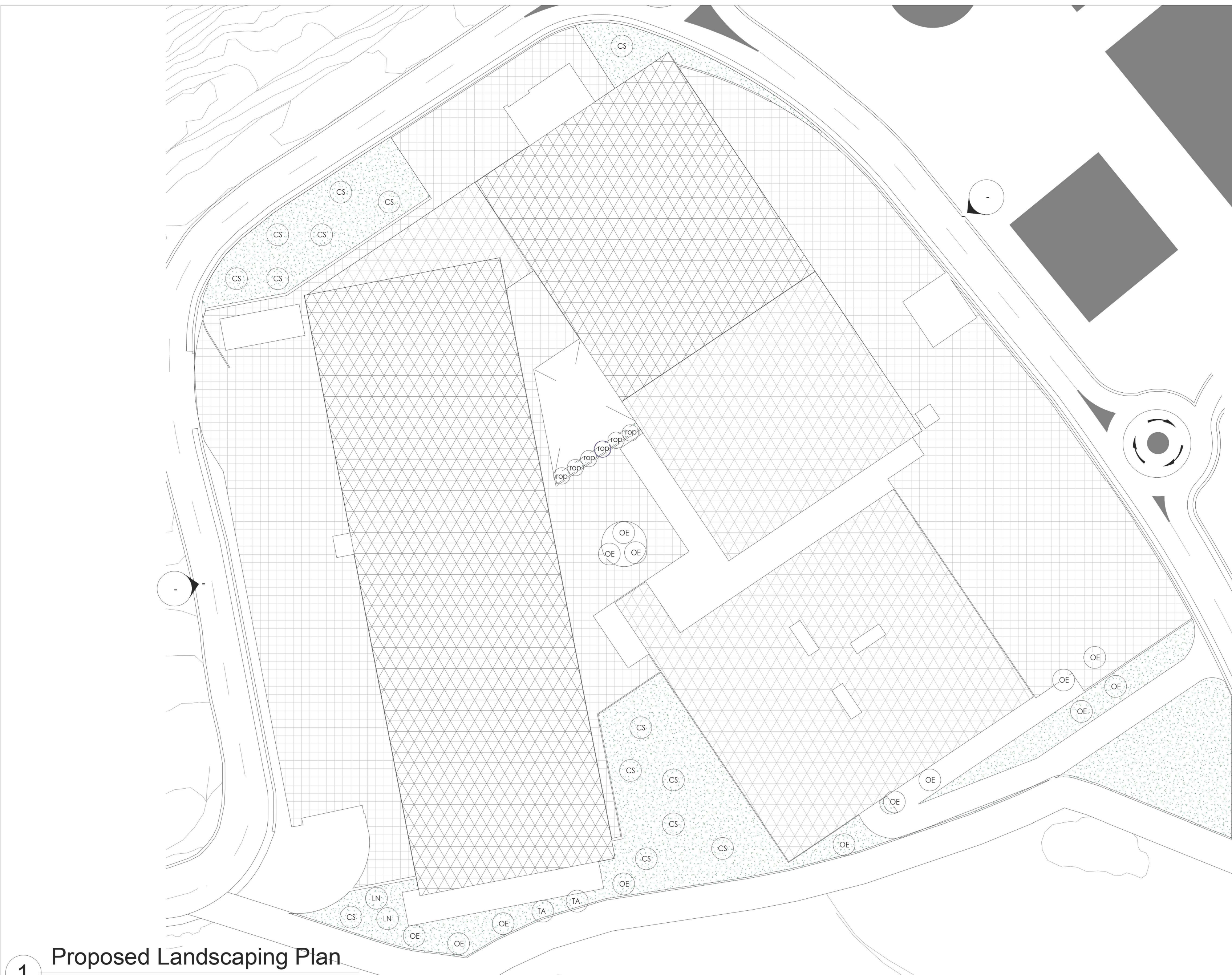


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CLIENT	Wasteserv Malta Ltd.		
PROJECT	Proposed Materials Recovery Facility in the ECOHIVE Complex		
LOCATION	ECOHIVE Complex, Maghtab, Naxxar		
DWG TITLE	Proposed Block Plan		
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ARCHITECT	Robert Sant	JOB REF	2944
DATE	19/04/2022	SCALE	1 : 500
		DWG REF	02-006-00



Symbol	Scientific Name	English Name	Maltese Name	Qty
OE	Olea Europaea	olive	Żebbuġ	14
CS	Ceratonia siliqua	carob	Harrib	14
TA	Tamarix africana	African tamarix	Brak	3
LN	Laurus nobilis	bay laurel	Rand	2
ROP	Rosmarinus officinalis prostratus	rosemary	Klin	6
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Proposed Landscaping Plan

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CLIENT **Wasteserv Malta Ltd.**

DRAWN BY **Author**

ARCHITECT **Checker**

DATE **04/19/22**

PROJECT **Proposed Materials Recovery Facility in the ECOHIVE Complex**

LOCATION **ECOHIVE Complex, Maghtab, Naxxar**

DWG TITLE **Proposed Preliminary Landscape Plan**

PAPER SIZE **ISO-A2 [420 x 594mm]**

SCALE **1 : 500**

JOB REF **2944**

DWG REF **02-026-00**

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RCV

Hook Loader

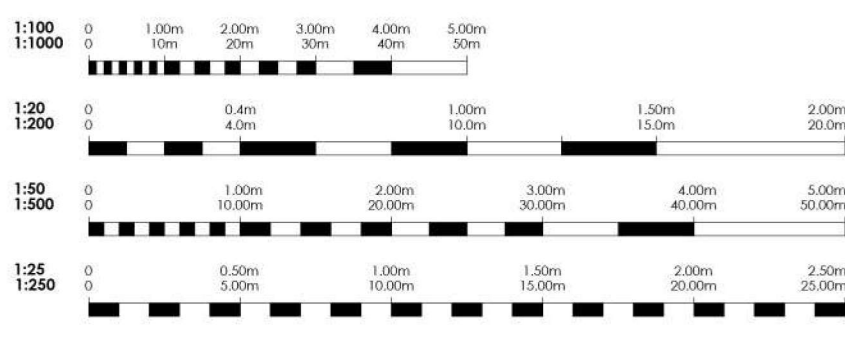
Maintenance

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Vehicular Flows Level +40.00

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Revision Schedule		
Number	Date	Description



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CLIENT	Wasteserv Malta Ltd.		
PROJECT	Proposed Materials Recovery Facility in the ECOHIVE Complex		
LOCATION	ECOHIVE Complex, Magtab, Naxxar		
DWG TITLE	Vehicular Flows Level +40.00		
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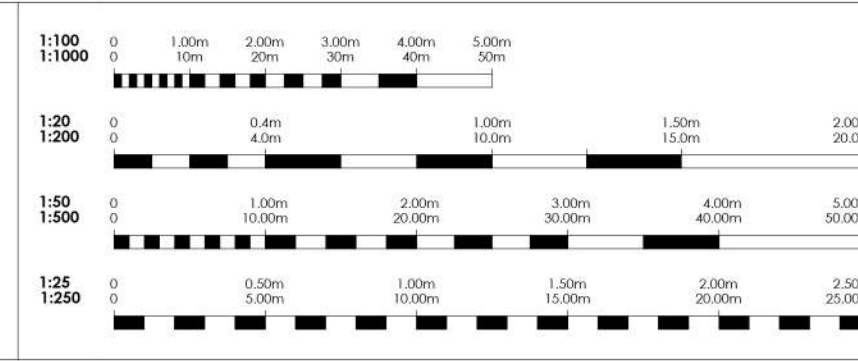


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1 Pedestrian Flows Reception Area
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Revision Schedule		
Number	Date	Description

Key: Plant Workers Office Workers Visitors



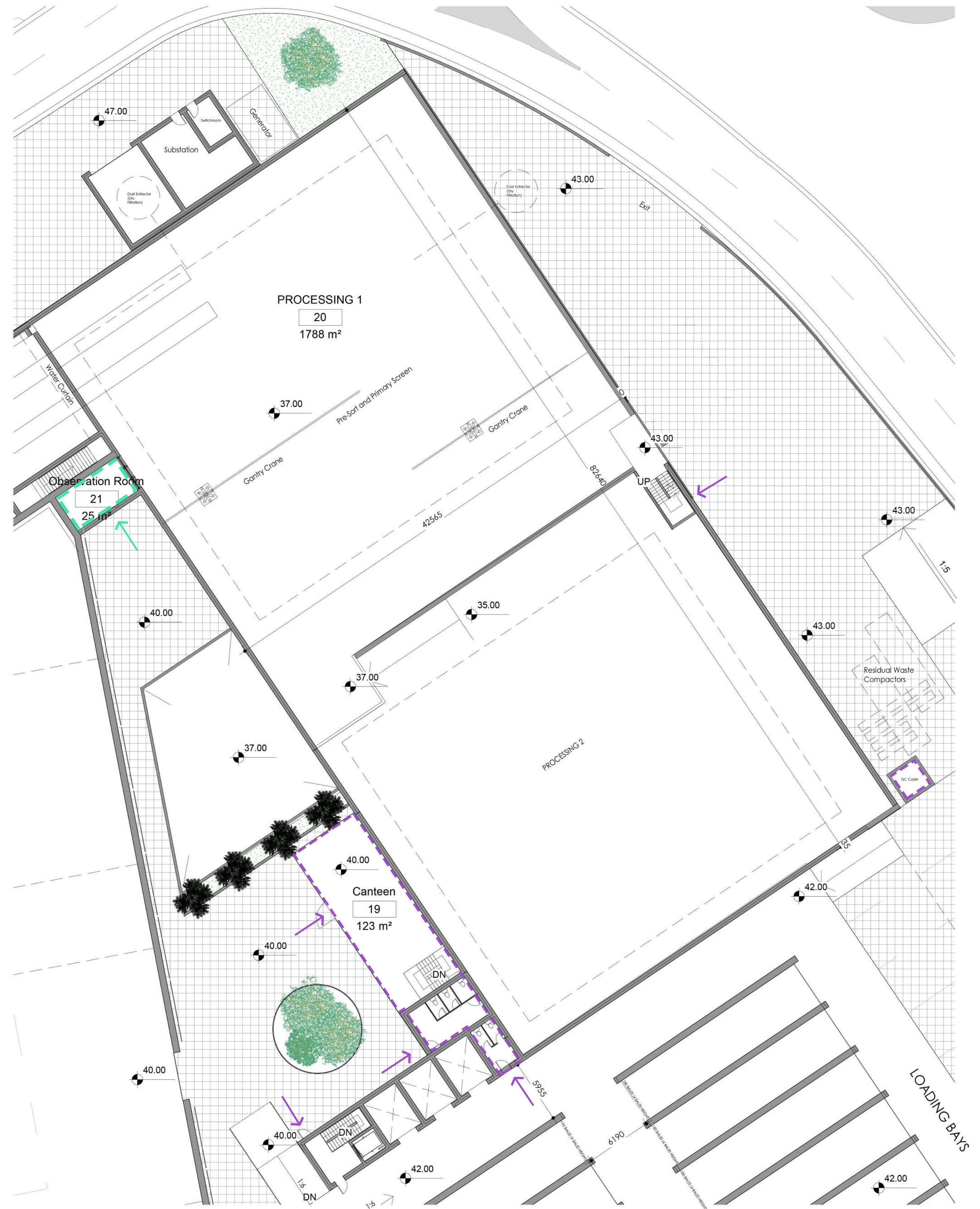
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CLIENT **Wasteserv Malta Ltd.**
PROJECT Proposed Materials Recovery Facility in the
ECOHIIVE Complex
LOCATION ECOHIIVE Complex, Magtab, Naxxar
DWG TITLE Proposed Pedestrian Flows 1
DRAWN BY AD / SN
ARCHITECT RS
DATE 08/04/22
PAPER SIZE ISO-A1 (594 x 841mm)
SCALE 1 : 250
JOB REF 2944
DWG REF 02-020-00

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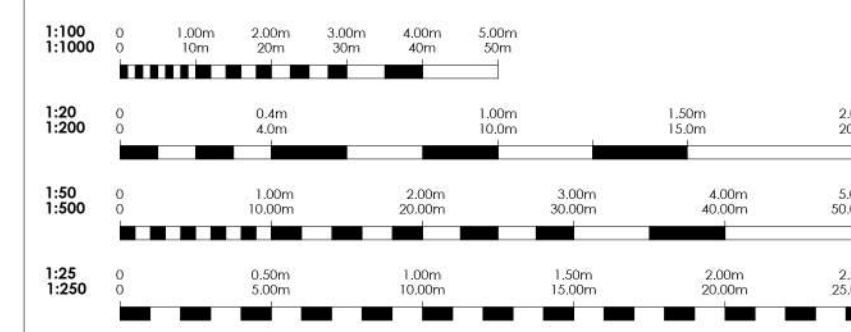


2 Pedestrian Flows Processing Building
1 : 250

Revision Schedule

Number	Date	Description

Key: ■ Plant Workers ■ Office Workers ■ Visitors



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dtr

CLIENT **Wasteserv Malta Ltd.**

PROJECT **Proposed Materials Recovery Facility in the ECOHIVE Complex**

LOCATION **ECOHIVE Complex, Magtab, Naxxar**

DWG TITLE **Proposed Pedestrian Flows 2**

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ARCHITECT **RS** JOB REF **2944** DWG REF **02-021-00**

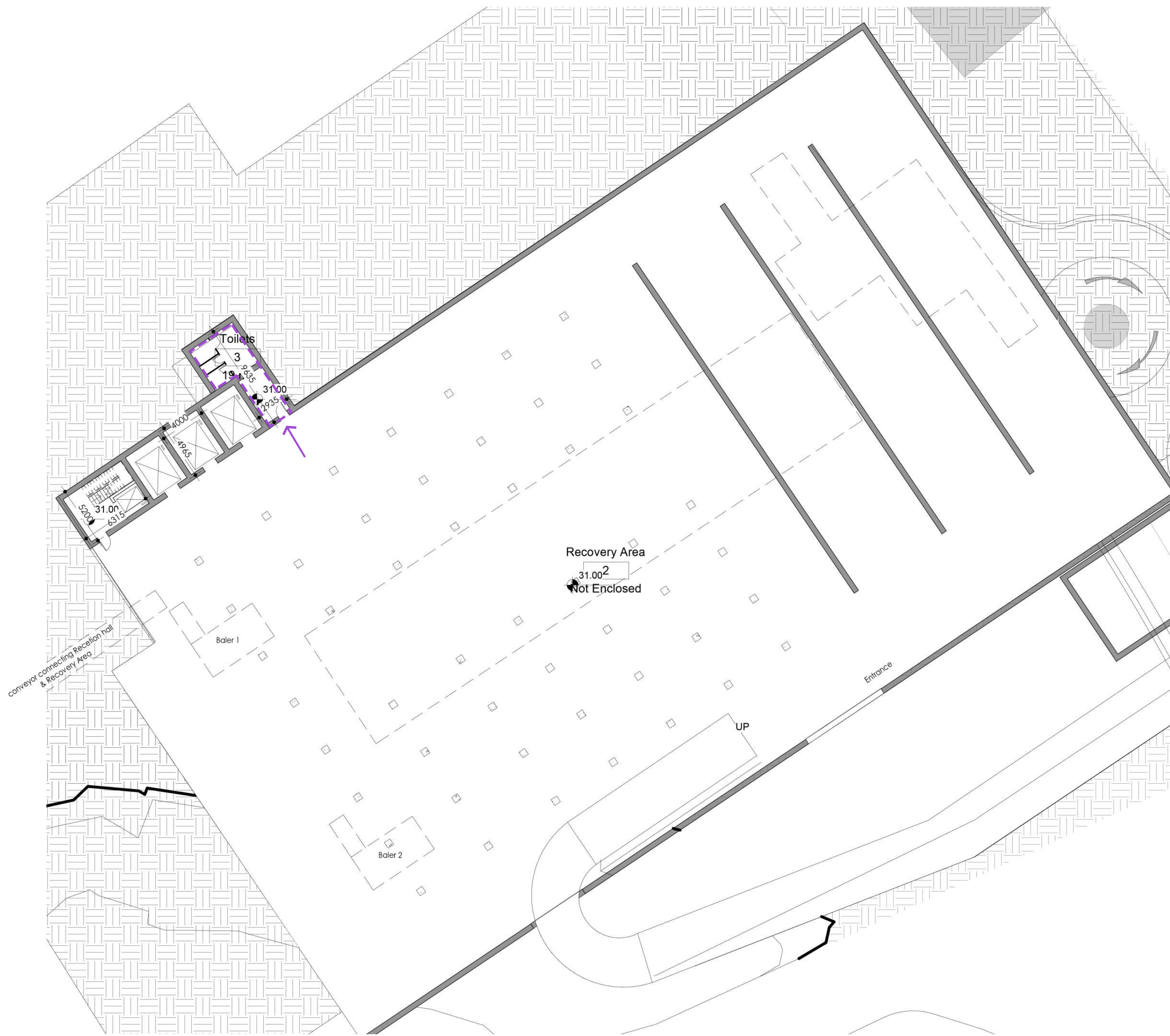
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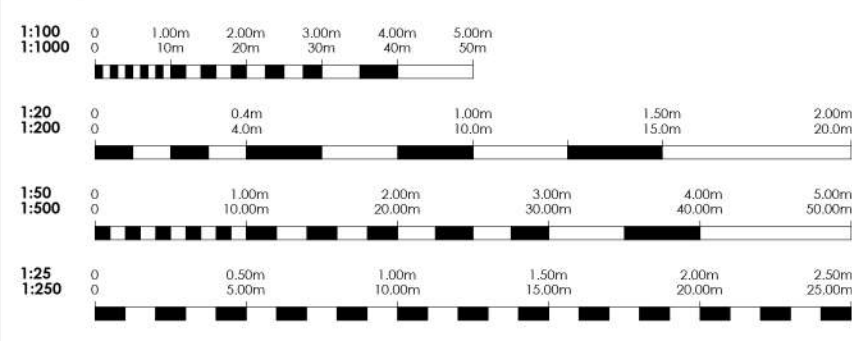
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2 Pedestrian Flows Recovery Building
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Revision Schedule		
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Key: Plant Workers Office Workers Visitors

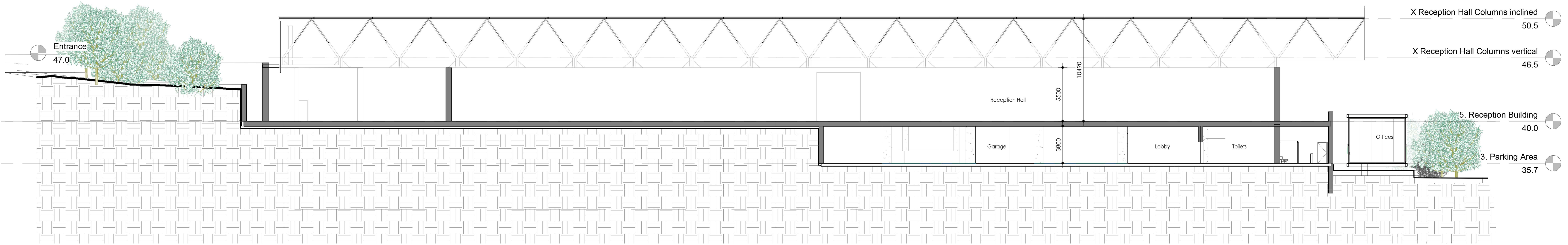


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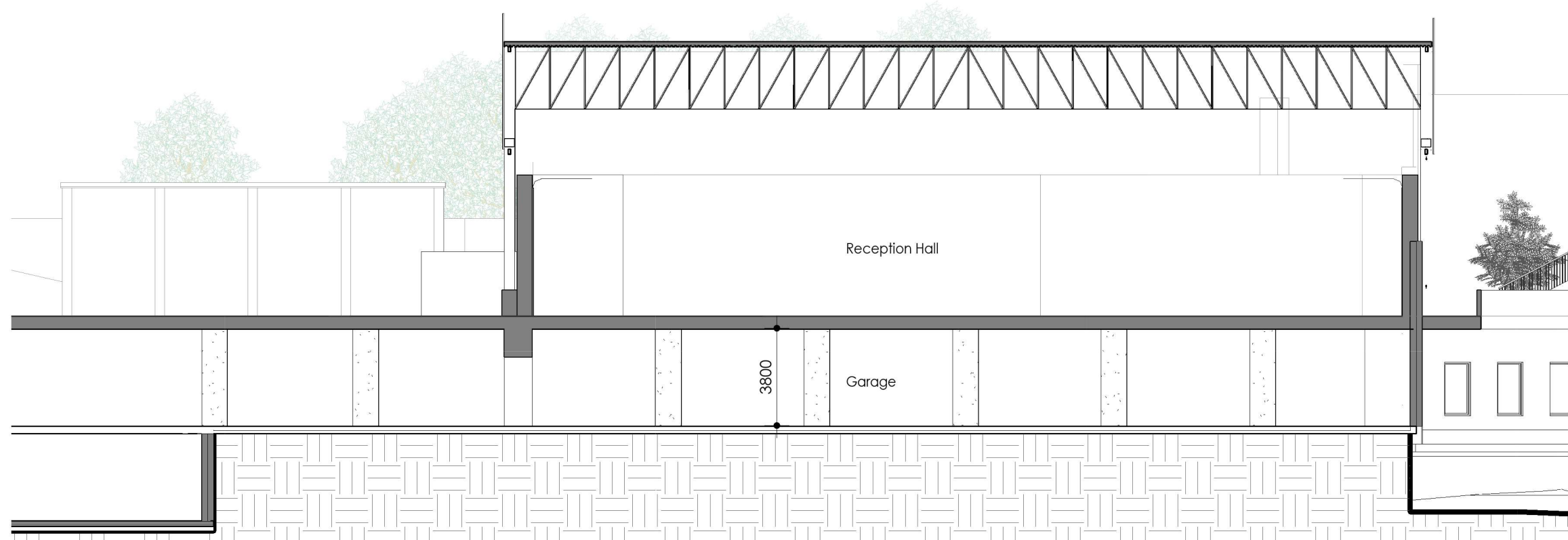
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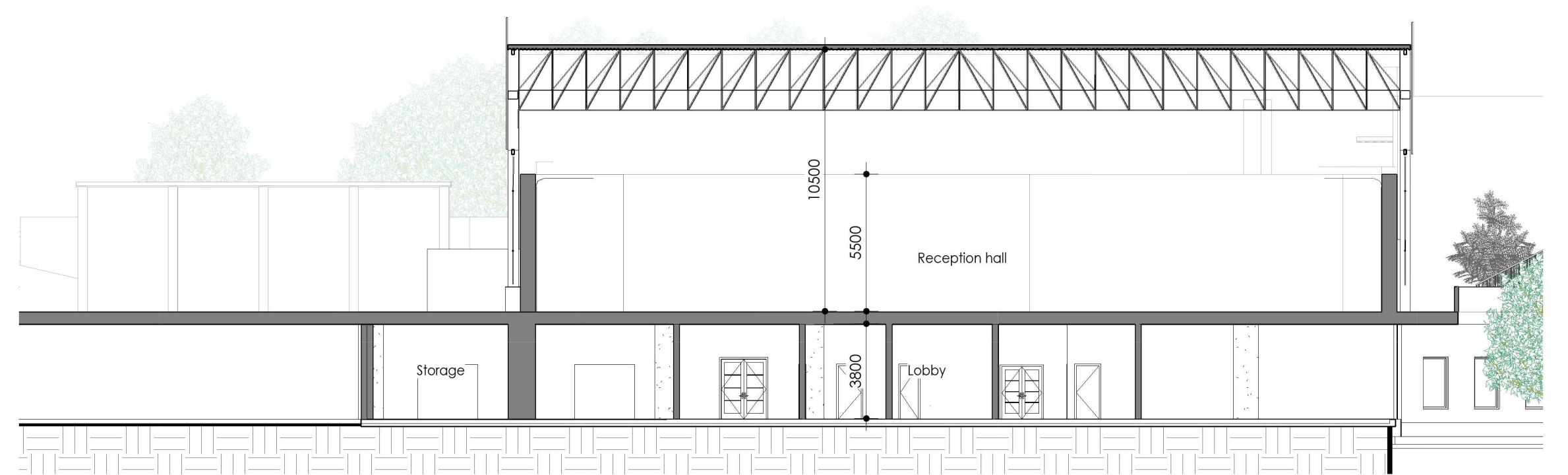
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PROJECT	Proposed Materials Recovery Facility in the ECOHIVE Complex		
LOCATION	ECOHIVE Complex, Magtab, Naxxar		
DWG TITLE	Proposed Pedestrian Flows 3		
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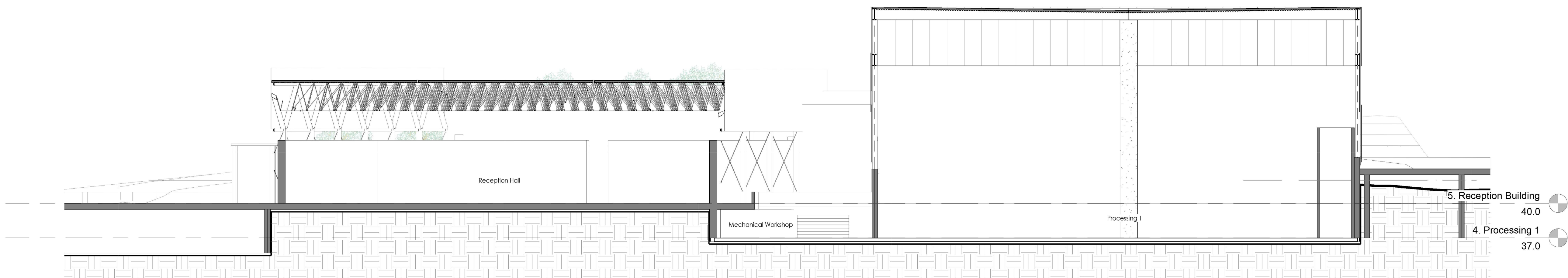
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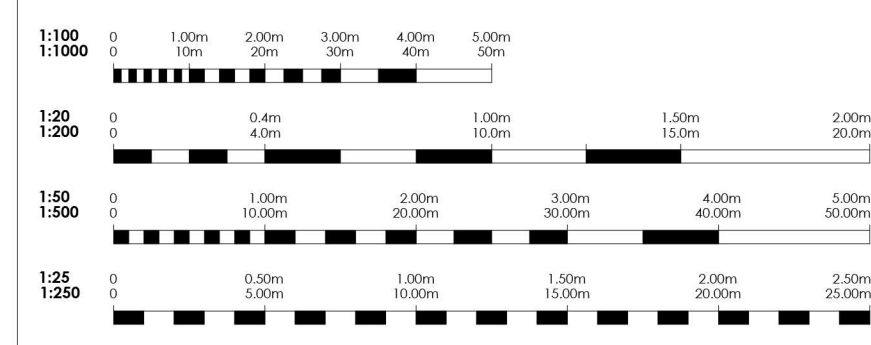


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4 Section D
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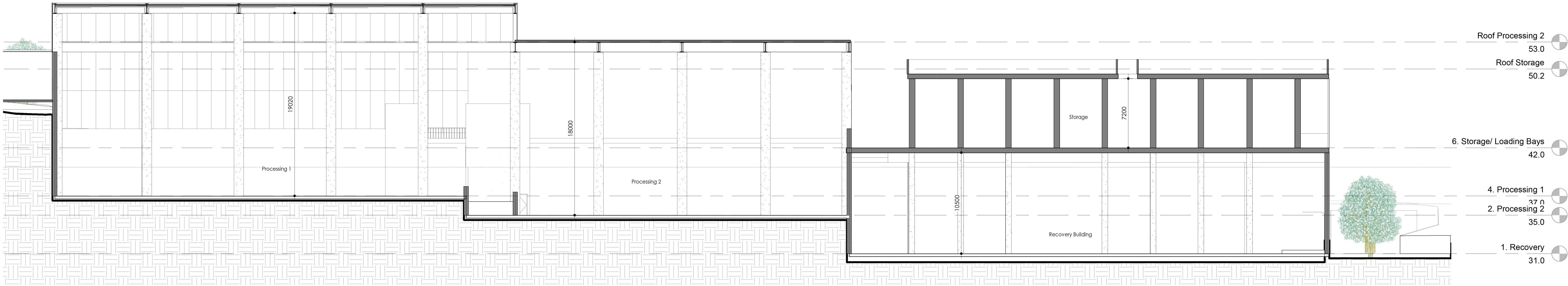


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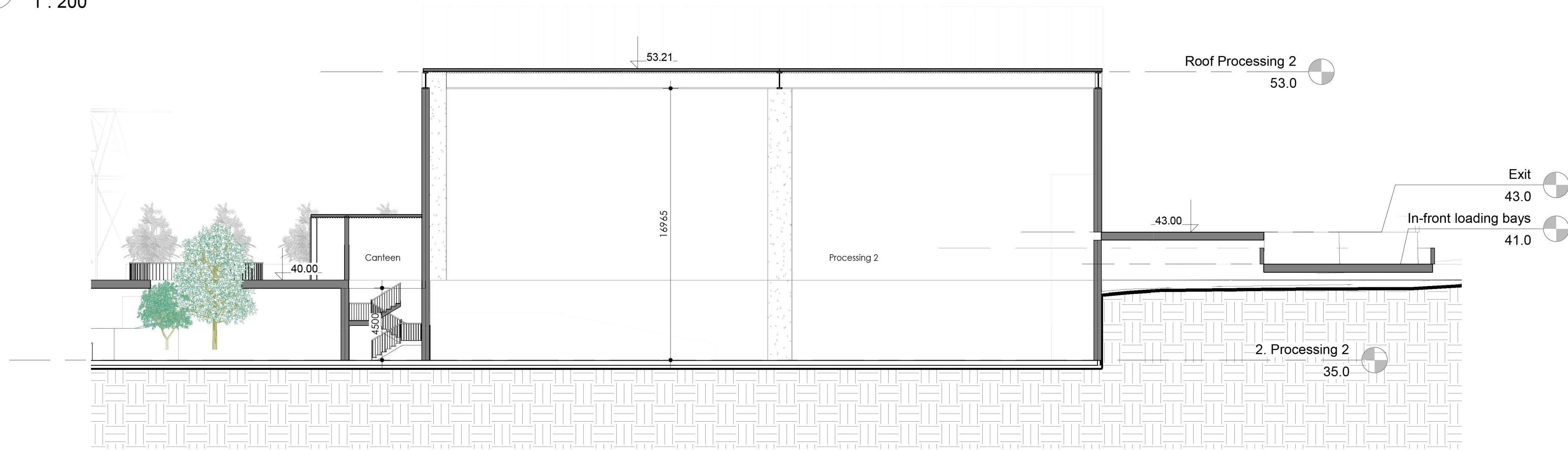
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✆ [00356] 2149-1934 ✆ [00356] 2149-2978
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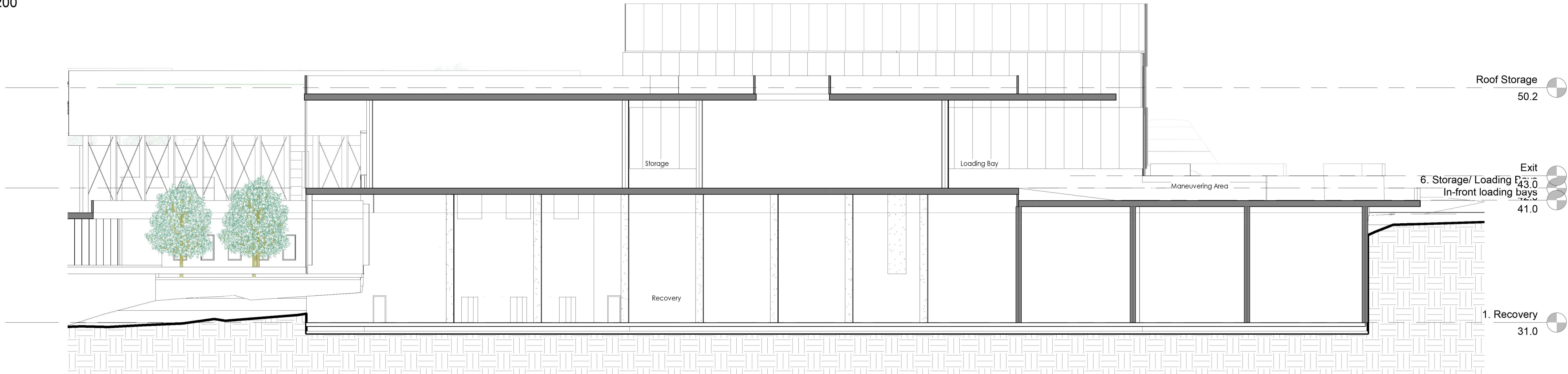
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PROJECT	Proposed Materials Recovery Facility in the ECOHIVE Complex		
LOCATION	ECOHIVE Complex, Magtab, Naxxar		
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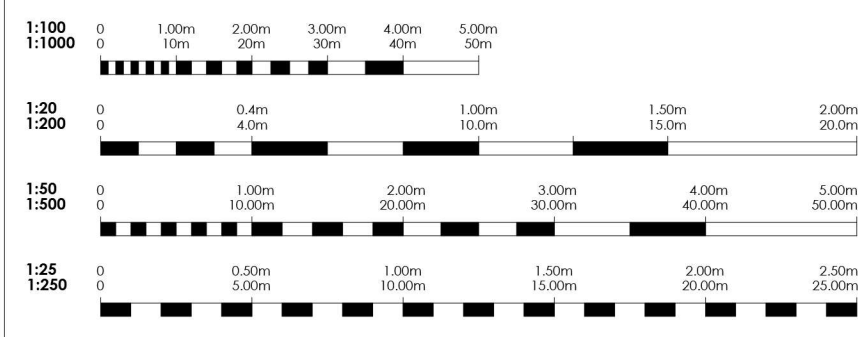


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3 Section G
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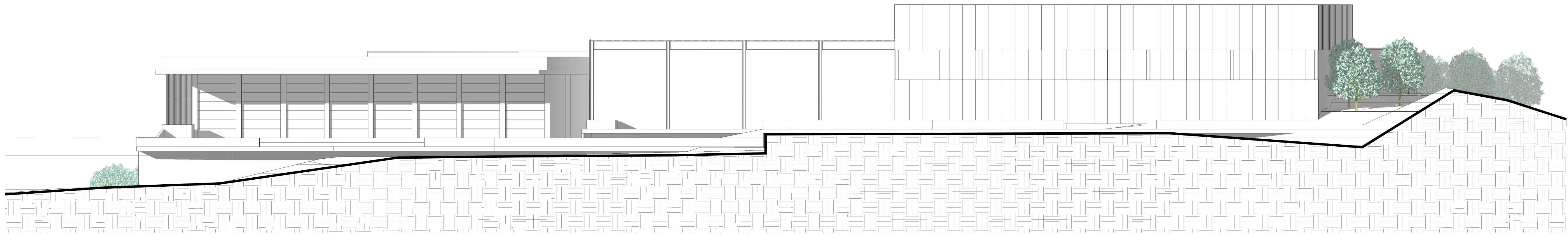


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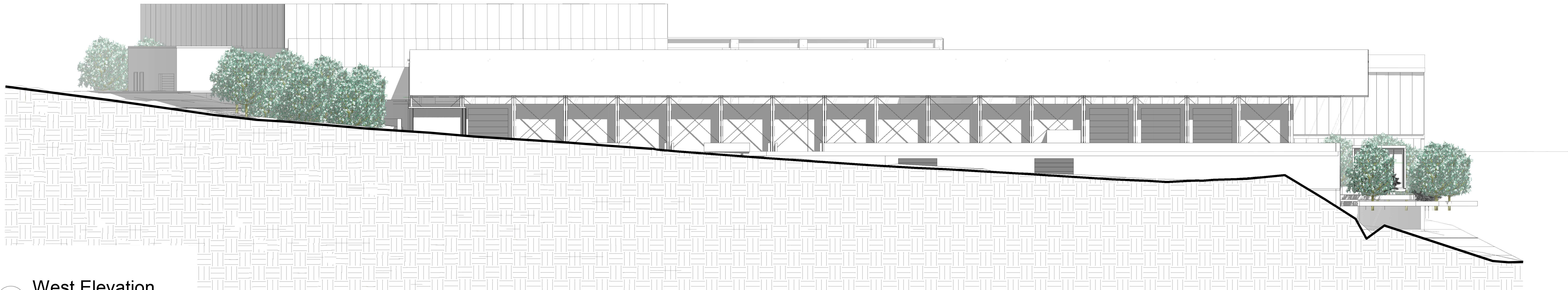
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CLIENT	Wasteserv Malta Ltd.		
PROJECT	Proposed Materials Recovery Facility in the ECOHIVE Complex		
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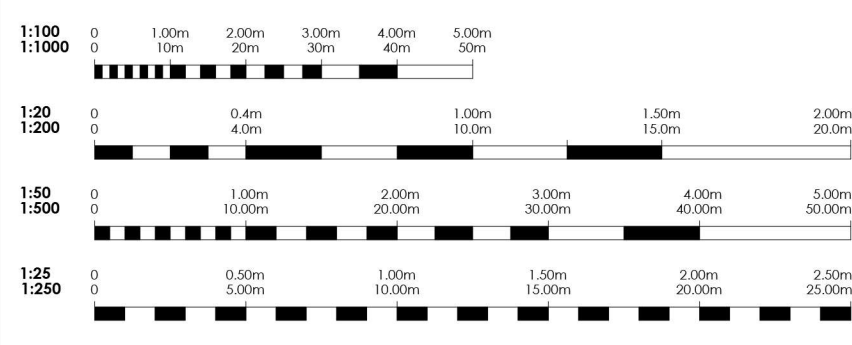


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2 West Elevation
1 : 250

Revision Schedule		
Number	Date	Description



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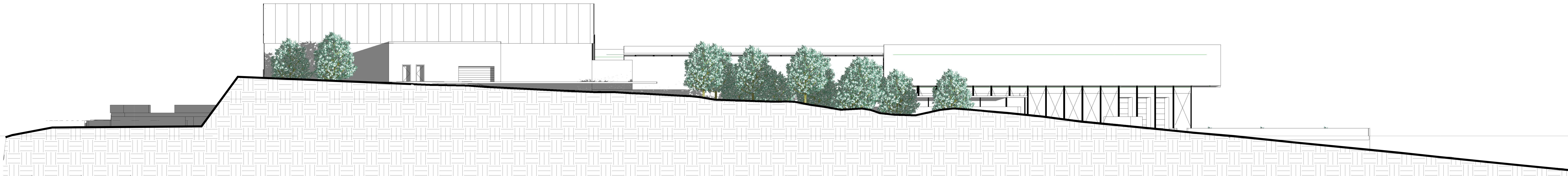
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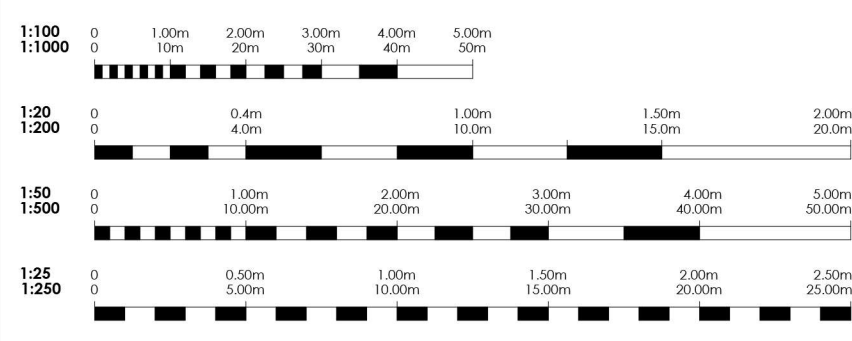


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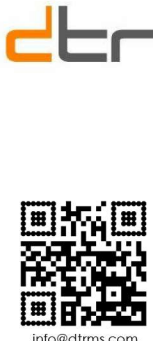
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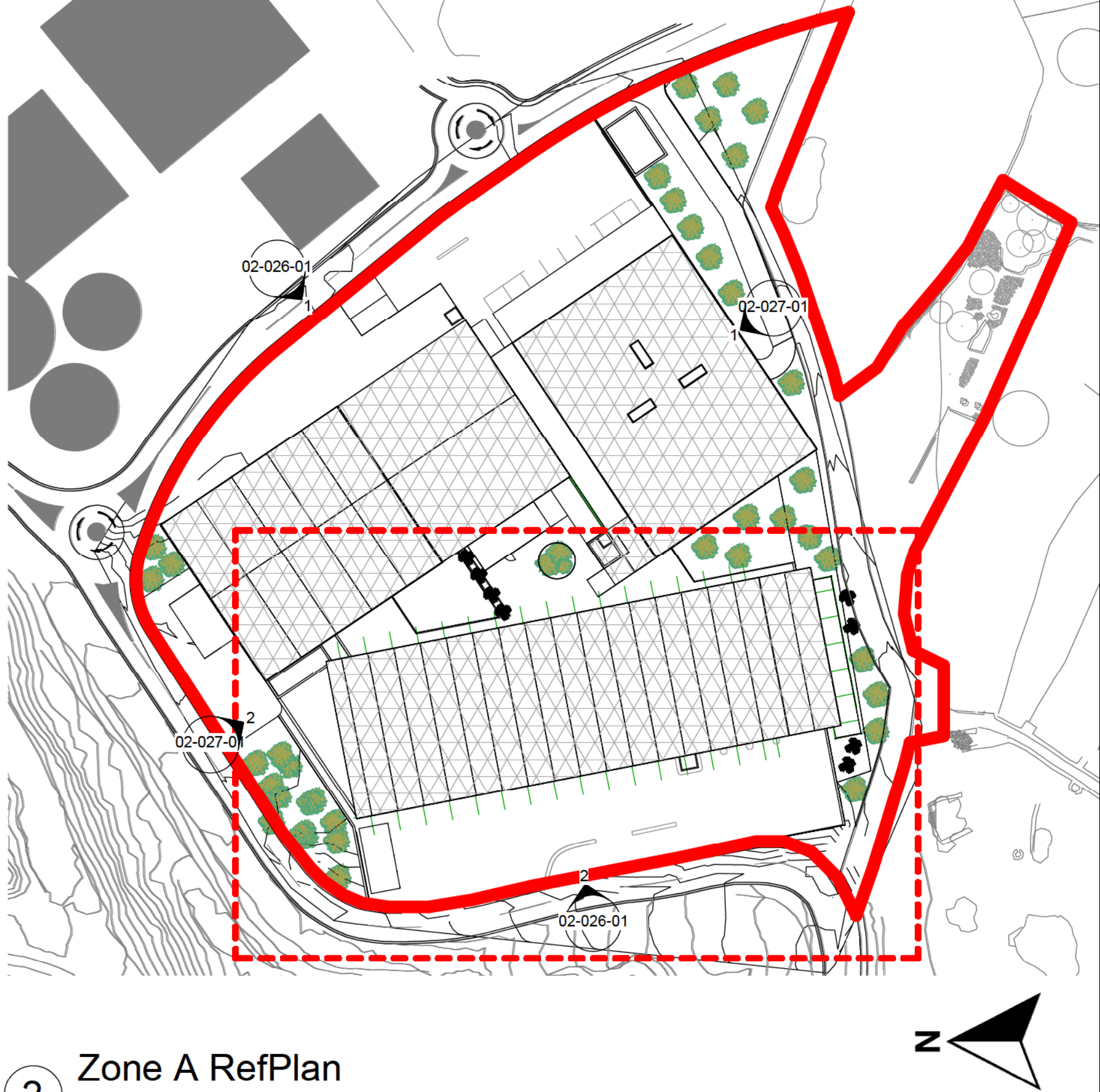


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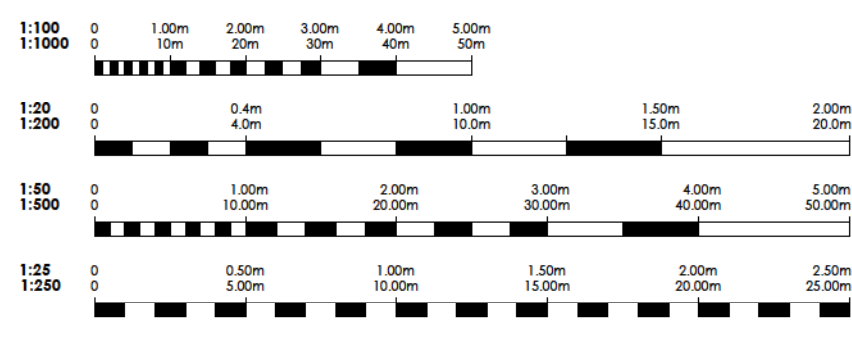
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PROJECT	Proposed Materials Recovery Facility in the ECOHIVE Complex		
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CLIENT	Wasteserv Malta Ltd.		
PROJECT	Proposed Materials Recovery Facility in the ECOHIVE Complex		
LOCATION	ECOHIVE Complex, Magtab, Naxxar		
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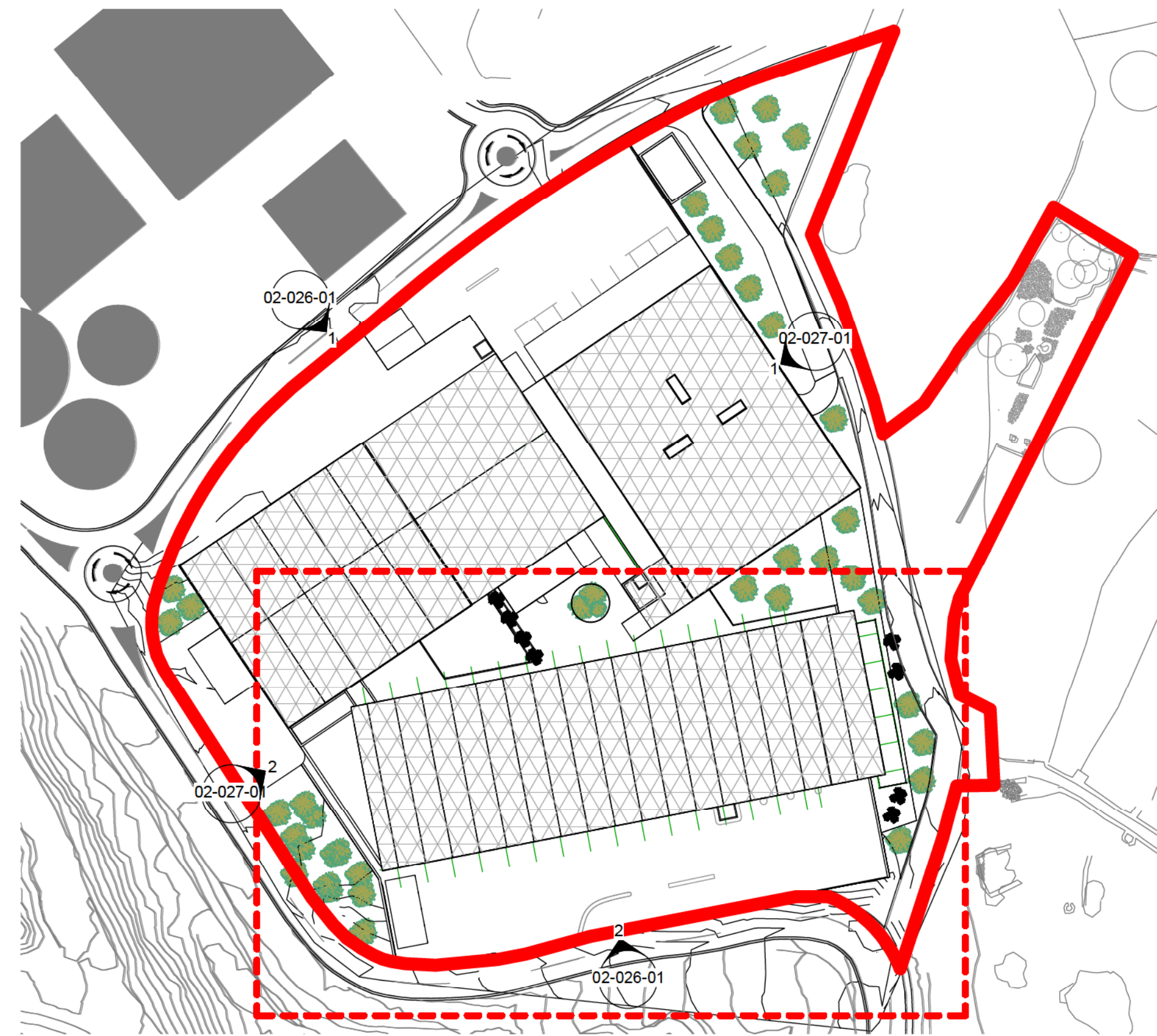


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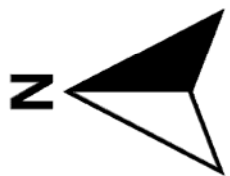
Revision Schedule		
Number	Date	Description



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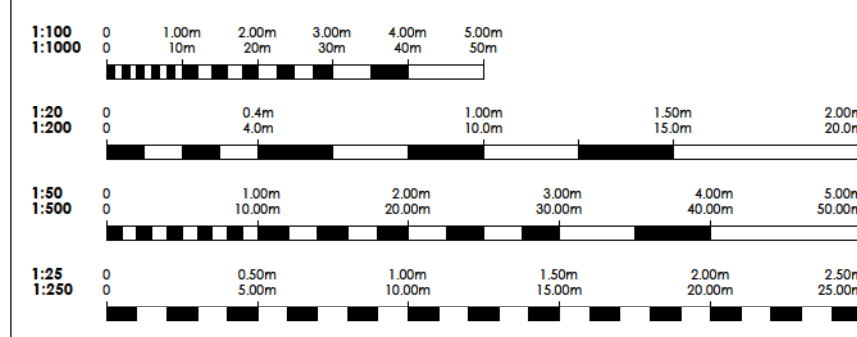


2 ZoneA Ref Plan
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Revision Schedule

Number	Date	Description
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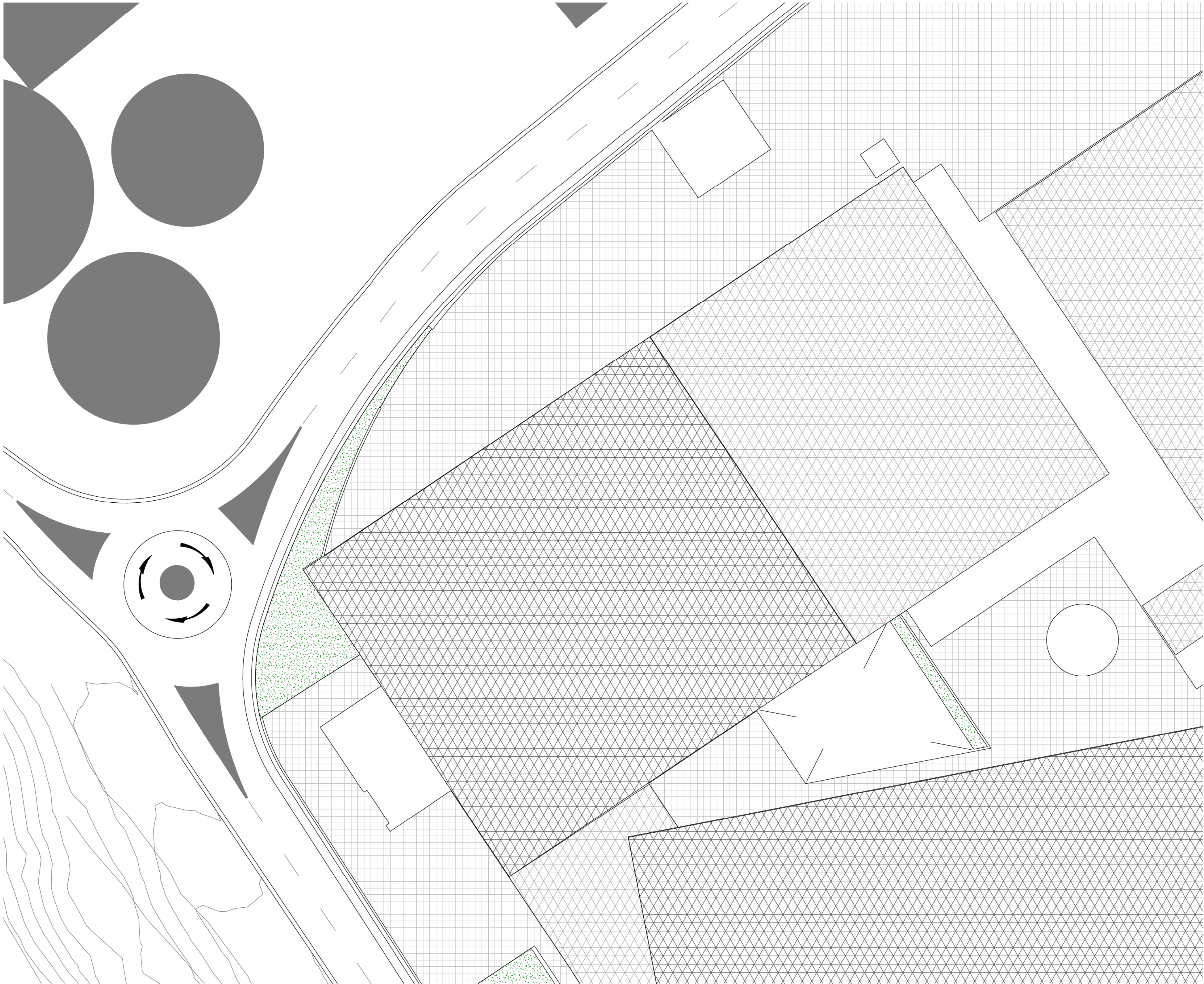


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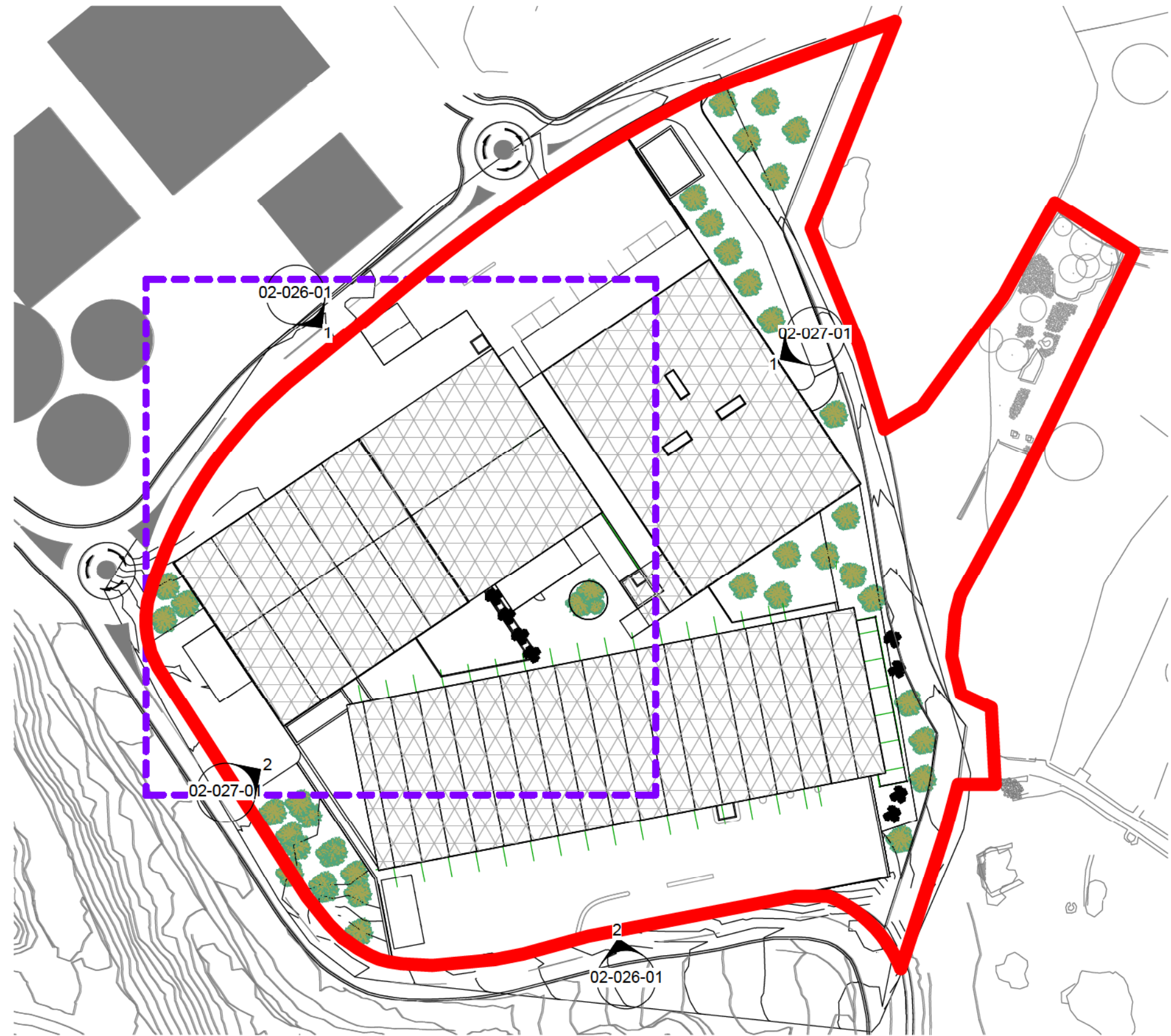
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CLIENT	Wasteserv Malta Ltd.		
PROJECT	Proposed Materials Recovery Facility in the ECOHIVE Complex		
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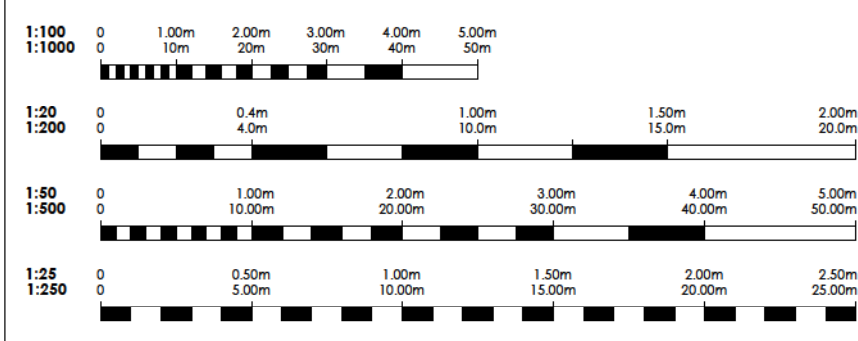
1 Processing Building Roof Plan
1 : 250



2 Zone B RefPlan
1 : 1000



Revision Schedule		
Number	Date	Description



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CLIENT	Wasteserv Malta Ltd.		
PROJECT	Proposed Materials Recovery Facility in the ECOHIVE Complex		
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1 Processing Building
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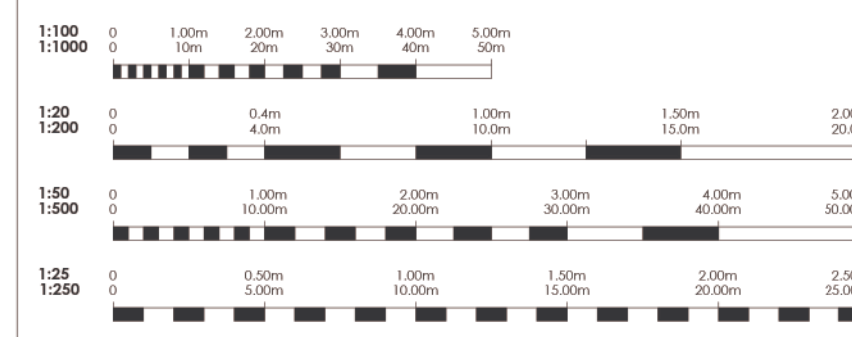


2 Zone B Ref Plan
1 : 1000



Revision Schedule

Number	Date	Description



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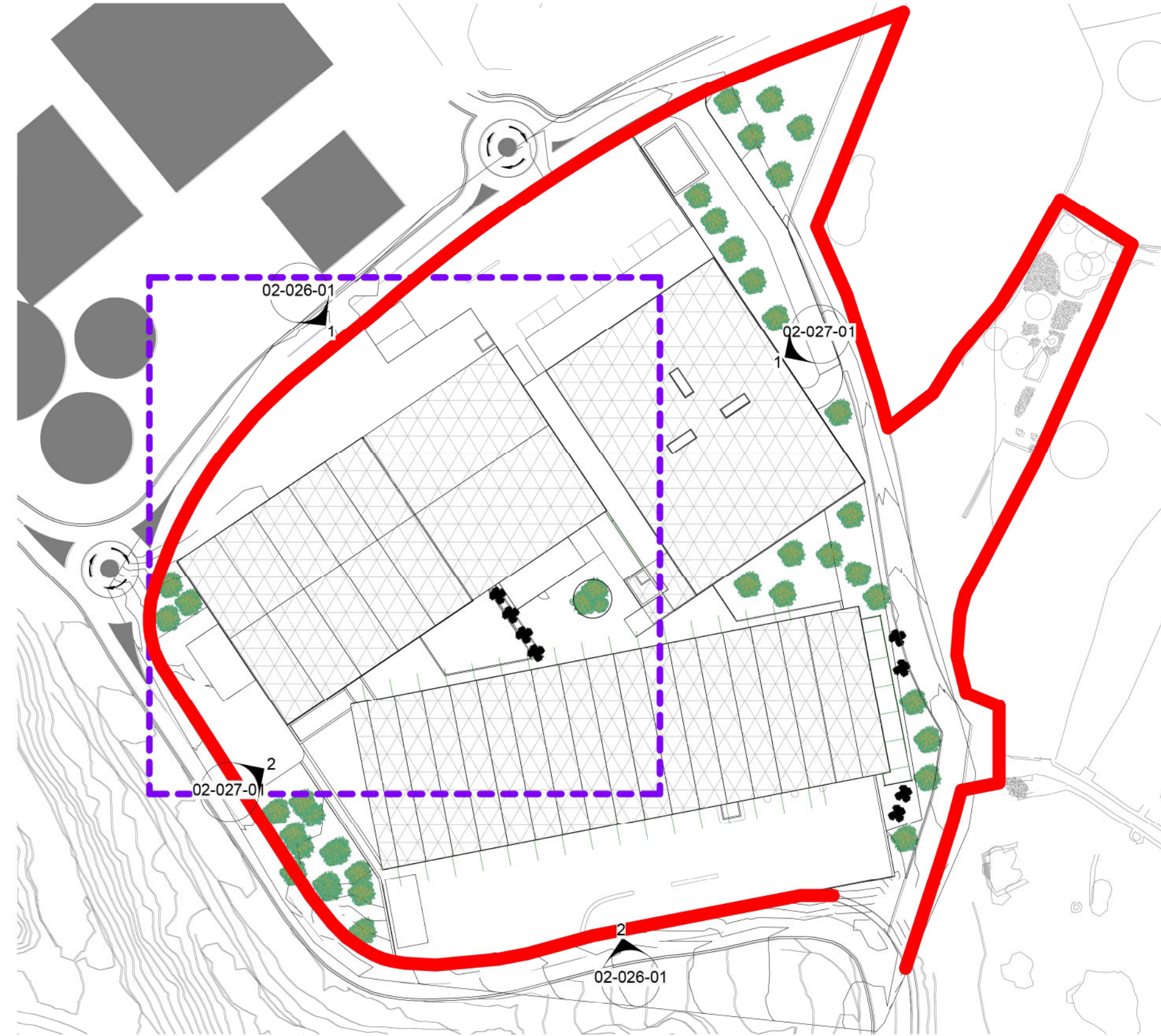
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CLIENT	Wasteserv Malta Ltd.		
PROJECT	Proposed Materials Recovery Facility in the ECOHIVE Complex		
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DATE	12/07/22	JOB REF	2944
		DWG REF	02-011-01



1 Processing Building and Workshop area
1 : 250



2 ZoneB Ref Plan
1 : 1000

Revision Schedule		
Number	Date	Description

1:100
1:1000

0 1.00m 2.00m 3.00m 4.00m 5.00m

1:20
1:200

0 0.4m 1.00m 1.50m 2.00m

1:50
1:500

0 1.00m 2.00m 3.00m 4.00m 5.00m

1:25
1:250

0 0.50m 1.00m 1.50m 2.00m 2.50m

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CLIENT
PROJECT
LOCATION
DWG TITLE

Wasteserv Malta Ltd.
Proposed Materials Recovery Facility in the
ECOHIVE Complex
ECOHIVE Complex, Maghtab, Naxxar
Processing Building Level +37.00

DRAWN BY
ARCHITECT
DATE

AD/SN/LB
RS
07/07/22

PAPER SIZE
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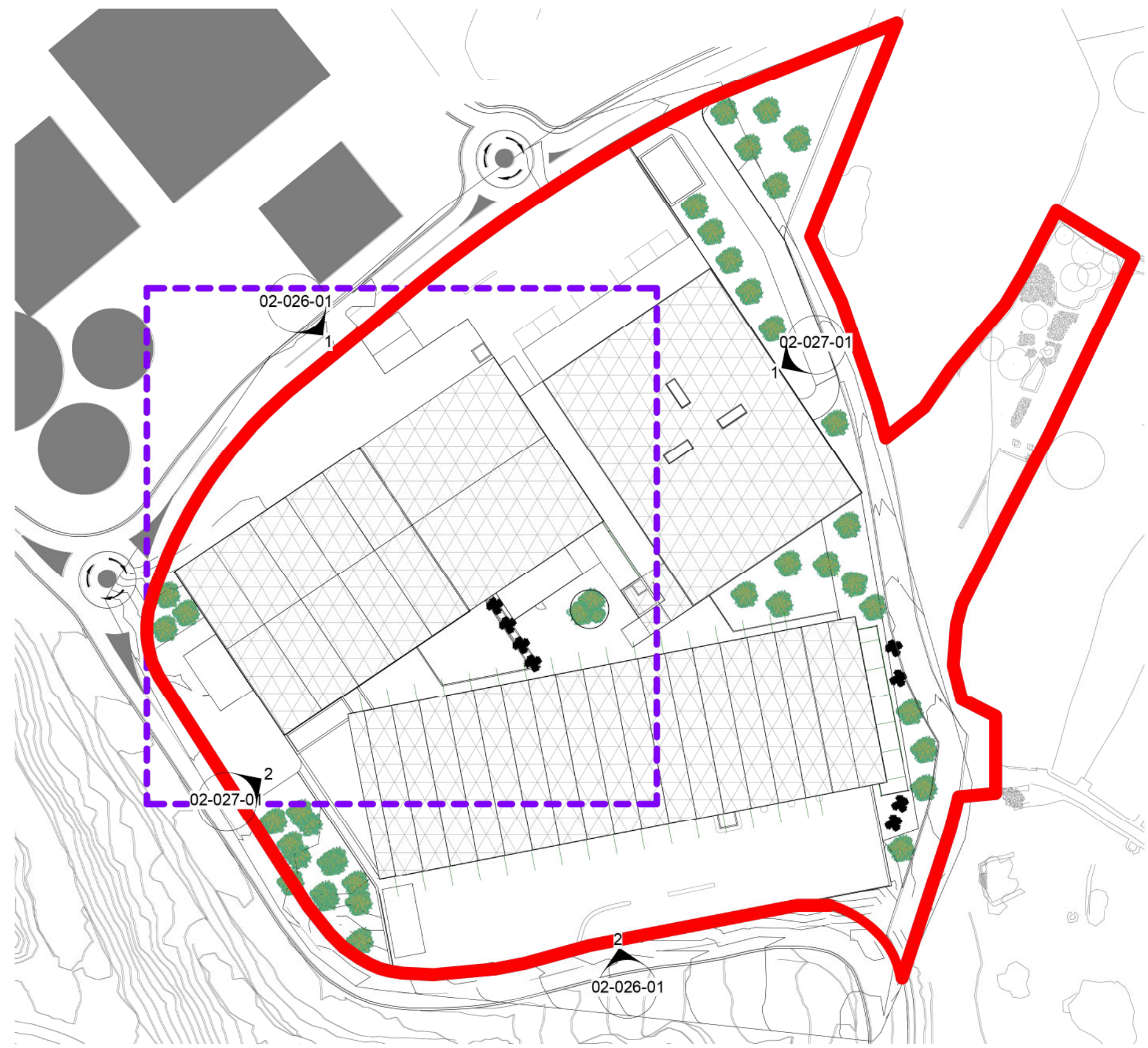
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DATE
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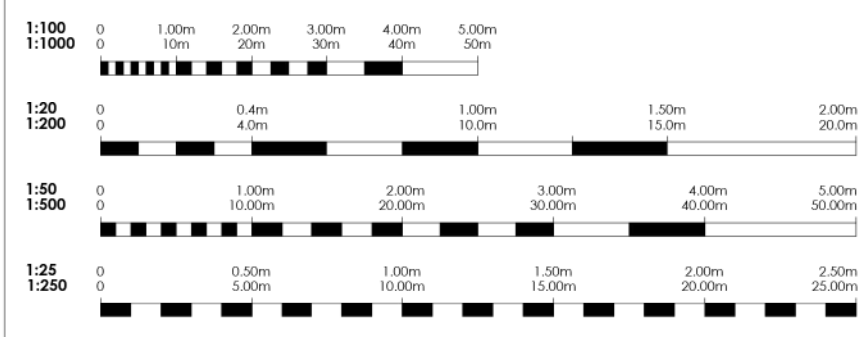


1 Processing Building (Rooms under workshops)
1 : 250



2 ZoneB RefPlan
1 : 1000

Revision Schedule		
Number	Date	Description



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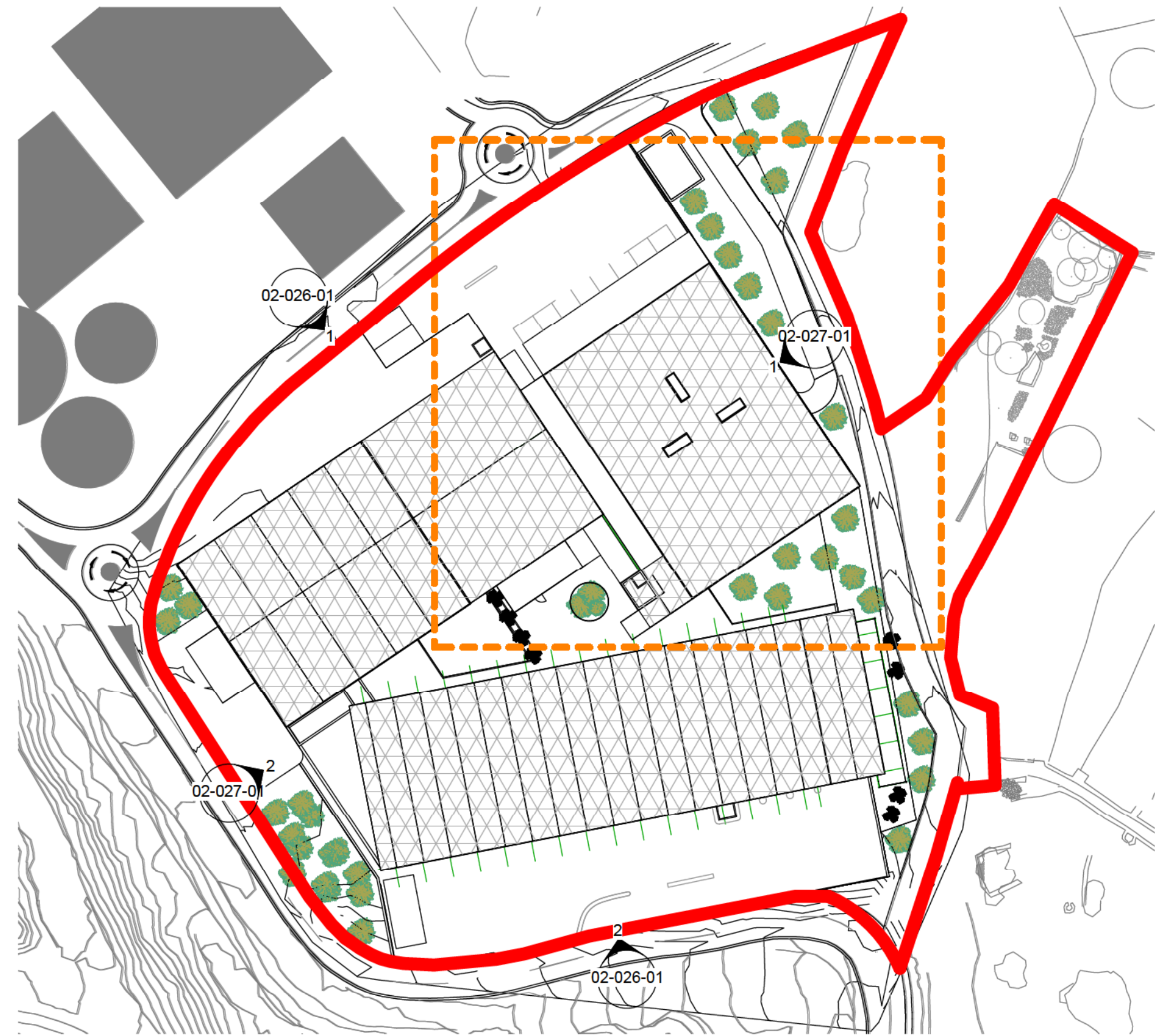
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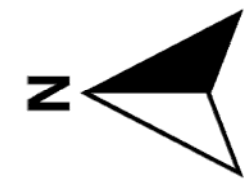
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1 Storage Area Roof Plan
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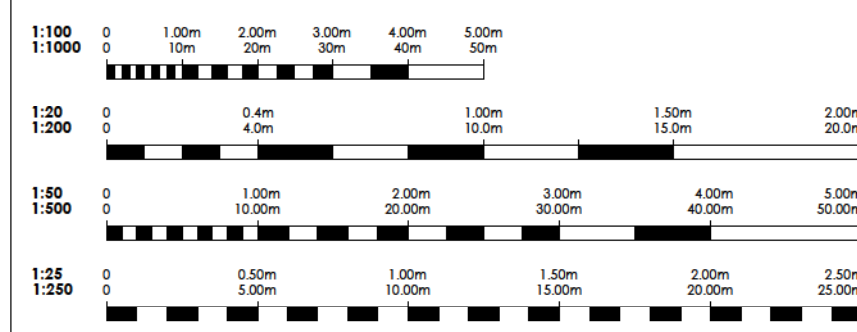


2 Zone C RefPlan
1 : 1000



Revision Schedule

Number	Date	Description
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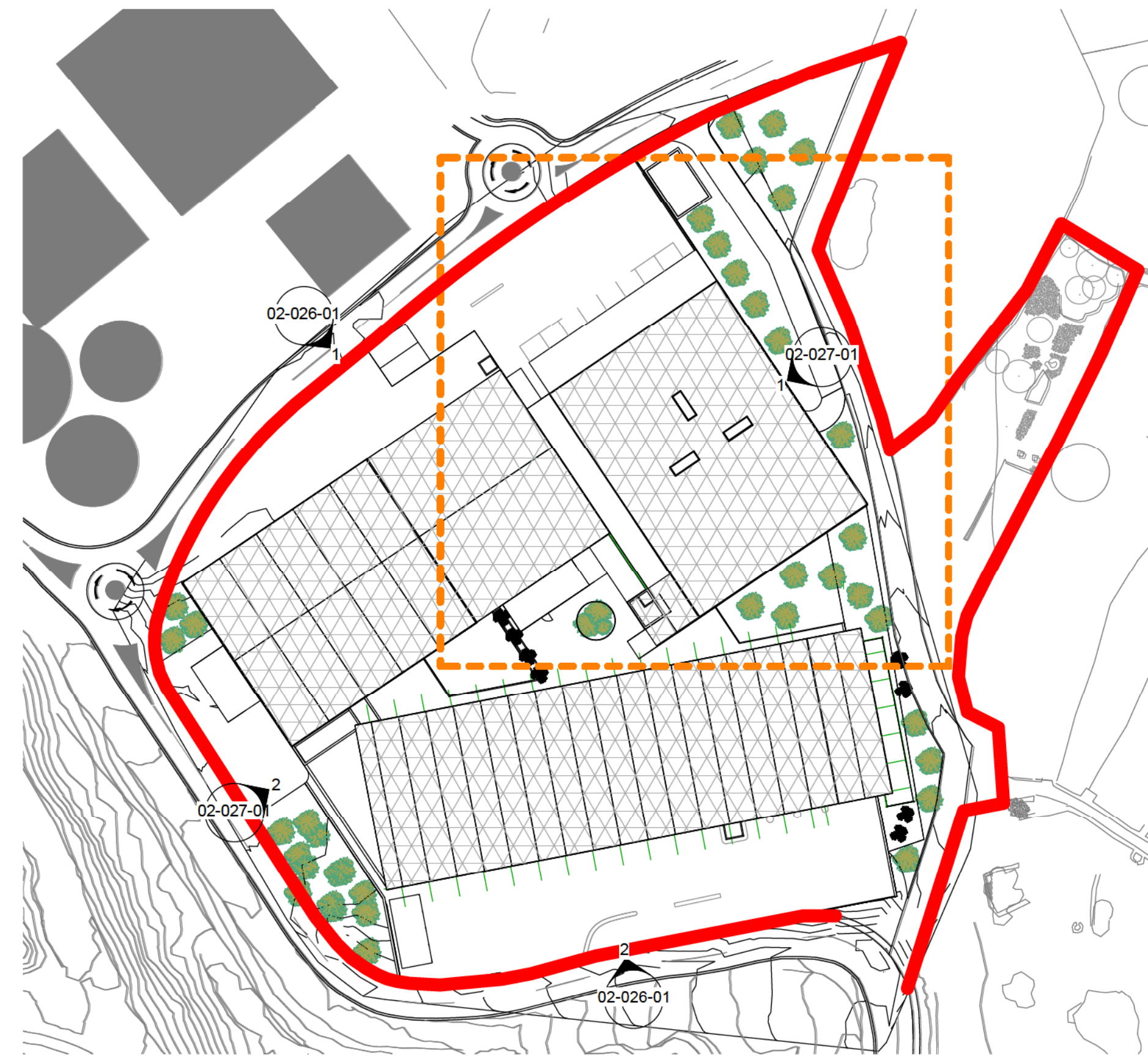
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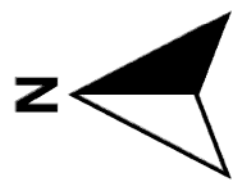
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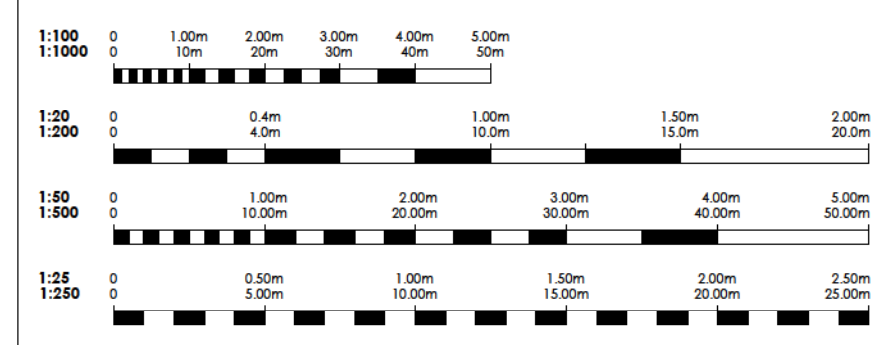
1 Storage Area
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2 Zone C Ref Plan
1 : 1000



Revision Schedule		
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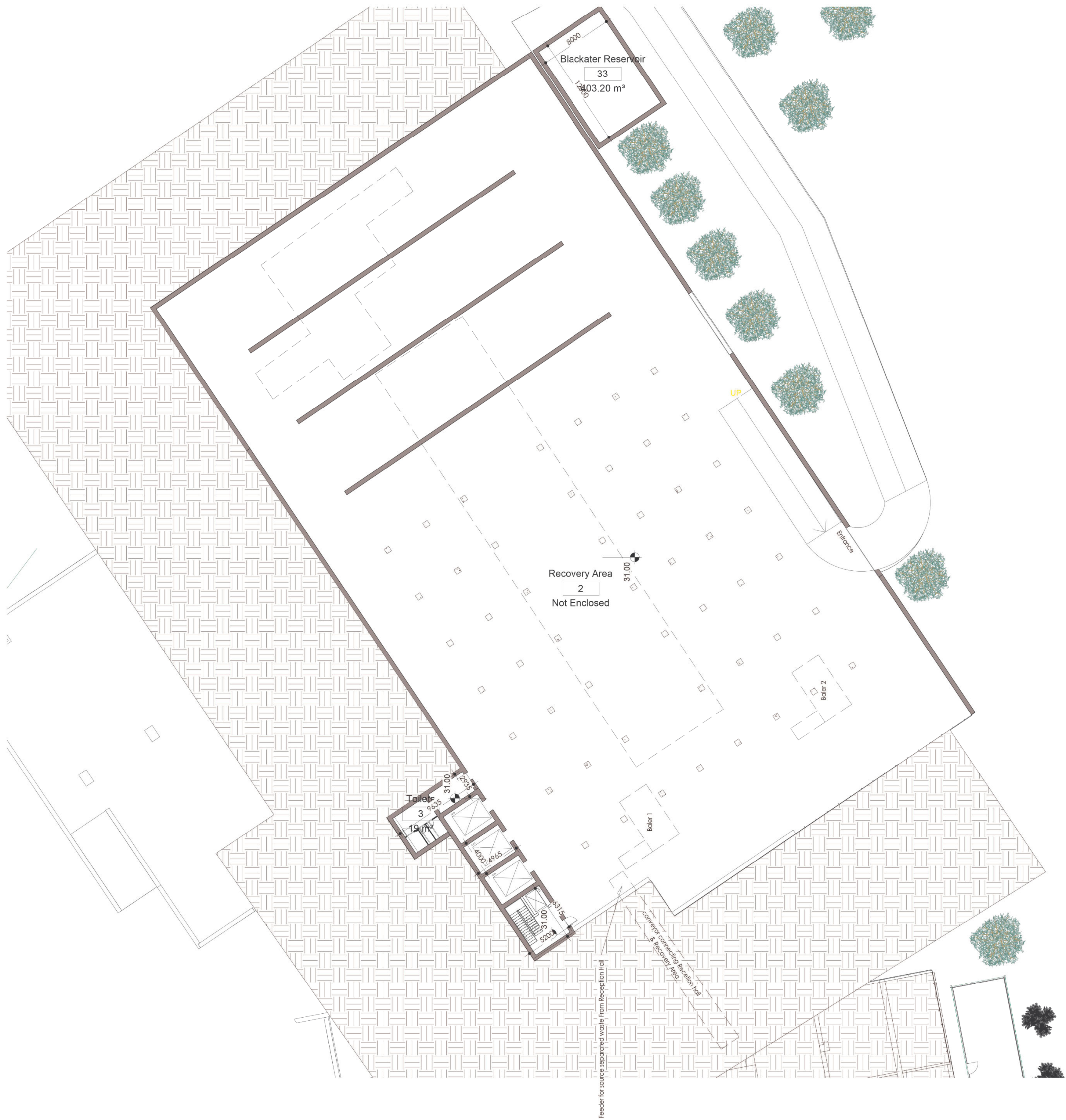


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CLIENT	Wasteserv Malta Ltd.		
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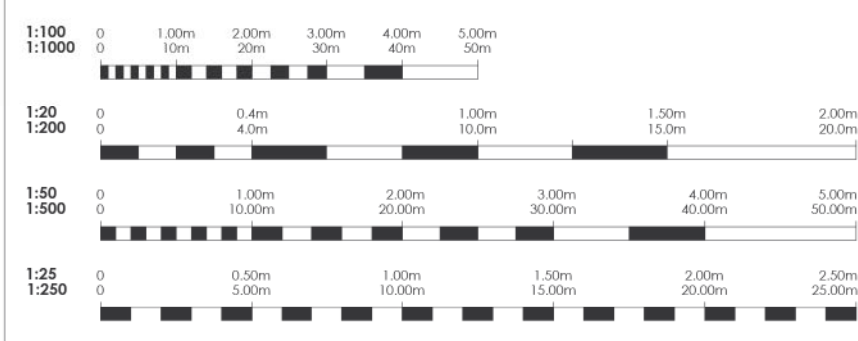


1 Recovery Building
1 : 250



2 ZoneC Ref Plan
1 : 1000

Revision Schedule		
Number	Date	Description



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CLIENT	Wasteserv Malta Ltd.		
PROJECT	Proposed Materials Recovery Facility in the ECOHIVE Complex		
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APPENDIX 2

TERRESTRIAL ECOLOGY BASELINE STUDY (DOUBLET & ZAMMIT, 2022)



Terrestrial Ecology Baseline Study and Impact Assessment in relation to the removal of soil in areas within the ECOHIVE Complex, limits of Naxxar, Malta

Joe Doublet, Mark Zammit

Version 1

20 October 2022

Project Title:

Terrestrial Ecology Baseline Study and Impact Assessment in relation to the removal of soil in areas within the ECOHIVE Complex, limits of Naxxar, Malta

Project Reference:

N/A

Client/ Applicant:

WasteServ Malta Ltd

Contributors:

Joe Doublet - Birds

Mark Zammit - Terrestrial ecology (excluding birds)

Report details:

Terrestrial Ecology Baseline Study and Impact Assessment

Date:

20 October 2022

Document Revision Schedule:

Version No.	Date issued	Details
Version 1	20/10/2022	First draft report – Baseline study only

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1. Introduction

This report has been commissioned by WasteServ Malta Ltd (WSM) (hereinafter referred to as the 'Applicant') and represents a terrestrial ecology baseline study and impact assessment (EclA) in relation to the removal of soil in areas within the ECOHIVE Complex, limits of Naxxar, Malta (hereinafter referred to as the 'Scheme').

The Terms of Reference (ToRs) for this EclA were issued by the Environment and Resources Authority (ERA) in July 2022.

The scope of the EclA is to determine whether the scheme or any part thereof will have any impacts on protected sites and any relevant ecosystems, habitats and species. This document therefore describes the full details of the scheme together with an assessment of all relevant ecological receptors in the area under consideration, the potential impacts presented by the scheme and possible mitigation measures, residual impacts, compensatory measures and alternative solutions, in order to satisfy the requirements of the ToRs.

2. Scheme Description

In the forthcoming years, WSM plans to develop a number of areas within the confines of the ECOHIVE Complex at Magħtab. In order to accelerate the process, WSM has applied to remove vegetation, soil and existing material from a number of areas (Areas A-D) shown in Figure 1. Eventually, WSM plans to develop an Organic Waste Processing Plant (OPP), a Thermal Treatment Facility (TTF) and an access road. Another area has also been earmarked to be used for storage during the works. Details of these developments at this stage are not yet fully available so a generic approach will be adopted when assessing the impacts. The following assumptions are being adopted:

- Any emissions from the plants will be within the existing threshold established in local legislation,
- Filtration systems will be installed in both plants in order to control any emissions within established threshold levels,
- No emissions will be discharged into the marine environment,
- The buildings/ chimneys will be of a height comparable to or lower than those which are already approved for the adjacent Waste to Energy (WtE) facility.

More detailed information on the proposed scheme and its operational processes is provided in the Project Description Statement (JV Salfo & Associates – ADO Ltd, 2022). However, certain features of the scheme may change during the final design based on any relevant considerations, particularly in terms of environmental performance and operating costs.

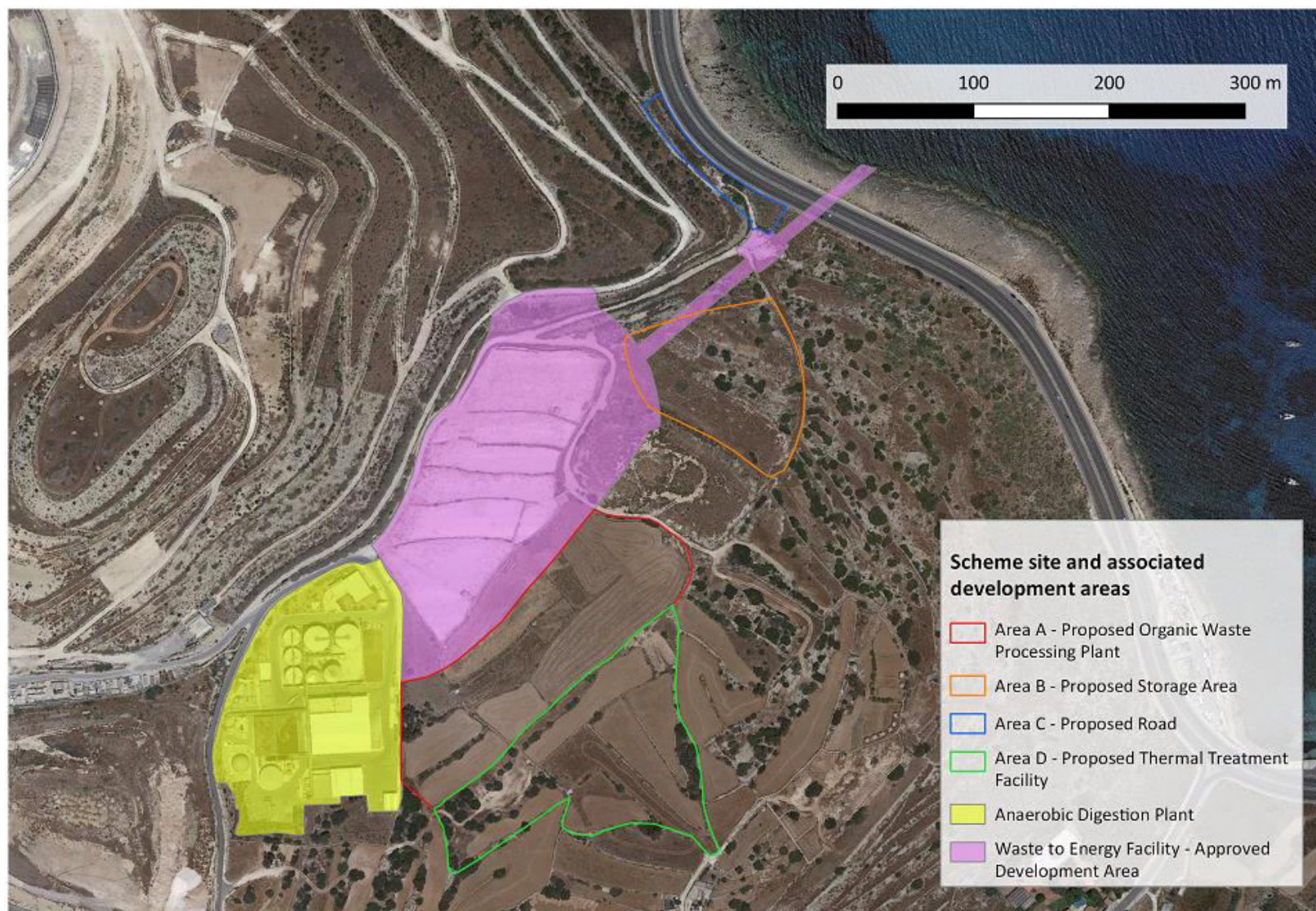


Figure 1: Aerial photo showing areas (Areas A-D) where works are planned in relation to the existing Anaerobic Digestion Plant and the Waste to Energy development area (aerial image from Google Earth, 2022)

3. Site description

3.1. Location of scheme site

The geographical location of the scheme with respect to the Maltese Islands is presented in Figure 2, and more detailed in Figure 2 and Figure 3. The area under consideration can be located at coordinates 35° 56.629'N, 14° 26.662'E at an altitude of about 40m above mean sea level.

The scheme site lies in a rural area close to the Northern coast of Malta, at the limits of Naxxar local council administrative area. It is located just outside the present boundaries of the ECOHIVE Complex, directly adjacent to the existing Anaerobic Digestion Plant, in the area known as Ta' Hammud.

The scheme site can be accessed from the two main entry points of the ECOHIVE Complex via a number of surfaced and unsurfaced roads.



Figure 2: General geographical location of the scheme site within the Maltese Islands (indicated with red point) (aerial image from Google Earth, 2022)



Figure 3: Geographical location of the scheme site (indicated with coloured outlines) in context with its surrounding landscape (aerial image from Google Earth, 2022)



Figure 4: Detailed location and extent of the scheme site (indicated with coloured outlines) (aerial image from Google Earth, 2022)

3.2. General land uses of the scheme site and surroundings

The site is located on the upland of Ta' Ħammud, which naturally developed between the drainage systems of Wied tal-Għallis to the North and Wied ta' Kieli to the South. Originally, these watercourses discharged within or in close proximity to the shallow embayment of Qalet Marku, but their hydromorphology has been extremely altered.

Wied tal-Għallis is nowadays entirely buried beneath the Għallis landfill, while Wied ta' Kieli has been predominantly modified for agricultural use. The water discharge of both valleys has also been further disrupted by the Coast road, an arterial road forming part of the TEN-T network.

A general presentation of the main geological strata and features in relation to the scheme site is illustrated in Figure 5.

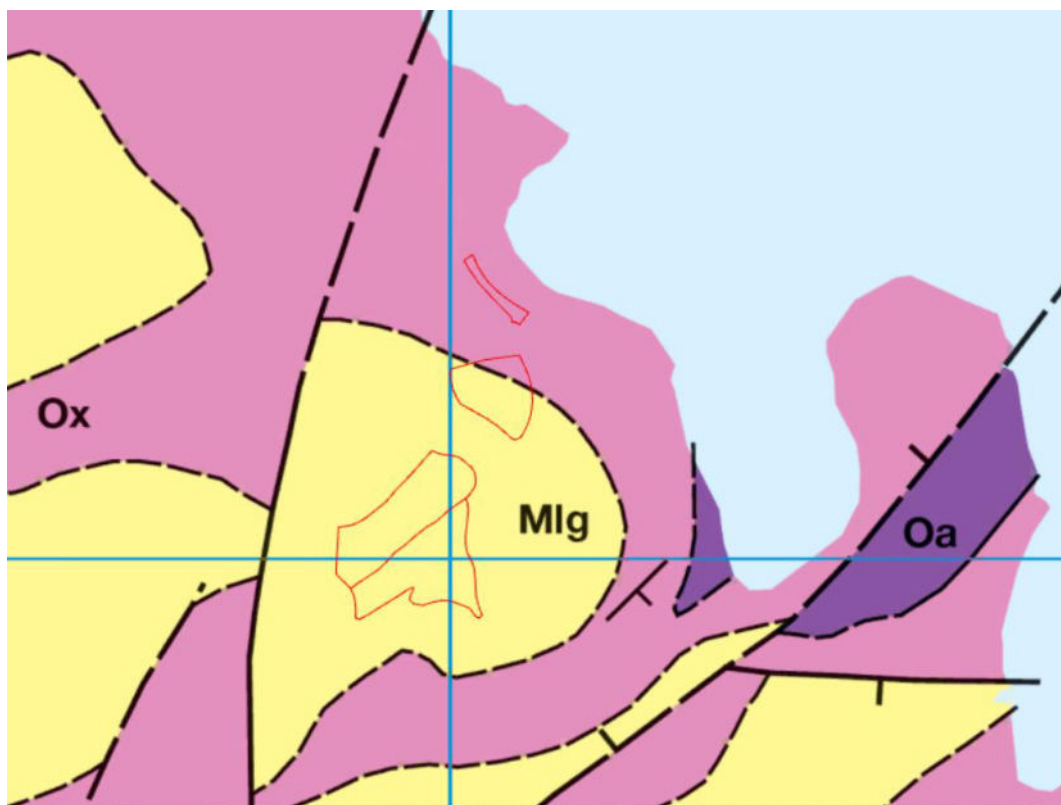


Figure 5: Geological map showing the scheme site (indicated with red outline) (Map extracted from the geological map published by the Oil Exploration Directorate, 1993). Legend: Ox – LCL Xlendi Member, Oa – LCL Attard Member, Mlg – Lower Globigerina Limestone

The slopes reaching the Għallis, Qalet Marku and Baħar iċ-Ċagħaq coastline are mainly based on the Xlendi member of the Lower Coralline Limestone (LCL), and to a lesser extent on the Attard member. These geological strata form a limestone pavement with surface karstic processes accumulating shallow pockets of soil within areas of bare rock. This type of soil is referred to as the Xagħra Soil Series.

Coastal areas exhibit a more rugged or serrated surface, which lead to the development of a rocky shore with minimal vegetation cover and a network of pools. One such coastal rock pool in the area is Ghadira s-Safra.

An overlaying layer of Lower Globigerina Limestone can be found in more inland areas with evident discontinuities caused by a number of minor fault lines. The soft Lower Globigerina Limestone usually yields a topsoil layer and for this reason the areas covered by this rock are largely occupied by agricultural land. The soil associated with such a geomorphological setting is the L-Inglin Complex Soil Series and is likely to be artificially supplemented with inorganic and organic materials that were transported from other sources.

Although not indicated in the geological map in Figure 5, the area also features the Il-Mara member of the LCL and Quaternary slope deposits (Scerri, 2020).

Agriculture in the area has led to the artificial modification of the land and original natural habitats. Agricultural land present includes fields used for extensive cultivation of seasonal crops, but others lie fallow or abandoned. Onsite observations indicate that the active fields are predominantly used for the cultivation of cereal fodder crops.

Boundary walls of varying heights delimit and separate different fields. These boundary walls are constructed of ashlar and/or traditional rubble stones, generally indicating land ownership subdivisions and also serving soil retention purposes. Various mature trees and shrubs are also found in clusters, in lines or singly along the boundary walls. These include trees and shrubs typical of the Maltese rural landscape generally associated with agriculture, such as stands of prickly pear, carobs, olives, figs and almonds.

The most prominent artificial landscape feature in the area is the decommissioned Magħtab landfill within the ECOHIVE Complex, which has been subjected to slope stabilisation measures and ecological reclamation through afforestation.

The ECOHIVE Complex also includes the engineered landfills of Żwejra and Għallis, a gas plant to treat gaseous emissions from the landfills, a Mechanical and Biological Treatment Plant, and an Anaerobic Digestion Plant. The development of an adjacent Waste-to-Energy facility (PA 03012/20 and EA 00057/18) has also been recently approved and is currently in the early phases of site clearance. Another prominent development in the area is the Magħtab Terminal of the Malta-Italy Interconnector. Other smaller buildings are considered to have an agricultural, residential, commercial or recreational use.

Small huts built of ashlar stone blocks or bricks are also present, and are generally associated with wild bird hunting and trapping activities. Planted trees generally associated with bird hunting and/ or for ornamental purposes are gum trees (*Eucalyptus*), wattles (*Acacia*), cypresses, oleander and yuccas.

Other signs of human disturbance around the scheme site include the sporadic deposition of mounds of inert debris as a means of land modification and irregular waste disposal, in particular excavation, construction and demolition waste.

The coastal area is also regularly used for various informal recreational activities including swimming, wind-surfing, jogging, fishing, barbecues, horse-bathing and as a hardstanding area for caravans.

In general terms, the terrestrial ecology of the area has been highly altered by human intervention. Remnants of natural scrubland (garrigue and phrygana) and grasslands (steppe) persist, but in most

areas are considered to represent degradation and recolonisation stages of the original natural environment. Ermes and ruderal communities typical of disturbed ground are very abundant.

Various ecological areas of conservation value are present in the vicinity of the scheme site, including:

- Terrestrial Special Area of Conservation (SAC) of International Importance of l-Għadira s-Safra u l-Iskoll tal-Għallis. L-Għadira s-Safra is also an Area of Ecological Importance Level 1 and 3, while Għallis Rocks is a Site of Scientific Importance Level 2.
- Wied ta' Kieli Listed Area/ Site of Scientific Importance and Scheduled Area/ Site.
- Wied tal-Għallis Listed Area/ Site of Scientific Importance, although it is nowadays entirely buried beneath the landfill.
- Protected Natural Coast.
- Listed (Terrestrial) Ecological Areas.
- Marine Special Area of Conservation (SAC) of International Importance of Żona fil-baħar bejn il-ponta ta' San Dimitri (Għawdex) u il-Qaliet.
- Marine Special Protection Area (SPA) of Żona fil-Baħar Madwar Għawdex.
- Other areas are also marked as agricultural areas and listed archaeological areas/ sites (MEPA, 2006).

At a distance of about 2km to the West is another agglomeration of sites of ecological conservation value at is-Salini and its surroundings. These include a terrestrial Special Area of Conservation (SAC) of International Importance, Area of Ecological Importance, Site of Scientific Importance, Bird Sanctuary, and Scheduled Trees.

4. Methodology

4.1. Area of Study

The area of study (AoS) comprised a coverage of about 100m radius around the scheme site, and modified to be delineated by existing physical features as indicated in Figure 6.



Figure 6: AoS for terrestrial ecology

4.2. Literature review

A literature review of existing and available information on the ecological resources in the AoS was carried out. The following data sources have been identified and consulted:

- Zammit M., Gatt M.C., Metzger B., Deidun A. (2021): *Ecological Impact Assessment in relation to PA 03012/20 and EA 00057/18: Development of a Waste to Energy Facility, to operate in conjunction with other waste management operations within the Magħtab Environmental Complex, Magħtab*. Version 2. April 2021.
- Zammit M. (2017): *Ecological study and impact assessment in relation to the proposed development of a 5 MW PV Farm overlying the Magħtab landfill including related surface culverts and four new Substations* (Tracking No. 175442). September 2017.
- Natura 2000 Standard Data Form for *Żona fil-Baħar Madwar Għawdex* Marine SPA (MT 0000112)

- Natura 2000 Standard Data Form for *Żona fil-Baħar bejn il-Ponta ta' San Dimitri (Għawdex) u l-Qaliet* as a Marine SCI (MT0000105).
- Standard Data Form for *L-Għadira s-Safra u l-Iskoll tal-Għallis* as a Terrestrial SCI/ SAC (MT0000008).
- Standard Data Form for *Is-Salini* as a Terrestrial SAC (MT0000007).
- Data on birds from BirdLife Malta, their journal *Il-Merill* and other local ornithologists.
- The Breeding Birds of Malta (Sultana et al., 2011), Malta Breeding Bird Atlas (Raine et al., 2008) and Important Bird Areas of EU Importance in Malta (Borg & Sultana, 2004).
- European Birds of Conservation concern - populations, trends and national responsibilities (Birdlife International, 2017).
- Malta Breeding Bird atlas 2018 (Epsilon Malta Ltd Nature Conservation Consultants (2019).
- European Breeding Bird Atlas 2 Distribution, Abundance and Change (Keller, V., Herrando, S., Vorisek, P. et al. (2020)).
- Managing Land for Nature Reserves reports for 2018-2019 (Birdlife, 2021).
- European Red List of Birds 2021 (Birdlife International, 2021).

The Strategic Plan for the Environment and Development (SPED) (2015), the Central Malta Local Plan (CMLP) and Area Policy Maps (PA, 2006) and the Rural Policy and Design Guidance (RPDG) (MEPA, 2014) will be consulted to identify relevant policies and site conservation objectives.

4.3. Field surveys and Assessment of data

4.3.1. Habitats, plant communities and flora

Onsite ecological surveys carried out on the following dates:

- 24th, 27th April 2022,
- 2nd, 18th May 2022,
- 6th, 12th, 16th, 18th, 19th, 23rd August 2022,
- 19th, 27th, 30th September 2022,
- 2nd, 3rd October 2022.

In view of the above, this report describes the terrestrial ecology of the dry season. Surveys on vegetation was carried out through a broad-brush walkover survey by recording plant species. Most survey effort was directed towards observation of dominant and protected species.

The surveys included mapping of the habitats, which were characterised based upon the abundance and distribution of dominant and indicator plant species. Geomorphological features, substrate and influencing human-induced factors were also taken into consideration.

Classification of habitats was based on the Palaearctic Habitat Classification (Devillers and Devillers-Terschuren, 2001) and cross-referenced with EUNIS Habitat Classification (Moss and Davies, 2002a) and the habitats listed in Annex I of the EC Habitats Directive (92/43/EEC) (Moss and Davies, 2002b), which is transposed into Schedule I of the Flora, Fauna and Natural Habitats Protection Regulations

(SL 549.44). The latter was further supplemented by reference to the phytosociological units and habitats of Community interest indicated in Brullo et al. (2020).

A habitat distribution map was produced and photographs illustrating the AoS during the field surveys are included in Section 5.

The presence of all vascular plant species encountered in the AoS was recorded and a complete list is presented in Appendix I.

4.3.2. Specific flora surveys

A targeted survey was carried out to record the occurrence of all trees. The location of isolated trees in accessible areas was recorded using a GPS Garmin Oregon750t and spatially georeferenced on a map using QGIS version 3.16. In cases of high tree density and/ or inaccessible areas, the number and location of trees was inferred visually and recorded manually on a printed satellite image.

Regardless of their shape and size, for the scope of this report, a ‘tree’ has the same definition as in Trees and Woodlands Protection Regulations (SL 549.123), thus being a perennial plant, whether dead or alive, which in its adult form has a main woody trunk or trunks and woody branches and including representatives of the family Arecaceae (Palmae), but excludes plants cultivated in pots.

The age of tree specimens within the scheme site was also relevant due to the possible requirement of compensatory planting and is indicated in ranges specified in Section 3.3 of the ‘Guidelines on Works Involving Trees’ (ERA, 2019), being:

- Less than 10 years old;
- Between 10 and 50 years old; and
- Over 50 years old.

Since the age of trees is difficult to determine accurately without destructive methods, it was based on a visual assessment of past aerial and satellite imagery (refer to Appendix II), and the ecologist’s judgement.

4.3.3. Fauna

4.3.3.1. Vertebrates (excluding bats) and invertebrates

No systematic surveys were carried out for faunal species, but additional effort was made during the vegetation surveys to record animal species, both vertebrates and invertebrates.

Some faunal species were directly observed, while the presence of others was inferred from trace remains (e.g. dead specimens, nests, shells, droppings, etc...). Most survey effort was directed towards observation and recording of animal species of conservation value.

4.3.3.2. Bats

A single Anabat Swift passive bat detector was deployed at a fixed location directed at the scheme site for seven nights between 18th and 25th May 2022 and four nights between 6th and 9th October 2022. The recording schedule was set between 20:00-06:00hrs in May and 18:00-06:00hrs in October.

This instrument enables the recording of bat calls in both full spectrum and zero crossing. The data collected was used to determine bat species present within the AoS. All recordings were analysed using Anabat Insight software.

Background noise recordings were deleted from the dataset collected resulting in 1,211 bat sonograms throughout the whole survey period. A total of four different bat species were identified with confidence and attributed according to the call parameters as indicated in Table 1. A sample sonogram of each bat species is provided in Section 5.3.2.2.

Accessible buildings within the scheme site were also monitored to check for possible evidence of bat roosting activity (e.g. presence of guano). In addition, pre-dawn bat surveys were carried out on 22nd May and 24th May 2022 to check for any specific pre-dawn bat behavioural activities that could be helpful in the localisation of bat roosts.

Table 1: Bat call parameters used in the determination of bat species

Peak Frequency (kHz)	Call shape	Bat species
42-51	FM/QCF (Frequency Modulated/ Quasi-Constant Frequency)	<i>Pipistrellus pipistrellus</i> (Common pipistrelle) Note: It is not possible to separate <i>P. pipistrellus</i> (Common pipistrelle) and <i>Miniopterus schreibersii</i> (Common bent winged bat) from call parameters. However, the latter species has not been reported locally since the 1960s and is assumed to be extirpated from the Maltese Island. Bat calls within this range were therefore assigned exclusively to <i>P. pipistrellus</i> .
36-41	FM/QCF	<i>Pipistrellus kuhlii</i> (Kuhl's pipistrelle)
30-35	FM/QCF	<i>Hypsugo savii</i> (Savi's pipistrelle)
25-35	FM	<i>Plecotus gaisleri</i> (Gaisler's long-eared bat)

4.3.3.3. Birds

The data sources utilised for this report consisted of both that found in available reports as well as birdwatching data collected by individuals. Walk-through surveys within the AoS were carried out during August and September. These were supplemented with bird watching data from the coast at Tas-Safra covering the period 2020-2022. In all there were twenty-seven birdwatching events which were most concentrated during 2020 and 2021. The latter data covered different periods of the year and also times of the day, details of which are shown in Table 2. In the latter case, most of the effort was for birds flying out at sea or flying inland or migrating out. Furthermore, data obtained from the

Schematic List for the Salina Nature Reserve for the period 2018-2019 as presented in the Managing Land for Nature –Reserve reports for 2018-19 (Birdlife Malta, 2021) was used. Data found in the avian section compiled by Gatt M.C. and Metzger B. and reported in Zammit et al. (2021) in relation to the development of the WtE facility project was also utilised. The latter was mainly based on literature review and listed species which were recorded, expected to cross or be present within a six km radius from the WtE facility. The mix of data sources can be considered as representative for the purposes of this report since it covers different periods of the year and also different areas both within the AoS and also in the surrounding protected areas.

Table 2: Details of avian data collected from the area of Tas-Safra during 2020-2022

Date	Time of day
26/01/2020	am/ pm
02/02/2020	am
08/02/2020	pm
16/02/2020	pm
09/08/2020	am
13/08/2020	pm
24/10/2020	pm
11/12/2020	pm
19/12/2020	pm
20/12/2020	pm
11/01/2021	am
12/01/2021	am
16/01/2021	pm
17/01/2021	am/pm
23/01/2021	pm
24/01/2021	am
07/02/2021	am
20/03/2021	pm
14/07/2021	pm
17/07/2021	am/ pm
18/07/2021	pm
24/07/2021	pm
20/08/2021	am
28/12/2021	pm
30/12/2021	pm
23/01/2022	pm
30/01/2022	pm

4.4. Evaluation of the legal protection and conservation status of the ecological resources

The designation of habitats and species (excluding birds) shall be in accordance with the relevant schedules in the Flora, Fauna and Natural Habitats Protection Regulations (SL 549.44), Trees and Woodlands Protection Regulations (SL 549.123) and Rubble Walls and Rural Structures (Conservation and Maintenance) Regulations (SL 552.01).

The conservation status of the habitats listed in Schedule I, and species listed in Schedule V, of the Flora, Fauna and Natural Habitats Protection Regulations (SL 549.44) will be based on the Habitats Directive Article 17 reports for the year 2019, while that of other species will be indicated in accordance with the Red Data Book of the Maltese Islands (RDB) (Schembri and Sultana (eds.), 1989).

The designation of species will be indicated in accordance to the Birds Directive. The conservation status of birds has been assigned in accordance to the Species of European Conservation Concern (SPEC) system (Birdlife International, 2017) and IUCN Red List (Category Europe).

5. Ecological assessment

5.1. Habitats and vegetation

As described in Section 3.2, the main ecological landscape features within the AoS consist of agricultural areas, disturbed ground, afforested areas, karstland and a stretch of coastal rocky shore. These elements determine the basic abiotic environmental conditions for colonisation by natural vegetation, which in turn is affected by the combined effect of natural biotic and anthropogenic factors.

The distribution of habitats and tree species are presented in Figure 7-Figure 9 and Figure 10-Figure 12 respectively.

Areas A and D of the scheme are predominantly made up of agricultural land, consisting of a number of actively cultivated fields with cereal fodder crops and to a lesser extent vegetable crops (Figure 13-Figure 14). The fields are defined by traditional rubble walls (Figure 15) of varying height, with some stretches in a state of disrepair. Common wild plants growing among the crops include *Glebionis coronaria* (Crown daisy), *Papaver rhoeas* (Common poppy), *Avena sterilis* (Animated oat), *Lolium rigidum* (Stiff ryegrass), *Diplotaxis tenuifolia* (Perennial wall-rocket), *Brassica rapa* subsp. *sylvestris* (Bargeman's cabbage) and *Fumaria* sp. (Fumitory), while *Foeniculum vulgare* (Fennel) and *Piptatherum miliaceum* (Smilo grass) are generally restricted to the less disturbed field verges.

One field in Area A adjacent to the Anaerobic Digestion Plant includes a small cluster of mature *Eucalyptus gomphocephala* (Tuart tree) (Figure 16), *Acacia saligna* (Blue-leafed wattle) and *Cupressus sempervirens* (Cypress) trees, which are typically planted to attract avifauna for bird hunting activities. A number of naturally-occurring *Pistacia lentiscus* (Lentisk) shrubs are also present in the otherwise herbaceous undergrowth comprised of *Piptatherum miliaceum* (Smilo grass), *Arisarum vulgare* (Friar's cowl), *Mercurialis annua* (Annual mercury), *Asparagus aphyllus* (Spiny asparagus), *Oxalis pes-caprae* (Cape sorrel), *Chenopodium murale* (Nettleleaf goosefoot), *Glebionis coronaria* (Crown daisy) and *Galactites tomentosa* (Boar thistle).

Area D bears prominent but fragmented, linear clusters of mature *Ceratonia siliqua* (Carob) trees along the boundaries of agricultural fields, accompanied by a number of *Pistacia lentiscus* (Lentisk) and *Ficus carica* (Fig).

Both Areas A and D feature tree lines of *Prunus dulcis* (Almond), with the one in Area A being interspersed with a few *Pistacia lentiscus* (Lentisk) shrubs, a young *Olea oleaster* (Wild olive) and growths of *Vitis* sp. (Wild vine). A number of isolated specimens of *Nerium oleander* (Oleander), *Opuntia ficus-indica* (Prickly pear), *Ficus carica* (Fig), *Prunus dulcis* (Almond), *Ceratonia siliqua* (Carob) and *Olea europaea* (Olive) trees are also present along the boundaries of agricultural parcels within both Areas A and D.

Agricultural land outside the scheme site exhibits a similar vegetation composition and planted trees to the ones described above, with the exception of one agricultural holding at the southeast of the AoS, which was extensively disturbed by works during the surveys, but had a noticeable abundance of planted *Olea europaea* (Olive) trees.

Fragmented patches of evergreen arborescent and shrubby vegetation (Figure 17) are also present outside the scheme site and these represent a combination of long-standing trees and natural recolonisation by perennial shrubs. These habitats are largely based on *Ceratonia siliqua* (Carob) and *Pistacia lentiscus* (Lentisk). The presence of mature *Olea europaea* (Olive) is more localised and likely

planted for agricultural or ornamental purposes, while the presence of mature *Eucalyptus gomphocephala* (Tuart tree) are more likely planted for bird hunting purposes. Less abundant, naturally-occurring shrubs within these habitat patches include *Lonicera implexa* (Evergreen honeysuckle), *Prasium majus* (White hedge-nettle) and *Periploca angustifolia* (Wolfbane). Less abundant, planted trees within these habitat patches include *Acacia saligna* (Blue-leafed wattle), *Cupressus sempervirens* (Cypress), *Opuntia ficus-indica* (Prickly pear) and *Yucca gloriosa* (Spanish dagger).

A possibly protected species of *Iris* sp. (Iris) (Figure 18) was also recorded outside the scheme site within the carob thicket and lentisk scrub. It could not be identified at species level during the survey due to the absence of flowers.

Two areas, one at the northeast and one at the southwest of the AoS, are characterised by highly disturbed ground. Extensive deposits of excavation, construction and demolition waste are prominent in the former area. The natural vegetation in these areas is composed of opportunistic species typical of ruderal communities (Figure 19), namely *Glebionis coronaria* (Crown daisy), *Galactites tomentosa* (Boar thistle), *Sonchus oleraceus* (Sow Thistle), *Malva arborea* (Tree mallow), *Borago officinalis* (Borage), *Diploxys tenuifolia* (Perennial wall rocket), *Piptatherum miliaceum* (Rice-grass), *Oxalis pes-caprae* (Cape sorrel), *Avena sterilis* (Animated oat), *Cynodon dactylon* (Bermuda grass), *Foeniculum vulgare* (Fennel), *Anthirrinum tortuosum* (Greater snapdragon) and *Mercurialis annua* (Annual mercury). A large extent of Areas B and C of the scheme are situated within this habitat type.

Remnants of natural scrubland and grasslands persist along the downslope part of the AoS towards the coast road. These fragmented patches and continuous mixed assemblages of different plant communities are considered to represent degradation and recolonisation stages of the original natural habitats conducive of the karst area. This habitat is made up of a heterogeneous complex of lentisk scrub, labiate garrigue/phrygana, ermes and steppe.

Stretches with mixed ermes and steppe communities (Figure 20) present within the AoS are characterised by the dominance of herbaceous plants, such as *Asphodelus aestivus* (Branched asphodel) and *Urginea pancration* (Seaside squill), the grasses *Hyparrhenia hirta* (Beard grass), *Stipa capensis* (Mediterranean steppe grass) and *Bromus* sp. (Brome), and the thistles *Galactites tomentosa* (Boar thistle), *Atractylis gummifera* (Ground thistle) and *Carlina involucreta* (Clustered carline thistle). This habitat introduces elements of a priority habitat of EU importance, referred to as Pseudo-steppe with grasses and annuals of the *Thero-Brachypodietea* (Habitat 6220*) making it of potential high conservation value. However, whether it qualifies as such may be subject to interpretation when taking into consideration the landscape context and its condition. Parts of Areas B and C of the scheme are within this habitat type.

The characteristic species of labiate garrigue/phrygana present is the low-growing shrub *Thymra capitata* (Mediterranean thyme) (Figure 21) and such habitat is of conservation interest as it is considered to represent an impoverished formation of a habitat of EU importance, namely the West Mediterranean clifftop phryganas (*Astragalo-Plantaginietum subulatae*) (Habitat 5410). Parts of Area C of the scheme is within this habitat type.

Areas with larger shrubs of *Pistacia lentiscus* (Lentisk) and to a lesser extent *Lonicera implexa* (Evergreen honeysuckle) form an open lentisk scrub. However, this habitat type is highly degraded by the prominence of the invasive, alien *Agave* spp. (Century plant) (Figure 22).

Withered remains of *Anacamptis* sp. (Pyramidal orchid) and other orchids were also noted in the scrub areas during the surveys but could not be identified at species level. A previous study carried out in

the wet season (Zammit et al., 2021) reported the presence of *Neotinea lactea* (Milky orchid). In addition, Lanfranco (2011) reported that the karst terrain between Għadira s-Safra and Qalet Marku supports populations of *Anacamptis pyramidalis* subsp. *pyramidalis* (Pyramidal orchid), *Anacamptis coriophora* subsp. *fragrans* (Fragrant orchid) and other species in the genera *Serapias* and/or *Ophrys*. Orchid populations within the area of study are however expected to be more limited as the specified karst terrain extends much further. According to the orchid distribution maps published in Mifsud (2018), the karst area may also host *Anacamptis collina* (Fan-lipped orchid), *Ophrys bombyliflora* (Bumble bee orchid), *Ophrys iricolor* subsp. *vallesiana* (Valles' rainbow bee orchid), *Ophrys melitensis* (Maltese spider orchid) and *Serapias parviflora* (Small-lipped ploughshare orchid).

The AoS also encompasses a narrow stretch of coastal rocky shore on the opposite side of the coast road. The supralittoral zone is typically bare and devoid of any vegetation. Closer to the road, the rocky shore supports aerohaline communities made up of a combination of salt steppes, maritime scrubs and associated annuals (Figure 23). This community consists of *Arthrocnemum macrostachyum* (Glaucous glasswort), *Limbarda crithmoides* (Golden samphire), *Crithmum maritimum* (Sea samphire), *Limonium zeraphae* (Zerafa's sea lavender), *Silene sedoides* (Hairy catchfly), *Anthemis urvilleana* (Maltese sea chamomile) and *Desmazeria pignatti* (Pignatti's fern grass). Small patches of *Mesembryanthemum nodiflorum* (Lesser crystal ice plant), *Cakile maritima* (Sea rocket) and *Salsola soda* (Smooth-leaved saltwort) were also present. Previous studies carried out in the wet season (Zammit et al., 2021) also reported the presence of *Senecio pygmaeus* (Pygmy ragwort), *Frankenia hirsuta* (Hairy sea heath) and *Spergularia* sp. (Sea-spurrey) within the area.

The presence of endemic sea lavender within the aerohaline community introduces elements of a habitat of EU importance, namely the Vegetated sea cliffs of the Mediterranean coasts with endemic *Limonium* spp. (Habitat 1240), and is therefore of high conservation value. Furthermore, this coastal stretch bears a few trees of *Tamarix* sp. (Tamarisk) and a natural remnant population of the endangered grass *Elymus pycnanthus* (Sea couch) (Figure 24).

The northern part of the AoS is within the precincts of the Magħtab Environmental complex and comprise the former Għallis landfill which was subjected to slope stabilisation measures and ecological reclamation through afforestation (Figure 25). Among the varied trees and shrubs planted within the AoS are *Tamarix* sp. (Tamarisk), *Atriplex halimus* (Shrubby orache), *Pinus halepensis* (Aleppo pine), *Tetraclinis articulata* (Sandarac gum tree), *Nerium oleander* (Oleander) and *Acacia saligna* (Blue-leaved wattle), while the undergrowth is predominantly composed of ermes and ruderal communities. The invasive alien species *Nicotiana glauca* (Shrub tobacco) and *Ricinus communis* (Castor oil tree) have also established populations within the afforested area.

An artificial pond (Figure 26) created between the afforested former landfill and the coast road is predominantly colonised by *Typha domingensis*, (Southern cattail), with more localised stands of *Arundo donax* (Great reed), *Phragmites australis* (Lesse reed) and *Tamarix* sp. (Tamarisk) trees.

The remaining parts of the AoS are occupied by the Anaerobic Digestion Plant and the development site of a Waste-to-Energy facility, which at the time of survey featured exposed bedrock and rubble walls prior to their dismantling (Figure 27). The landscaped areas of the Anaerobic Digestion Plant (Figure 28) were largely planted with *Ceratonia siliqua* (Carob), *Olea europaea* (Olive) and *Prunus dulcis* (Almond). Other trees and shrubs present included *Myoporum laetum* (Ngaio), *Laurus nobilis* (Bay laurel), *Citrus* sp. (Citrus tree), *Punica granatum* (Pomegranate) and *Hibiscus rosa-sinensis* (Rose of China).

5.2. Summary of habitats

The described ecological communities can be classified by a combination of the habitats units listed in Table 3.

Table 3: Habitat types present at the AoS in accordance with established habitat classification systems

Palaearctic Habitats Classification	EUNIS Habitat Classification	Schedule I of SL 549.44
11.296. Supralittoral rocks	B3.1 Supralittoral rock (lichen or splash zone)	N/A
18.22174. Hyblaeo-Maltese sea-cliff communities	B3.3/P-18.22 Tethyan sea-cliff communities	Habitat 1240 - Vegetated sea cliffs of the Mediterranean coasts with endemic <i>Limonium</i> spp.
32.122. Carob arborescent matorral	F5.122 Carob arborescent matorral	N/A
32.214. Lentisc brush	F5.514 Lentisc brush	N/A
32.471. Thyme, sage, small germander and other labiate garrigues	F6.1/P-32.47 Western [Teucrium] and other labiate garrigues	[Impoverished formation of] Habitat 5410 - West Mediterranean clifftop phryganas (<i>Astragalo-Plantaginetum subulatae</i>)
32.91. Asphodel fields	E1.C1 Asphodelus fields	N/A
32.92. Thistle fields	E1.C2 Thistle fields	N/A
32.94. Ferula stands	E1.C4 Ferula stands	N/A
34.513. Mediterranean annual communities of shallow soils	E1.3/P-34.51 West Mediterranean xeric grassland	*6220 Pseudo-steppe with grasses and annuals of the Mediterranean xeric grassland <i>Thero-Brachypodietea</i>
34.6343. Central Mediterranean andropogonid grass steppes	E1.4343 Central Mediterranean andropogonid grass steppes	*6220 Pseudo-steppe with grasses and annuals of the Mediterranean xeric grassland <i>Thero-Brachypodietea</i>
53.134. Southern reedmace beds	C3.2/P-53.13(p) [<i>Typha</i>] beds	N/A
84.4. Rural mosaics - Reticulated landscapes of tree-lines, hedgerows, plantations, woodlots, pastures and crops.	X10 Mosaic landscapes with a woodland element	N/A
86.32. Active industrial constructions	J2.32 Rural industrial sites	N/A
86.5. Rural scattered constructions	J2.4 Agricultural constructions	N/A

Palaearctic Habitats Classification	EUNIS Habitat Classification	Schedule I of SL 549.44
87.1. Fallow fields	I1.53 Fallow un-inundated fields with annual and perennial weed communities	N/A
87.2. Ruderal communities	E5.13 Weed communities	N/A

Habitats map (1 of 3)

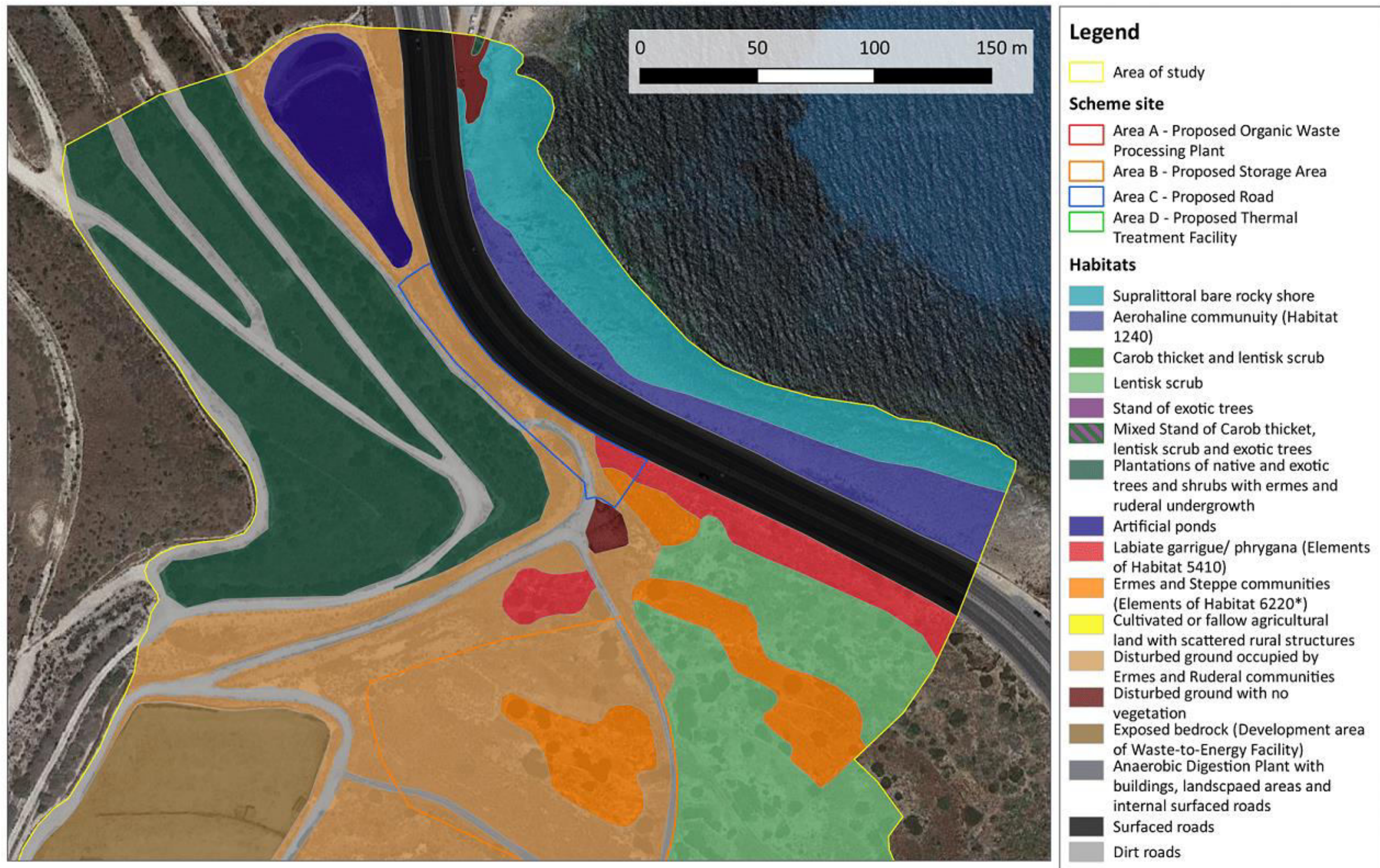


Figure 7: Habitats map of the AoS

Habitats map (2 of 3)

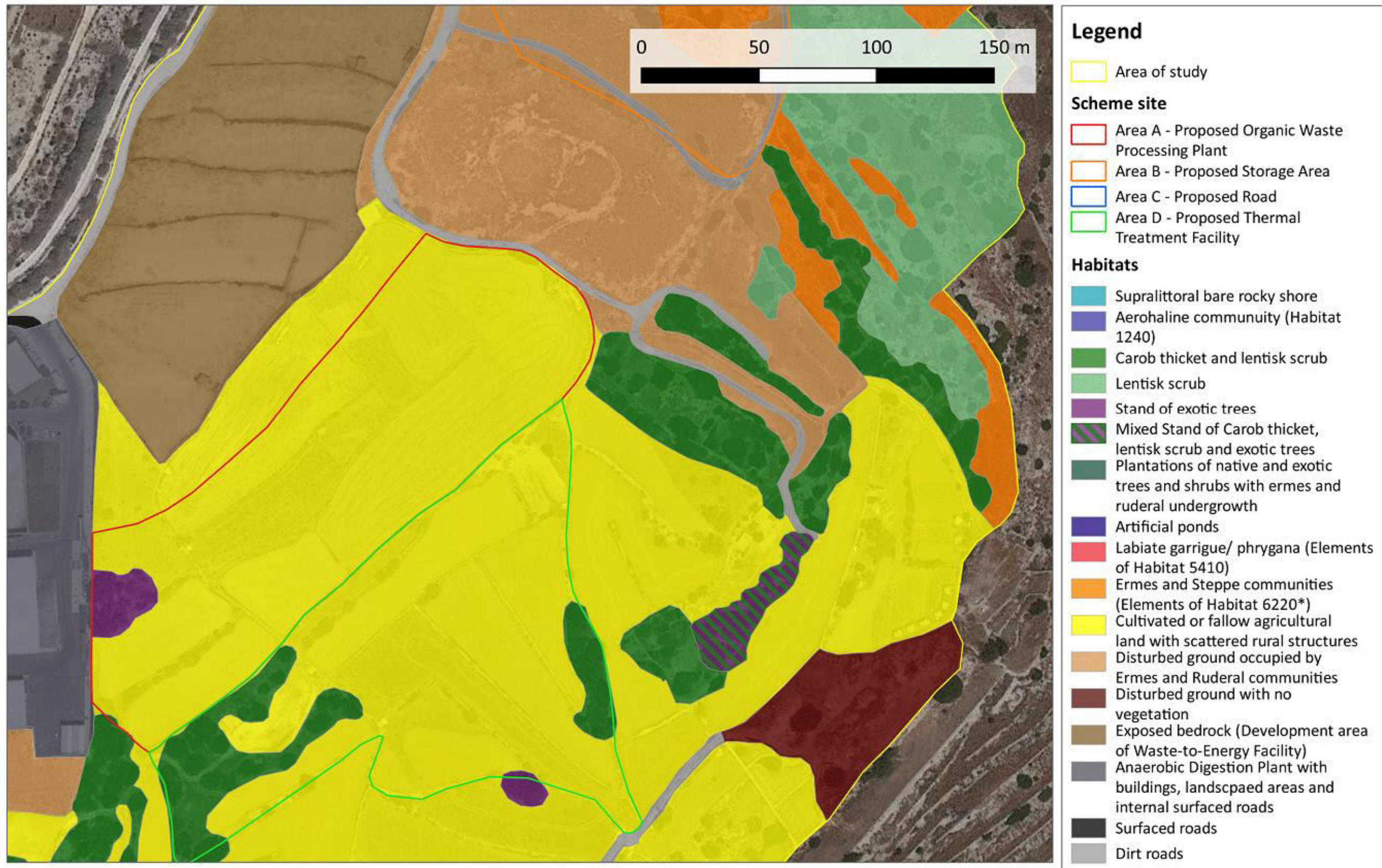


Figure 8: Habitats map of the AoS

Habitats map (3 of 3)

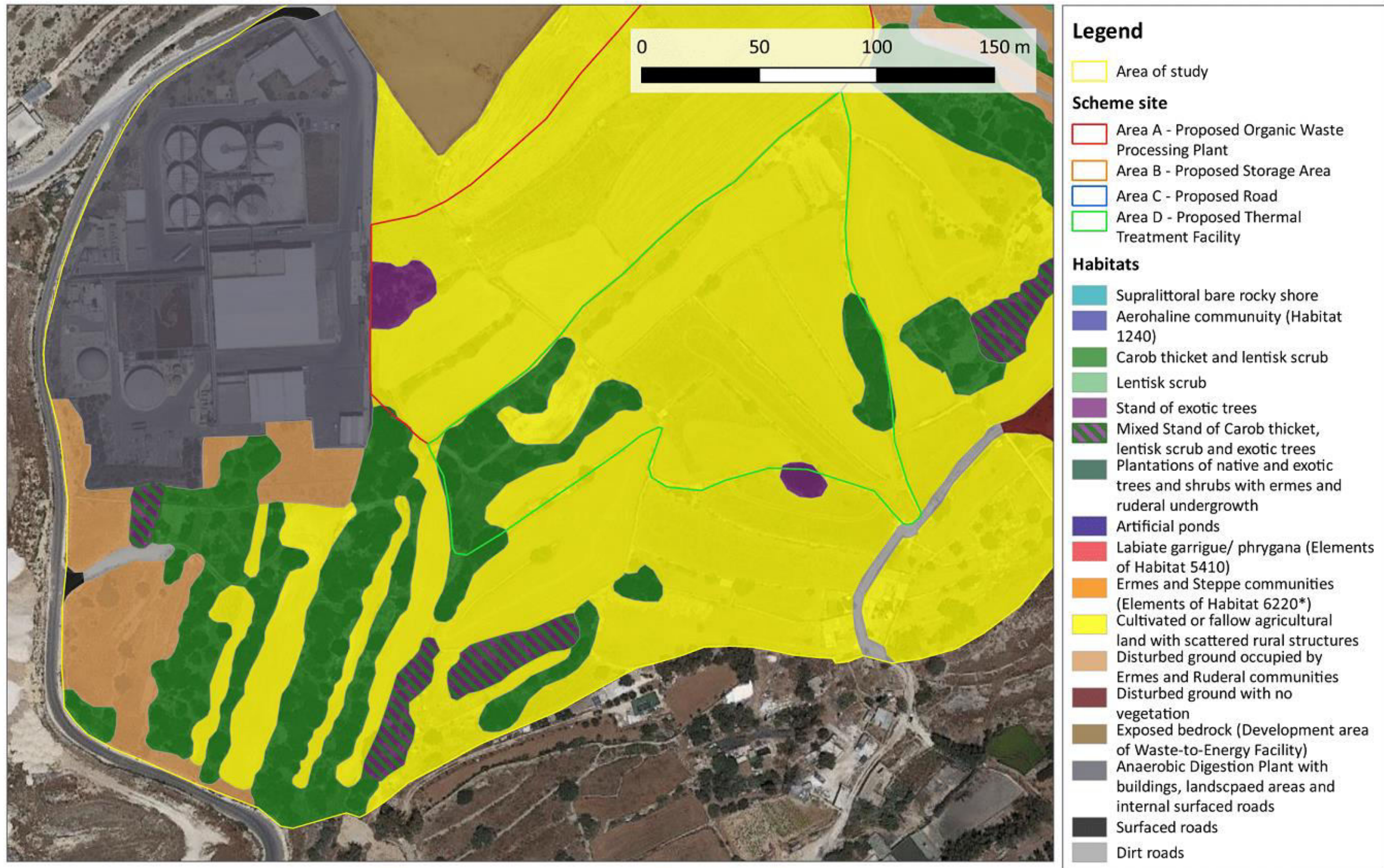


Figure 9: Habitats map of the AoS

Trees map (1 of 3)

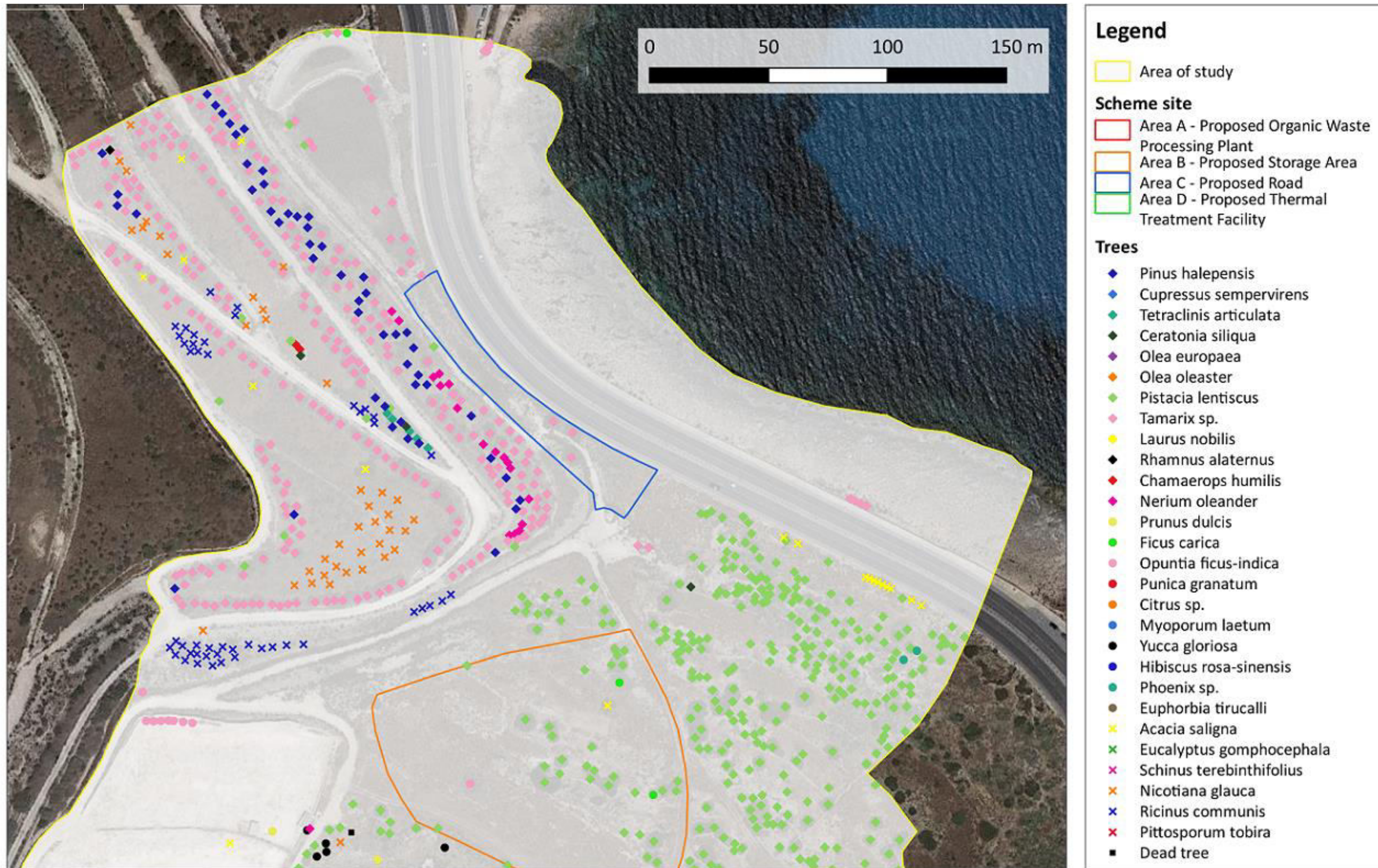


Figure 10: Trees map of the AoS

Trees map (2 of 3)

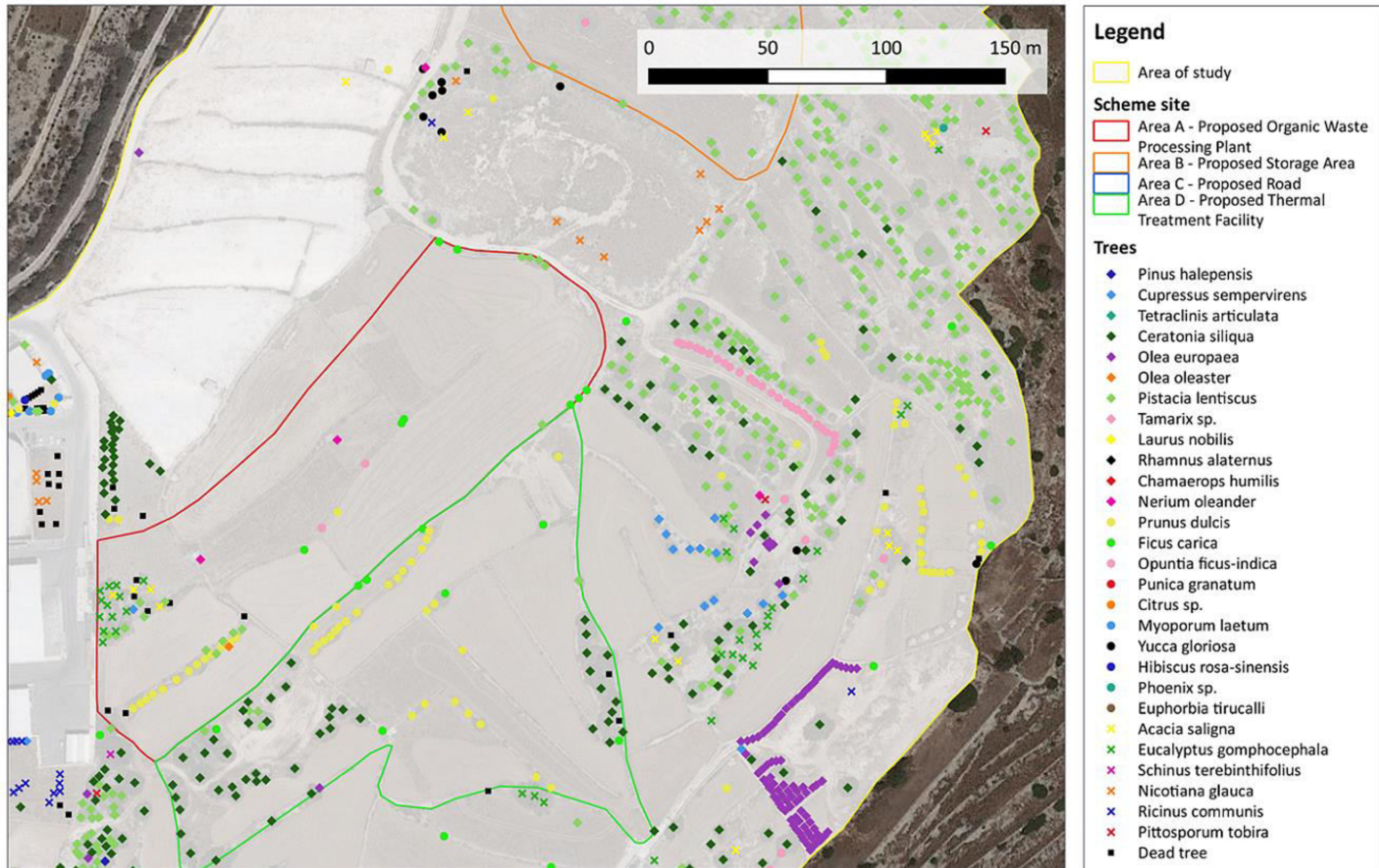


Figure 11: Trees map of the AoS

Trees map (3 of 3)

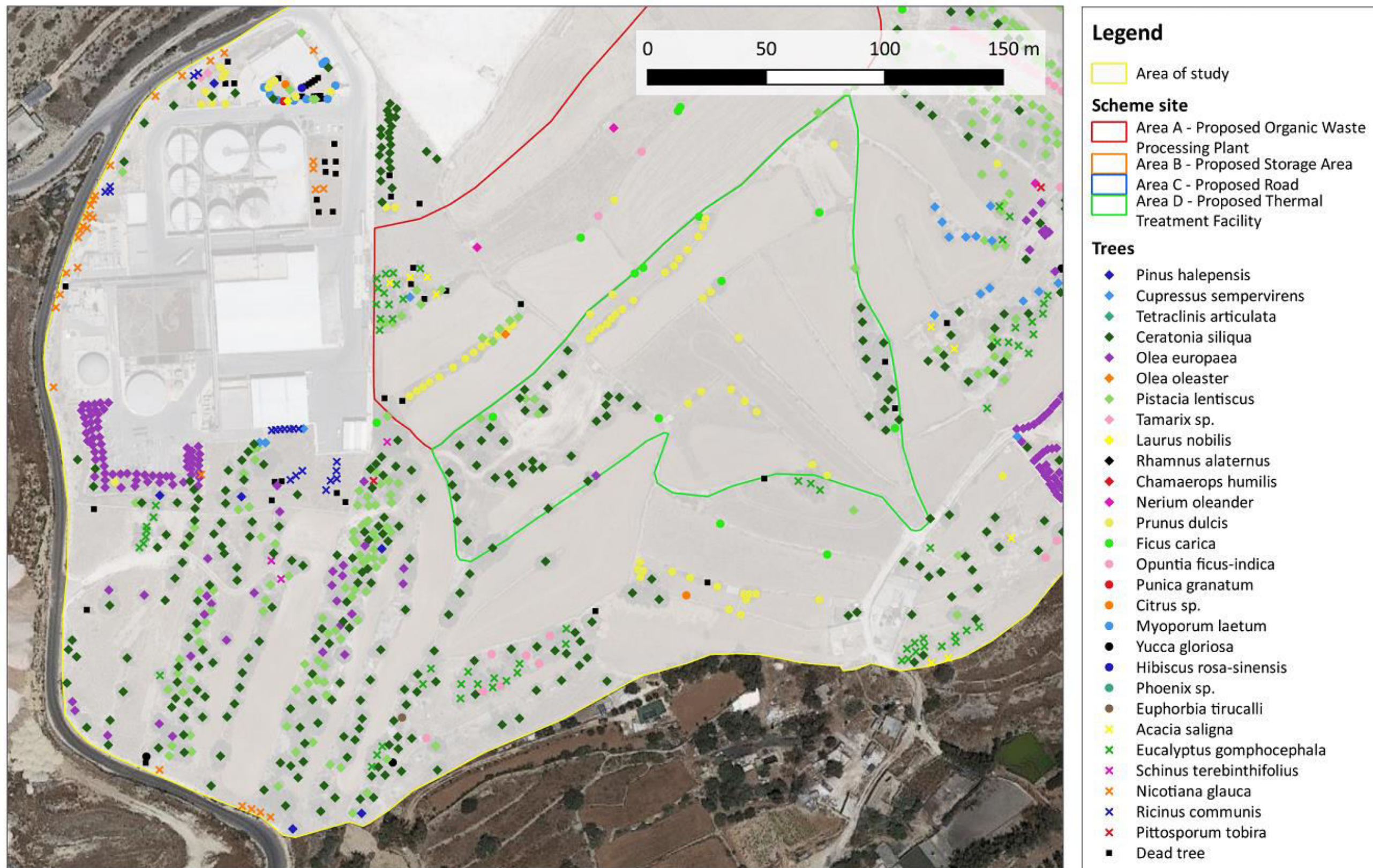


Figure 12: Trees map of the AoS



Figure 13: Fields cultivated with cereal fodder crops within scheme site



Figure 14: Fields cultivated with vegetable crops within scheme site



Figure 15: Traditional rubble wall within scheme site



Figure 16: Exotic trees within scheme site



Figure 17: Carob thicket outside scheme site



Figure 18: Unidentified, possibly protected species of *Iris* sp. (Iris) outside the scheme site



Figure 19: Ruderal plant communities outside scheme site



Figure 20: Ermes and steppe community dominated by herbaceous plants outside scheme site



Figure 21: Labiate garrigue/ phrygana with Mediterranean thyme



Figure 22: Lentisk scrub invaded with *Agave* spp.



Figure 23: Aerohaline communities along the rocky shore with endemic sea lavenders



Figure 24: *Elymus pycnanthus* (Sea couch), an endangered grass growing naturally on the rocky shore



Figure 25: Slopes of former landfill subjected to ecological reclamation through afforestation



Figure 26: Artificial pond with wetland vegetation



Figure 27: Area with exposed bedrock to be developed into a Waste-to-Energy Facility



Figure 28: Landscaped areas of the Anaerobic Digestion Plant

5.3. Fauna

Even though the AoS has been subjected to artificial modification, the rural environment present provides a variety of potential habitats and resources to fauna.

5.3.1. Invertebrates

The most common invertebrate fauna observed in the AoS are plant-associated arthropods.

The hymenoptera were the most common. The most frequent during early summer was the pollinator *Apis mellifera* (Honeybee), while *Xylocopa violacea* (Large carpenter bee) was observed twice. The number of *Polistes* sp. (Paper wasp) and their nests was noticeably higher during late summer.

Of more importance for the scope of the present report because of their legal protection are *Colias croceus* (Clouded yellow), and the endemics *Papilio machaon melitensis* (Maltese swallowtail) (Figure 29) and *Lampyrus pallida* (Maltese glow worm) (Figure 30), all of which were recorded in April.

Other non-protected lepidopterans observed in the early dry season were adult *Pieris brassicae* (Cabbage white) and *Pieris rapae* (Small white), and a larva of *Lasiocampa trifolii* (Grass eggar). Adult *Vanessa cardui* (Painted lady) were observed in September.

One abundant coleopteran encountered during the early summer surveys was *Labidostomis taxicornis* (Leaf beetle), which was largely associated with lentisk shrubs. In late summer, lentisk shrubs exhibited reddish leaf galls typical of the aphid *Aploneura lentisci* (Mealy grass root aphid).

Specimens of *Coccinella septempunctata* (Seven-spot ladybird) and *Graphosoma lineatum* (Striped shield bug) were observed in September. Previous studies carried out in February 2021 also reported the presence of the phytophagous beetle *Oxythyrea funesta* (White-spotted barbary beetle) on flowers, and *Chnootriba elaterii* (Gourd ladybird) on squirting cucumber plants (Zammit et al., 2021).

A rain episode in the second week of August 2022 led to the occurrence of water puddles, which contained larvae of Stratiomyidae (Soldier flies) and *Culex* sp. (Mosquito). The presence of water in the same period also attracted a number of dragonflies, including *Crocothemis erythraea* (Broad scarlet) and *Orthetrum trinacria* (Long skimmer), with the latter being of conservation value.

The presence of *Cicada barbara* (Cicada) was inferred by the its sound during late summer.

Terrestrial molluscs observed comprised *Cornu aspersum* (Edible snail), *Eobania vermiculata* (Red-banded snail), *Rumina decollata* (Decollate snail), *Theba pisana* (White garden snail) and the endemic *Tudorella melitense* (Maltese round-mouthed snail).

5.3.2. Vertebrates

5.3.2.1. Herpetofauna

The reptiles encountered within the scheme site include six specimens of *Tarentola mauritanica* (Moorish gecko) (Figure 32) basking on the walls of rural structures and one specimen of *Hierophis viridiflavus carbonarius* (Black whip snake) (Figure 33), which was trapped in a small water reservoir.

Within the AoS but outside the scheme site, *Hierophis viridiflavus carbonarius* (Black whip snake) was observed on another occasion in the landscaped area of the Anaerobic Digestion Plant. A dead specimen of *Telescopus fallax* (Cat snake) (Figure 34) was also recorded.

At least four specimens of *Chalcides ocellatus* (Ocellated Skink) were observed partly exposed from rubble walls and one *Chamaeleo chamaeleon* (Mediterranean chameleon) (Figure 35) was present in disturbed ground with nearby lentisk scrub. The occurrence of *Podarcis filfolensis maltensis* (Maltese wall lizard) was more evident along the rocky shore due to the lower vegetation cover and were observed regularly on multiple days during visits.

The presence of *Chalcides ocellatus* (Ocellated Skink) and *Podarcis filfolensis maltensis* (Maltese wall lizard) was also reported in the area in previous studies (Zammit 2017; Zammit et al., 2021).

5.3.2.2. Mammals

Previous studies reported that the area is frequented by *Atelerix algirus* (Algerian hedgehog) and *Rattus* sp. (Rat) (Zammit et al., 2021). During the present study, one live specimen of *Atelerix algirus* (Algerian hedgehog) was encountered (Figure 36) and the regular observation of droppings along dirt roads and exposed bedrock (Waste-to Energy development site) could be an indication that the species is relatively abundant in the area. Droppings typical of *Oryctolagus cuniculus* (Wild rabbit) were also encountered once on tilled soil within the agricultural land.

The highest proportion of mammals is represented by bats which use the area for commuting and foraging. The surveys using the passive bat detector have shown that the area is mostly frequented by pipistrelles, namely *Pipistrellus kuhli* (Kuhl's pipistrelle), *Pipistrellus pipistrellus* (Common pipistrelle) and *Hypsugo savii* (Savi's pipistrelle). Another less frequently recorded bat species is *Plecotus gaisleri* (Gaisler's long-eared bat). Sample sonograms which aided in the identification of these species are illustrated in Figure 37-Figure 40.

Some built structures have the potential to be used by bats as roosting sites. Accessible buildings within the scheme site were investigated for potential bat roosting activity but no evidence was found. The pre-dawn surveys did not yield any indications of bat roosts either.



Figure 29: *Papilio machaon melitensis* (Maltese swallowtail) observed within the scheme site



Figure 30: *Lampyris pallida* (Maltese glow worm) larva observed within the scheme site



Figure 31: *Orthetrum trinacria* (Long skimmer) observed within the AoS



Figure 32: *Tarentola mauritanica* (Moorish gecko) observed within the scheme site



Figure 33: *Hierophis viridiflavus carbonarius* (Black whip snake) observed within the scheme site



Figure 34: *Telescopus fallax* (Cat snake) observed within the AoS



Figure 35: *Chamaeleo chamaeleon* (Mediterranean chameleon) observed within the AoS



Figure 36: *Atelerix algirus* (Algerian hedgehog) observed within the AoS

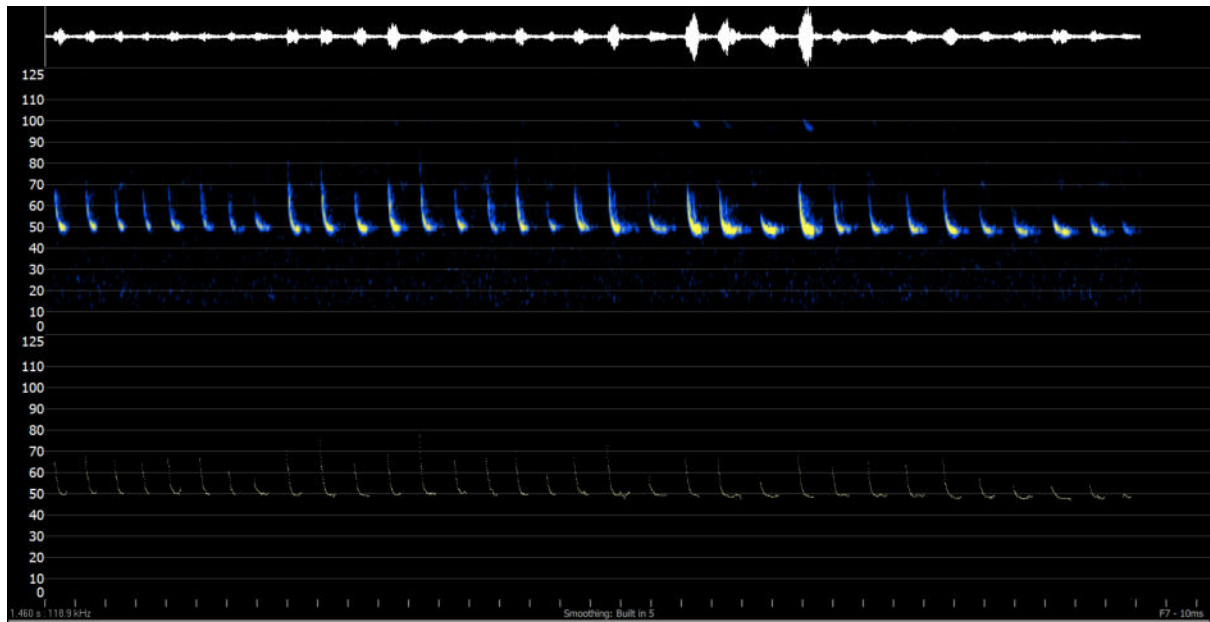


Figure 37: Bat echolocation sonogram with characteristics typical of *Pipistrellus pipistrellus* (Common pipistrelle) – File reference 20220520041120

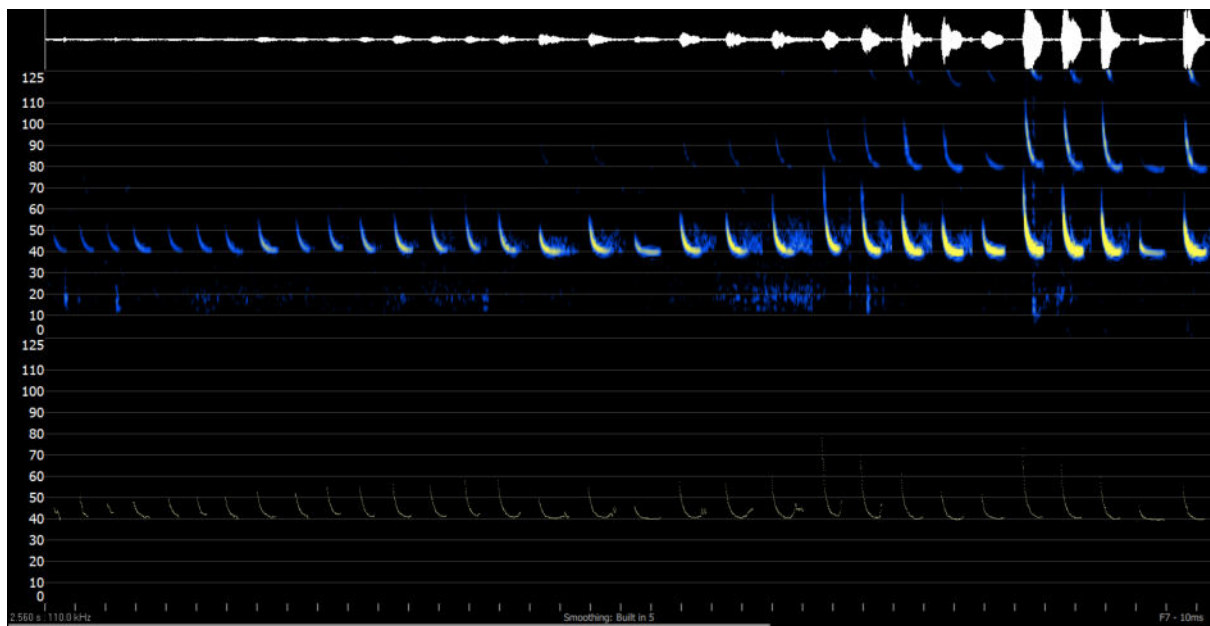


Figure 38: Bat echolocation sonogram with characteristics typical of *Pipistrellus kuhli* (Kuhl's pipistrelle) – File reference 20220518203842

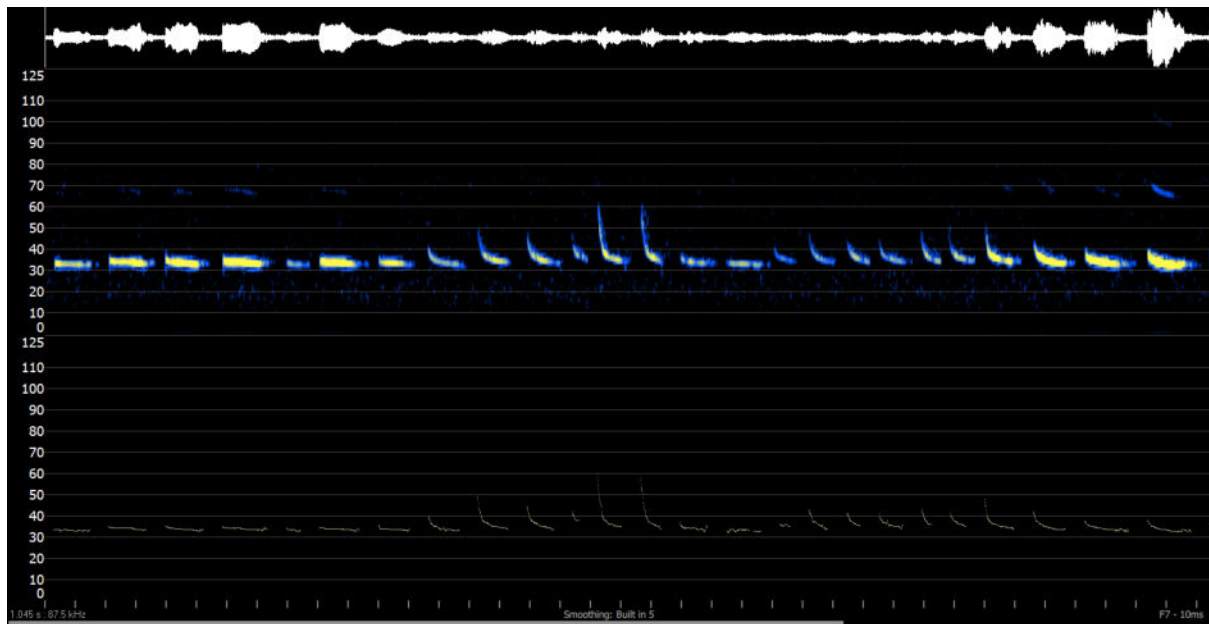


Figure 39: Bat echolocation sonogram with characteristics typical of *Hypsugo savii* (Savi's pipistrelle) – File reference 20220523202404

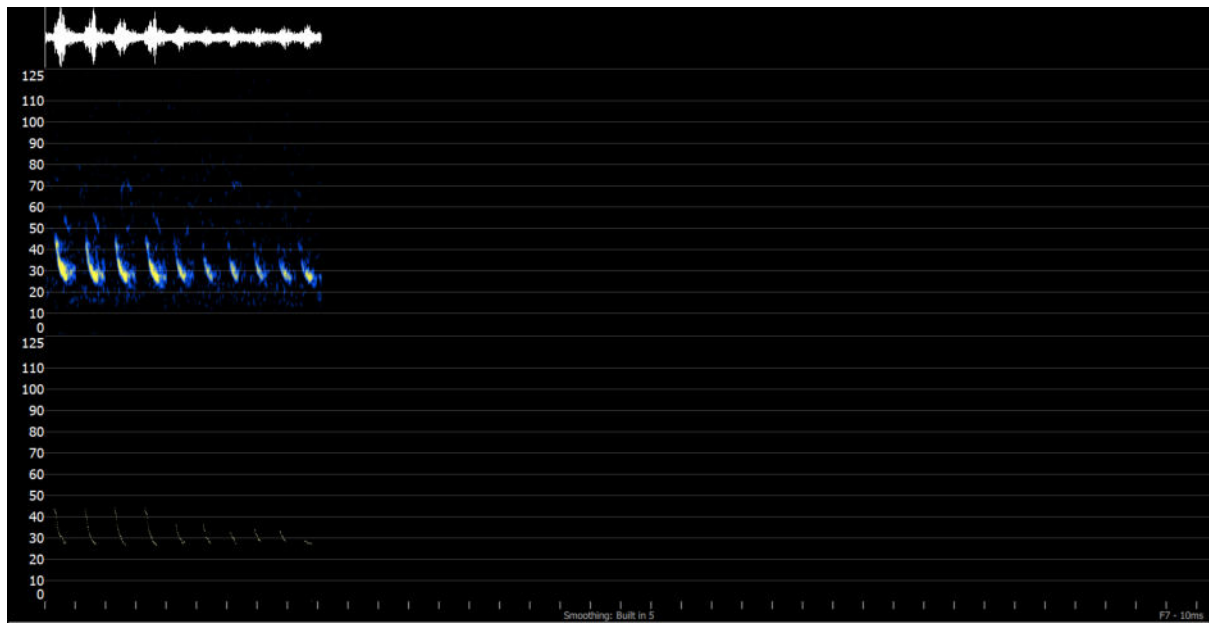


Figure 40: Bat echolocation sonogram with characteristics typical of *Plecotus gaisleri* (Gaisler's long-eared bat) – File reference 20220520222402

5.3.2.3. Avifauna

The AoS is not a protected area for birds, however there are a number of protected areas in the immediate proximity which are of both local and international importance. Hence, any development within the AoS could have an effect on the resources found here. The author (JD) is unaware that any development to be built within the AoS will have any structures such as pipelines etc. which cross any

of the protected areas. This doesn't imply that avian receptors found in or flying across the protected areas will not be impacted by the proposed development hence this assessment.

The closest protected area touches the edge of the AoS whereas the further ones are around 1.5 km away. Since most of the avian receptors in the area are migratory, such distances are considered as very small and so such receptors could easily be impacted by any development. This is mainly for those which are affected by light, noise or atmospheric discharges.

Żona fil-Baħar Madwar Għawdex

The Żona fil-Baħar Madwar Għawdex is a large marine Special Protection Area stretching from Qalet Marku in Malta extending several kilometres off the coast around Malta and Gozo and ending at Ras il-Waħx in the limits of Mellieħa. The site was identified in the Maltese marine IBA inventory as result of the EU LIFE+ Malta Seabird Project (LIFE10NAT/MT090) due to its importance for Scopoli's Shearwater (*Calonectris diomedea*), and Yelkouan Shearwater (*Puffinus yelkouan*) during the breeding season.

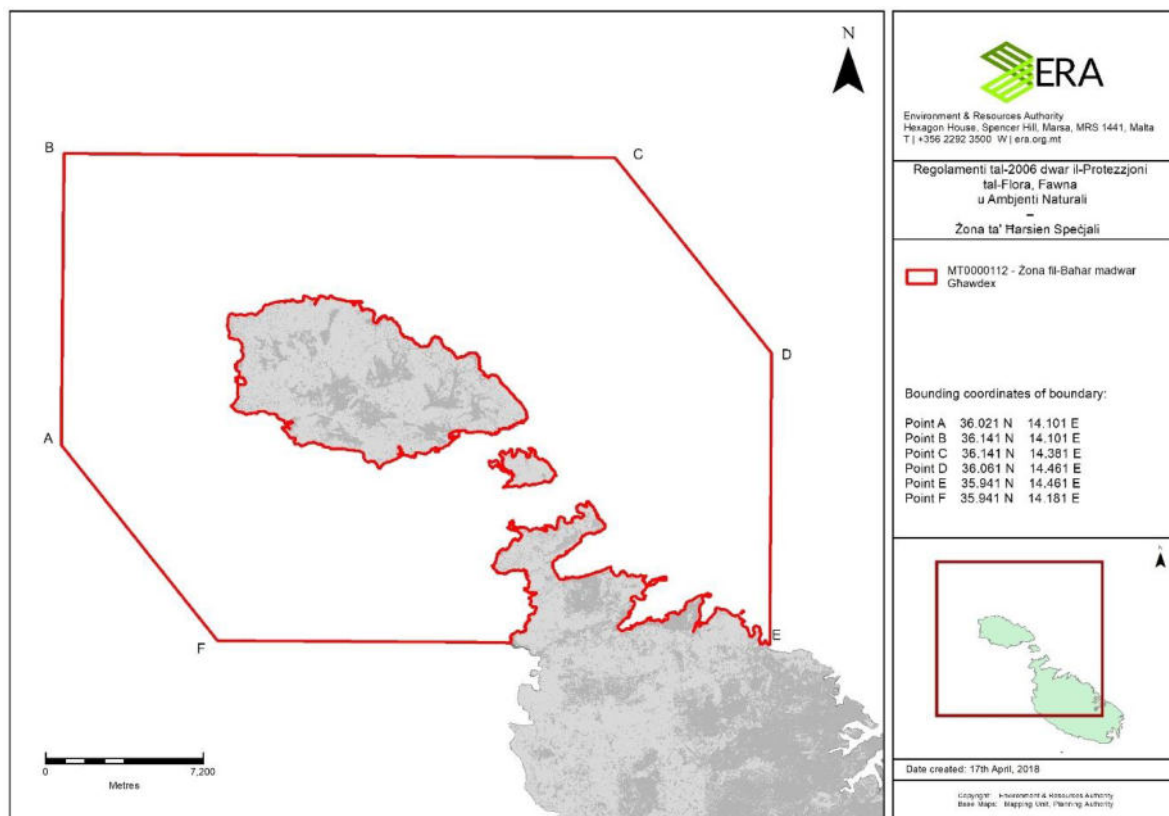


Figure 41: Żona fil-Baħar Madwar Għawdex Special Protection Area

EU LIFE+ Malta Seabird Project (LIFE10 NAT/MT090)

The LIFE+ Malta Seabird Project was led by Birdlife Malta in collaboration with the Ministry of Sustainable Development, The Environment and Climate Change, the RSPB and SPEA (Birdlife in Portugal). The project ran between September 2011 and June 2016.

The project utilised high-end technology to gather results about the lives of the three species of tubenoses breeding in Malta. These results showed that these species utilise various parts of the areas around the Maltese islands for rafting prior to moving into their nests and also for feeding.

One of the major concerns for these species is disturbance from light sources which tend to keep adults at bay refraining from flying back into their nests and also disorients the offspring when they fly out of their nests hence light has a significant impact on the lives of these species.

The final outcome from this project was the declaration by the Maltese Government of a number of Marine Protected Areas around the islands, three of which are relevant to this project (Figure 42).

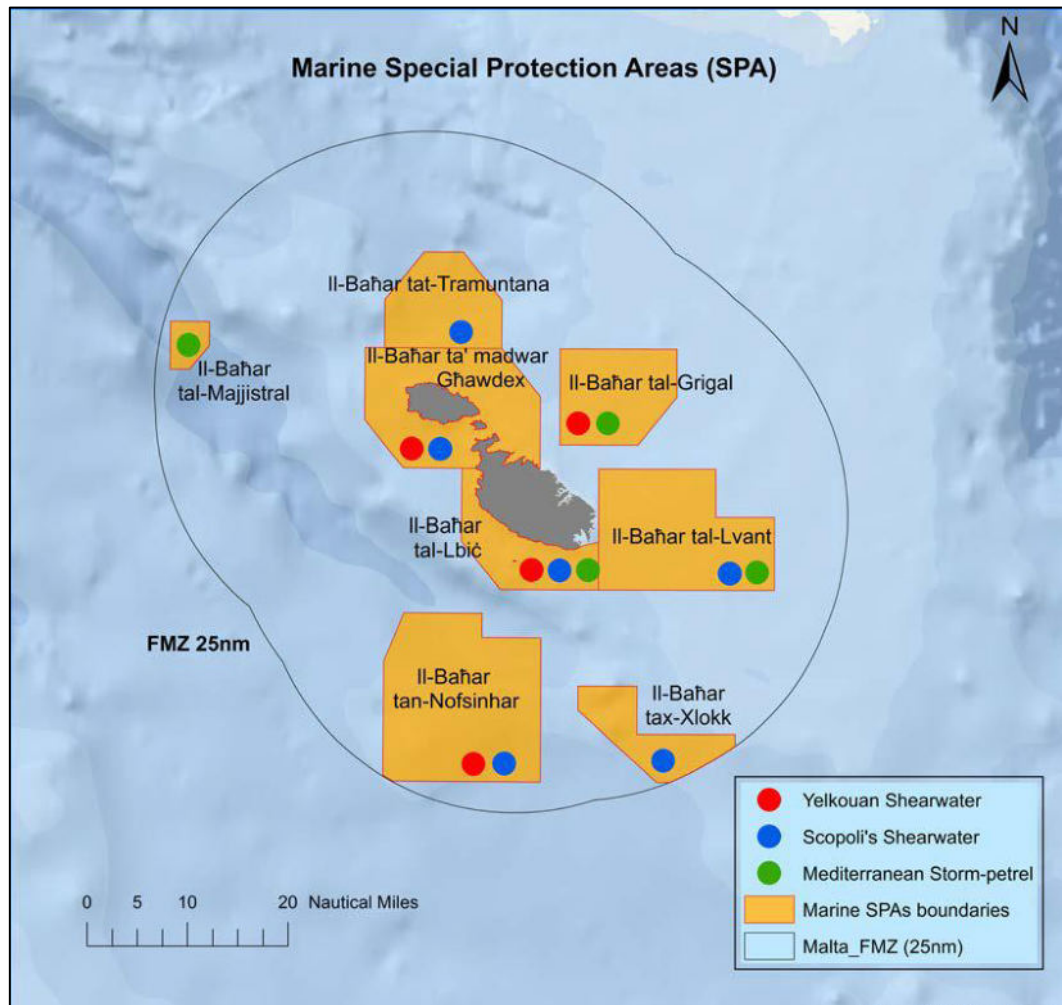


Figure 42: Marine SPAs around the Maltese Islands (source BLM, 2015)

L-Għadira s-Safra u l-Iskoll tal-Għallis

L-Għadira s-Safra u l-Iskoll tal-Għallis is a Special Area of Conservation of International Importance between Għallis and Qalet Marku. It consists of a temporary rainwater body in a bed of Lower Coralline Limestone less than a metre above sea level. The temporary pool supports biotic assemblages that are typical of freshwater habitats during the wet period and halophytic species colonise the area around the pool.

L-Iskoll tal-Għallis have characteristics of rocky shoals as the sea inundates them for a significant part of the year and consequently they neither support terrestrial vegetation nor a real supralittoral zone. However, this shoal is a significant resident, resting and foraging site for avifauna and also important for migratory birds.

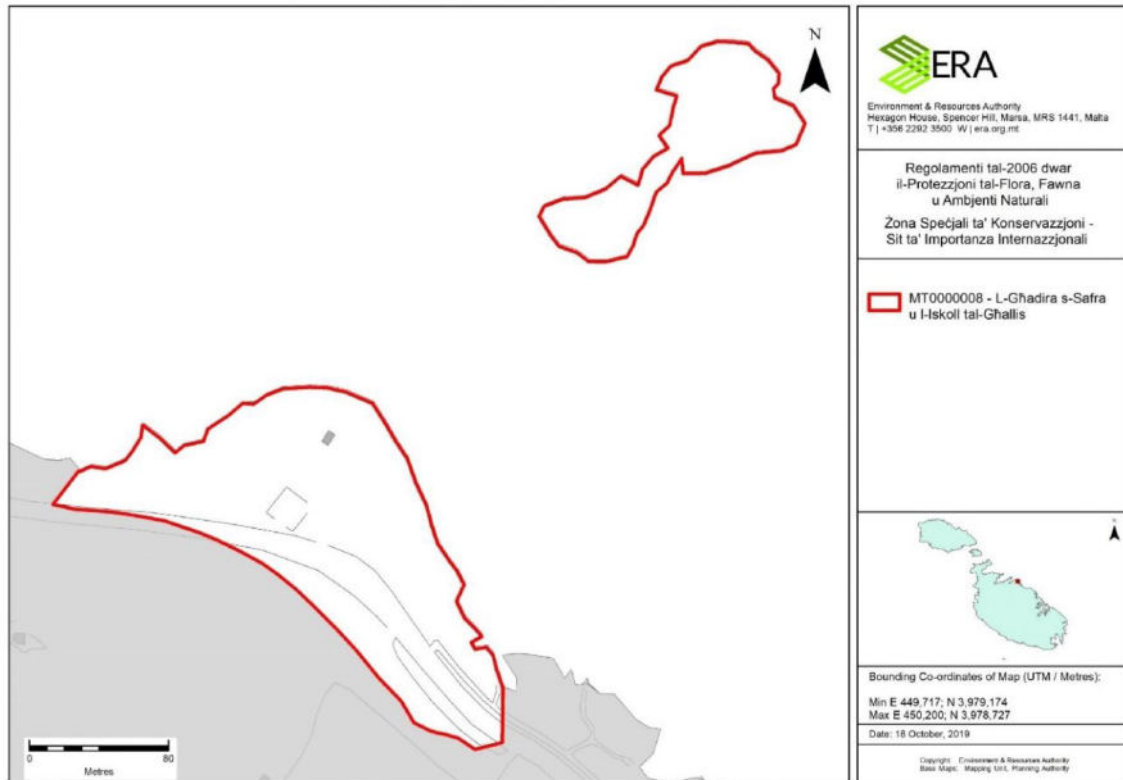


Figure 43: L-Għadira s-Safra u l-Iskoll tal-Għallis Special Area of Conservation

Is-Salini

This site is a Special Area of Conservation of International Importance and one of the last remaining salt marshes in the Maltese Islands. It supports a number of endemic flora and fauna, as well as a considerably large number of rare, endangered and/or locally threatened species. Is-Salini, following the dredging and reclamation of the Marsa marsh system in the 19th century, is the largest extant marshland in the Maltese Islands. In the past, it used to be more extensive but was reduced due to reclamation of the upper stream area of Burmarrad for health and agricultural aspects. Other parts were later developed (Ta' Mattew area) or afforested and turned into a recreational area (Kennedy Grove). The latter has been planted by trees such as pines, olives and tamarisks. A canal runs on the left and to the right of the salt pans. This canal, known as Tas-Sokkorsu, provides freshwater to the marsh. Maritime shrubs and reeds are common along the sides of the canal, which are mostly composed of wrack, mainly seagrass debris. The inner parts of the canal are characterised by reeds and these are important in particular to reed-associating birds. The estuary of Is-Salini is very dynamic and dependent on the accretion and deposition caused by dead sea grass foliage. Pockets of garrigue remnants are found on the border of the saltmarsh.

The area is characterised by a bay in which sea water intermixes with rain water originating from a complex of valley systems leading to Is-Salini. This forms an estuary with salt marsh and freshwater vegetation. The salt marsh is very species diverse and the species composition at Is-Salini is different

from the other salt marshes in the Maltese Islands, since it is a mixture of freshwater elements and marsh species.

The salt pans and salt marsh area is an important ornithological site for migratory birds. It is also an important habitat for salt marsh and brackish water species.

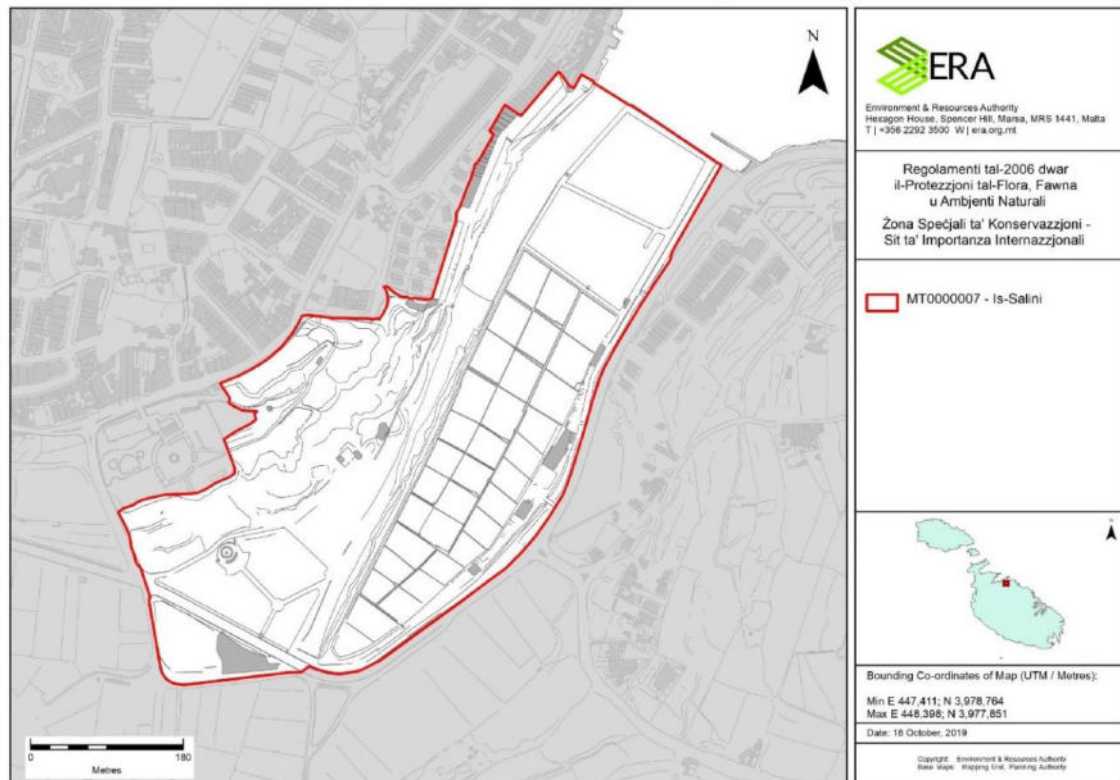


Figure 44: Is-Salini Special Area of Conservation

International Conservation Status

The best source of data currently available to understand the status of wild birds is that provided by Birdlife International through its publication European Birds of Conservation Concern (EBCC), which is in its third review of the conservation status of all wild birds in Europe. The aim of the publication was to identify priority species (Species of European Conservation Concern, or SPECs) in order that conservation action can be undertaken to improve their status.

The geographical range for the data collection extends from Greenland to the Urals and from Macaronesia in the southwest to the Caucasus in the southeast. Data was collected through a network of national coordinators who sought input from experts, organizations, and an army of field workers.

The methodology used in previous assessments was also used in the third version thus maintaining consistency.

The following five categories were developed in order to classify each species:

Category	Description
SPEC 1	European species of global conservation concern i.e. Critically Endangered, Vulnerable or Near Threatened at global level (Birdlife International 2016 a)
SPEC 2	Species whose global population is concentrated in Europe, and which is classified as Regionally Extinct, Critically Endangered, Endangered, Vulnerable, Near Threatened, Declining, Depleted or rare at European level (Birdlife International 2015, Butterfield <i>et al</i>)
SPEC 3	Species whose global population is not concentrated in Europe and which, but which is classified as Regionally Extinct, Critically Endangered, Endangered, Vulnerable, Near threatened, Declining, Depleted or rare at European level (Birdlife International 2015, Butterfield <i>et al</i>)
Non-SPEC ^E	Species whose global population is concentrated in Europe, but whose population status is currently considered to be Secure (Butterfield <i>et al</i>)
Non-SPEC	Species whose global population is not concentrated in Europe and whose European population Status is currently considered to be Secure (Butterfield <i>et al</i>)

A species is considered as concentrated in Europe if more than 50% of its global breeding or wintering population or range occurs in Europe.

Table 4: Percentage of European species in each category in BiE1 (1994), BiE2 (2004) and BiE3 (2017)

Status	Birds in Europe 1994 (BiE1)	Birds in Europe 2004 (BiE2)	European Birds of Conservation Concern 2017 (EBCC)
SPEC 1	5	8	13
SPEC 2	8	9	7
SPEC 3	25	27	19
Non-SPEC ^E	16	18	60
Non-SPEC	46	39	

Table 4 shows that during the last fifteen years or so, birds in Europe continued to be threatened by widespread environmental change and many populations are in greater trouble than they were in the previous decade.

European Red List Assessment

The European Red List of Birds assessment follows the IUCN Red List Categories and Criteria (version 3.1, second edition)¹ as well as the Guidelines for Using the IUCN Red List categories and Criteria (version 14, August 2019)². The extinction risk of a species can be assessed at global, regional or national levels. It is quite common for a species to be listed in different Red List categories on the Global IUCN Red List and a Regional Red List. Figure 45 shows the IUCN Red List Categories used at a regional scale. To avoid under or overestimating a particular species, the Guidelines for Application of IUCN Red List Criteria at Regional and National Levels (version 4.0)³ are applied.

¹ <https://portals.iucn.org/library/node/10315>

² <https://www.iucnredlist.org/resources/redlistguidelines>

³ <https://www.iucn.org/content/guidelines-application-iucn-red-list-criteria-regional-and-national-levels-version-40>

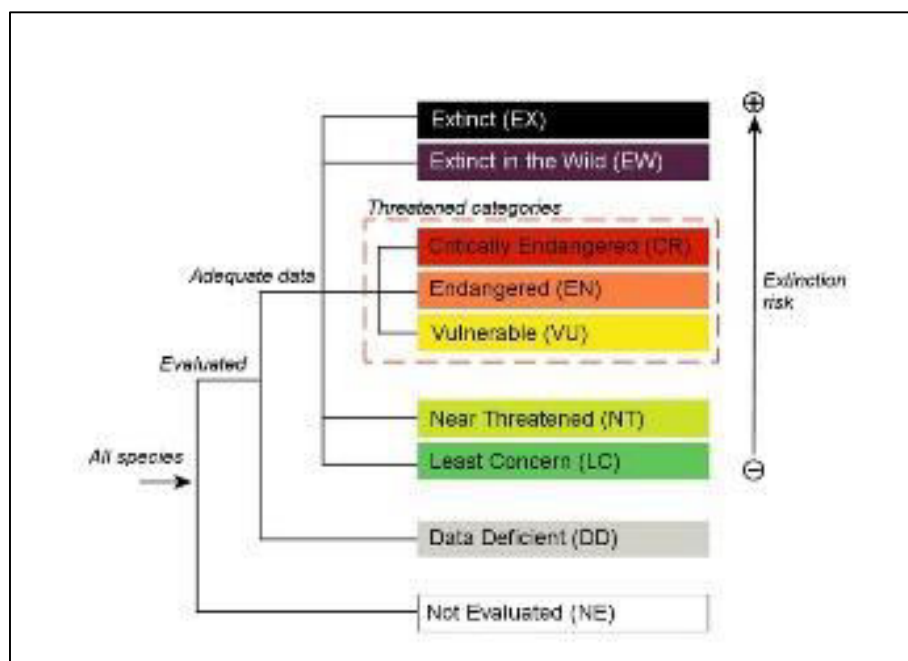


Figure 45: IUCN Red List Categories at a regional scale

The assessment of the European Threat Status is based on the minimum European population size and the percentage of the total European population which is in countries where populations have declined. These criteria have therefore had to take into consideration the quality and availability of information on European bird populations, and calculations are thus based on categories of population trend rather than precise figures.

The assessment used in this report is based on data reported by the 28 Member States of the European Union (EU)⁴ under Article 12 of the EU Birds Directive, as described in the State of Nature in the EU Methodological paper⁵, as well as national reports from 22 countries and territories in Europe which are not part of the EU.

The latter were collated by BirdLife International through national experts, coordinators of bird monitoring programmes and organisations, including BirdLife International Partners and many others. The reports were submitted in 2019-2020 and included information on the size and trend of populations and distributions of individual bird species. Additional sources such as scientific reports, national atlases and Red Data Books, as well as peer-reviewed literature were also used to make sure the most recent data available were considered.

These assessments are made on the basis of breeding season data unless a species qualifies on winter data. Assessment of overall population trends based solely on the basis of the quantitative data which are available would introduce regional biases and therefore be invalid.

The criteria used in establishing the threat status was as follows:

- **Extinct [EX]** No reasonable doubt that last individual has died.

⁴ As it stood in 2019, and therefore at the time, still comprising the UK (hereafter referred to as "the EU28 or just "EU", a level for which regional Red List assessments have also been previously undertaken in 2020 for native species that regularly occur within the region).

⁵ Roschel, L., Noebel, R., Stein, U., Naumann, S., Romao, C., Tryfon, E., Gaudillat, Z., Roscher, S., Moser, D., Ellmauer, T., Lohnertz, M., Halada, L., Staneva, A. and Rutherford, C. A. (2020). State of Nature in the EU - Methodological paper. Methodologies under the Nature Directives reporting 2013-2018 and analysis for the State of Nature 2000. ETC/BD report to the EEA.

- **Regionally Extinct [RE]** Where no reasonable doubt that the last individual in Europe has died. (If it is possible that the species survives, then it is CR (PE), i.e. Possibly Extinct).
- **Critically Endangered [CR]** if the European population meets any of the IUCN Red List Criteria for Critically Endangered species. Such species have an Unfavourable conservation status in Europe because they are considered to be facing an extremely high risk of extinction in the wild (IUCN, 2001).
- **Endangered [EN]** if the European population meets any of the IUCN Red List Criteria for endangered species. Such species have an Unfavourable conservation status in Europe because they are considered to be facing an extremely high risk of extinction in the wild (IUCN, 2001).
- **Vulnerable [VU]** if the European population meets any of the IUCN Red List Criteria for vulnerable species. Such species have an Unfavourable conservation status in Europe because they are considered to be facing an extremely high risk of extinction in the wild (IUCN, 2001).
- **Least Concern [LC]** if its European population does not meet any of the criteria listed above.

European Birds Directive

The EU Birds Directive (transposed into LN 79 of 2006 [S.L.549.42]) provides a framework for the conservation and management of, and human interactions with, wild birds in Europe. The main provisions of the Directive include, amongst others:

- The maintenance of the populations of all wild bird species across their natural range with the encouragement of various activities to that end.
- The identification and classification of Special Protected Areas (SPAs) for rare or vulnerable species listed in Annex I of the Directive, as well as for all regularly occurring migratory species, paying particular attention to the protection of wetlands of international importance. Together with Special Areas of Conservation (SAC) designated under the Habitats Directive, SPAs form a network of European protected areas known as Natura 2000 sites.
- The establishment of a general scheme of protection for all wild birds including specification of conditions under which hunting and falconry can be undertaken. Huntable species are listed on Annex II of the Directive.

The Birds Directive is a primary tool for delivery against EU obligations under global Conventions, including the Convention on Biological Diversity, the Ramsar and Bonn Conventions and the Plan of implementation of the World Summit on Sustainable Development. The EU had also committed itself to halting biodiversity decline by the year 2010. The full and proper implementation of both the Birds and Habitats Directives including the proper designation and adequate management of Natura 2000 sites should have been crucial to achieving this target.

EU member states are obliged under the above-mentioned Directives to:

- Take measures to conserve all naturally occurring bird species across the EU;
- Classify as Special Protected Areas (SPAs) the most suitable territories for species listed on Annex I of the Directive and migratory species;

- Maintain SPAs in Favourable conservation status;
- Prepare and implement management plans, setting clear conservation objectives for all SPAs in the EU 28;
- Provide co-financing of the management of these SPAs;
- Regulate hunting of certain species of birds listed in Annex II of the Birds Directive;
- Follow the procedure outlined in Article 6 of the Habitats Directive for carrying out appropriate assessments of environmental impacts on SPAs.

Review of potential breeding species within the AoS and its proximity

A review of bird species which have been recorded breeding within the AoS and in its proximity was undertaken using the Malta Breeding Bird Atlas 2018 as a source of information. The following species were recorded breeding:

Species	Within AoS/ Outside AoS
Sardinian Warbler (<i>Sylvia melanocephala</i>)	within AoS
Zitting Cisticola (<i>Cisticola juncidis</i>)	within AoS
Spanish Sparrow (<i>Passer hispaniolensis</i>)	within AoS
Blue rock Thrush (<i>Monticola solitarius</i>)	within AoS
Spectacled Warbler (<i>Sylvia conspicillata</i>)	outside AoS
Cetti's Warbler (<i>Cetta cetti</i>)	outside AoS
Greater Short-toed Lark (<i>Calandrella brachydactyla</i>)	outside AoS
Cattle Egret (<i>Bubulcus ibis</i>)	outside AoS ⁶
Little Egret (<i>Egretta garzetta</i>)	outside AoS ⁶

The only species which are listed in Annex I of the Birds Directive are the Little Egret and the Greater Short-toed Lark. Whereas the Little Egret is a Non-SPEC species the Greater Short-toed Lark is a SPEC 3 species.

Avian data together with their local and conservation status (SPEC and European Threat Status) and whether they are Birds Directive Annex I species were collated from the following sources and shown in Table 16. The sources used were:

- A list of birds recorded during surveys during period 2018-19 at the Salina Nature Reserve, together with those recorded during field surveys (2020-22) within the AoS and in the proximity.
- Birds listed by Gatt M.C. and Metzger B. (Zammit et al., 2021) as recorded, expected to cross or be present within six kilometres of the WtE plant.

⁶ Breed on cages of Bird Park

There are various species which are shown on Table 16 which were recorded or reviewed as either SPEC 1 or Annex I species. These can be split between those which could occur or be recorded within the AoS and those which could be recorded within the protected areas found just outside the AoS. In the latter case, those which are of main concern are the seabirds, namely the Scopoli's (Annex I and Non-SPEC) and Yelkouan Shearwater (Annex I and SPEC 1) and the Storm Petrel (Annex I and Non-SPEC).

The closest colonies of the Shearwaters are found along the I-Aħrax tal-Mellieħa cliffs and on Comino. Higher numbers of Yelkouan Shearwater are found breeding here when compared to the Scopoli's. A small number of Storm Petrel have also been recorded breeding along the Aħrax cliffs. The designation of the Marine SPA Żona fil-Baħar Madwar Għawdex was mainly due to the presence of these three species.

Shearwaters are usually seen flying a few centimetres above the water level several hundreds of metres away from the shore, albeit sometimes one can also witness some pretty close. Occasionally, one can witness birds rafting. Storm Petrels are harder to see from the shore since they are very small birds. The presence of fish farms offshore has also changed the dynamics of these birds which are occasionally seen flying close by these structures. Borg J.J. (2013) reports the presence of double and treble figures of Storm Petrels around fish farms.

The main concern with regards to the Shearwaters is light during the night. This is mainly due to the fact that these species tend to fly back to their nests during the night and can easily get disoriented by light. Several fledglings are recovered annually from land as a result of this. In the case of adults, the issue mainly concerns that adults do not return to their nests if there is light in the proximity.

Other Annex I species which could potentially be recorded in the proximity of the AoS or within it are the several gull species which feed within the ECOHIVE complex or bathe in the artificial ponds of the same complex. These are the Mediterranean gull, Little gull, Slender-billed gull and Audouin's gull. None of these breeds in Malta and are only recorded here mainly between late summer and early spring. They are usually recorded rafting at sea just off I-Għadira s-Safra and flying inland to feed at the landfill at the Ecohive complex, then they bathe in the artificial ponds or at sea. They are also regularly recorded at the Salina Reserve. Out of these species, the Mediterranean gull is considered as a Non-SPEC species which has a status of Least Concern in Europe. The Little gull has a similar European threat status but falls within a SPEC 3 category. Both the Slender-billed Gull and the Audouin's gull both are in the Non-SPEC category but are listed as Vulnerable on a European threat status list mainly due to their decreasing populations. Whereas locally, the Mediterranean gull is recorded in high numbers especially during winter, the other species are only recorded in very low numbers, reaching single or double digits.

The tern species which are Annex I species are mainly found or possibly found along the coast or at sea albeit some (Common gull-billed tern, Caspian tern and Sandwich tern) have also been recorded at the Salina Reserve. They are mainly recorded locally in low single or double figures and are mainly migrants. They all have a threat status of Least Concern in Europe whereas their SPEC category varies between SPEC 3 and Non-SPEC.

The only other Annex I species which could potentially breed in the AoS is the Greater short-toed lark which had been recorded as possible breeding in the vicinity of the AoS.

All the other Annex I species can only be recorded flying across the AoS or feeding during migration or in some cases wintering. With the exception of three species of birds of prey which are mainly recorded during migration and have a European Threat Status of Vulnerable, the rest all have a threat status of Least Concern.

The impacts which could result from the development on the proposed sites within the AoS are mainly those associated with the loss of habitat and food availability for avian receptors, mainly migrants, wintering and resident species. Illumination of the various parts of the facilities could also impact species which are impacted by light such as nocturnal migrant species and also Shearwaters, much depending on the level and height of illumination and hence visibility from the sea. This must be seen in the context that the level of illumination and land uptake will increase over time thanks to the fact that the WtE facility has already been greenlighted and that there is already the AD plant within the AoS. Hence the impacts are more of a cumulative nature rather than individual one.

6. Ecological value and Level of Protection

The scheme site and AoS comprises a number of features of ecological interest that have been designated and/ or protected by a number of legal and policy instruments for their environmental qualities, as follows:

- Listed Ecological Area subject to Central Malta Local Plan (CMLP) Policy CG22 as indicated in Figure 46.
- Agricultural areas (awaiting classification of Agricultural Value) in accordance with CMLP Policy CG24 as indicated in Figure 46.

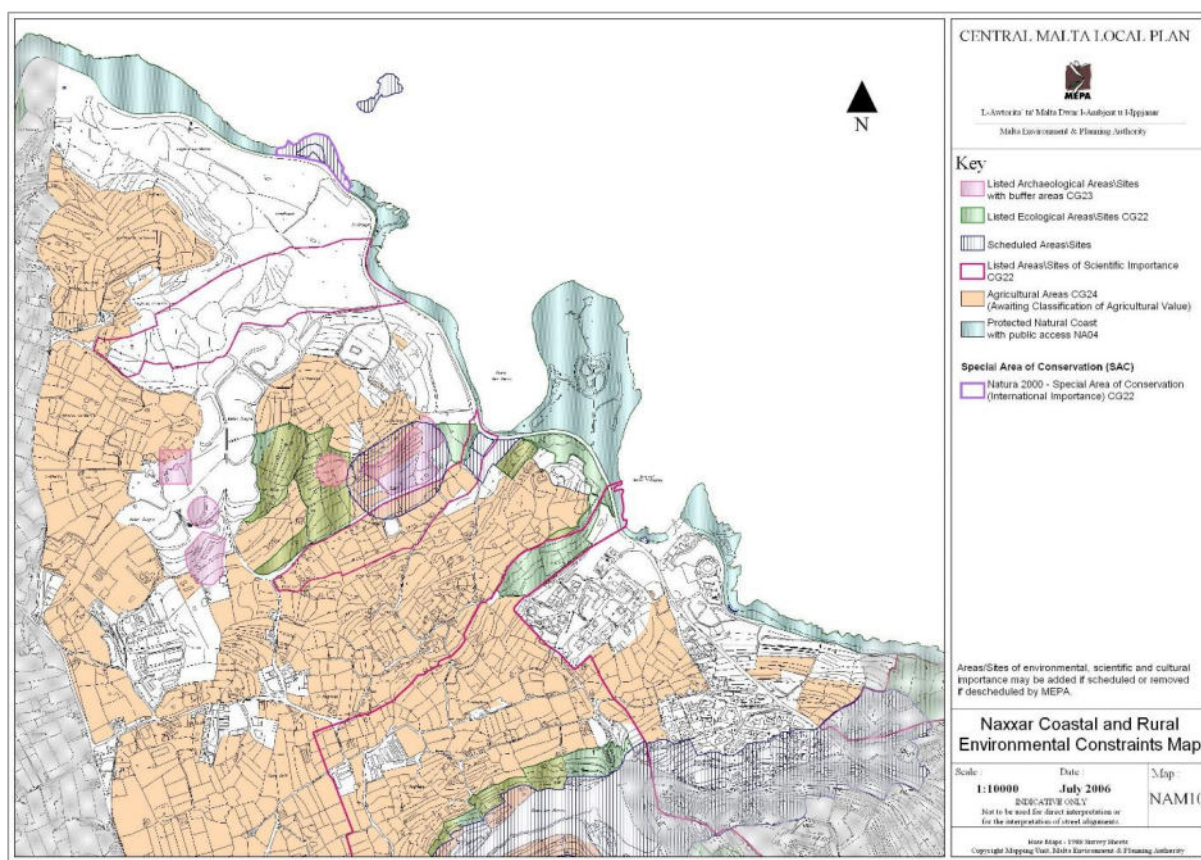


Figure 46: Naxxar Coastal and Rural Environmental Constraints Map (MEPA, 2006)

- Rubble walls and non-habitable rural structures are protected by virtue of SL 552.01 due to their affording of a habitat for flora and fauna.
- The habitats listed in Table 9 are listed in Schedule I of SL 549.44 and therefore subject to the relevant legal provisions. The indicated conservation status is based on the Habitats Directive Article 17 report for the year 2019.
- The species listed in Table 10-Table 14 are subject to the legal provisions as indicated in accordance with their listing in the relevant schedules. The conservation status of species listed in Schedule V of SL 549.44 and in the RDB of the Maltese Islands is also provided. It is important to point out that all endemic species are protected by Regulation 26 of SL 549.44,

except for those species listed in Schedule X of the same legal notice. The definitions of the relevant regulations, and the terms and symbols associated with the legal and conservation status are provided in Table 5-Table 8.

- All trees that are visible on the 1967 aerial photos or are more than fifty (50) years of age, are protected if located within protected areas and ODZ as per SL 549.123 Schedule I Part B. Table 15 provides detailed information on the trees present within the scheme site including species, quantities and age.
- The species listed in SL 549.44 Schedule VIII are considered to be of national interest whose taking in the wild and exploitation may be subject to management measures. However, there are no established management measures for the recorded species and therefore their occurrence does not present any constraints.
- The bird species listed in Table 16 are subject to the legal provisions as indicated in accordance with their listing in the Birds Directive. The International Conservation and Threat Status are also provided.

Table 5: Titles of relevant regulations

Code	Title
SL 10.10	Wild Thyme (Protection) Regulations
SL 10.22	Conifer Trees (Preservation) Regulations
SL 549.02	Reptiles (Protection) Regulations
SL 549.44	Flora, Fauna and Natural Habitats Protection Regulations
SL 549.90	Protection Of Wild Rabbit Regulations
SL 549.119	Control of Invasive Alien Species of European Union Concern Regulations
SL 549.120	Species Protection (Designation of National Species) Regulations
SL 549.123	Trees and Woodlands Protection Regulations

Table 6: Definitions of relevant schedules in SL 549.44

Schedule	Definition
Schedule V	Animal and plant species of Community Interest in need of strict protection
Schedule VI	Animal and plant species of national interest in need of strict protection
Schedule VIII	Animal and plant species of national interest whose taking in the wild and exploitation may be subject to management measures
Schedule X	Endemic species not covered by Regulation 26
Reg 26	Protected endemic species

Table 7: Definitions of relevant schedules in SL 549.123

Schedule	Definition
Schedule I, Part A, Table 2	Trees protected within protected areas, in ODZ, in green areas, and in natural or rural/ green enclaves in an urban area (development zone), or in urban public open spaces
Schedule I, Part A, Table 2 (*)	As per Schedule I, Part A, Table 2, but are not protected if planted for agricultural purposes for fruit or oil production in a field registered for agricultural use with the Agriculture Directorate and used by a registered farmer
Schedule I, Part A, Table 2 (*)	As per Schedule I, Part A, Table 2, but are not protected if horticulturally grown
Schedule II	Invasive, alien or environmentally-incompatible species
Schedule II (†)	As per Schedule II, but are protected in urban public open spaces

Table 8: Definitions of relevant terms and symbols in RDB status

Symbol/ Term	Definition
Endemic	Taxon is endemic to the Maltese Islands
V	Taxon is vulnerable locally
R	Taxon is rare locally

Symbol/ Term	Definition
Rest (MI)	Taxon has a restricted distribution in the Maltese Islands
Rest (MED)	Taxon has a restricted distribution in the Mediterranean region
I	Taxon's status in the Maltese Islands is not known
(?)	following any other symbol signifies uncertainty in the information given

Table 9: Conservation status of relevant habitats listed in Schedule I of SL 549.44 present in the AoS (The sign '*' indicates priority habitat types)

Habitat	Habitats Directive Article 17 Report (Year)	Habitat Range and Area in Malta				Conclusion of Assessments				
		Surface area of range (km ²)	Trend of range	Surface area coverage (km ²)	Trend of surface area coverage	Range	Area	Specific structure & function	Future Prospects	Overall Conservation status
1240 - Vegetated sea cliffs of the Mediterranean coasts with endemic <i>Limonium</i> spp.	2019	146	Stable	3.16	Stable	Favourable	Favourable	Unfavourable - Bad	Unfavourable - Bad	Unfavourable – Bad
5410 - West Mediterranean clifftop phrygas (<i>Astragalo-Plantaginetum subulatae</i>)	2019	185	Stable	13.88	Stable	Favourable	Favourable	Unfavourable - Bad	Unfavourable - Bad	Unfavourable – Bad
6220 *Pseudo-steppe with grasses and annuals of the <i>Thero-Brachypodietea</i>	2019	205	Stable	9.56	Stable	Favourable	Favourable	Unfavourable - Bad	Unfavourable - Bad	Unfavourable – Bad

Table 10: Legal and conservation status of relevant plant species recorded during the field surveys

Family	Species Name	Vernacular Name	Legal Status			Malta RDB status
			SL 549.44	SL 549.123	Other	
PINACEAE	<i>Pinus halepensis</i>	Aleppo pine		Schedule I Part A Table 2	SL 10.22	
CUPRESSACEAE	<i>Cupressus sempervirens</i>	Cypress			SL 10.22	
	<i>Tetraclinis articulata</i>	Alerce/ Sandarac Gum tree	Schedule III, Schedule VI	Schedule I, Part A, Table 1	S.L.549.1 20	E, Rest (MED+MI)
LAURACEAE	<i>Laurus nobilis</i>	Bay laurel		Schedule I Part A Table 2		R, Rest (MI)
PLUMBAGINACEAE	<i>Limonium zeraphae</i>	Zerafa's sea-lavender	Schedule III, Reg 26			Endemic, R, Rest (MI)
TAMARICACEAE	<i>Tamarix</i> sp.	Tamarisk		Schedule I Part A Table 2		R, Rest (MED+MI) [if <i>T. africana</i>]
CAPPARACEAE	<i>Capparis orientalis</i>	Caper	Schedule VIII			
EUPHORBIACEAE	<i>Ricinus communis</i>	Castor oil tree		Schedule II		
ROSACEAE	<i>Prunus dulcis</i> (= <i>Amygdalus communis</i>)	Almond		Schedule I Part A Table 2 (*)		
RHAMNACEAE	<i>Rhamnus alaternus</i>	Mediterranean buckthorn		Schedule I Part A Table 2		
FABACEAE	<i>Acacia saligna</i> (= <i>A. cyanophylla</i>)	Blue-leaved wattle		Schedule II	SL 549.119	
	<i>Ceratonia siliqua</i>	Carob		Schedule I Part A Table 2		
LYTHRACEAE	<i>Punica granatum</i>	Pomegranate		Schedule I Part A Table 2 (*)		
MYRTACEAE	<i>Eucalyptus gomphocephala</i>	Tuart tree		Schedule II (†)		
ANACARDIACEAE	<i>Pistacia lentiscus</i>	Lentisk		Schedule I Part A Table 2		

Family	Species Name	Vernacular Name	Legal Status			Malta RDB status
			SL 549.44	SL 549.123	Other	
	<i>Schinus terebinthifolius</i>	Brazilian pepper tree		Schedule II		
APIACEAE	<i>Ferula melitensis</i>	Maltese ferule	Reg 26			
PITTOSPORACEAE	<i>Pittosporum tobira</i>	Japanese mock orange		Schedule II		
APOCYNACEAE	<i>Nerium oleander</i>	Oleander		Schedule I Part A Table 2 (*)		
	<i>Periploca angustifolia</i>	Wolfbane				Rest (MED)
SOLANACEAE	<i>Nicotiana glauca</i>	Shrub tobacco		Schedule II		
OLEACEAE	<i>Olea europaea</i>	Olive		Schedule I Part A Table 2 (*)		Rest (MI) (?)
	<i>Olea oleaster</i>	Wild olive		Schedule I Part A Table 2		Rest (MI) (?)
LAMIACEAE	<i>Micromeria microphylla</i>	Maltese savory	Schedule VIII			Rest (MED)
	<i>Thymbra capitata</i>	Mediterranean thyme	Schedule III		SL 10.10	No Specific category
OROBANCHACEAE	<i>Phelipanche nana</i> subsp. <i>melitensis</i>	Maltese dwarf sorrel broomrape	Schedule X			Endemic
ASTERACEAE	<i>Anthemis urvilleana</i>	Maltese sea chamomile	Schedule X			Endemic
	<i>Carlina involucrata</i>	Clustered carline thistle				Rest (MED)
	<i>Jacobaea maritima</i> subsp. <i>sicula</i> (= <i>Senecio bicolor</i>)	Silvery ragwort	Reg 26			
	<i>Phagnalon rupestre</i> subsp. <i>graecum</i>	Eastern phagnalon				Rest (MED)
ARECACEAE	<i>Chamaerops humilis</i>	Dwarf fan palm		Schedule I Part A Table 2		X (?), Rest (MED)
	<i>Phoenix</i> sp.	Date palm species		Schedule I Part A Table 2 [if <i>P. dactylifera</i>]		
POACEAE	<i>Desmazeria pignattii</i>	Pignatti's fern grass	Reg 26			Rest (MED)

Family	Species Name	Vernacular Name	Legal Status			Malta RDB status
			SL 549.44	SL 549.123	Other	
	<i>Elymus pycnanhtus</i>	Sea Couch				E, Rest (MI)
IRIDACEAE	<i>Iris</i> sp.	Iris	<i>Depends on species</i>			<i>Depends on species</i>
AMARYLLIDACEAE	<i>Allium polyanthum</i> (=A. <i>melitense</i>)	Many flowered garlic	Schedule X			
ASPARAGACEAE	<i>Urginea pancracion</i>	Seaside squill	Schedule VIII, Schedule X			Rest (MED)
	<i>Ornithogalum narbonense</i>	Southern star-of-Bethlehem	Schedule VIII			

Table 11: Legal and conservation status of relevant plant species recorded in the area of study, which were not recorded in the present study but reported in previous studies (Zammit et al., 2021)

Family	Species Name	Vernacular Name	Legal Status			Malta RDB status
			SL 549.44	SL 549.123	Other	
ASTERACEAE	<i>Senecio pygmaeus</i>	Pygmy groundsel	Schedule VI			RR, Rest (Med + MI)
ORCHIDACEAE	<i>Neotinea lactea</i>	Milky orchid	Schedule VI			

Table 12: Legal and conservation status of relevant invertebrate fauna species recorded during the field surveys

Class	Order	Family	Scientific Name	Vernacular Name	Legal Status	Malta RDB Status
					SL 549.44	
INSECTA	COLEOPTERA	LAMPYRIDAE	<i>Lampyrus pallida</i>	Maltese glow worm	Reg 26	V
	LEPIDOPTERA	PAPILIONIDAE	<i>Papilio machoan melitensis</i>	Maltese Swallowtail	Reg 26	Endemic (?)
		PIERIDAE	<i>Colias croceus</i>	Clouded Yellow	Schedule VI	
	ODONATA	LIBELLULIDAE	<i>Orthetrum trinacria</i>	Long Skimmer	Schedule VI	
GASTROPODA	LITTORINIMORPHA	POMATIIDAE	<i>Tudorella melitense</i>	Maltese round-mouthed snail	Reg 26	Endemic (?)

Table 13: Legal and conservation status of relevant vertebrate fauna species (excluding birds) recorded during the field surveys

Class	Order	Family	Scientific Name	Vernacular Name	Legal Status		Malta RDB status
					SL 549.44	Other	
REPTILIA	SQUAMATA	CHAMAELEONIDAE	<i>Chamaeleo chamaeleon</i>	Mediterranean chameleon		SL 549.02	
		SCINCIDAE	<i>Chalcides ocellatus</i>	Ocellated skink	Schedule V	SL 549.02	V, Rest (MED)
		LACERTIDAE	<i>Podarcis filfolensis maltensis</i>	Maltese wall lizard	Schedule V	SL 549.02	
		COLUBRIDAE	<i>Telescopus fallax fallax</i>	Cat Snake	Schedule V	SL 549.02	V, Rest (MED + MI)
			<i>Hierophis viridiflavus carbonarius</i>	Black whip snake	Schedule V	SL 549.02	V
		GEKKONIDAE	<i>Tarentola mauritiana</i>	Moorish gecko	Schedule VI	SL 549.02	V
MAMMALIA	EULIPOTYPHLA	ERINACEIDAE	<i>Atelerix algirus</i>	Algerian hedgehog	Schedule V		
	LAGOMORPHA	LEPORIDAE	<i>Oryctolagus cuniculus</i>	Wild rabbit		SL 549.90	
	CHIROPTERA	VESPERTILIONIDAE	<i>Hypsugo savii</i>	Savi's pipistrelle	Schedule V		
			<i>Pipistrellus kuhlii</i>	Kuhl's pipistrelle	Schedule V		
			<i>Pipistrellus pipistrellus</i>	Common pipistrelle	Schedule V		
			<i>Plecotus gaisleri</i>	Gaisler's long-eared bat	Schedule V		

Table 14: Conservation status of species listed in Schedule V of SL 549.44 recorded during the field surveys

Species	Habitats Directive Article 17 Report (Year)	Conclusion of Assessments				
		Range	Population	Habitat for the species	Future Prospects	Overall Conservation status
1274 <i>Chalcides ocellatus</i> (Ocellated skink)	2019	Unknown	Unknown	Favourable	Unknown	Unknown
1237 <i>Podarcis filfolensis maltensis</i> (Maltese wall lizard)	2019	Favourable	Favourable	Favourable	Favourable	Favourable
1289 <i>Telescopus fallax fallax</i> (Cat snake)	2019	Unknown	Unknown	Favourable	Unknown	Unknown
5670 <i>Hierophis viridiflavus</i> (Black whip snake)	2019	Unknown	Unknown	Favourable	Unknown	Unknown
5978 <i>Atelerix algirus</i> (Algerian hedgehog)	2019	Favourable	Favourable	Favourable	Favourable	Favourable
5365 <i>Hypsugo savii</i> (Savi's pipistrelle)	2019	Favourable	Favourable	Favourable	Favourable	Favourable
2016 <i>Pipistrellus kuhlii</i> (Kuhl's pipistrelle)	2019	Favourable	Favourable	Favourable	Favourable	Favourable
1309 <i>Pipistrellus pipistrellus</i> (Common pipistrelle)	2019	Favourable	Favourable	Favourable	Favourable	Favourable

Species	Habitats Directive Article 17 Report (Year)	Conclusion of Assessments				
		Range	Population	Habitat for the species	Future Prospects	Overall Conservation status
6936 <i>Plecotus gaisleri</i> (Gaisler's long-eared bat)	2019	Unfavourable - Inadequate	Unfavourable - Inadequate	Unfavourable - Inadequate	Unfavourable - Inadequate	Unfavourable - Inadequate

Table 15: Trees recorded within the scheme site and determination of their age

Scientific name	Vernacular name	Number of specimens	Age Range Estimation	
			Age Range	Inference
<i>Eucalyptus gomphocephala</i>	Tuart tree	Area A = 12	Between 10 and 50 years old	- Visible in 2012 Orthophoto but not visible in 1967 Aerial Photograph. - Ecologist's judgement due to specimens' size.
		Area A = 1	Less than 10 years old	Ecologist's judgement due to specimen's size.
<i>Acacia saligna</i>	Blue-leaved wattle	Area A = 4	Between 10 and 50 years old	- Presumed planted with other trees visible in 2012 Orthophoto but not visible in 1967 Aerial Photograph. - Ecologist's judgement due to specimens' size.
		Area B = 1	Between 10 and 50 years old	Visible in 2012 Orthophoto but not visible in 1967 Aerial Photograph.
<i>Cupressus sempervirens</i>	Cypress	Area A = 1	Between 10 and 50 years old	- Presumed planted with other trees visible in 2012 Orthophoto but not visible in 1967 Aerial Photograph. - Ecologist's judgement due to specimens' size.
<i>Tamarix</i> sp.	Tamarisk	Area C = 3	Between 10 and 50 years old	Visible in 2012 Orthophoto but not visible in 1967 Aerial Photograph.
<i>Ceratonia siliqua</i>	Carob	Area D = 36	Over 50 years old	Visible in 1967 Aerial Photograph.
<i>Prunus dulcis</i>	Almond	Area A = 14 Area D = 28	Between 10 and 50 years old	- Visible in 2012 Orthophoto but not visible in 1967 Aerial Photograph. - Ecologist's judgement due to specimens' size.
<i>Olea europaea</i>	Olive	Area D = 1	Between 10 and 50 years old	Visible in 2012 Orthophoto but not visible in 1967 Aerial Photograph.
<i>Olea oleaster</i>	Wild olive	Area A = 1	Less than 10 years old	Ecologist's judgement due to specimens' size.
<i>Pistacia lentiscus</i>	Lentisk	Area A = 17 Area B = 32 Area D = 4	Between 10 and 50 years old	Visible in 2012 Orthophoto but not visible in 1967 Aerial Photograph or associated with other trees visible in 2012 Orthophoto but not visible in 1967 Aerial Photograph.

Scientific name	Vernacular name	Number of specimens	Age Range Estimation	
			Age Range	Inference
				Ecologist's judgement due to specimens' size.
		Area D = 1	Less than 10 years old	Not visible in 2012 Orthophoto
<i>Opuntia ficus-indica</i>	Prickly pear	Area A = 2	Less than 10 years old	Ecologist's judgement due to specimens' size.
		Area B = 1	Between 10 and 50 years old	Visible in 2012 Orthophoto but not visible in 1967 Aerial Photograph.
<i>Ficus carica</i>	Fig	Area A = 5	Less than 10 years old	Ecologist's judgement due to specimens' size.
		Area B = 2	Between 10 and 50 years old	Visible in 2012 Orthophoto but not visible in 1967 Aerial Photograph.
		Area D = 8	Between 10 and 50 years old	Visible in 2012 Orthophoto but not visible in 1967 Aerial Photograph.
<i>Nerium oleander</i>	Oleander	Area A = 2	Less than 10 years old	Ecologist's judgement due to specimens' size.
Dead trees	N/A	Area A = 6 Area D = 1	N/A	N/A

Table 16: List of all birds recording from area and reviewed together with their local and conservation status (SPEC, European Threat Status and Birds Directive Annex I species)

Common name	Latin name	Status in Malta				International Protection Status			WtE	Salina 2018	Salina 2019	Tas-Safra BW 2020	Tas-Safra BW 2021	Tas-Safra BW 2022
		Breeding	Migrant	Winter visitor	Rare & Irregular	SPEC Category	European Threat Status	Birds Directive						
Common Shelduck	<i>Tadorna tadorna</i>		x	x		Non-SPEC	LC		x	x	x			
Eurasian Wigeon	<i>Mareca penelope</i>		x	x		Non-SPEC	LC		x		x			
Common Teal	<i>Anas crecca</i>		x	x		Non-SPEC	LC		x	x	x			
Mallard	<i>Anas platyrhynchos</i>		x	x		Non-SPEC	LC		x					
Northern Pintail	<i>Anas acuta</i>		x	x		SPEC 3	VU		x	x	x			
Garganey	<i>Spatula querquedula</i>		x			SPEC 3	LC		x	x	x			
Northern Shoveler	<i>Spatula clypeata</i>		x	x		Non-SPEC	LC		x	x	x			
Common Pochard	<i>Aythya ferina</i>		x	x		SPEC 1	VU		x		x			
Ferruginous Duck	<i>Aythya nyroca</i>		x			SPEC 1	LC	I	x	x				
Red-breasted Merganser	<i>Mergus serrator</i>		x	x		SPEC 3	NT		x		x			
Common Quail	<i>Coturnix coturnix</i>	VR	x			SPEC 3	NT		x		x			
Little Grebe	<i>Tachybaptus ruficollis</i>	VR		x		Non-SPEC	LC		x					
Great Crested Grebe	<i>Podiceps cristatus</i>		x	x		Non-SPEC	LC		x	x	x			
Black-necked Grebe	<i>Podiceps nigricollis</i>			x		Non-SPEC	VU		x	x	x			
Scopoli's Shearwater	<i>Calonectris diomedea</i>	x (SV)				Non-SPEC	LC	I	x			x	x	
Yelkouan Shearwater	<i>Puffinus yelkouan</i>	x (PR)				SPEC 1	VU	I	x					x
European Storm-petrel	<i>Hydrobates pelagicus</i>	x (SV)				Non-SPEC	LC	I	x					
Northern Gannet	<i>Morus bassanus</i>			x		Non-SPEC	LC		x		x			x
Great Cormorant	<i>Phalacrocorax carbo</i>			x		Non-SPEC	LC		x	x	x		x	x
Little Bittern	<i>Ixobrychus minutus</i>	VR	x			SPEC 3	LC	I	x	x				
Black-crowned Night Heron	<i>Nycticorax nycticorax</i>		x			SPEC 3	LC	I	x	x	x			

Common name	Latin name	Status in Malta				International Protection Status			WfE	Salina 2018	Salina 2019	Tas-Safra BW 2020	Tas-Safra BW 2021	Tas-Safra BW 2022
		Breeding	Migrant	Winter visitor	Rare & Irregular	SPEC Category	European Threat Status	Birds Directive						
Squacco Heron	<i>Ardeola ralloides</i>		x			SPEC 3	LC	I	x		x			
Cattle Egret	<i>Bubulcus ibis</i>	x			x	Non-SPEC	LC			x	x	x	x	
Little Egret	<i>Egretta garzetta</i>		x	x		Non-SPEC	LC	I	x			x	x	
Great White Egret	<i>Ardea alba</i>		x			Non-SPEC	LC	I	x	x	x			
Grey Heron	<i>Ardea cinerea</i>		x	x		Non-SPEC	LC		x	x	x		x	
Purple Heron	<i>Ardea purpurea</i>		x			SPEC 3	LC	I	x	x	x		x	
Black Stork	<i>Ciconia nigra</i>				x	Non-SPEC	LC	I	x					
White Stork	<i>Ciconia ciconia</i>		x			Non-SPEC	LC	I	x	x				
Glossy Ibis	<i>Plegadis falcinellus</i>		x			Non-SPEC	LC	I	x	x	x			
Eurasian Spoonbill	<i>Platalea leucorodia</i>		x			Non-SPEC	LC	I	x	x	x			
Greater Flamingo	<i>Phoenicopterus roseus</i>		x			Non-SPEC	LC	I	x	x	x			
Egyptian Vulture	<i>Neophron percnopterus</i>					SPEC 1	VU	I	x					
European Honey-buzzard	<i>Pernis apivorus</i>		x			Non-SPEC	LC	I	x	x	x			
Black Kite	<i>Milvus migrans</i>		x			SPEC 3	LC	I	x					
Lesser Spotted Eagle	<i>Clanga pomarina</i>		x			Non-SPEC	LC	I	x					
Short-Toed Snake-Eagle	<i>Circaetus gallicus</i>		x			Non-SPEC	LC	I	x					
Western Marsh Harrier	<i>Circus aeruginosus</i>		x			Non-SPEC	LC	I	x	x	x			
Hen Harrier	<i>Circus cyaneus</i>		x			SPEC 3	LC	I		x	x			
Montagu's Harrier	<i>Circus pygargus</i>		x			Non-SPEC	LC	I	x					
Eurasian Sparrowhawk	<i>Accipiter nisus</i>		x			Non-SPEC	LC	I* (A. n. granti)	x		x			
Booted Eagle	<i>Hieraaetus pennatus</i>		x			Non-SPEC	LC	I	x					
Osprey	<i>Pandion halieetus</i>		x			Non-SPEC	LC	I	x					

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		Breeding	Migrant	Winter visitor	Rare & Irregular	SPEC Category	European Threat Status	Birds Directive						
Lesser Kestrel	<i>Falco naumanni</i>		x			SPEC 3	LC	I	x					
Common Kestrel	<i>Falco tinnunculus</i>	VR	x	x		SPEC 3	LC		x	x	x	x		
Red-footed Falcon	<i>Falco vespertinus</i>		x			SPEC 1	VU	I	x					
Merlin	<i>Falco columbarius</i>		x			Non-SPEC	VU	I	x					
Eurasian Hobby	<i>Falco subbuteo</i>		x			Non-SPEC	LC		x		x			
Eleonora's Falcon	<i>Falco eleonora</i>		x			Non-SPEC	LC	I	x	x	x			
Peregrine Falcon	<i>Falco peregrinus</i>	E	x			Non-SPEC	LC	I	x	x	x			
Western Water Rail	<i>Rallus aquaticus</i>		x	x		Non-SPEC	LC		x					
Spotted Crake	<i>Porzana porzana</i>		x	x		Non-SPEC	LC	I	x					
Common Moorhen	<i>Gallinula chloropus</i>	x	x			Non-SPEC	LC		x	x	x			
Common Coot	<i>Fulica atra</i>		x	x		SPEC 3	NT		x		x			
Common Crane	<i>Grus grus</i>		x			Non-SPEC	LC	I	x					
Eurasian Oystercatcher	<i>Haematopus ostralegus</i>		x			SPEC 1	VU		x		x		x	
Black-winged Stilt	<i>Himantopus himantopus</i>		x			Non-SPEC	LC	I	x	x	x			
Pied Avocet	<i>Recurvirostra avosetta</i>		x			Non-SPEC	LC	I	x	x	x			
Eurasian Thick-knee	<i>Burhinus oedicnemus</i>		x			SPEC 3	LC	I	x					
Collared Pratincole	<i>Glareola pratincola</i>				x	SPEC 3	LC	I	x		x			
Little Ringed Plover	<i>Charadrius dubius</i>	x	x			Non-SPEC	LC		x	x	x			
Common Ringed Plover	<i>Charadrius hiaticula</i>		x			Non-SPEC	LC		x	x	x			
Kentish Plover	<i>Charadrius alexandrinus</i>		x			SPEC 3	LC	I	x		x			
Eurasian Dotterel	<i>Eudromias morinellus</i>		x			Non-SPEC	LC	I	x					
Eurasian Golden Plover	<i>Pluvialis apricaria</i>		x	x		Non-SPEC	LC	I	x	x	x			

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		Breeding	Migrant	Winter visitor	Rare & Irregular	SPEC Category	European Threat Status	Birds Directive						
Grey Plover	<i>Pluvialis squatarola</i>		x			Non-SPEC	LC		x	x	x			
Northern Lapwing	<i>Vanellus vanellus</i>		x	x		SPEC 1	VU		x		x			
Sanderling	<i>Calidris alba</i>		x			Non-SPEC	LC		x					
Little Stint	<i>Calidris minuta</i>		x	x		Non-SPEC	LC		x	x	x		x	
Temminck's Stint	<i>Calidris temminckii</i>		x			Non-SPEC	LC		x		x			
Curlew Sandpiper	<i>Calidris ferruginea</i>		x			SPEC 1	VU		x	x	x			
Dunlin	<i>Calidris alpina</i>		x	x		SPEC 3	LC	I* (C. a. schinzii)	x	x	x			
Ruff	<i>Calidris pugnax</i>		x			SPEC 2	NT	I	x	x	x			
Jack Snipe	<i>Limnospiza minima</i>		x			Non-SPEC	LC		x					
Common Snipe	<i>Gallinago gallinago</i>		x	x		SPEC 3	VU		x	x				
Great Snipe	<i>Gallinago media</i>		x			SPEC 1	LC	I	x					
Eurasian Woodcock	<i>Scolopax rusticola</i>		x	x		Non-SPEC	LC		x					
Black-tailed Godwit	<i>Limosa limosa</i>		x			SPEC 1	NT		x					
Whimbrel	<i>Numenius phaeopus</i>		x			Non-SPEC	LC		x					
Eurasian Curlew	<i>Numenius arquata</i>		x			SPEC 1	NT		x		x			
Spotted Redshank	<i>Tringa erythropus</i>		x			SPEC 3	LC		x	x				
Common Redshank	<i>Tringa totanus</i>		x	x		SPEC 2	VU		x	x	x			
Marsh Sandpiper	<i>Tringa stagnatilis</i>		x			Non-SPEC	LC		x					
Greenshank	<i>Tringa nebularia</i>		x			Non-SPEC	LC		x		x			
Green Sandpiper	<i>Tringa ochropus</i>		x			Non-SPEC	LC		x	x	x			
Wood Sandpiper	<i>Tringa glareola</i>		x			SPEC 3	LC	I	x	x	x			
Common Sandpiper	<i>Actitis hypoleucos</i>		x	x		SPEC 3	LC		x	x	x	x	x	

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Red Knot	<i>Calidris canutus</i>				x	SPEC 1	LC		x					
Ruddy Turnstone	<i>Arenaria interpres</i>		x			Non-SPEC	LC		x					
Long-tailed Jaeger	<i>Stercorarius longicaudus</i>				x	Non-SPEC	LC		x					
Pomarine Jaeger	<i>Stercorarius pomarinus</i>		x			Non-SPEC	LC		x					
Arctic Jaeger	<i>Stercorarius parasiticus</i>				x	Non-SPEC	EN		x					
Great Skua	<i>Catharacta skua</i>		x			Non-SPEC	LC		x					
Mediterranean Gull	<i>Larus melanocephalus</i>		x	x		Non-SPEC	LC	I	x	x	x	x	x	x
Little Gull	<i>Hydrocoloeus minutus</i>			x		SPEC 3	LC	I	x	x	x			
Black-headed Gull	<i>Larus ridibundus</i>		x	x		Non-SPEC	LC		x	x	x	x	x	x
Slender-billed Gull	<i>Larus genei</i>		x			Non-SPEC	VU	I	x	x	x	x		
Audouin's Gull	<i>Larus audouinii</i>			x		Non-SPEC	VU	I	x	x	x	x	x	
Mew Gull	<i>Larus canus</i>				x	Non-SPEC	LC					x		
Lesser Black-backed Gull	<i>Larus fuscus</i>		x	x		Non-SPEC	LC		x	x	x	x	x	x
Yellow-legged Gull	<i>Larus michahellis (CACHINNANS)</i>	x	x	x		Non-SPEC	LC			x	x	x	x	x
Black-legged Kittiwake	<i>Rissa tridactyla</i>				x	SPEC 3	VU			x			x	
Caspian gull	<i>Larus cachinnans</i>		x			Non-SPEC	LC			x	x	x		
Little Tern	<i>Sternula albifrons</i>		x			SPEC 3	LC	I	x					
Common Gull-billed Tern	<i>Gelochelidon nilotica</i>		x			SPEC 3	LC	I	x	x	x			
Caspian Tern	<i>Hydroprogne caspia</i>		x			Non-SPEC	LC	I	x	x	x			
Whiskered Tern	<i>Chlidonias hybrida</i>		x			Non-SPEC	LC	I						
Black Tern	<i>Chlidonias niger</i>		x			SPEC 3	LC	I	x					
Sandwich Tern	<i>Thalasseus sandvicensis</i>		x	x		Non-SPEC	LC	I	x	x	x	x	x	

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Common Wood Pigeon	<i>Columba palumbus</i>		x	x		Non-SPEC	LC	I* (C. p. azorica)						
Eurasian Collared Dove	<i>Streptopelia decaocto</i>	x				Non-SPEC	LC		x	x	x			
European Turtle Dove	<i>Streptopelia turtur</i>	VR	x			SPEC 1	VU		x	x	x			
Common Cuckoo	<i>Cuculus canorus</i>	VR	x			Non-SPEC	LC		x					
Eurasian Scops Owl	<i>Otus scops</i>		x	x		SPEC 2	LC		x					
Short-eared Owl	<i>Asio flammeus</i>	VR	x	x		SPEC 3	LC	I	x					
European Nightjar	<i>Caprimulgus europaeus</i>		x			SPEC 3	LC	I	x					
Alpine Swift	<i>Tachymarptis melba</i>		x			Non-SPEC	LC		x					
Common Swift	<i>Apus apus</i>	VR	x			SPEC 3	NT		x	x	x			
Pallid Swift	<i>Apus pallidus</i>		x			Non-SPEC	LC		x	x	x			
Common Kingfisher	<i>Alcedo atthis</i>		x	x		SPEC 3	LC	I	x	x	x			
European Bee-eater	<i>Merops apiaster</i>		x			Non-SPEC	LC		x	x	x			
European Roller	<i>Coracias garrulus</i>		x			SPEC 2	LC	I	x					
Common Hoopoe	<i>Upupa epops</i>		x			Non-SPEC	LC		x		x			
Eurasian Wryneck	<i>Jynx torquilla</i>		x	x		SPEC 3	LC		x	x	x			
Greater Short-toed Lark	<i>Calandrella brachydactyla</i>	x (SV)	x			SPEC 3	LC	I	x		x			
Eurasian Sky Lark	<i>Alauda arvensis</i>		x	x		SPEC 3	LC		x	x	x			
Woodlark	<i>Lullula arborea</i>					SPEC 2	LC	I	x					
Collared Sand Martin	<i>Riparia riparia</i>		x			SPEC 3	LC		x	x	x			
Barn Swallow	<i>Hirundo rustica</i>	VR	x	x		SPEC 3	LC		x	x	x			
Northern House Martin	<i>Delichon urbicum</i>	VR	x			SPEC 2	LC		x	x	x			
Red-rumped Swallow	<i>Cecropis daurica</i>		x			Non-SPEC	LC		x					

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Tawny Pipit	<i>Anthus campestris</i>	VR	x			SPEC 3	LC	I	x					
Tree Pipit	<i>Anthus trivialis</i>		x			SPEC 3	LC		x					
Meadow Pipit	<i>Anthus pratensis</i>		x	x		SPEC 1	LC		x	x	x	x	x	x
Red-throated Pipit	<i>Anthus cervinus</i>		x	x		Non-SPEC	LC		x					
Water Pipit	<i>Anthus spinoletta</i>		x	x		Non-SPEC	LC		x					
Western Yellow Wagtail	<i>Motacilla flava</i>		x			SPEC 3	LC		x	x	x			
Grey Wagtail	<i>Motacilla cinerea</i>		x	x		Non-SPEC	LC		x	x	x	x	x	
White Wagtail	<i>Motacilla alba</i>		x	x		Non-SPEC	LC		x	x	x	x	x	x
Dunnock	<i>Prunella modularis</i>		x	x		Non-SPEC	LC		x	x				
European Robin	<i>Erithacus rubecula</i>	VR	x	x		Non-SPEC	LC		x	x	x	x	x	x
Common Nightingale	<i>Luscinia megarhynchos</i>	VR	x			Non-SPEC	LC		x		x			
Bluethroat	<i>Cyanecula svecina</i>		x	x		Non-SPEC	LC	I	x					
Black Redstart	<i>Phoenicurus ochruros</i>		x	x		Non-SPEC	LC		x	x	x	x	x	x
Common Redstart	<i>Phoenicurus phoenicurus</i>		x			Non-SPEC	LC		x					
Whinchat	<i>Saxicola rubetra</i>		x			SPEC 2	LC		x	x				
Common Stonechat	<i>Saxicola torquatus</i>		x	x		Non-SPEC	LC		x	x	x	x	x	x
Isabelline Wheatear	<i>Oenanthe isabellina</i>					Non-SPEC	LC		x					
Northern Wheatear	<i>Oenanthe oenanthe</i>		x	x		SPEC 3	LC		x	x	x			
Black-eared Wheatear	<i>Oenanthe hispanica</i>	VR	x			Non-SPEC	LC		x					
Rufous-tailed Rock Thrush	<i>Monticola saxatilis</i>		x			SPEC 3	LC		x					
Blue Rock Thrush	<i>Monticola solitarius</i>	x				Non-SPEC	LC		x	x	x			
Eurasian Blackbird	<i>Turdus merula</i>		x	x		Non-SPEC	LC		x		x			

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Song Thrush	<i>Turdus philomelos</i>		x	x		Non-SPEC	LC		x	x	x			
Redwing	<i>Turdus iliacus</i>		x	x		SPEC 1	LC		x					
Mistle Thrush	<i>Turdus viscivorus</i>		x			Non-SPEC	LC		x					
Fieldfare	<i>Turdus pilaris</i>		x			Non-SPEC	LC		x					
Rudous-tailed Scrub-robin	<i>Cercotrichas galactotes</i>				x	SPEC 3	LC		x					
Cetti's Warbler	<i>Cettia cetti</i>	x				Non-SPEC	LC		x	x	x			
Zitting Cisticola	<i>Cisticola juncidis</i>	x				Non-SPEC	LC		x	x	x	x	x	x
Savi's Warbler	<i>Locustella lusciniodes</i>		x			Non-SPEC	LC		x					
Moustached Warbler	<i>Acrocephalus melanopogon</i>			x		Non-SPEC	LC	I	x					
Sedge Warbler	<i>Acrocephalus schoenobaenus</i>		x			Non-SPEC	LC		x	x				
Common Reed Warbler	<i>Acrocephalus scirpaceus</i>	x	x			Non-SPEC	LC		x	x	x			
Great Reed Warbler	<i>Acrocephalus arundinaceus</i>		x			Non-SPEC	LC		x	x				
Isabelline Warbler	<i>Iduna opaca</i>		x			SPEC 3	LC		x					
Eastern Olivaceous Warbler	<i>Iduna pallida</i>				x	Non-SPEC	LC		x					
Icterine Warbler	<i>Hippolais icterina</i>		x			Non-SPEC	LC		x					
Eurasian Blackcap	<i>Sylvia atricapilla</i>		x	x		Non-SPEC	LC		x	x	x			
Garden Warbler	<i>Sylvia borin</i>		x			Non-SPEC	LC		x	x	x			
Lesser Whitethroat	<i>Sylvia curruca</i>		x			Non-SPEC	LC		x					
Common Whitethroat	<i>Sylvia communis</i>		x			Non-SPEC	LC		x					
Spectacled Warbler	<i>Sylvia conspicillata</i>	x				Non-SPEC	LC		x					
Subalpine Warbler	<i>Sylvia cantillans</i>		x			Non-SPEC	LC		x		x			
Sardinian Warbler	<i>Sylvia melanocephala</i>	x	x			Non-SPEC	LC		x	x	x	x	x	x

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Yellow-browed Warbler	<i>Phylloscopus inornatus</i>				x	SPEC 3	LC		x					
Western Bonelli's Warbler	<i>Phylloscopus bonelli</i>		x			Non-SPEC	LC		x					
Eastern Bonelli's Warbler	<i>Phylloscopus orientalis</i>		x			Non-SPEC	LC		x					
Wood Warbler	<i>Phylloscopus sibilatrix</i>		x			Non-SPEC	LC		x	x	x			
Iberian Chiffchaff	<i>Phylloscopus ibericus</i>				x	Non-SPEC	LC				x			
Siberian Chiffchaff	<i>Phylloscopus tristis</i>				x	Non-SPEC	LC				x			
Common Chiffchaff	<i>Phylloscopus collybita</i>		x	x		Non-SPEC	LC		x	x	x	x	x	
Willow Warbler	<i>Phylloscopus trochilus</i>		x			SPEC 3	LC		x	x	x			
Goldcrest	<i>Regulus regulus</i>		x	x		SPEC 2	LC		x					
Common Firecrest	<i>Regulus ignicapilla</i>		x	x		Non-SPEC	LC		x					
Spotted Flycatcher	<i>Muscicapa striata</i>	x	x			SPEC 2	LC		x	x	x			
Red-breasted Flycatcher	<i>Ficedula parva</i>		x			Non-SPEC	LC	I		x				
Semi-collared Flycatcher	<i>Ficedula semitorquata</i>				x	SPEC 2	LC	I	x					
Collared Flycatcher	<i>Ficedula albicollis</i>		x			Non-SPEC	LC	I	x					
European Pied Flycatcher	<i>Ficedula hypoleuca</i>		x			Non-SPEC	LC		x	x	x			
Eurasian Penduline Tit	<i>Remiz pendulinus</i>				x	Non-SPEC	LC		x					
Eurasian Golden Oriole	<i>Oriolus oriolus</i>		x			Non-SPEC	LC		x		x			
Red-backed Shrike	<i>Lanius collurio</i>		x			SPEC 2	LC	I	x					
Woodchat Shrike	<i>Lanius senator</i>	x	x			SPEC 2	NT		x					
Common Starling	<i>Sturnus vulgaris</i>	x	x	x		SPEC 3	LC		x	x	x			
Spanish Sparrow	<i>Passer hispaniolensis</i>	x				Non-SPEC	LC		x	x	x	x	x	x
Eurasian Tree Sparrow	<i>Passer montanus</i>	x	x			SPEC 3	LC		x	x	x			

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Common Chaffinch	<i>Fringilla coelebs</i>	x	x	x		Non-SPEC	LC	I* (F. c. ambrosia)	x	x	x			
European Serin	<i>Serinus serinus</i>	VR	x	x		SPEC 2	LC		x					
European Greenfinch	<i>Chloris chloris</i>	VR	x	x		Non-SPEC	LC		x	x				
European Goldfinch	<i>Carduelis carduelis</i>		x			Non-SPEC	LC		x					
Eurasian Siskin	<i>Spinus spinus</i>		x			Non-SPEC	LC		x					
Common Linnet	<i>Linaria cannabina</i>	VR	x	x		SPEC 2	LC		x					
Hawfinch	<i>Coccothraustes coccothraustes</i>		x			Non-SPEC	LC		x					
Reed Bunting	<i>Emberiza schoeniclus</i>			x		Non-SPEC	LC		x		x			
Corn Bunting	<i>Emberiza calandra</i>	x	x			SPEC 2	LC		x					
Ortolan Bunting	<i>Emberiza hortulana</i>					SPEC 2	LC	I	x					

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Annex I: List of all vascular plant species recorded during the field surveys

Table 17: List of all vascular plant species recorded during the field surveys

Family	Species Name	Vernacular Name	Legal Status			Malta RDB status
			SL 549.44	SL 549.123	Other	
PINACEAE	<i>Pinus halepensis</i>	Aleppo pine		Schedule I Part A Table 2	SL 10.22	
CUPRESSACEAE	<i>Cupressus sempervirens</i>	Cypress			SL 10.22	
	<i>Tetraclinis articulata</i>	Sandarac gum tree	Schedule III, Schedule VI	Schedule I Part A Table 1	SL 549.120	E, Rest (MED+MI)
LAURACEAE	<i>Laurus nobilis</i>	Bay laurel		Schedule I Part A Table 2		R, Rest (MI)
PAPAVERACEAE	<i>Fumaria</i> sp.	Fumitory				
	<i>Papaver hybridum</i>	Bristly poppy				
	<i>Papaver rhoeas</i>	Common poppy				
AIZOOACEAE	<i>Mesembryanthemum nodiflorum</i>	Lesser crystal plant				
CACTACEAE	<i>Opuntia dillenii</i>	Erect Prickly Pear				
	<i>Opuntia ficus-indica</i>	Prickly pear				
AMARANTHACEAE	<i>Arthrocnemum macrostachyum</i>	Glaucous glasswort				
	<i>Atriplex prostrata</i>	Spear-leaved orache				
	<i>Beta maritima</i>	Sea beet				
	<i>Chenopodium murale</i>	Nettleleaf goosefoot				
	<i>Salsola soda</i>	Smooth-leaved saltwort				
CARYOPHYLLACEAE	<i>Silene colorata</i>	Red campion				
	<i>Silene sedoides</i>	Hairy catchfly				
POLYGONACEAE	<i>Polygonum aviculare</i>	Prostrate knotweed				
PLUMBAGINACEAE	<i>Limonium zeraphae</i>	Zerapha's sea lavender	Schedule III, Reg 26			Endemic, R, Rest (MI)
TAMARICACEAE	<i>Tamarix</i> sp.	Tamarisk		Schedule I Part A Table 2		R, Rest (MED+MI) [if <i>T. africana</i>]
CUCURBITACEAE	<i>Ecballium elaterium</i>	Squirting cucumber				
CAPPARACEAE	<i>Capparis orientalis</i>	Caper	Schedule VIII			
BRASSICACEAE	<i>Brassica rapa</i> subsp. <i>slyvestris</i>	Bargeman's cabbage				
	<i>Cakile maritima</i>	Sea rocket				
	<i>Diplotaxis tenuifolia</i>	Perennial wall-rocket				
	<i>Lobularia maritima</i>	Sweet alison				
	<i>Raphanus raphanistrum</i>	Wild radish				
	<i>Sinapis alba</i>	White mustard				
RESEDACEAE	<i>Reseda alba</i>	White mignonette				
MALVACEAE	<i>Hibiscus rosa-sinensis</i>	Rose of China				
	<i>Malva</i> (=Lavatera) <i>arborea</i>	Tree mallow				
	<i>Malva multiflora</i> (=Lavatera <i>cretica</i>)	Cretan mallow				
	<i>Malva parviflora</i>	Lesser mallow				
HYPERICACEAE	<i>Hypericum triquetrifolium</i>	Crisped St. John's wort				
EUPHORBIACEAE	<i>Euphorbia helioscopia</i>	Sun spurge				
	<i>Euphorbia pinea</i>	Pine spurge				
	<i>Euphorbia tirucalli</i>	African milkbush				
	<i>Mercurialis annua</i>	Annual mercury				
	<i>Ricinus communis</i>	Castor oil tree		Schedule II		
LINACEAE	<i>Linum strictum</i>	Upright yellow flax				
MORACEAE	<i>Ficus carica</i>	Fig				
URTICACEAE	<i>Parietaria judaica</i>	Pellitory-of-the-wall				

Family	Species Name	Vernacular Name	Legal Status			Malta RDB status
			SL 549.44	SL 549.123	Other	
ROSACEAE	<i>Prunus dulcis</i> (=Amygladus communis)	Almond		Schedule I Part A Table 2 (*)		
RHAMNACEAE	<i>Rhamnus alaternus</i>	Mediterranean buckthorn		Schedule I Part A Table 2		
FABACEAE	<i>Acacia saligna</i> (=A. cyanophylla)	Blue-leaved wattle		Schedule II	SL 549.119	
	<i>Bituminaria bituminosa</i>	Pitch clover				
	<i>Ceratonia siliqua</i>	Carob		Schedule I Part A Table 2		
	<i>Hedysarum coronarium</i>	Sulla				
	<i>Hippocrepis multisiliquosa</i>	Common Horseshoe vetch				
	<i>Lathyrus clymenum</i>	Crimson pea				
	<i>Lotus ornithopodioides</i>	Common birdsfoot trefoil				
	<i>Medicago minima</i>	Burr medick				
	<i>Medicago orbicularis</i>	Disk medick				
	<i>Medicago polymorpha</i>	Toothed medick				
	<i>Melilotus indicus</i>	Small melilot				
	<i>Ononis sieberi</i>	Sieber's restharrow				
LYTHRACEAE	<i>Punica granatum</i>	Pomegranate		Schedule I Part A Table 2 (*)		
MYRTACEAE	<i>Eucalyptus gomphocephala</i>	Tuart tree		Schedule II (†)		
RUTACEAE	<i>Citrus</i> sp.	Citrus tree				
ANACARDIACEAE	<i>Pistacia lentiscus</i>	Lentisk		Schedule I Part A Table 2		
	<i>Schinus terebinthifolius</i>	Brazilian pepper tree		Schedule II		
OXALIDACEAE	<i>Oxalis pes-caprae</i>	Capesorrel				
GERANIACEAE	<i>Erodium moschatum</i>	Musk storksbill				
VITACEAE	<i>Vitis</i> sp.	Wild vine				
PRIMULACEAE	<i>Anagallis arvensis</i>	Pimpernel				
APIACEAE	<i>Crithmum maritimum</i>	Sea samphire				
	<i>Daucus carota</i>	Wild carrot				
	<i>Ferula melitensis</i>	Maltese ferule	Reg 26			
	<i>Foeniculum vulgare</i>	Fennel				
	<i>Smyrniolus olusatrum</i>	Alexanders				
PITTOSPORACEAE	<i>Pittosporum tobira</i>	Japanese mock orange		Schedule II		
RUBIACEAE	<i>Galium aparine</i>	Cleavers				
	<i>Galium verrucosum</i>	Southern cleavers				
	<i>Rubia peregrina</i>	Wild madder				
APOCYNACEAE	<i>Nerium oleander</i>	Oleander		Schedule I Part A Table 2 (*)		
	<i>Periploca angustifolia</i>	Wolfbane				Rest (MED)
GENTIANACEAE	<i>Centaurium pulchellum</i>	Lesser centaury				
CAPRIFOLIACEAE	<i>Lonicera implexa</i>	Evergreen honeysuckle				
SOLANACEAE	<i>Nicotiana glauca</i>	Shrub tobacco		Schedule II		
CONVOLVULACEAE	<i>Convolvulus althaeoides</i> subsp. <i>althaeoides</i>	Mallow-leaved bindweed				
	<i>Convolvulus althaeoides</i> subsp. <i>tenuissimus</i> (=C. elegantissimus)	Silvery mallow-leaved bindweed				
	<i>Convolvulus arvensis</i>	Field bindweed				
BORAGINACEAE	<i>Borago officinalis</i>	Borage				
	<i>Lithospermum arvense</i> (=Buglossoides arvensis)	Field gromwell				
OLEACEAE	<i>Olea europaea</i>	Olive		Schedule I Part A Table 2 (*)		Rest (MI) (?)

Family	Species Name	Vernacular Name	Legal Status			Malta RDB status
			SL 549.44	SL 549.123	Other	
	<i>Olea oleaster</i>	Wild olive		Schedule I Part A Table 2		Rest (MI) (?)
LAMIACEAE	<i>Ajuga iva</i>	Southern bugle				
	<i>Satureja</i> (=Micromeria) <i>microphylla</i>	Maltese savory	Schedule VIII			Rest (MED)
	<i>Prasium majus</i>	White hedge-nettle				
	<i>Thymbra capitata</i>	Mediterranean thyme	Schedule III		SL 10.10	No specific category
SCROPHULARIACEAE	<i>Myoporum laetum</i>	Ngaio				
OROBANCHACEAE	<i>Bellardia</i> (=Bartsia) <i>trixago</i>	Bellardia				
	<i>Phelipanche nana</i> subsp. <i>melitensis</i>	Maltese dwarf sorrel broomrape	Schedule X			Endemic
	<i>Phelipanche nana</i> subsp. <i>nana</i>	Dwarf sorrel broomrape				
	<i>Orobanche crenata</i>	Bean broomrape				
	<i>Orobanche pubescens</i>	Hairy broomrape				
PLANTAGINACEAE	<i>Antirrhinum siculum</i>	Sicilian snapdragon				
	<i>Antirrhinum tortuosum</i>	Greater snapdragon				
	<i>Misopates orontium</i>	Lesser snapdragon				
	<i>Plantago coronopus</i>	Buck's horn plantain				
	<i>Plantago lagopus</i>	Hare's foot plantain				
ASTERACEAE	<i>Anthemis urvilleana</i>	Maltese sea chamomile	Schedule X			Endemic
	<i>Atractylis gummifera</i>	Ground thistle				
	<i>Aster squamatus</i>	Narrow-leaved aster				
	<i>Carlina involucrata</i>	Clustered carline thistle				Rest (MED)
	<i>Centaurea nicaeensis</i>	Southern star thistle				
	<i>Cichorium spinosum</i>	Spiny chicory				
	<i>Cynara cardunculus</i>	Wild artichoke				
	<i>Evax pygmaea</i>	Pygmy cudweed				
	<i>Filago pyramidata</i>	Broad-leaved cudweed				
	<i>Galactites tomentosa</i>	Boar thistle				
	<i>Glebionis coronaria</i>	Crown daisy				
	<i>Hypochaeris achyrophorus</i>	Mediterranean catsear				
	<i>Jacobaea maritima</i> subsp. <i>sicula</i> (=Senecio <i>bicolor</i>)	Silvery ragwort	Reg 26			
	<i>Limbarda crithmoides</i>	Golden samphire				
	<i>Pallenis spinosa</i>	Spiny ox-eye daisy				
	<i>Phagnalon rupestre</i> subsp. <i>graecum</i>	Eastern phagnalon				Rest (MED)
	<i>Reichardia picroides</i>	Common reichardia				
	<i>Sonchus oleraceus</i>	Smooth sow-thistle				
ARECACEAE	<i>Chamaerops humilis</i>	Dwarf fan palm		Schedule I Part A Table 2		X (?), Rest (MED)
	<i>Phoenix</i> sp.	Date palm species		Schedule I Part A Table 2 (if <i>P. dactylifera</i>)		
POACEAE	<i>Arundo donax</i>	Great reed				
	<i>Avena sterilis</i>	Animated oat				
	<i>Brachypodium distachyon</i> (=Trachynia <i>distachya</i>)	False brome				
	<i>Brachypodium retusum</i>	Mediterranean false-brome				
	<i>Bromus diandrus</i>	Great brome				
	<i>Bromus hordaceus</i>	Soft brome				
	<i>Bromus madritensis</i>	Compact brome				

Family	Species Name	Vernacular Name	Legal Status			Malta RDB status
			SL 549.44	SL 549.123	Other	
	<i>Catapodium rigidum</i>	Fern grass				
	<i>Dactylis hispanica</i>	Cock's foot				
	<i>Desmazeria pignattii</i>	Pignatti's fern grass	Reg 26			Rest (MED)
	<i>Elymus pycnanhtus</i>	Sea couch				E, Rest (MI)
	<i>Hordeum leporinum</i>	Hare's tail barley				
	<i>Hyparrhenia hirta</i>	Hispid beard grass				
	<i>Lagurus ovatus</i>	Hare's tail grass				
	<i>Lolium rigidum</i>	Stiff ryegrass				
	<i>Phalaris minor</i>	Lesser canary grass				
	<i>Piptatherum miliaceum</i>	Smilo grass				
	<i>Rostraria cristata</i>	Mediterranean hair grass				
	<i>Stipa capensis</i>	Mediterranean steppe grass				
	<i>Trisetaria aurea</i>	Golden oat grass				
	<i>Vulpia ciliata</i>	Fringed fescue				
ARACEAE	<i>Arisarum vulgare</i>	Friar's cowl				
SMILACACEAE	<i>Smilax aspera</i>	Mediterranean smilax				
IRIDACEAE	<i>Gladiolus communis</i>	Eastern gladiolus				
	<i>Gynandriris sisyrinchium</i>	Barbary nut iris				
	<i>Iris</i> sp.	Iris	<i>Depends on species</i>			<i>Depends on species</i>
	<i>Romulea</i> sp.	Sand crocus				
XANTHORRHOEACEAE	<i>Asphodelus aestivus</i>	Branched asphodel				
AMARYLLIDACEAE	<i>Allium polyanthum</i> (=A. <i>melitense</i>)	Many flowered garlic	Schedule X			
ASPARAGACEAE	<i>Agave americana</i>	Century plant				
	<i>Agave sislana</i>	Sisal hemp				
	<i>Asparagus aphyllus</i>	Spiny asparagus				
	<i>Urginea pancracion</i>	Seaside squill	Schedule VIII, Schedule X			Rest (MED)
	<i>Muscari comosum</i>	Tassel hyacinth				
	<i>Ornithogalum narbonense</i>	Southern star-of-Bethlehem	Schedule VIII			
	<i>Yucca gloriosa</i>	Spanish dagger				

Annex II: Past aerial/ satellite imagery of the scheme site



Figure 47: Aerial photograph of the scheme site dated 1967 provided for reference purposes to show the presence of trees of over 50 years of age (Source: Planning Authority)



Figure 48: Satellite image of the scheme site dated 2012 provided for reference purposes to show the presence of trees of over 10 years of age (Source: PA Map Server, accessed in October 2022)

APPENDIX 3

TA' HAMMUD VEGETATION REPORT II (AGL DESIGN LANDSCAPE ARCHITECTS, 2018)'

Ta' Hammud Vegetation report II

As part of the proposal for the construction of a Waste-to-Energy Facility



AGL Design

Landscape Architects

For Wasteserv Malta Ltd.

January 2018

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Ta' Hammud

Report on the state of the vegetation at Ta' Hammud

This report is a study on the existing vegetation located within the area known as Ta' Hammud and can be taken to be an extension of the previous report with the same name compiled in September 2012. However this document can be read independently from the first report. The site is proposed for the construction of the waste-to-energy facility for Wasteserv Malta Ltd. The scope of this report is to record the species of trees and perennial shrubs found on site, quantify the number of plants per species, give a general outlook on the health of the trees and shrubs, discuss the legal status and indicate which species are suited for uprooting considering the physical characteristics of the area and the biological characteristics of the species in question. It will also discuss the feasibility of utilising an area for afforestation purposes to make up for the trees to be uprooted.



Figure 1 Site plan

The site (shown in green above) is located to the east of the Magħtab Landfill. It is composed of a number of shallow terraces falling towards the east and divided by low rubble walls some of which are breached or in a poor state of repair. It has an area of circa 25,650m²(2.6hectares).

The parcels are relatively level although in the upper areas the soil has been shifted and crushed soft stone deposited. This might indicate previous stockpiling of material.

Context

The immediate context around the site varies in character. To the south-south-west, and the west are landfill sites which are either being utilised or have been rehabilitated, having the slopes stabilised and/or re-contoured. To the north is the recently constructed anaerobic digestion plant. To the east the landscape is composed of agricultural land subdivided into small parcels by rubble walls. The resulting terraces vary in size and have a gradual fall towards the east. Within the area, trees and shrub density varies. Trees are generally found growing along the perimeter of the fields along the rubble walls or in areas not suitable for agriculture (shallow soils and rocky outcrops). An access road runs along the south and west of the land in question providing access to both the site and the landfill. This road is generally at a higher level from the site in question. A track provides access from the road to the site in question.



Figure 2 View of the site from the west



Figure 3 A broader view of the site and context (above)



Figure 4 The site (marked in green)

Climatic conditions

Exposure to the north winds is relatively buffeted by the landfill site and now by the anaerobic digestion plant. However, the site is exposed to winds blowing from the north east through to the south. It is also sheltered by landmass from the south west through to the west. Exposure to wind has given the trees a distinct rounded canopy which is fairly low.

The prevailing wind in Malta is the northwest.

The area is exposed to solar radiation, especially reflected light from the landfill and the topography does not overshadow the site except in late evenings.

Soil

In the past and prior to the establishment of the landfill, the site in question constituted the apex of a hillock, thus the soil here would have originally been shallow. Two types of soils have been observed. In areas with rocky outcrops the soil is very shallow making it inappropriate for cultivation. The soils found in these areas are probably the original soil type (Leptosol¹).

In cultivated areas the soils are deeper. These soils are not native to the site and would have been deposited here to build up the required terraces for agricultural purposes. From observations made on site and speaking to a local farmer during the first report presented, it was deducted that the depth of soil varies from around 300mm to around 500mm.

Vegetation

This document has been drafted in January 2018 which is the middle of the wet season. In areas where the soil is deep and the terrace wide, the land is being cultivated (in this case cereal). In areas with shallow soils a garigue and maquis type vegetation has been observed. Vegetation typical of disturbed and abandoned agricultural land is also present in isolated areas.

The dominant vegetation found growing on site is mainly composed of perennial species. The area in question is densely planted mainly with carob although isolated olive trees and eucalypts have been observed. In areas of shallow soil asphodel (*Asphodelus* sp) was observed, *Pistaccia lentiscus* is also observed as being abundant and interspersed amongst the carob and olive trees. The following table illustrates the species observed. Most of these species are native and typical of the local countryside and synonymous with agricultural land. Few examples of non-native (exotic) species have been observed, these have been introduced on site voluntarily or through natural processes.

Ref.	Species name		
	Maltese common name	English common name	Scientific name
	Trees		
1	Tabakk tas-Swar	Shrub tobacco	<i>Nicotiana glauca</i>
3	Bajtar tax-Xewk	Prickly pear	<i>Opuntia ficus-indica</i>
4	Sigra tal-Harrub	Carob	<i>Ceratonia siliqua</i>
5	Sigra tal-Lewż	Almond	<i>Prunus dulcis</i>
6	Sigra taż-Żebbuġ	Olive	<i>Olea europaea</i>
7	Ewkalipus	Gum tree	<i>Eucalyptus</i> sp.

¹ SOER05 Background report soil: www.mepa.org.mt/file.aspx?f=1821

8	Akaċja	Wattle	<i>Acacia sp.</i>
Conifers			
9	Ċipress	Cypress	<i>Cupressus sempervirens</i>
10	Siġra taż-Żnuber	Aleppo pine	<i>Pinus halepensis</i>
Shrubs			
11	Qarn il-Mogħża	Honeysuckle sp	<i>Lonicera sp.</i>
12	Skornabekk	Terebinth	<i>Pistaccia terebintus</i>
14	Deru	Lentisk	<i>Pistaccia lentiscus</i>
Reeds			
16	Qasba Kbira	Giant reed	<i>Arundo donax</i>

Table 1 Predominant species observed

Ref.	Species name		
	Maltese common name	Scientific name	Origin
Trees			
1	Tabakk tas-Swar	<i>Nicotiana glauca</i>	South America
2	Siġra tat-Tin	<i>Ficus carica</i>	Native
3	Bajtar tax-Xewk	<i>Opuntia ficus-indica</i>	Americas
4	Siġra tal-Ħarrub	<i>Ceratonia siliqua</i>	Native
5	Siġra tal-Lewż	<i>Prunus dulcis</i>	Native
6	Siġra taż-Żebbuġ	<i>Olea europaea</i>	Native
7	Ewkalipus	<i>Eucalyptus sp.</i>	Australia
8	Akaċja	<i>Acacia sp.</i>	Africa
Conifers			
9	Ċipress	<i>Cupressus sempervirens</i>	Native
10	Siġra taż-Żnuber	<i>Pinus halepensis</i>	Native
Shrubs			
11	Qarn il-Mogħża	<i>Lonicera sp</i>	Native
12	Skornabekk	<i>Pistaccia terebintus</i>	Native
14	Deru	<i>Pistaccia lentiscus</i>	Native
Reeds			
16	Qasba Kbira	<i>Arundo donax</i>	East & South Asia

Table 2 Origin of plants observed

The distribution of most of these species on site is consistent. Throughout the area in question, the occurrence of these trees and shrubs is abundant. Most of these species would have been cultivated/planted for fodder, crop or shelter. Non crop species have been planted either to mask buildings or to attract birds for hunting/trapping purposes or have regenerated spontaneously. Hides and remnants of a trapping site have been observed.

The location of the trees, as stated above, is generally along the boundary wall of the fields. This was done to allow ample space for the cultivation of the fields and act as shelter against the elements thus protecting the crop.

Condition of trees and shrubs

It can be said that in general the trees and perennial shrubs are in good health. There were no signs of disease or poor growth. A small number of trees (circa 3) are dead and most of these are within

the boundary of the anaerobic digestion plant. These trees see to have been transplanted to the site following the construction of the plant.



Figure 5 The boundary of the anaerobic digestion plant showing the dead trees



Figure 6 General view of part of the site



Figure 7 General view showing cultivated agricultural land with olive and carob trees on either side



Figure 8 In areas with shallow soil Asphodel dominates surrounded by carob trees and other perennial shrubs



Figure 9 General view of site showing the density of trees and shrubs

Of particular note are the carob trees found growing on site which are of the *Għasli*² variety. This type of carob tree is considered as one of the best varieties in terms of the production of carob pods with high sugar content.

Carob is a dioecious plant with unisexual flowers. The male and female flowers are found to grow on separate trees. Thus, the trees that are not fruit bearing would be the males, which are normally surrounded by female trees.

The plant community is mainly composed of native species, non-native trees are few in number. No saplings and/or new trees have been found growing within the site in question however the cultivation of the agricultural land could have partly influenced this.

² Personal contact with Mr C Grima, officer Ghammieri Government Farm

Legal Protection

The Legal Notices and Government Notices consulted include:

LN 200/2011 Trees and Woodland Protection Regulation, 2011 (S.L.549.44)

GN 473/2011 Trees and Woodland Protection Regulation, 2011

GN 269/1933 List of Antiquarian Tree Order

LN 311/2006 Flora, Fauna and Natural Habitats Protection Regulations, 2006

L.N. 379 of 2016. Environment Protection Act. (CAP. 549) (S.L.549.64)

GN 328/1949 Conifer Protection Regulation,

G.N. 316 of 2017 (Trees and Woodlands Protection Regulations) Declaration of Tree Protection Areas

G.N. 316 of 2017 does not cover the land in question.

Ref.	Species name		
	Maltese common name	Scientific name	LN/GN
	Trees		
1	Tabakk tas-Swar	<i>Nicotiana glauca</i>	-
3	Bajtar tax-Xewk	<i>Opuntia ficus-indica</i>	-
4	Siġra tal-Harrub	<i>Ceratonia siliqua</i>	LN200/2011 Schedule II
6	Siġra taż-Żebbuġ	<i>Olea europaea</i>	LN200/2011 Schedule II
7	Ewkalipus	<i>Eucalyptus sp.*</i>	LN200/2011 Schedule III
8	Akaċja	<i>Acacia sp.</i>	LN200/2011 Schedule III
	Conifers		
9	Ċipress	<i>Cupressus sempervirens</i>	LN200/2011 Schedule I, GN328/1949
10	Siġra taż-Żnuber	<i>Pinus halepensis</i>	LN200/2011 Schedule II, GN328/1949
	Shrubs		
11	Qarn il-Mogħża	<i>Loncera sp.</i>	-
12	Skornabekk	<i>Pistaccia terebintus</i>	LN200/2011 Schedule I, LN311/2006
14	Deru	<i>Pistaccia lentiscus</i>	LN200/2011 Schedule II
	Reeds		
16	Qasba Kbira	<i>Arundo donax</i>	-

Table 3: Legal status of trees and shrubs

Plants listed in 'LN200/2011 Schedule I' are strictly protected. Plants listed in 'LN200/2011 Schedule II' are protected in selected areas:

- (a) "All trees of more than 50 year of age are protected within protected area, in ODZ and UCA. This protection shall not apply to trees listed in Schedule III and to those trees which, in the Competent Authority's opinion, are causing any damage or adverse effect to the environment or to structures or features of natural or cultural heritage value.

- (b) Trees belonging to the species listed in the following table are protected within protected areas and in ODZ.” (LN 200/2011 Trees and Woodland Protection Regulation,2011)

SCIENTIFIC NAME	MALTESE NAME	ENGLISH NAME
Ceratonis siliqua	Siġra tal-Ħarrub	Carob
Cercis siliquastrum	Siġra ta' Ġuda; Ħarrub ta' Ġuda	Judas Tree; Mediterranean Redbud
Chamaerops humilis	Ġummar	Dwarf Fan Palm
Crataegus azarolus	Ġħanzalor	Azarole; Crete Hawthorn
Crataegus monogyna	Žagħrun	Whithorn; Common Hawthorn
Crataegus x rusinonensis	Ġħanzalor Selvaġġ	Hybrid Hawthorn
Cydonia oblonga	Sfargel	Quince
Juniperus phoenicea	Ġnibru; Ġniepru	Phoenian Juniper
Laurus nobilis	Rand	Bay Laurel, Sweet Bay
Morus alba	Ċawsli	White Mulberry
Morus nigra	Tut	Black Mulberry
Myrtus communis	Riħan	Myrtle
Olea europaea s.l.	Žebbuġ, Žejtun	Olive
Olea oleaster	Žebbuġ Selvaġġ	Wild Olive
Phoenix dactilifera	Palma tat-Tamar	Date Palm
Pinus brutia	Žnuber tal-Lvant	Brutia Pine; Calabrian Pine
Pinus halepensis	Žnuber, Siġra tal-Prinjol, Siġra ta' l-Arżnu	Aleppo Pine; Jerusalem Pine
Pinus pinea	Žnuber ta' l-Ikel	Stone Pine; Umbrella Pine
Pistacia lentiscus	Deru; Delu	Lentisk; Mastic Tree
Populus alba	Luq	White Poplar
Quercus ilex	Ballut; Siġra tal-Ġandar	Holm Oak; Evergreen Oak
Rhamnus alaternus	Alaternu	Mediterranean Buckthorn
Sambucus nigra	Sambuka; Sebuq Kbir	Common Elder
Spartum junceum	Ġenista Safra	Spanish Broom
Tamarix spp.	Bruk	Tamarisks
Viburnum tinus	Meruna; Viburnum	Laurustinus
Ziziphus ziziphus [=Ziziphus jujba]	Žinžel	Jujube

*Rows marked yellow relate to species found on site

Any works to be carried out on species (of plants) protected through S.L.549.44 and S.L.549.64 shall require permitting in advance by ERA in line with the provisions of the said Regulations

This section has been adapted from the previous report

Transplanting of trees

It is understood that the proposed development will have a footprint which will occupy all or most of the site.

Transplanting the existing trees and shrubs affected by the development could be an option to save those specimens which are worth saving, both for the merit of their intrinsic value as well as to safeguard the variety. However transplanting is risky. For a better chance of success, transplanting should only take place in the right time of year and under particular physical/climatic conditions. Transplanting established trees and shrubs should only be carried out if absolutely necessary as even with the best of care failures are unavoidable. Transplanting creates stress on the trees especially those well established and advanced preparation is required to maximise the chances of success.

The species worth transplanting are the Carob and Olive trees. The pines will not transplant. With regards to the lentisk, transplanting might be feasible.

Factors which dictate whether trees could be transplanted include:

The depth of soil/subsoil: The depth of soil is the ultimate crucial factor in dictating whether the tree can be transplanted or not. With soil depths inferior to 600-750mm it would not be possible to transplant the tree as the bulk of the root system will have penetrated the underlying rock bed. As a consequence not enough roots will be present to sustain the species. Only after having analyzed the physical characteristics of the soil would it be possible to determine the feasibility of transplanting each tree.

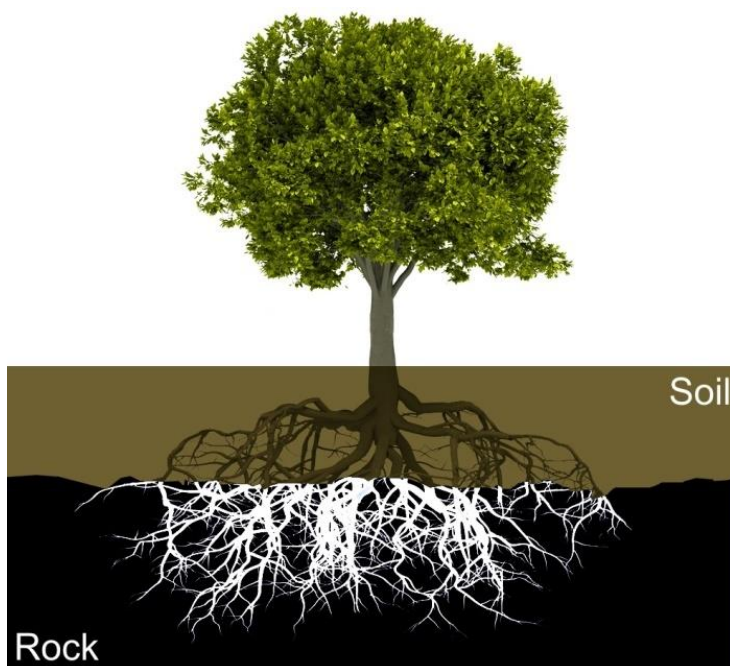


Figure 10 In shallow soils, the bulk of the root system penetrates the rock bed making it impossible for the tree to be transplanted.

Root to shoot ratio: Prior to digging up the trees, the shoots of the same trees have to be pruned in such a way as to balance the eventual volume of the root system with the volume of the canopy.

Timing: Different types of trees need to be transplanted at different times of the year. Carob and olive are transplanted between February and March/April as the soil begins to warm up and trees start to bud (depending on local climatic conditions). This allows the roots to re-establish themselves quicker with lesser chance for the plant to become diseased.

Phasing of works: For a better chance of success, transplanting is carried out over a two year period, whereby in the first year fibrous roots are encouraged to develop closer to the tree by root-pruning. In the second year the tree could be lifted.

Transplanting work is a specialised skill and would be best left to specialists in the field. The Agriculture Department could be contacted for their expertise.

For the plants to have a better chance of establishing themselves, replanting should be carried out immediately after uprooting. Failure to do so will jeopardise the success of the operation.

Replanting of transplanted trees

Assuming that the trees can be transplanted, Wasteserv has identified an area where the trees can be relocated. The overall area of this site is of c. 2,537m² with a perimeter of 300m. The site is occupied by a number of mature trees including Carob (*Ceratonia siliqua*), Olive (*Olea europaea*), Wattle (*Acacia* sp), and Eucalypts (*Eucalyptus* sp) and other perennial vegetation such as the giant reed (*Arundo donax*). Yucca (*Yucca* sp) and prickly pear (*Opuntia ficus-indica*) have also been identified on site together with another unidentified exotic succulents. The field where replanting is being proposed by Wasteserv is located east of the project site (refer to Figure 11). The area in question constitutes areas of shallow soils and those which are relatively deeper. An elevated area with deep soil constitute a trapping site. The area is already densely planted with trees and could not accommodate the quantity of trees which could be transplanted. An alternative site/s is therefore required to accommodate the remaining transplanted vegetation.

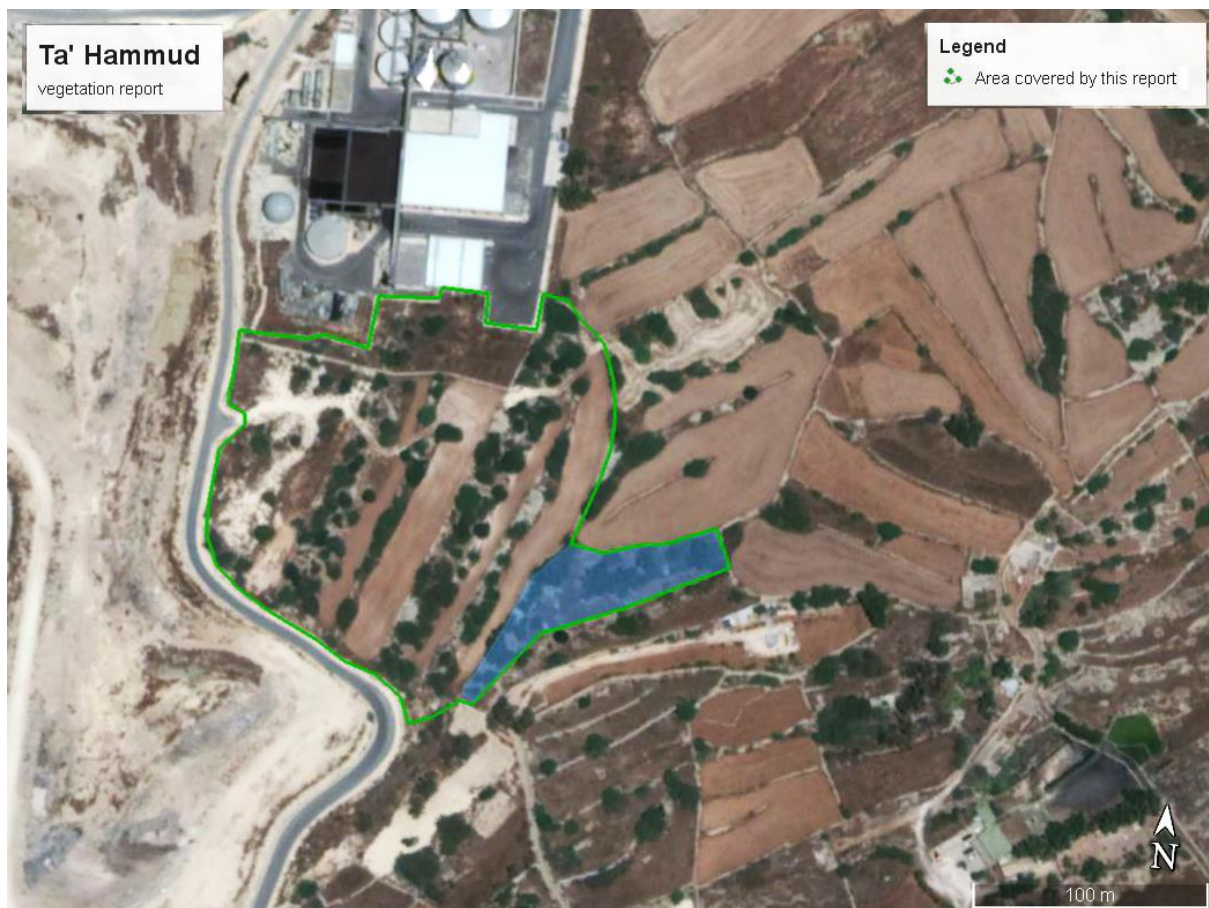


Figure 11 Site plan indicating the area for replanting as proposed by Wasteserv (shaded in blue)



Figure 12 Area indicating location for transplanting trees

The advantage of relocating the uprooted trees within the proximity of the site is that the trees, once lifted, will be placed into their new location within a short period of time. This increases the success rate of the operation.

The area allocated for transplanting as indicated in the site plan below (figure 10) is owned by Wasteserv Malta.



Figure 13 General view of the area proposed for transplanting trees in



Figure 14 View of the trapping site within the area proposed for transplanting



Figure 15 Relatively large trees growing within the area designated for afforestation

Any trees planted on site should have an informal layout so as to give the area a natural appearance. Trees should be spaced in such a way as to respect the context and allow enough sunlight to reach the soil surface. In this way a ground and shrub layer will eventually establish. Any exotic trees will first need to be uprooted. This might however create an issue of allelopathy where remains of the uprooted trees would chemically inhibit the development of the transplanted trees.

Protecting trees from construction works on site

Generally speaking trees are bound to suffer damage during the construction phase. Trees are subject to damage by heavy machinery and the deposition of material for stockpiling etc. Damage to trees could be to both the aerial and subterranean parts of the tree. As such the trees not effected by the development should be cordoned off preferably utilising a semi rigid structure such as a picket fence. The cordoned area should extend around 5m from the trunks of the peripheral trees. This would guarantee the protection of the root system.

Annexe 1:

Number of trees and shrubs recorded on site:

Common name	Scientific name	Total nr. of trees
Trees		
Carob	<i>Ceratonia siliqua</i> *	186
Olive	<i>Olea europaea</i> *	24
Cypress	<i>Cupressus sempervirens</i>	4
Eucalyptus	<i>Eucalyptus sp.</i>	19
Aleppo Pine	<i>Pinus halepensis</i>	9
Wattle	<i>Acacia sp.</i>	3
Terebinth	<i>Pistaccia terebintus</i>	2
Shrubs		
Lentisk	<i>Pistaccia lentiscus</i> *	49
Shrub tobacco	<i>Nicotiana glauca</i>	1
Honeysuckle	<i>Lonicera sp</i>	17
Total		314

* Plants withstanding transplanting

Comparison between the plant lists compiled in 2012 and in 2017

The land area covered by the two reports does not match exactly as can be seen in the image hereunder. For this exercise the plants within the common area have been compared with comments to justify any difference in numbers.



Common name	Scientific name	2012 report	2017 report	Comments
Carob tree	<i>Ceratonia siliqua</i>	90	77	The difference relates to specimens located between the south of the anaerobic digestion plant and the boundary wall which have been removed during the construction of the same plant. Tree growth habit.
Olive tree	<i>Olea europae</i>	12	12	
Cypress	<i>Cupressus sempervirens</i>	8	4	Specimens located between the south of the anaerobic digestion plant and the boundary wall have been removed during the construction of the same plant.
Eucalyptus sp.	<i>Eucalyptus sp.</i>	8	7	One specimen found dead
Aleppo Pine	<i>Pinus halepensis</i>	3	2	Specimen located between the south of the anaerobic digestion plant and the boundary wall has been removed during the construction of the same plant.
Lentisk	<i>Pistaccia lentiscus</i>	9	15	A few young plants. Individual specimens growing into each other.
Terebinth	<i>Pistaccia terebintus</i>	0	1	One sapling observed.
Wattle sp.	<i>Acacia sp.</i>	3	0	These must have been uprooted. One specimen was located within the anaerobic digestion plant precincts the other two on the upper terrace (west of site).
Shrub tobacco	<i>Nicotiana glauca</i>	0	1	Young specimen
Honeysuckle	<i>Lonicera sp</i>	0	9	Have not been recorded in the previous report
Almond	<i>Prunus dulcis</i>	0	0	

-  *Arundo donax*
-  *Nicotiana glauca*
-  *Opuntia ficus-indica*
-  *Ceratonia siliqua*
-  *Olea europaea*
-  *Eucalyptus sp.*
-  *Acacia sp.*
-  *Pinus halepensis*
-  *Cupressus sempervirens*
-  *Loncera sp.*
-  *Pistaccia terebintus*
-  *Pistaccia lentiscus*
-  *Yucca sp.*



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Notes

Project title		Drawing title	
Ta' Hammud vegetation study		Existing planting plan	
Drawing no	Revision	Scale	1:250
Drawn by AG	Date	January 2018	

Annexe 2

General images of site



Figure 16



Figure 17



Figure 18



Figure 19



Figure 20



Figure 21



Figure 22



Figure 23



Figure 24



Figure 25



Figure 26



Figure 27



Figure 28 Photographs of the site