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Water Bodies
In Relation To An Environmental Impact Assessment
For The
Proposed ex-Jerma Hotel Redevelopment at Marsascalea

Technical Report

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FIRST VERSION

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1.0 Introduction

1.1 ERA Requirement

This report represents the study on Water Bodies, to fulfil the Terms of Reference issued by ERA, in relation to the Environmental Impact Assessment (EIA) for the proposed ex-Jerma Palace Hotel Redevelopment, at Marsascala (Figure 1).



Figure 1: Location of the site (ex-Jerma Hotel in Marsascala)

1.2 The Proposed Development

The Scheme site covers an area of around 44,812 m² and includes the five-storey shell of the former Jerma Palace Hotel, areas dedicated to landscaping and concrete terraces, a public road and two open spaces on the sides of It-Torri ta' San Tumas ditch (Figure 2).

The proposed development hereby known as the 'Scheme', will include two hotels. One of the hotels will be a five-star hotel with 134 rooms, whilst the other hotel will consist of a six-room boutique hotel.

Level 0 of the five-star hotel will include the hotel lobby, the hotel's administration, an ancillary bar and an ancillary restaurant. The Scheme will also include 259 serviced

apartments. The residential units will span from Level 1 to Level 7. It will have a total of 155 residential units and will also have six food & beverage outlets and seven retail outlets, which will be located at Level 0. There will also be a chapel located at this level. It will include the rehabilitation of the rocky coast through the removal of any concrete accretions.

The developable area is 17,570m², although the actual site footprint is much larger given that it includes the protected foreshore and public streets. The site specifically includes the five-storey dilapidated former Jerma Palace Hotel, areas dedicated to landscaping and concrete terraces, a public road and two open spaces on the sides of It-Torri ta' San Tumas ditch.



Figure 2:Ground floor plan of the proposed development

An Environmental Impact Assessment (EIA) Report is to be prepared as required by the Schedule I, Category II, Sections 1.0.2.1 and 13.0.2.1 of the Environmental Impact Assessment Regulations (S.L. 549.46).

1.3 This Report

This report represents the geo-environmental baseline study - Water Bodies as part of the Environmental Impact Assessment.

2.0 Terms of reference

The terms of reference issued by ERA were the following:

3.0 A Description of the Site and its Surroundings (i.e. Environmental Baseline)

3.4 Water Bodies (including Terrestrial, Underground and Marine water bodies, as relevant)

The study should identify the hydrological, hydromorphological and physicochemical characteristics of the water bodies, water resources and aquatic environments in the area under investigation, including (as relevant):

- 1. The hydrology of the site and its surroundings, including all relevant features and dynamics, such as: aquifers; springs; surface waters; wetlands; watercourses; valley catchments; etc, including a description of any potential linkages between different water bodies (i.e. groundwater linkages to surface waters, coastal water linkages to inland surface waters), also cross-referring to hydrogeological factors (see Section 3.3 above) as relevant*
- 2. The type, size and physical characteristics of any aquifers and surface water bodies within the area of influence of the site, including: the nature of the water body (e.g. aquifer, flowing surface water, marine, etc.); whether the water body is ephemeral or permanent; and other characteristics such as depth/bathymetry; type of bottom and topography; prevailing currents and wave exposure; as well as physical and chemical characteristics of the water column which are deemed relevant for determination of hydrological characteristics such as nutrient status, temperature, salinity, dissolved oxygen and pH;*
- 3. Natural and anthropogenic dynamics including groundwater recharge patterns; pumping and abstraction patterns; on-site and off-site drainage patterns; pipe/culvert connectivity between water bodies, run-off patterns; and flood risks;*
- 4. Water quality (salinity, pollutant load, sediment load and characteristics, microbiological load, BOD & COD, transparency, temperature, etc.), with particular reference to any established quality parameters (e.g. legally established bathing water quality parameters; effluent discharge parameters; objectives and requirements of the Water Framework Directive, Marine Strategy Framework Directive and related instruments); and*
- 5. The study should provide a sufficiently detailed baseline to enable assessment of the effects of the proposal on the quality of the water body (terrestrial, underground and marine), the extent of area affected by hydrographical changes (terrestrial and marine), the nature of the changes (whether temporary or permanent) and effects of such changes on the ecological features and functions as described in line with Section 3.5. Such assessment should be undertaken in line with indicators used/established by relevant EU policy.*

4.0 ASSESSMENT OF ENVIRONMENTAL IMPACTS AND ENVIRONMENTAL RISKS

All likely significant effects and risks posed by the proposed project on the environment during all relevant phases (including construction/excavation/demolition, operation and decommissioning) should be assessed in detail, taking into account the information emerging from Sections 1, 2 and 3 above. Apart from considering the project on its own merits (i.e. if taken in isolation), the assessment should also take into account the wider surrounding context and should consider the limitations and effects that the surrounding environmental constraints, features and dynamics may exert on the proposed development, thereby identifying any incompatibilities, conflicts, interferences or other relevant implications that may arise if the project is implemented.

In this regard, the assessment should address the following aspects, as applicable for any category of effects or for the overall evaluation environmental impact, addressing the worst-case scenario wherever relevant:

- 1. An exhaustive identification and description of the envisaged impacts;*
- 2. The magnitude, severity and significance of the impacts;*
- 3. The geological extent/range and physical distribution of the impacts, in relation to: site coverage; the features located in the site surroundings; whether the impacts are short-, medium- or long-range; and any transboundary impacts (i.e. impacts affecting other countries);*
- 4. The timing and duration of the impacts (whether the impact is temporary or permanent; short-, medium- or long-term; and reasonable quantification of timeframes);*
- 5. Whether the impacts are reversible or irreversible (including the degree or reversibility in practice and a clear identification of any conditions, assumptions and pre-requisites for reversibility);*
- 6. A comprehensive coverage of direct, indirect, secondary and cumulative impacts, including:*
 - Interactions (e.g. summative, synergistic, antagonistic, and vicious-cycle effects) between impacts;*
 - Interactions or interference with natural or anthropogenic processes and dynamics;*
 - Cumulation of the project and its effects withj other past, present or reasonably foreseeable developments, activities and land uses and with other relevant baseline situations; and*
 - Wider impacts and environmental implications arising from consequent demands, implications and commitments associated with the project (including: displacement of existing uses; new or increased pressures on the environment in the surroundings of the project, including pressures which may be exacerbated by the proposal but of which effects may go beyond the area of influence; and impacts of any additional interventions likely to be triggered or necessitated by situations created, included or exacerbated by the project);*
- 7. Whether the impacts are adverse, neutral or beneficial;*

8. *The sensitivity and resilience of resources, environmental features and receptors vis-à-vis the impacts;*
9. *Implications and conflicts vis-à-vis environmentally-relevant plans, policies and regulations;*
10. *The probability of the impacts occurring; and*
11. *The techniques, methods, calculations and assumptions used in the analysis and predictions, and the confidence level/limits and uncertainties vis-à-vis impact prediction.*

The impacts that need to be addressed are detailed further in the sub-sections below.

4.1 Effects on the Environmental Aspects Identified in Section 3

The assessment should thoroughly identify and evaluate the impacts and implications of the project on all the relevant environmental aspects identified in Section 3 above, also taking into account the various considerations outlined in the respective sections.

With regards to Section 3.4 and 3.5 above, the ecological status of the area in question is to be evaluated, taking into consideration the definition of status by relevant EU Policy, and assessing the extent to which the project will cause deterioration in status or compromise the achievement of good status in line with Article 4(7) of the EU Water Framework Directive.

5.0 Required Measures, Identification of Residual Impacts and Monitoring Programme

5.1 Mitigation Measures

*A clear identification and explanation of the measures envisaged to prevent, eliminate, reduce or offset (as relevant) the identified significant adverse effects of the project during all relevant phases including construction, operation and decommissioning [see **Section 1.2.3** above].*

*As a general rule, mitigation measures for construction-phase impacts should be packaged as a holistic Construction Management Plan (CMP). Whilst the detailed workings of the CMP may need to be devised at a later stage (e.g. after the final design of the project has been approved and/or after a contractor has been appointed), the key parameters that the CMP must adhere to for proper mitigation need to be identified in the EIA. Broadly similar considerations also apply vis-à-vis operational-phase impacts [which may need to be mitigated through an operational permit] and decommissioning-phase impacts [see **Section 5.4** below], where relevant.*

Mitigation measures for accident/risk scenarios should be packaged as a holistic plan that includes the integration of failsafe systems into the project design as well as well-defined contingency measures.

The recommended measures should be feasible, realistically implementable to the required standards and in a timely manner, effective and reliable, and reasonably exhaustive. They should not be dependent on factors that are beyond the developer's and ERA's control or which would be difficult to monitor, implement or enforce. The actual scope for, and feasibility of, effective prevention or mitigation should also be clearly indicated, also identifying all potentially important pre-requisites, conditionalities and side-effects.

5.2 Residual Impacts

Any residual impacts [i.e. impacts that cannot be effectively mitigated, or can only be partly mitigated, or which are expected to remain or recur again following exhaustive implementation of mitigation measures] should also be clearly identified.

5.3 Additional Measures

Compensatory measures (i.e. measures intended to offset, in whole or in part, the residual impacts) should also be identified, as reasonably relevant. Such measures should be not considered as an acceptable substitute to impact avoidance or mitigation.

If the assessment also identifies beneficial impacts on the environment, measures to maximise the environmental benefit should also be identified.

In both instances, the same practical considerations as indicated vis-à-vis mitigation measures should also apply.

5.5 Monitoring Programme

A realistic and enforceable programme for effective monitoring of those works envisaged to have an adverse or uncertain impact. The monitoring programme should include:

- 1. Details regarding type and frequency of monitoring and reporting, including spot checks;*
- 2. The parameters that will be monitored, their units of measurement, the monitoring indicators to be used; and standard analytical methods in line with relevant EU policy;*
- 3. An effective indication of the required action to address any exceedances, risks, mitigation failures or non-compliances for each monitoring parameter;*
- 4. An evaluation of forecasts, predictions and measures identified in the EIA; and*
- 5. An indication of the nature and extent of any additional investigations (including EIAs or ad hoc detailed investigations, if relevant) that may be required in the event of any contingencies, unanticipated impacts, or impacts of larger magnitude or extent than predicted.*

The programme should address all relevant stages, as follows:

- (a) Where relevant, monitoring of preliminary on-site investigations that may entail significant disturbance or damage to site features (e.g. archaeological excavations,*

geological sampling, or any works that require prior site clearance or any significant destructive sampling);

[Note: Official written consent from the competent authorities (e.g. Superintendence of Cultural Heritage) may also be required for such interventions.]

(b) Monitoring of the construction phase, including the situation before initiation of works (including site clearance), during appropriate stages of progress, and after completion of works;

(c) Monitoring of the operational phase, except where otherwise directed by ERA (e.g. where monitoring would be more appropriately integrated into an operating permit); and

(d) Where relevant, monitoring of the decommissioning phase, including the situation before initiation of works, during appropriate stages of progress, and after completion of works.

3.0 A Description of the Site and its Surroundings

The Scheme site is located at the inner segment of a headland known as Il-Gżira between Il-Bajja ta' Marsaskala and Il-Bajja ta' San Tumas (Figure 3). A promenade runs along the northern coastline of the Area of Study. The coastal foreshore is characterised by rock-hewn salt pans forming part of a shore platform running from Il-Ponta Tal-Mignuna northward for about 250m and interrupted by a fault.

The existing building is in a derelict state in stark contrast with the San Tumas Tower across the road –in Triq Ir-Ridott- at the back of the hotel.

The area fronting the promenade and the coast is characterised by low-density residences, whilst the inland part of the Area of Study is characterised by a mix of apartments, maisonettes and terraced houses.



Figure 3: Large scale map showing the extent of the ex-Jerma Palace Hotel. Saltpans located on the shore platform are shown in blue colour

Environmental and Cultural Designations

The closest terrestrial environmental designation to the Scheme site is “Il-Bajja ta’ San Tumas to Il-Ponta tal-Miġnuna” Area of Ecological Interest (GN 400 of 1996). “Iż-Żona fil-Baħar tal-Lvant” Special Protection Area (MT0000108) is located less than 350 m to the east of Ras il-Gżira.

It-Torri ta’ San Tumas is found immediately to the west of the Scheme site. This coastal tower was built by Grand Master Alof de Wignacourt and dates back to 1614.

The foreshore surrounding the Scheme is characterised by extensive salt pans that are an important vernacular coastal feature. It has also been reported that Roman baths have been identified close to the proposed development.

4.0 Area of Influence

Marsascala is roughly a conical hill having a diffuse runoff discharge at the coastline largely controlled by the road network. The site is the Ex-Jerma Palace Hotel in Marsascala. It measures about 70m long by about 50m wide and lies close to the coastline at about 0.8m above sea level. A sea wall forms an enclosure protecting boats and adjacent coastline from southeast and east stormy seas.

The proposed scheme lies on the coastline where no freshwater bodies are developed. The site lies on fractured Lower Globigerina Limestone which being at the coastline is saturated with seawater. The water bodies present are represented by the coastal waters and the groundwater underlying the Scheme site. Consequently, the impacts arising from the proposed project depend largely on emissions into the sea or the subsurface arising during construction and operation of the scheme. The area of influence therefore shall be represented by the site and the adjoining shore platform as shown in Figure 4.



Figure 4: Area of influence for water bodies study (Green Line).

5.0 Study Methodology

5.1 Literature Review

A literature search in relation to previous geo-environment survey work relevant to the AoI was undertaken. This, together with the Consultant's own knowledge of the area, provided a context for the baseline surveys.

5.2 Field survey

Desktop study accompanied by a field survey established the existing water bodies baseline conditions. This involved the identification and description of the water bodies within the Area of Influence; as well as the physical features with which the water interacts (Hydromorphology) such as the shore platform and the seabed within the area of influence.

5.3 Reporting

A report shall be submitted in relation to the water bodies present within the area of influence.

Impact Assessment

5.4.1 Impact Significance

This section includes, 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 geo-environmental resources to impacts;
- » Probability of impact occurring (certain, likely, uncertain, unlikely, remote); and
- » Scope for mitigation / enhancement (very good, good, none).

Based on the above, a summary of the significance of the impact is judged in terms of whether the impact is considered to be:

- » **Not significant:** Little or no change to the quality of the water bodies.
- » **Minor significance:** Changes to the water bodies which may be offset by mitigation measures.
- » **Moderate significance:** Changes to the water bodies may be partially offset by mitigation measures.
- » **Major significance:** Changes to the quality water bodies which may not be offset by mitigation measures (if negative) or may be enhanced by mitigation measures (if positive).

The significance of likely impacts on the geo-environment are listed in Table 1 and Table 2.

Table 1: 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 groundwater 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)

Adverse/Beneficial -- Hydrology/hydrogeology	
Assessment	Criterion
Highly beneficial	Developments that will protect or enhance watercourses and catchment basins
Beneficial	Developments that will enhance infiltration
Neutral	Developments that do not involve any changes in the hydrological cycle

Table 2: Significance of likely impacts on Water Quality

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
Low	contamination of groundwater by minor spillages with scope for easy mitigation
Insignificant	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

5.4.2 Impact Mitigation and Monitoring

The scope for mitigation was identified, and the need for monitoring of the water quality and hydromorphology aspects within the Area of Influence have been addressed in the Environmental Impact Assessment (EIA).

6.0 Hydrology, Hydrogeology and Hydromorphology, Including Water Bodies

Important hydrological and hydrogeological features relevant to the present reconstruction project are:

- The catchment upstream of the sea
- Runoff characteristics
- Water bodies
 - The sea level water body
 - The coastal waters

6.1 The Catchment Upstream of the Site

The hydrological catchment upstream of the site is shown in Figure 5. However, considering that the area is fully developed, the path taken by runoff is controlled by the road network.

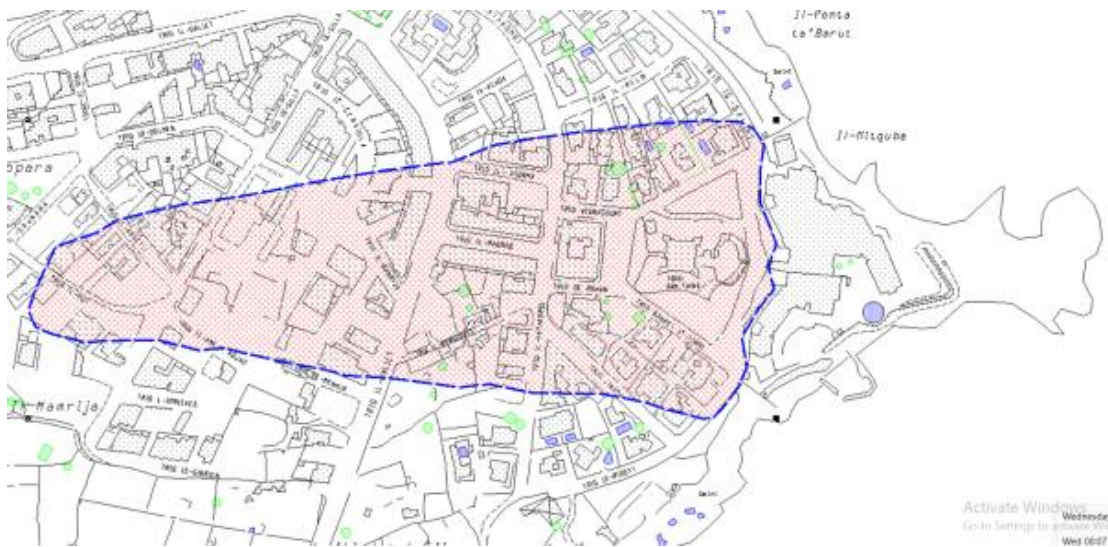


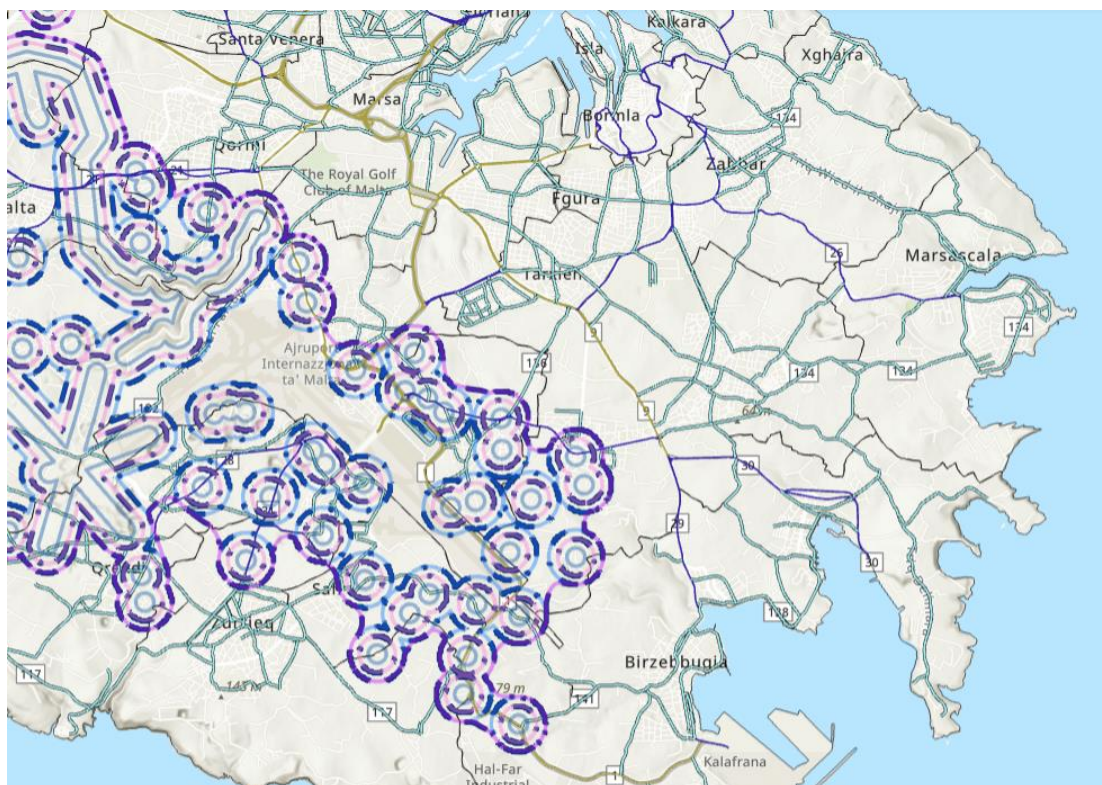
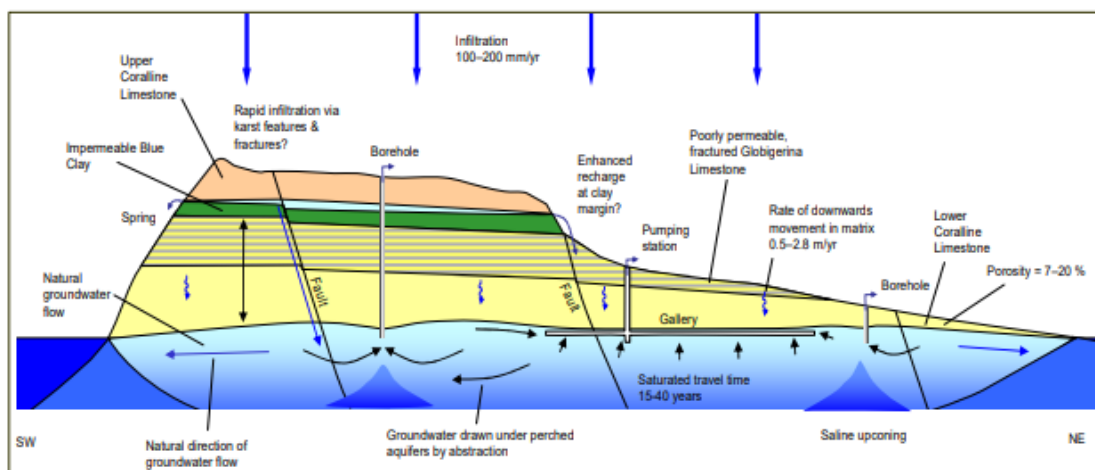
Figure 5: Map showing the catchment upstream of the site

6.2 Runoff Characteristics

The area upstream of the proposed development is a conical hill. There are no watercourses. The flow of runoff is controlled by the road network. Discharge is at the coastline and it is of a diffuse nature.

6.3 The Mean Sea Level Aquifer

Fractured Lower Globigerina Limestone may act as an aquifer, however, the site lies at the coastline where the thickness of the freshwater body saturating the mean sea level aquifer is zero (Figure 6). This implies that the fractured rock underlying the site is saturated with seawater. In fact, the site lies outside of the water protection zone (Figure 7).



6.4 The Marine Environment

The proposed Scheme is located at the coastline. Development along the coastline will have a direct impact on the marine environment either by direct emissions into the sea or by emissions on the shore platform which is washed by wave breakers as well as by direct connection of the platform with the sea through fissures and bedding planes.

7.0 Impact Assessment

For the construction of the Scheme directly at the coastline, the most important water-body receptors are normally coastal seawater, saline coastal groundwater, and the hydromorphology of the shore platform. No freshwater lens occurs beneath the immediate site and therefore there is no contamination of the freshwater aquifer. The focus instead, lies on the hydraulic connection between fractured limestone, saline groundwater and the sea.

The likely impacts can be summarised as follows:

Phase	Potential impact	Main receptor	Typical character
Construction	Dust and fine limestone entering runoff or the sea	Coastal water	Temporary adverse; increased turbidity/suspended solids
Construction	Concrete/cement wash water	Coastal water / saline groundwater	Potentially important because of very high pH
Construction	Accidental fuel, hydraulic oil or lubricant spills	Fractured rock, saline groundwater, sea	Localised but potentially significant
Construction	Excavation exposing fissures and bedding planes	Groundwater–sea pathway	Can provide rapid migration routes for contaminants
Construction	Stockpiling excavated material near shore	Coastal water	Sediment/dust mobilisation during wind or rainfall
Construction	Dewatering, if required	Saline groundwater / sea	May alter local groundwater flow and requires appropriate disposal
Construction	Works on coastal defences/platform	Hydromorphology	Possible alteration of wave reflection, erosion and sediment movement
Operation	Leakage from foul sewers or pumping systems	Groundwater and coastal water	Potential microbiological and nutrient contamination
Operation	Kitchen oils, grease and detergents	Sewer/drainage system and ultimately coastal waters	Chronic pollution risk if poorly managed
Operation	Stormwater from roads, garages and parking areas	Coastal waters	Hydrocarbons, tyre/brake residues, suspended solids
Operation	Swimming-pool backwash or chlorinated water	Coastal waters	Chemical/water-quality impact if discharged improperly
Operation	Increased impermeable surfaces	Hydrological regime	Greater runoff and reduced infiltration
Operation	Litter and plastics	Shore platform and marine environment	Persistent marine pollution risk
Operation	Exceptional storm waves/storm surge	Hotel drainage and wastewater systems	Flooding may mobilise pollutants back into the sea

Operation	Coastal structures or altered defences	Hydromorphology	Possible changes to wave action, local scour and shoreline processes
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7.1 Construction Phase

During construction, potential impacts on water bodies are principally associated with the mobilisation of dust and fine excavated material, contaminated surface runoff, accidental spillages of fuels, lubricants and other construction chemicals, and the uncontrolled discharge of concrete or cement wash water. Owing to the coastal location of the Scheme and the fractured nature of the underlying limestone, contaminants released at ground level may migrate through fissures and bedding discontinuities towards saline groundwater and the adjoining marine environment. Surface runoff may also transport suspended material directly across the shore platform into coastal waters.

Mitigation

During construction, potential impacts on water bodies shall be mitigated primarily through prevention and containment. Uncontrolled runoff from the works shall not be permitted to discharge directly onto the shore platform or into coastal waters. Fuels, lubricants and other potentially contaminating substances shall be stored within appropriately bunded and impermeable areas, and routine servicing and refuelling of plant shall be undertaken away from the foreshore wherever practicable. Concrete and cement wash water shall be collected and contained, and no such alkaline effluent shall be discharged to the ground, fractured limestone, surface drainage system or marine environment. Dust and fine excavation material shall be controlled by appropriate damping, covering, barriers and timely removal from site.

7.2 Operational Phase

During operation, potential impacts are mainly associated with accidental leakage from foul-water systems, contaminated stormwater runoff from trafficked and parking areas, oils and fats from catering facilities, detergents and cleaning chemicals, swimming-pool water and inappropriate disposal of solid waste. Increased impermeable surfaces may also modify the existing runoff regime. Because the Scheme is located immediately adjacent to the coastline, exceptional storm-wave and storm-surge events should also be considered, particularly in relation to the integrity of drainage, wastewater and below-ground infrastructure.

Where coastal defence works or other interventions are proposed along the foreshore, their potential effects on local hydromorphology, including wave reflection, erosion, scour and sediment transport, should also be assessed. Subject to appropriate design, containment, drainage and pollution-prevention measures, most water-quality impacts during construction and normal operation should be capable of substantial mitigation; accidental pollution events remain the principal residual risk.

Loss of groundwater recharge is of lesser importance immediately beneath the coastal site as the freshwater lens has effectively tapered out there. Marine-water contamination and saline-groundwater pathways are much more relevant.

Mitigation

During operation, foul-water, stormwater and drainage systems shall be maintained so as to minimise the possibility of leakage to the subsurface or coastal waters. Runoff from trafficked and parking areas shall be appropriately managed, with interception of sediment and hydrocarbons where necessary. Oils and fats from catering facilities shall be separately controlled, while swimming-pool backwash and other chemically treated waters shall be discharged only through an approved system. Particular consideration shall be given to the coastal location of the Scheme and to the protection of wastewater and drainage infrastructure from exceptional storm-wave and coastal-flooding events.

Subject to the full implementation and maintenance of these measures, the likelihood and magnitude of adverse impacts on saline groundwater and coastal water quality should be substantially reduced.

- No uncontrolled discharge to the sea;
- No concrete washout to ground;
- Bunded fuel/chemical storage; and
- Physical protection of the shore platform/salt pans.

1.0

1.0

1.0

1.0

8.0 Monitoring

8.1 Operational Phase

Periodic checks of effluents and second-class water effluents and other waste disposal systems would ensure that no harmful substances are leaked to the ground. Seawater analysis as part of the baseline study would produce a baseline water quality which would serve as a base for future monitoring of the water quality.

9.0 Residual Impacts

Although a development site might be considered to have little impact on hydrology and hydrogeology - the residual impact is always present.

The development of a site, accompanied by excavation for a basement will always be accompanied by:

- Increase in run-off or decrease depending on availability of storm water storage reservoir/s
- Loss of recharge
- Loss of groundwater quality - leakage of sewers pollution of run-off e.g. traffic or acid rain
- Loss of recharge to the aquifers

All these impacts, arising from a single building or larger development site, might be very small indeed and would cause no significant change to the Geo-Environment when taken on a one –by- one basis. But, collectively they would produce a town with all the accompanying cumulative negative impacts on the geo-Environment that are usually associated with towns and large villages.

10.0 Summary of Impacts Table

Impact type and source			Impact receptor		Effect & Scale							Probabilit y of impact occurring (Inevitabl e/ Likely/ Unlikely/ Remote/ Uncertain	Overall impact significance	Proposed mitigation measures	Residual impact significance	Other requireme nts
Impact type	Specific intervention leading to impact	Project phase (construction/ operation/ decommission ing)	Receptor type	Sensitivi ty & resilienc e toward impact	Direct/ Indirect/ Cumulati ve	Benefici al/ Adverse	Severity	Physical/ geographic extent of impact	Short-/ Mediu m-/ Long- term	Tempora ry (indicate duration) / Permane nt	Reversible (indicate ease of reversibilit y)/ Irreversibl e					
Dust emissions	Excavation	Construction	Runoff and seawater	Low	Direct	Adverse	Moderat e	coastal marine water	Short term	Tempora ry	Reversible	unlikely	Moderate	Cart Excavation material away as soon as it is generated for reuse or disposal depending on outcome of contaminat ion study	Negligible	/
Uncontrolled runoff from the works	Excavation	Construction	Runoff and seawater	Low	Direct	Adverse	Moderat e	Catchment	Short term	Tempora ry	Reversible	Unlikely as excavation s are usually isolated from the surroundi ngs	Moderate	Excavation walls isolate the site from the surroundin g environme nt	Negligible	/
Fuel and lubricant spills	Excavation and construction machinery	Construction	Seawater	Low	Direct	Adverse	High	Coastal marine water	Short term	Tempora ry	Reversible	Unlikely as excavation s are usually isolated from the surroundi ngs	Moderate	Such substances should be stored in designated impermeab le and bunded areas,	Minor	/
Alkaline concrete wash	Laying of fresh	Construction –	seawater	Low	Direct	Adverse	High	coastal marine water	Short term	Tempora ry	Reversible	Unlikely as excavation	Moderate	Inject concrete wash in the	Minor	/

	concrete											s are usually isolated from the surroundings		rock . prevent from reaching the sea		
Contamination from washings from trafficked and parking areas	Washing	Operation	Coastal waters	Low	Direct	Adverse	Moderate	Coastal waters	Short term	Temporary	Reversible	Unlikely	Moderate	Care during operation appropriate filters and sediment collectors	Minor	/
Storm surge	Stormy seas	Operation	wastewater and drainage infrastructure	Low	Direct	Adverse	Moderate	wastewater and drainage infrastructure	Short term	Temporary	Reversible	Unlikely	Moderate	Care during operation appropriate filters oil separators and sediment collectors	Minor	/
Spillage of sewer and other fluids	Facility operations and surface run-off	Operation	Coastal waters	Low	Direct	Adverse	Moderate	Coastal waters	Short term	Temporary	Reversible	Unlikely	Minor	Care during operation of the plant-employ experienced operatives	Minor (reduced)	/
Disposal of oil and chlorinated water	Inappropriate Disposal	Operation	Coastal waters	High	Direct	Adverse	Moderate	Coastal waters	Short term	Temporary	Reversible	Unlikely	Moderate	discharged only through an approved system	Minor	/
Littering	Careless disposal of waste	Operation	Shore platform and coastal waters	Low	Direct	Adverse	Moderate	Hydromorphology of the shore platform and marine environment	Short term	Temporary	Reversible	Likely	Minor	Provision of appropriate waste disposal bins and appropriate signage	Negligible	/

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