

SECTION 6: KEY ENVIRONMENTAL ISSUES

6.1 INTRODUCTION

The scope of an environmental impact assessment is defined by the range of issues and alternatives to be considered, and the approach towards the assessment that will follow (DEAT 2002). The scoping exercise has been undertaken by incorporating the following basic elements:

- An open participatory process, that involved authorities, the applicant and stakeholders;
- Feasible alternatives identified and selected for further assessment in the EIA phase;
- Important characteristics of the affected environment as highlighted in Section 4.

Key factors that have been considered in determining the scope of issues or impacts for further investigation include:

- The nature of the activities to be undertaken in the proposed upgrade and expansion of the port;
- The legal, policy and planning context of the proposed expansion;
- The environmental priorities or sensitivities of the affected population (DEAT, 2002); and
- Wide I&AP consultation and involvement in the scoping exercise (see Section 5).

It was therefore decided that the scoping exercise will concentrate on addressing key issues, i.e. issued-focussed as opposed to all issues raised in the process. Nevertheless, responses have been provided to issues raised as far as possible within the limits of the scoping phase. Many of the issues raised to date have been adequately addressed or responded to without requiring further study. These issues are thus considered as dealt with in the scoping stage, and will not be revisited in the EIA. The identification of issues/potential impacts of each activity was conducted in the following order:

- a) Detailed identification and analysis of the activities required to implement the proposed development (as outlined in the project description in Section 2);

- b) Identification of key risks or impact sources arising from activities to be undertaken in the expansion project, which could potentially impact on the environment;
- c) Identification of potential issues and / or impacts that could arise due to these activities through preliminary information provided by a team of specialists;
- d) Determination of those activities, issues or potential impacts that require further investigation in the EIA phase; and
- e) Recommendations to be taken into account in developing detailed Terms of Reference for further specialist studies in the EIA phase.

6.2 KEY ISSUES

The key issues listed in the following section have been determined through an internal review process based on similar developments, desktop analysis, revision of existing information, historical data, previously issued environmental authorisations, consultation with Interested and Affected Parties, stakeholders, issues raised in previous EIA processes and the existing Environmental Monitoring Committee (EMC). In addition, a preliminary site visit was conducted by a team of specialists.

6.2.1 List of Key Issues

It is necessary to accurately identify the range of issues that must receive detailed assessment in the EIA phase, so that the process is focussed on the issues most pertinent to the site and the nature of the proposed development. It is noted here that the impacts arising from the current operation of the iron ore expansion facility are limited mainly to the specific operations such as iron ore stockpiling and ship loading. The issue of cumulative impacts of the entire development was identified, especially in the historical context of previous upgrades. The list of key issues is grouped as follows:

6.2.1.1 The physical and biological environment

The key issues identified here are based on an overview of the entire study site that was obtained from the site visit. This entailed a cursory assessment by a team of specialists that were commissioned to assess the environment and the likely impacts that the iron ore expansion facility could have on it. In this regard, the chosen site layout/location will need to bear in mind key impacts such as:

- Groundwater – i.e. contamination and dewatering of aquifers;
- Iron ore dust emissions, including the health and nuisance impact;
- Potential impact of dust emissions from current operations, e.g. PM10 other than iron ore dust;
- Noise pollution from the Tipplers and rail operations;
- Beach erosion and litter;
- Road traffic impacts including impacts on future development of the road network;
- Shipping traffic risks (including management and control of Ballast Water discharge);
- Impact of development on scarce resources such as water;
- The cumulative impact of dust generated by the expanded development (mainly operational phase);
- Engineering services (water supply, energy supply and availability);
- Potential increase in storm water runoff from the site;
- Waste management;
- Impacts on terrestrial ecology, such as the potential impact on sensitive dune system north of the Stockyards;
- Impacts on avian and non-avian fauna;
- Impact of underwater blasting on marine vertebrate (e.g. penguins) and invertebrate macrofauna;
- Impact of dredging and construction works on the marine environment and resources. These include:
 - Impacts on the marine and benthic ecology in the bay, including ballast water risks;

- Issues arising from compliance with the London Convention on Dumping at Sea;
- Shoreline evolution and stability;
- Sediment and water quality (turbidity);
- Sampling and characterisation of possible dredge disposal site; and
- The cumulative impact of the entire development on the integrity of marine environment in the bay.

6.2.1.2 *The social environment*

In order for any development to be sustainable it must be ensured that the environment surrounding the development is safe and secure, and in all respects acceptable to the approving authority. In this regard the social issues flagged during the site visit, as well as the concerns raised in the public consultation process must be taken into account. It is anticipated that the following social issues (including perceptions) could arise as a result of the port expansion:

- Economic impacts, i.e. potential spin-offs (benefits) or negative impacts;
- Visual and aesthetics impacts;
- Cultural and heritage impacts;
- Impact of the influx of construction workers – number of workers and time that will be spent in the community;
- Impact on tourism;
- Job creation and recruitment;
- The negative social impacts of construction camps such as the spread of diseases, and pressures on local infrastructure; and
- Social concerns arising from crews of ships entering the harbour.

6.3 SPECIALIST STUDIES PROPOSED

Table 10 below summarises the full complement of studies envisaged for the EIA phase of this study. An integration workshop will be held to ensure that the issues raised by the various specialists can be harmonised and incorporated into the final EIA Report. The plan of study for the EIA (Appendix B5) provides a detailed analysis of the Terms of Reference for each study.

All specialist studies will be subjected to an independent review process, whereby an expert in each field will be required to continuously review the study. Thus, each reviewer will be expected to comment on the development of the terms of reference, the literature review and data gathering, the methodology and the final report. A tentative list of reviewers for the specialist investigations has been provided in Plan of Study for the EIA.

Table 10: List of planned specialist studies

Study	Specialist	
	Person	Organization
Air Quality		
- Dispersion Modelling Study & Impact Assessment	Vis Reddy	SRK
Avi-fauna	Lukas Niemand	SEF
Non-Avian Fauna	Lukas Niemand	SEF
Cultural Heritage	Tim Hart	UCT
Groundwater	Des Visser	SRK
Marine Studies	Roy van Ballegooyen	CSIR
- Sediment Quality	Andrew Pascall	CSIR
- Water Quality Assessment	Dr Pedro Monteiro	CSIR
~ Turbidity Modelling	Roy van Ballegooyen	CSIR
~ Water Quality Modelling	Dr Pedro Monteiro	CSIR
~ Ecological Assessment		
- Basic Ecological Assessment	Dr Robin Carter / (alt) Silke Bohlmor	Llwandle
- Ballast Water Issues	Dr Robin Carter	Llwandle
- Blasting Assessment	Dr Robin Carter	Llwandle
- Shoreline Stability	Dr Koos Schoonees	Entech
- Incremental Shipping Risk Study	Dr Hans Moes	CSIR
- Report Integration	Roy van Ballegooyen	CSIR
Social Impact	Ilse Aucamp	SEF
Economic	Hugo van Zyl	Independent Economic Researchers
Vegetation	Barrie Low	COASTECH
Noise	Demos Dracoulides	Demos Dracoulides & Assocs
Traffic and Transportation	Brian Roberts	PDNA
Electrical Power	Allen Potgieter / Mackenzie Hoy	PDNA

Study	Specialist	
	Person	Organization
Visual Impact Assessment	Eamonn O'Rourke	SEF
Health Impact Assessment (Dust)	Vis Reddy / Dr Mary Gulumian	SRK
Integrated Water and Waste Management	--	PDNA/SRK
- Report Integration	Jackie Burke	SRK
- Potable Water	Chris Warner	PDNA
- Stormwater	Martyn Warren	PDNA
- Sanitation	Chris Warner	PDNA
- Domestic Waste	Larry Eichstadt	RMS (PDNA)
- Hazardous Waste	Larry Eichstadt	RMS (PDNA)
- Construction Waste	Larry Eichstadt	RMS (PDNA)
- Industrial Effluent/Wastewater	Chris Warner	PDNA

The terms of reference for each of these studies are discussed below, while a full set of terms of reference for the EIA are discussed in the Plan of Study: Appendix B5.

6.3.1 Air Quality and Health Impact Assessment

The following terms of reference are required to assess the impact that the proposed expansion of the facility will have on air quality and to provide management and mitigation measures where necessary:

- Conduct a site inspection and baseline information collection;
- Review baseline data and gap analysis;
- Preparation of an emissions inventory;
- Quantification of emissions, particularly the nuisance effects of iron ore dust, such as discoloration;
- Model ambient PM10 dust - baseline conditions;
- Model ambient PM10 dust for the proposed expansion without mitigation;
- Model ambient PM10 for proposed expansion with mitigation;
- Liaise with the other specialists to determine other impacts of dust on biodiversity and marine life;
- Assess and compare the air quality scenarios for the various Stockyard layout options;

- Comment on the levels of anticipated dust emissions with regard to legal limits, social norms (including nuisance threshold) and environmentally acceptable limits;
- Recommend mitigations measures, including technical solutions to reduce dust emissions and limit the air quality impacts of proposed expansion;
- Identify improvements that would enhance or complement the current air quality monitoring systems; and
- Compile an impact assessment report, which specifically evaluates the cumulative effects of the proposed expansion.

The terms of reference for the Health Impact Assessment will entail:

- Identify and prioritise chemicals of concern, including additives for dust control;
- Provide a conceptual model of potential exposure pathways;
- Identify primary exposure pathways of key receptors and broad categories of key receptors;
- Review the literature for records of medical ailments that could be associated with the advent of industrial emissions in the study area;
- Review the literature to identify standards and/or risk based concentrations to assess health impact;
- Investigate the nuisance threshold of iron ore dust on human health and recommend monitoring measures in collaboration with the air quality study;
- Conduct a comprehensive ecotoxicological and/or human health risk assessment;
- Conduct an epidemiological study, to assess the health risk of iron ore dust and investigate the potential for iron ore dust inhalation to cause ailments such as asthma, hay fever, eye irritations, bronchitis, sinusitis, etc; and
- Compile a health impact assessment report; recommending mitigatory measures as required, based on the findings of the study.

6.3.2 Avian and Terrestrial Fauna

The terms of reference for Avifaunal assessment will entail the following:

- Review existing information concerning the status and sensitivity of bird communities within the Saldanha Bay region through a desktop and literature survey of the affected environment (collation of baseline information). The study will also focus on the preferred foraging grounds, flight routes from roosting sites to foraging grounds and vice versa;
- Conduct a site visit to assess the status quo and possible risks associated with the proposed activity on the nesting and foraging activities of bird populations and their associated habitat. It is not considered necessary to conduct concise bird population studies or counts since the area has been well documented by studies in the past;
- Review and analyse current shipping volumes (traffic volumes) including anticipated volumes after commissioning. Such a review will provide the necessary information regarding the impacts (or direct disturbances) associated with passing ships on bird populations of the region;
- Assess and predict the impacts/risk associated with oil/metal spillage/re-sedimentation on important foraging habitat, and to identify areas that are of great risk;
- Liaise with other specialists, such as Botanist, marine Ecologists and Shipping Traffic expert, particularly with regard to shoreline habitats and impacts on sea bird populations;
- Provide practical recommendations and mitigation measures to minimise negative impacts and maximise positive impacts; and
- Assess the impact of overhead power lines and other electrical infrastructure on the bird populations in the study area.

The terms of reference for Non-Avifaunal assessment (terrestrial component) will entail the following:

- Review existing information concerning the status and sensitivity of the non-avian faunal community (focussing on mammals) within the Saldanha Bay region through a desktop and literature

survey of the affected environment. The study will include a Red Data scan;

- Initiate a site visit to assess the status quo and possible risks associated with the proposed activity on the foraging and roosting activities of faunal populations and terrestrial (land-based) faunal habitat;
- Review and analyse current shipping volumes (traffic volumes) including anticipated volumes after commissioning. Such a review will provide the necessary information regarding the impacts (or direct disturbances) associated with passing ships on mammal populations of the region;
- Assess the risks associated with possible alien faunal introductions from foreign ships that may impact on the indigenous faunal populations;
- Assess and predict the impacts/risk associated with oil spillage/re-sedimentation on important foraging habitat, and to identify areas that are of great risk;
- Obtain collection permits for the purpose of conducting this study; and
- Provide practical recommendations and mitigation measures to minimise negative impacts and maximise positive impacts.

6.3.3 Cultural Heritage

The terms of reference for the Cultural Heritage impact assessment are as follows:

- Conduct a literature review and desktop study on land- and marine-based heritage in the study area; priority should be given to identifying and reviewing reliable published sources with respect to maritime heritage;
- Conduct a field survey in those parts of the study area that could be affected by land based expansion, such as the adjacent dunes;
- Compile an inventory of historical and archaeological material in the area;

- Identify heritage issues, that could be affected by the project, such as historical sites, and fossil remains;
- Investigate maritime archaeology in consultation with maritime archaeologists experts at both the National Maritime Survey and Iziko Museum, and by consulting the SAHRA database of maritime heritage;
- Liaise with relevant parties at the West Coast Fossil Park, e.g. Pippa Haarhoff. This should be done in order to make use of relevant information from the local community;
- Investigate the need to undertake a maritime survey, making specific recommendations as to whether this survey is required;
- Specify the relevant authorizations or permits that may be required in terms of the National Heritage Resources Act;
- Assess the heritage impacts based on the impact assessment methodology; and
- Compile a Heritage Impact Report, which proposes mitigation measures as required.

6.3.4 Groundwater

The terms of reference for this study will be to:

- Collate, process and evaluate all existing groundwater information (reports, maps and National Groundwater Database) for the Site and its immediate surrounds (1 km radius);
- Undertake a hydrocensus and sample existing monitoring boreholes for an independent chemical analysis (This will be aimed at identifying potential areas from which groundwater could be abstracted);
- Map any interpreted lineaments and potential groundwater-bearing formations and structures using aerial photographs and existing geological maps;
- Conduct a feasibility study to drill and test exploration boreholes;
- Consider the (direct and cumulative) effects of abstraction on the environment, adjacent water bodies and other groundwater users; and

- Compile a groundwater impact assessment report for inclusion into the EIR. The potential of bulk water supply from groundwater resources will be discussed.

6.3.5 Economic Impact Assessment

The terms of reference for this study will entail describing the current economic environment and describing in detail the potential impacts of the project on economic activity at the national, regional and local (municipal) scales.

The terms of reference will entail:

- Conduct a broad level cost-benefit review of the justification and financial projections for the project with a particular emphasis on highlighting risk factors that are important to the project's success;
- Identify and assess potential impacts (positive and negative) on commercial activity in nearby commercial nodes, with particular attention given to the nature of the project and its surroundings – impacts on sectors such as tourism and agriculture (including fishing) will be assessed in this regard;
- Assess the impacts on other activities in the area (incl. impacts on other businesses sectors, nodes and amenity);
- Assess the impact on the economy in longer term due to skills development arising from project;
- Assess the impact of ongoing supply of services and goods to the expanded operation including supply to ships and services to ships and their staff;
- Assess potential impacts on direct employment and household income associated with the proponent's expenditure on the site will be analysed based on experience at similar developments and past expansions of the port;
- Assess impacts on employment, which should give detailed figures on job-creation and job security) and incomes from development expenditure;
- Indirect impacts will be discussed qualitatively to the extent possible, but local impact analysis would focus on direct impacts;

- Assess the impact of the project on property values and rates income;
- Review the strategic justification and financial sustainability of the project and how this may change if viewed from a societal costs and benefits perspective; this must be seen in the context of the scale of the project and its location;
- Determine the degree of fit with the economic development visions for the area; and
- Compile an economic impact report that makes relevant recommendations on how the economic benefits of the project could be enhanced, while limiting negative economic impacts.

6.3.6 Social Impact Assessment

The Social Impact Assessment process will be an in-depth baseline study to determine the actual state of the community. This will be done via desktop studies of existing literature and reports, statistical data and in-depth interviews with key people in the community, as well as focus groups.

The purpose of this study will be to assess the social impacts associated with the expansion of the export iron ore terminal at the Port of Saldanha. The scope of this study will entail the following:

- A baseline socio-economic description of the affected environment (Saldanha, Vredenburg; Langebaan; White City; Diazville, Hopefield, and Paternoster);
- Identify and assess potential social change processes that may occur as a result of the project;
- Identify and assess potential negative social impacts; such as crime, influx of job seekers, decline in tourism, pressures on social infrastructure and local amenities, etc;
- Identify and assess potential benefits and/or positive impacts of the project such as job creation;
- Identify of mitigation measures;
- Make recommendations regarding the most suitable alternatives from a social impact perspective;

- Liaise with other specialists, particularly the economic impact specialist to determine the socio-economic impacts of the project;
- Investigate potential social offsets that could alleviate the impacts on rural landowners, and curtailed commercial activities arising from dust impacts; and
- Compile a comprehensive Social Impact Assessment report.

6.3.7 Vegetation

The objectives of this specialist vegetation study are to:

- Establish the baseline condition of potentially affected vegetation communities and species found on the proposed project areas and investigate the changes that have occurred to date;
- Determine the impacts of the proposed expansion on the existing plant communities; and
- Suggest measures to manage/mitigate negative impacts and enhance the positive impacts identified during the study.

The proposed terms of reference for the specialist vegetation study is outlined below.

- Literature review: review existing data concerning the extent and conservation status of the flora in the Saldanha Bay area.
- Field survey: A field survey will be undertaken during the last week of September. Saldanha is located in a winter rainfall region and September is thus an appropriate time to undertake a field survey for this area as it is late spring and all the geophytes and annuals should be flowering allowing for a more comprehensive vegetation survey. Based on current information the field survey will cover the following three areas:
 - The dunes behind the lagoon (approximately 1 km) in the vicinity of the proposed expansion;
 - Salkor Rail Yard and loop one of the railway line; and

- Additional railway spur of approximately 5km: although this is proposed within the existing servitude the servitude may be extended.

The following activities will be included in the scope of field survey and subsequent reporting:

- Description of the biotic environment of the project area, including the following as a minimum:
- Edaphic and structural characteristics of plant communities identified;
- Species composition of each distinct community (identification of dominant species of each community);
- Identification of rare and endangered plant species and photographic record of each such species (to be included in an appendix to the report);
- Identification of exotic invader species, if present, and photographic record of each species;
- Comment on the conservation status and conservation importance of the vegetation communities and habitats and state whether there are any sensitive habitats and/or landscapes on the proposed project area;
- Describe any risks to the deterioration of the vegetation status; and
- Comment on plants of cultural, commercial or recreational significance and the medicinal value of plant species present where possible.

The vegetation communities identified on site will be depicted on a topographical map. Should plant species identifications need to be verified this will be done by the Kirstenbosch herbarium.

The Impact assessment report will provide details on the following aspects:

- A description of important ecological relationships between fauna and flora (and where possible comment will be provided on the integrity of these ecological processes on site);

- The present ecological “successional status” of the habitats in the study area, in relation to human impact on them will be described;
- Identification of impacts and provide management recommendations including future monitoring requirements and rehabilitation procedures. The impact assessment should take into consideration cumulative impacts and assess the local, regional and national effect of the proposed upgrade project on the flora, taking into consideration the technical details of the project and the conservation significance of the affected species and communities (e.g. the endemic dune system). This should include the potential for dust emissions and water contamination to affect on-site and neighbouring flora/fauna communities (including livestock and game);
- Conservation priorities will be identified for the project; this may include a review of the Saldanha fine-scale plan being undertaken under the auspices of the CAPE project, and a sub-regional conservation plan/linkage proposed as part of the assessment. As the fine scale plan is not complete, it could be excluded from the current assessment, but should be consulted if available before the final EIR is completed;
- A detailed discussion and feasible proposal on suitable biodiversity offsets; particularly with regard to recommendations made for the Phase 1A expansion;
- Assessment of the impacts on the terrestrial-marine interface and a review of the CapeNature Biodiversity Management Plan for the Saldanha Bay area;
- Where necessary, recommendations will be provided for the relocation and subsequent protection of selected indigenous plants for conservation purposes;
- A list of potential plant species to be propagated in nurseries from seed, root stock or cuttings etc, will be provided; this is for the rescue of potential key species for rehabilitation and/or conservation purposes;
- Comment will be provided on the appropriateness of the legal requirements in light of site-specific factors; and

- An indication of additional legal and other requirements that will need to be followed should disturbance to protected or sensitive species, communities, habitats and landscapes be unavoidable. This will include a review of the most recent biodiversity and related conservation legislation.

6.3.8 Traffic and Transportation Impact

The terms of reference for the Traffic Impact Study will consist of the following:

- Undertake a Traffic Impact Assessment (TIA) to understand construction traffic and also impact on the public roads due to the additional railway lines and general increase in traffic;
- Liaise with provincial and municipal road authorities in determining road network upgrades/plans that could be impacted by the project;
- Determine what road improvements are required to alleviate potential impacts if any are identified;
- Assess the impacts of increased traffic on current traffic in the area; and
- Compile a Traffic Impact Report.

6.3.9 Energy Supply

The terms of reference for the energy supply study will consist of the following:

- Liaise closely with Eskom and local authority in order to develop an understanding of the capacity of overhead lines, possible need for additional lines, their location and impact on other studies;
- Describe the current electrical regime and future scenario with respect to power quality and blackouts in the light of the energy requirements of the proposed expansion;
- Establish the effect on local authority of increased fault levels if applicable;
- Analyse the means of integration into existing infrastructure for the required power supply upgrade;

- Investigate opportunities for Green Power;
- Liaise closely with specialists on avian study and also on visual quality regarding night glow; light pollution; power line visual impact;
- Establish emergency power requirements of iron ore facility;
- Establish bulk fuel requirements of iron ore facility during the construction and operational phases;
- Establish communication tower requirements; and
- Compile a report that outlines the energy requirements of the project, indicating what the impacts on local supply could be. This report should make recommendations on sustainable power supply for the upgrade.

6.3.10 Visual and aesthetic impacts

A level four VIA is usually required for large scale infrastructure that could have a high visual impact. Therefore, the VIA will conform to the requirements of a level four assessment which requires the realisation of the following objectives (adapted from Oberholzer (2005)):

- Determine the extent of the study area;
- Describe the proposed project and the receiving environment;
- Identify and describe the landscape character of the study area;
- Identify the elements of particular visual value and quality that could be affected by the proposed project;
- Identify landscape and visual receptors in the study area that will be affected by the proposed project and assess their sensitivity;
- Indicate potential landscape- and visual impacts;
- Assess the significance of the landscape- and visual impacts;
- Assess the sensitivity of the landscape- and visual receptors;
- Determine the severity of the landscape- and visual impacts;
- Assess the significance of the visual and landscape impacts;

- Recommend mitigation measures to reduce and/or alleviate the potential adverse landscape- and visual impacts; and
- Document the findings of the study in a VIA.

The VIA will give particular importance to assessing impacts that could arise during the construction phase, such as are those associated with the dredging activities. These include:

- Visual (or aesthetic) impact: due to large turbidity plumes that could be associated with the dredging operations;
- Visual and aesthetic impact of dust due to discoloration;
- Visual impact of extra machinery during construction and operational phase of the project;
- Visual impact of more iron ore stockpiles in harbour area; and
- Visual impact of more trains entering and exiting the harbour area.

6.3.11 Noise

The terms of reference for the noise impact study will be as follows:

- Determine the process and locations of each existing and proposed facility that potentially causes a noise impact. This will cover infrastructure and operations at the site such as, the Tippler building; Stacker Reclaimers, shunting of train trucks, Conveyors, trains, dredging, construction works during reclamation, and Ship loaders;
- Determine ambient noise levels at selected locations within the boundaries and along the perimeter of the site, as well as at selected sensitive locations within the noise exposed communities such as Blue Water Bay and Saldanha;
- Model the movement of noise waves taking into account planned positions of the machinery, potential noise barriers, meteorological conditions, etc;

- Model the resulting ambient noise levels after the expansion of the port, at selected locations within the boundaries and along the perimeter of the site, as well as at selected locations within the noise-sensitive communities, such as Blue Water Bay and Saldanha;
- Assess the noise impact of the proposed expansion on the relevant affected communities;
- Determine the cumulative impacts of the proposed expansion, especially in light of previous expansions and current environmental issues at the port;
- Assess the “no development” alternative and indicate whether the sites/options proposed are environmentally acceptable or unacceptable for the Phase 2 expansion as proposed in terms of the impacts assessed;
- Indicate the environmentally most preferred alternatives;
- Set acceptable noise limits, should the noise control regulations be deemed inadequate to address local noise concerns;
- Recommend appropriate and practical mitigation measures to minimise the negative impacts and maximise the potential benefits associated with the various options. This should include measures such as noise barriers to protect noise sensitive receptors (communities); and
- Compile an impact assessment report based on local regulated noise limits, SANS 10103: 2003, The Environmental Conservation Act, 1989 (Act No. 73 of 1989), Noise Control regulations, as well as WHO guidelines.

6.3.12 Waste Management

The specialist study will include all waste streams such as construction waste, domestic – non hazardous waste, hazardous waste and medical waste (health care risk waste). The above categories will also include the following specific waste generation areas:

- Surface marine sediments to be removed during dredging (construction phase);
- The brine concentrate from the proposed desalination plant (operational phase);

- Identified iron ore waste material (operational phase);
- Residue from the dust filtering system (operational phase);
- General waste from ships including medical waste; and
- The sludge from the Stormwater settling dams (operational phase).

The purpose and brief of the waste management specialist study will be largely threefold, i.e. to:

- Assess the potential impact that the current waste management system is likely to have on the receiving environment. This could be considered an audit of the waste management practices;
- Using the baseline information obtained to develop an understanding of the potential impacts the additional waste materials that are likely to be generated during construction and future site operations could have and thereby propose suitable mitigation measures; and
- To prepare a basic waste management plan in parallel to this assessment and integrate this plan with the Water and Waste Management Plan as requested by the Department of Water Affairs and Forestry. This plan needs to reflect the shortcomings of the current waste management system and how these shortfalls are going to be addressed as a form of mitigating potential future environmental impacts.

The assessment-audit and waste planning phases of this study will provide clarity on those areas where potential impacts are likely to occur should the appropriate mitigation measures including possible site engineering changes not be put in place. The mitigation measures will focus on key waste handling areas.

6.3.12.1 Hazardous Waste (including medical waste)

The terms of reference for the hazardous waste stream will involve the following tasks:

- Develop an understanding of the current Waste Management Plan of the site. Review Integrated Waste Management Plan of local authority. Develop an understanding of current processes, also at

Saldanha Steel and other relevant industries, and identify opportunities for cooperation;

- Seek to understand the waste from operations including health care waste and waste from ships;
- Review existing practices;
- Review and comment on temporary storage facilities and procedures, contingencies, contractors and safe disposal procedures;
- Confirm waste types and relevant classification;
- Understand disposal constraints – hazardous and de-listed waste types;
- Liaise with relevant authorities in the study area, including municipal staff; and
- Compare broadly the costs, risks and cumulative impacts of the proposed management and mitigation measures.

6.3.12.2 Construction Waste

This component of the study will investigate the handling of excess concrete, wash water from concreting activities, demolition waste, on-site fuel, oil and diesel. The specialist will be required to develop an Environmental Construction Management Plan (ECMP), which will inform the Environmental Management Plan for the Construction and Operational phases of the project.

6.3.13 Stormwater Management

This study will entail the following tasks:

- Determine the current status quo with regards to Stormwater management at the site;
- Review existing rainfall records particularly autographic records to establish time and extent of periodic storms;
- Review catchment areas and hydrology studies to establish the risk of the capacity of existing and proposed Stormwater retention ponds being exceeded;

- Review the appropriateness of storm return periods adopted in view of the risk;
- Review the appropriateness of the methods used in the estimation of runoff;
- Review the infiltration scenario in conjunction with the Groundwater specialist;
- Review the proposed short term and long term maintenance programmes; and
- Recommend mitigation measures to address potential stormwater issues.

6.3.14 Integrated Waste and Water Management Plan

Developing the IWWMP will entail synthesizing the information from various specialist reports dealing with waste and water issues as discussed above. In addition, the requirements of Regulation 704 (Government Gazette 20118, 4 June 1999) and the Operational Policy for the disposal of land-derived water containing waste to the marine environment of South Africa (Edition 1, 2004) will be addressed.

The IWWMP team will undertake the following:

- A site visit;
- Review the specialist studies to ensure that all the requirements of DWAF, Regulation 704 and the Operational Policy for the disposal of land-derived water containing waste to the marine environment of South Africa have been addressed;
- Collate the specialist studies into an IWWMP;
- Liaise with the project engineers and specialists to obtain any additional information required;
- Develop a site water balance;
- Complete a draft IWWMP;
- Complete the final IWWMP for submission to DWAF; and

- Maintain contact with the various DWAF representatives during the approval process to ensure that missing data or misunderstandings do not delay the approval process – an allowance has been made for two meetings with DWAF (one at site and one at the regional office).

6.3.15 Marine Studies

The approach proposed is that existing data be utilised to provide the necessary baseline description of hydrodynamics, water quality, sediment biogeochemistry, ecology and designated uses in the bay (e.g. mariculture, etc). Such a baseline description will form part of the various specialist studies to the degree required.

Studies that need to be undertaken for assessing the potential impacts in the marine environment due to both construction activities and long-term water quality and ecosystem changes and shoreline stability, are detailed below:

- Sediment Quality or London Convention Compliance Study;
- Turbidity Modelling Study;
- Water Quality Assessment;
- Modelling of long-term the changes in water quality;
- Assessment of ecological impacts, including those due to blasting and ballast water risks;
- Assessment of impacts associated with shoreline erosion; and
- Incremental shipping risk study.

For the disposal of dredge spoil offshore as opposed to onshore disposal, an additional suite of studies will be required for selection of a suitable disposal site and assessment of potential impacts associated with dredge disposal. The EIA requires as a minimum that:

- One or more sites is selected based on existing topographic data and a screening survey of the physical parameters (rock and sand) of potential benthic habitats;
- A survey be undertaken to establish a biogeochemical and ecological baseline of the sites for the purposes of an EIA assessment and dredge permitting; and

- Appropriate modelling studies to assess potential impacts associated with the disposal of the dredge material at the designated disposal site (i.e. studies indicating the likely “footprint” of the disposed dredge material over time and its likely ecological impacts, as well as potential aesthetic impacts during dredge disposal).

In addition to the above, a quantitative baseline survey comprising an accurate survey of bathymetry and bottom types ultimately will be required for the dredge disposal permitting process.

These terms of reference includes the additional suite of studies required for selection and of a suitable disposal site and assessment of potential impacts associated with dredge disposal. Details on each of these studies are provided below.

6.3.15.1 *London Convention Compliance Study*

The terms of reference for the study will be to assess the dredge sediment properties in terms of particle size distributions, contaminant concentrations, and toxic condition. Ideally the material to be dredged needs to be assessed with sufficient spatial resolution in both the horizontal and vertical profiles.

The purpose of the London Convention compliance assessment will be to provide the baseline information on sediments and potential associated toxicants contained within these sediments that may be released during dredging activities. In addition, grain size analyses are proposed as part of this study to provide the necessary characterisations of the sediments to be dredged, which are essential for the detailed turbidity modelling studies and subsequent ecological assessments. These data will also be required should there be a requirement for offshore disposal of dredge spoil, both in terms of the environmental impact assessment and the dredge dumping permit application procedures.

This study will entail the compilation of a report to assess changes in water quality during construction activities against the environmental quality objectives as set out the Water Quality Management Plan for the Bay. This report will include dredge plume modelling and the assessment of the quality of sediments to be dredged. The assessment of sediment quality is required as part of the dredge dumping permitting process in terms of the Marine and Coastal Management's requirements (in compliance with the London Convention).

6.3.15.2 Water Quality Assessment

The water quality assessment comprises three components, namely:

- Turbidity and sediment modelling;
- Detailed Water Quality modelling;
- Detailed Ecological assessment due to modelled changes in hydrodynamics and water quality.

Turbidity and sediment modelling:

The terms of reference for this study will be to accurately simulate water column turbidity and likely deposition scenarios of dredge-derived sediments in the Bay for the proposed dredging activities. This information, together with that from the sediment quality assessments will be used in both the detailed water quality modelling and associated ecological impact assessment.

The modelling will be based on a representative hydrodynamic database that includes wave and current impacts on sediment plume advection and deposition of sediments on the seabed. The hydrodynamic data base will be developed based on existing wave, current and water column stratification data. The turbidity modelling will be based on the hydrodynamic database, information on the characteristics of sediments to be dredged and the nature of dredging operations.

The modelling will thus cover a range of representative environmental conditions (scenarios) and will include processes that describe the transport and behaviour of sediments in the marine environment as well as the behaviour of any toxic constituents dissolved in the water column (treated as a conservative tracer).

The model output will include magnitude, frequency and extent of turbidity plumes experienced both at the time of dredge disposal as well as subsequently due to re-suspension events (to the extent applicable). Also provided will be information on the accumulation of sediments on the seabed. The focus will be on the fines that are the most likely to result in turbidity plumes and also are those components of the sediments most likely to contain toxic components (i.e. trace metals, etc). Suspended sediment concentrations will be simulated for identified sensitive sites.

Allowance has been made for providing advice on recommended dredge methods and mitigation measures, etc that may be required to minimise the dredging impacts.

Detailed Water Quality modelling:

The terms of reference for the detailed water quality modelling study would be to assess likely changes in water quality and the ecosystem state variables that would exceed those considered to be acceptable in terms of water quality management plans for the bay. The model outputs will need to be adequate as input to a robust ecological assessment of both short-term (those due to construction activities) and long-term (those due to structural changes) impacts associated with the proposed development.

Detailed modelling of water quality and the ecosystem state variables described above will be undertaken using Delft3D-WAQ (Van Ballegooyen *et al.*, 2005). The modelling will be based on the hydrodynamic database and scenarios developed for the turbidity modelling study and detail of the proposed changes in port layout.

The following specific issues will be considered within the context of Saldanha Bay:

- Assessment of the potential changes in water quality associated with dredging activities and changes in port layout within the generally accepted management framework developed for multi-user marine environments such as Saldanha Bay in line with the specific management plans and recommended thresholds of change for Saldanha Bay (as per the requirements of the Saldanha Bay Water Quality Forum);
- The specific thresholds for specific ecosystem state variables to be used over and above the specified water quality criteria for the region are: phytoplankton biomass, as mg C/m^3 , dissolved oxygen as $\text{ml O}_2/\ell$ and particulate organic carbon (POC) in deposition areas as mg C/m^2 . These reflect the overall productivity of the Saldanha Bay system and its biogeochemical status;

- Threshold levels for these variables are set at changes of 10% (or more) over the ambient condition that extend for a period of 7 days or longer; the purpose being to be able to reliably show whether there is any net change in the system due to the proposed development and associated changes in water quality (Monteiro and Kemp, 2004); and
- If the analyses of the proposed discharge indicate that the identified system indicator levels are to be exceeded the potential ecological consequences would need to be assessed in more detail, i.e. the exceedance of a 10% change for more than 7 days acts as a “red flag”. The assessment of potential exceedance of these thresholds requires that detailed water quality modelling be undertaken. The detailed modelling will also provide a much firmer scientific basis for the ecological assessment than would otherwise be available.

Detailed Ecological assessment

The ecological assessment will investigate the anticipated impacts during the construction, namely those associated with the dredging activities. These include:

- Visual (or aesthetic) impact: Due to large turbidity plumes associated with the dredging operations;
- Mariculture activities – potential smothering caused by large quantities of particulate matter and potentially reduced growth rates; and
- Ecosystem functioning/benthic community structure – changes in light conditions can lead to reduction in primary productivity while smothering can cause significant changes in benthic community structure.

While the aesthetic impacts will be assessed as part of the turbidity modelling study, the remaining impacts indicated above will form part of this Ecological Impact Assessment.

The following terms of reference apply to the study:

- Identify the nature of risks posed to the Saldanha Bay ecosystem and ecosystem services dependant on this marine environment;
- Qualify the risks that the proposed operations may pose in terms of accepted water and sediment quality guidelines, including any water quality management plans of relevance to the bay. If water/sediment quality guidelines are exceeded, quantify the risks in terms of the proportions of biological populations under threat and qualify these in terms of ecological consequences;
- Where required, identify the need for mitigation and suggest methods to achieve this; and
- Devise a practical monitoring programme that will, firstly, allow real time control of project activities to reduce environmental risks and, secondly, facilitate a qualitative determination of actual versus predicted project impacts.

The assessment will be based on existing baseline data, data and experience from other similar operations as well as the outputs of both the turbidity and water quality modelling studies proposed above. This information, together with specialist knowledge of ecosystem impact thresholds, i.e. for mariculture activities and the benthic community, will be used to predict likely dredging impacts and long term changes in water quality. For example benthic invertebrate communities could respond to impacts from construction and operation by showing different biomass and species abundance, usually as a result of deposition of large amounts of material that was suspended during dredging and construction.

The potential impacts will be assessed both against existing environmental quality objectives for the bay that include water quality guidelines and acceptable thresholds of changes in ecosystem function as proposed for the Saldanha Bay Water Quality Management Plan and potential impacts on the benthic ecology.

6.3.15.3 Shoreline Stability Impact Assessment

The potential changes in the shoreline have been and will be subject to extensive studies during the engineering feasibility phase of the project. The scope of this study includes an assessment of the marine specialist studies comprising the engineering feasibility and technical studies required for the EIA study and will entail:

- Assessment/interpretation of other marine studies, which address issues pertinent to shoreline erosion;
- Provision of descriptive impact tables, with associated discussion (e.g. on why and how the various ratings (high, medium, low etc) are predicted. This would require an indication of what is acceptable in terms of erosion – the other marine studies should provide the necessary background for this assessment;
- Estimation of the impact of the proposed new port configuration on Langebaan beaches and lagoon, as well as on Small Bay and summarising the findings in impact tables. The differences in wave, current and sediment transport patterns determined in the engineering shoreline study will be used;
- Modelling will be conducted for the area south of Club Mykonos (including Langebaan). Prediction of impacts on this area will be also be corroborated by relying on work done previously in the greater bay;
- The impact of the proposed new port configuration on the beach between Club Mykonos and the causeway will be determined and listed in impact tables;
- Possible mitigation measures to limit shoreline erosion or to select an alternative layout that allows accretion where required in the bay, will be identified; and
- A recommendation will be made regarding monitoring of the shoreline before and after the expansion to the iron ore terminal.

This study will also be required to assess the potential impacts of offshore disposal on shoreline stability: The approach assumes that:

- That the pre-defined dumping method ensures that no localised sediment accumulations of more than 10 to 30 centimetres in the vertical profile will occur. A single, pre-defined dumping method (and associated timing) will be applied, i.e. one disposal scenario and dredge disposal sediment configuration. The objective of the study is not to inform or refine the dumping method.
- No assessment of the effects of sea-level rise is anticipated in this study. In the event that undesirable erosion is predicted, it may be necessary to investigate the additional impact of sea-level rise.
- No assessment of mitigation measures is included in this study; however, if there are shoreline stability effects, the proposed dump site will need to be relocated to increasingly greater depths until the shoreline effects are considered negligible.

6.3.15.4 Incremental Shipping Traffic

The terms of reference for this specialist incremental shipping traffic risk study has been formulated as follows:

- Confirm the ship size range and assess the increase in number of ships for the increase of iron ore export from 45 to 93 MTPA. This will be based on international shipping data and trends, as derived from international publications. Discuss the findings with the maritime staff of NPA at Saldanha;
- Discuss specific aspects related to shipping procedures and safety in the Port of Saldanha with the local maritime staff. This would concern pilotage, tug boat support, turning, berthing and mooring procedures, passing of moored ships, other maritime traffic in the port, etc. It will include an assessment of the availability and operational procedures of tugs for the present and required future port conditions (number, type, bollard pull, limiting operational sea state conditions, etc.), pilotage procedures and channel marker identification, port operational procedures and shipping traffic guidance systems, procedures and guidelines;

- Use the results of an available wave refraction study for Saldanha Bay, to obtain the wave climate in the ship manoeuvring area of Saldanha Bay, for the modified layout of the port. Analyse the wave conditions in the manoeuvring area, together with the local wind and current conditions, to assess any related increases in shipping risks;
- Identify potential sources of environmental risk due to increased shipping. These will include risks like shipping accidents, grounding, collisions, oil spills, pollution, ballast water discharge, accidental or illegal discharges (the actual impact of the increased volumes of ballast water discharge is part of the Water Quality Assessment);
- Determine the frequency and conditions under which possible risks associated with increased shipping traffic could occur;
- Assess the potential risks and possible impacts, particularly in terms of pollution, that could result from the risk sources identified, such as insufficient disaster management contingency plans; and
- Provide recommendations to reduce the potential risks associated with increased shipping traffic in Saldanha Bay, including implications for management systems and management controls for shipping in the area.

The above aspects will be detailed in a comprehensive report on risks of incremental shipping traffic. The basic information for this study will be mainly derived from earlier reports related to shipping in Saldanha Bay (CSIR, 2000 and CSIR, 2005) and from information obtained from Transnet and NPA Saldanha. The affected environment and relevant information will be evaluated and risk components related to shipping traffic will be identified.

6.3.15.5 *Marine Studies specific to dredge disposal impacts*

A study was commissioned to identify several possible dredge disposal sites. This study was aimed at conducting the necessary site characterisation studies as well as sediment quality investigations. Preliminary results from the investigations have resulted in the postponement of further studies on dredge disposal at

sea (Van den Bossche and Ramsay, 2007). The final choice of the disposal site at sea or land will be based on the feasibility of in-land disposal. The appropriate permits for dumping/disposal will be obtained once the disposal site has been selected. Direct liaison with Marine and Coastal Management is central to this exercise, and will be coordinated by the EIA team. The proposed specialist studies specific to dredge disposal and dumpsite selection and assessment are listed below:

- Field Survey of Dump-sites;
- Biological and chemical analyses of field survey data;
- Shoreline Stability Assessment (discussed above); and
- Turbidity modelling study extension to include assessment of dredge disposal.

6.3.15.6 *Integrated Marine Impact Report*

An Integrated Marine Impact Report will be compiled, in order to summarise the potential impacts during both the operation and construction phases of the project. The marine impact report will contextualise and address all the issues and impacts that have been identified to date in the EIA scoping procedure for the proposed expansion, as well as previous studies (i.e. Phase 1A, 1B, etc).

The report will be required to answer key questions on issues including, but not limited to the impact of the dredging and port expansion on:

- Shoreline stability;
- Beach litter;
- Beach erosion at specific beaches, particularly Langebaan, Lynch Point and Club Mykonos;
- Incremental shipping traffic, expanded stockyards, larger tonnages of ore throughput, etc) on the general function and integrity of the bay, i.e. the entire Saldanha Bay system: neighbouring beaches in Big Bay, Small Bay, and the Langebaan Lagoon;

- Marine disturbances such as dredging, underwater blasting and construction on water quality and turbidity standards in terms of the provisions of the London Convention; and
- The potential impact of climate change effects, such as global warming and sea-level rises, the impact on the frequency and pattern of waves and currents in the bay.

The Integrated Marine Impact Report must assess the potential changes in hydrodynamics and associated water quality and ecosystem function due to changes in the port layout. This will be based on both modelling studies and assessment of benthic ecology, based on existing data, and knowledge of potential impacts on the benthic ecology associated with dredge plume and long-term hydrodynamic changes in water quality functioning.

6.4 ASSESSMENT OF IMPACTS

The impacts listed in section 6.2.1 above have been described in a cursory way that seeks to outline the key issues and / or potential impacts for further investigation and assessment in the EIA phase. These issues will need further assessment in the environmental impact assessment, during which the significance of impacts will be evaluated by specialists, according to scientific criteria and assessment methods.

The EIA phase of this study is specifically designed to include the full assessment of all the cumulative impacts arising from the iron ore facility expansion from 38 - 93 MTPA. It is proposed that the specialist studies be concluded with an integration workshop, where the inputs from various specialist fields are incorporated into the EIA. All the issues raised in this scoping report are to be included in the final terms of reference for the various specialists studies. Specialists will also be required to comparatively assess the impacts associated with the various alternatives, and recommend the most preferred options.