TRANSNET

SCOPING AND ENVIRONMENTAL IMPACT ASSESSMENT

Scoping and Environmental Impact Assessment for the proposed Manganese Export Facility and Associated Infrastructure in the Coega Industrial Development Zone, Port of Ngqura and Tankatara area

DRAFT EIA REPORT

CHAPTER 10:

INTEGRATED WATER MANAGEMENT

Summary

The primary objective of this study is to identify the significance of possible environmental impacts of (1) water use, (2) domestic sewage discharge, (3) service wastewater discharge, and (4) stormwater discharge from the proposed site during construction, operation and decommissioning of the proposed Manganese Ore Export Facility. It must be noted that the assessment was made based on the commitments specified by the project proponent within design documents and associated management practises to be followed on-site during the construction period (i.e. requires implementation of management measures already proposed by the project proponent).

The following impacts have been identified:

- **Construction**
  - **Water Use**
    Increased water use during construction is expected to have a **medium** negative impact (with no mitigation) and **low** negative impact (with mitigation) (with implementation of management measures already proposed by the project proponent). This is because of the small quantities of potable water required during construction. It is, however, important that stated quantities are adhered to, and that water conservation should still be practiced.
  - **Domestic Wastewater Discharge**
    Domestic wastewater discharge during construction is expected to have a **medium** negative impact (with no mitigation) and **low** negative impact (with mitigation). This, however, requires normal sewage management practices already proposed by the project proponent to be adhered to (e.g. regularly empty toilets, safe transport and disposal of sewage, employee training, etc.). In addition, planned wastewater treatment facilities (upgrading of existing facilities and possible new facilities) in the future will ensure that sufficient wastewater treatment capacity is available.
  - **Service Wastewater Discharge**
    During construction, no service wastewater will be generated (i.e. hydrostatic testing of tanks or pipes with associated discharge is not expected).
  - **Stormwater Discharge**
    Stormwater discharges are expected to have a **medium** negative impact (with no mitigation) and **low** negative impact (with mitigation).
  - **Solid Waste Disposal**
    Non-hazardous solid waste disposal is expected to have a **medium** negative impact (with no mitigation) and **low** negative impact (with mitigation).
  - **Hazardous Materials/wastes Disposal**
    Hazardous materials disposal is also expected to have a **medium** negative impact (with no mitigation) and **low** negative impact (with mitigation, e.g. disposal at an appropriate hazardous waste facility – e.g. Aloes 2).

- **Operations**
  - **Water Use**
    Increased water use during operation is expected to have a **medium** negative impact (with no mitigation) and **low** negative impact (with mitigation) (with implementation of management measures already proposed by the project proponent – e.g. use of

surfactants). This is because of the small quantities of potable water required during operation. It is, however, important that stated quantities are adhered to, and that water conservation should still be practiced. In addition, planned water treatment facilities (upgrading of existing facilities and possible new effluent reclamation facilities) for future water supply ensure that sufficient water is available. Possible use of groundwater for service water purposes (e.g. dust suppression) can be considered if the available groundwater is of suitable quantity and quality (refer to Chapter 8 Groundwater specialist study for further details).

- **Domestic Wastewater Discharge**
  Domestic wastewater discharge during operation is expected to have a **medium** negative impact (with no mitigation) and **low** negative impact (with mitigation) (with implementation of management measures already proposed by the project proponent e.g. regularly inspect systems, appropriate maintenance, employee training, etc.). In addition, planned wastewater treatment facilities (upgrading of existing facilities and possible new facilities) in the future will ensure that sufficient wastewater treatment capacity is available.
- **Service Wastewater Discharge**
  Process wastewater discharge during operation is expected to have a **medium** negative impact (with no mitigation) and **low** negative impact (with mitigation). This assessment is based on commitments specified by the project proponent within design documents, and it is expected that proposed management actions are adhered to at all times. In particular, it is noted that service wastewaters will not generally leave the site (re-used) and if they do, will be disposed of at an appropriate treatment facility (e.g. via the municipal sewer, and if an agreement has been reached with the necessary authority). If this cannot readily be met, additional treatment processes may need to be considered.
- **Hazardous Wastes Disposal**
  Hazardous wastes generated at the Terminal and at the Compilation yard (e.g. chemical and oil wastes) disposal during operation is expected to have a **medium** negative impact (with no mitigation) and **low** negative impact (with mitigation). It is expected that good practice is followed throughout the facility (e.g. containment and immediate clean-up of any spillages, collection of chemical/oil wastes, disposal at an appropriate hazardous waste facility, etc.).
- **General Solid Waste Management**
  Non-hazardous solid waste disposal from operation of the facility is expected to have a **medium** negative impact (with no mitigation) and **low** negative impact (with mitigation).
- **Stormwater Discharge**
  Stormwater discharge during operation is expected to have a **medium** negative impact (with no mitigation) and **low** negative impact (with mitigation). Management actions include not releasing any contaminated stormwater from the site into the environment, but either treating it appropriately for re-use on site, or disposing thereof at an appropriate treatment facility.
- **Manganese Ore Mud Management**
  Run-off from the manganese ore stockpiles at the stockyard is likely to accumulate manganese ore dust, which will settle out in the silt traps (prior to the stormwater control dam) as a manganese ore mud. At this stage, the exact composition of the manganese ore mud is not known. Considering the Precautionary Principle, a waste stream will always be regarded as a hazardous waste where there is any doubt about the danger of the waste stream to the public or the environment. Given the above, and unless proven to the contrary during operations via analysis and characterisation, the manganese ore mud waste will initially need to be categorized as a hazardous waste and will need to be disposed of at an appropriate facility. Therefore, at this stage, a **medium significance negative impact** with regards to the manganese ore mud disposal is noted. If more clarity

is obtained regarding the mud composition (quality) and disposal options (i.e. agreements with Authorities) and that the Manganese ore mud is classified as a non-hazardous material, the proposed impact could be reviewed and modified.

In addition, if the manganese ore mud can be used for beneficial purposes (e.g. returned to the stockpiles and used as a sacrificial layer, or recycled in an alternative process), the impact could be further reviewed/modified (e.g. potentially to a **low** negative impact or a **positive impact**).

- **Decommissioning**
  The previously suggested best practice site management measures should also be followed during decommissioning.
  - **Water Use**
    Although no details are provided at this stage, it is anticipated that water used during decommissioning will largely be for domestic (potable) purposes, that the number of staff on site will be less than that required for construction (i.e. water use should be less than that used on a daily basis during the construction period), and that the period for decommissioning will be shorter than the construction period. Despite the lack of detail at this stage, it is anticipated that the daily quantities required for the decommissioning phase will therefore be less than that required during the construction phase (the significance of this negative impact was rated as low). Considering this, the **significance** of the **negative impact** of the use of water during the decommissioning phase of the project is considered to be **low**.
  - **Domestic Wastewater (Sewage)**
    During decommissioning, domestic wastewater will either be discharged via the CDC/NMBM sewage network or portable chemical toilets will need to be provided (for disposal at a suitable discharge facility/wastewater treatment works). As previously noted, the estimated quantities of potable water to be used during decommissioning are low. Consequently, domestic wastewater generated is also anticipated to be low. Despite the lack of detail at this stage, it is anticipated that the quantities generated during the decommissioning phase will be less than that generated during the construction phase (the significance of this negative impact was rated as low). Considering this, the **significance** of the **negative impact** associated with domestic wastewater (sewage) discharges is expected to be **low.**
  - **Stormwater**
    With respect to decommissioning stormwater, contamination could result from contact with, for example, chemicals, oils, fuels, sewage, solid waste and litter. To minimise any impact associated with this, the previously noted stormwater management measures should be maintained and associated processes should be adhered to. This will ensure that the **negative impact** associated with decommissioning stormwater is of **low significance**.
  - **Solid Waste/Redundant equipment**
    Non-hazardous solid waste generated during decommissioning/demolition is similar to that generated during construction and could include wood, metals, concrete, etc. The proposed management measures will ensure that the **negative impacts** associated with decommissioning solid waste is of **low significance**.
  - **Hazardous Waste/Redundant equipment**
    Decommissioning activities may pose the potential for leakage/spillage of petroleum based products (e.g. fuels, lubricants, hydraulic fluids) or chemicals. As previously noted, it is important that techniques for prevention, minimization, and control of these impacts are readily at hand. These techniques and associated good management practice (such as

that already proposed by the project proponent), will ensure that the **negative impacts** associated with decommissioning hazardous materials are of **low significance.**

The following summary is presented:

Construction	**Before Mitigation**	**After Mitigation**
Water Use	Medium	Low
Domestic Wastewater Discharge (sewage)	Medium	Low
Stormwater Discharge	Medium	Low
Solid Waste Disposal	Medium	Low
Hazardous Waste Disposal	Medium	Low
Operations	**Before Mitigation**	**After Mitigation**
Water Use	Medium	Low
Domestic Wastewater Discharge (sewage)	Medium	Low
Service Wastewater Discharge	Medium	Low
Stormwater Discharge	Medium	Low
Hazardous Wastes Disposal	Medium	Low
General Solid Waste Disposal	Medium	Low
Manganese ore Mud Management	Medium	Low

Decommissioning	**Before Mitigation**	**After Mitigation**
Water Use	Low	Low
Domestic Wastewater Discharge (sewage)	Medium	Low
Stormwater Discharge	Medium	Low
Solid Waste Disposal (demolition rubble)	Low	Low
Hazardous Waste Disposal	Medium	Low

Considering the above, the following summary of proposed mitigation measures is noted (see Section 10.8 for further detail):

- Integrated Water Management Study related mitigation measures already proposed by project proponent:
    - **Quality Management System**
        - Construction Environmental Plan and associated Standard Environmental Specification
        - Bunding
        - Emergency Systems (Fire)
        - Conveyor System optimisation/best practice measures
        - Dust Control optimisation/best practice measures including the use of surfactants
        - Stockyard, tippler and quay drainage optimisation/best practice measures
        - Stormwater control dams and associated stormwater reuse
        - Oily Waste Drains and Oil/Water Separator Systems
        - Manganese ore Spillage Management
        - Energy saving measures (which have an indirect positive impact on water use reduction)
- Integrated Water Management Study related additional mitigation measures (perhaps being planned, but not yet documented):
    - **Stormwater Management Plan for Operations**
    - **Railway Operation Management Plan**

- **Additional recommendations to be incorporated in Waste Management Plan**
- **Water Conservation and possible use of groundwater for dust suppression**

Considering the commitment by the project proponent to good practice, it is anticipated that the above items will receive the necessary attention.

Likely permits/licenses/agreements required from applicable authorities in terms of water use have also been noted. In particular, the Department of Water Affairs would require the project proponent to register the proposed stormwater dams/ponds, as their storage capacity exceeds 10,000 m^3. As it is proposed to construct a road bridge across the Coega River to access the stockyard, a permit for this activity will be required. Care should also be taken to ensure that other construction activities (e.g. construction of the stormwater control dam at the stockyard), does not impact on the Coega River.

The proposed waste management activities at the proposed Manganese Ore Export Facility require a waste management license. A waste license application has been lodged for the above mentioned activities with the National Department of Environmental Affairs and was acknowledged on 17 May 2012 (Reference number: 12/9/11/L920/1).

Contents

TABLES, FIGURES AND MAPS

CHAPTER 10: INTEGRATED WATER MANAGEMENT

This chapter presents the Integrated Water Management Specialist Study undertaken by Philip de Souza from Emanti Management (Pty) Ltd, under appointment to CSIR, as part of the Environmental Impact Assessment for the proposed Manganese ore export facility and associated infrastructure in the Coega Industrial Development Zone, Port of Ngqura and Tankatara area.

10.1 INTRODUCTION AND METHODOLOGY

10.1.1 Terms of Reference

The Integrated Water Management Specialist Study will investigate water use, the proposed handling of liquid waste generated on-site (e.g. domestic wastewater, contaminated stormwater), and the impacts and associated management of possible emergency conditions (e.g. spillages from stormwater facilities). The impacts will include confirmation and assessment of available water sources, liquid wastewater characterization (assumed minimal domestic wastewater, possibly contaminated stormwater from poor handling and/or spillage) and on-site liquid waste management requirements. The study includes the following components:

- ***Water Use***
  Consideration of the following water uses:
  - Preliminary earthworks
  - Manganese Ore Export Facility construction
  - Manganese Ore Export Facility operation: drinking-water, service water (e.g. dust suppression) and fire-fighting water
  - Description and quantification of water quality and quantity requirements for different uses (e.g. construction, domestic, etc)
  - Review of existing water use permit, identification of the source of any potable or recycled water required for the project, and confirm availability within the region for the provision of these water requirements. In addition, any potential sources of conflict that might arise regarding water availability and supply to the proposed project must be highlighted.
  - Assessment of the predicted quality of source water for the project against the design requirements for the project, with discussion of the implications thereof.
  - Brief description of any on-site water treatment facilities.

- ***Water and Wastewater Discharges***
  - Consideration of the following water and wastewater discharges: domestic wastewater (construction and operation), service wastewater (operation) and stormwater (construction and operation)
  - Identification and quantification of all wastewater streams (e.g. sewage, stormwater)
  - Identification of potential sources of environmental concern (e.g. erosion), sources of contamination, constituents of concern, their expected concentrations (if possible), and an assessment of the potential impacts thereof.
  - Description of the proposed wastewater/stormwater disposal approach and

identification of the points of discharge for wastewater/stormwater different streams.
  - o Review of any proposed product handling methods to minimize/prevent on-site spillages and associated water pollution.
  - o Review of any available spill contingency plan and associated management actions in response to an undesired event (e.g. spillage) proposed by the proponent.
  - o Discussion of the potential constraints (e.g. legislative, environmental or practical) associated with wastewater/stormwater disposal.
  - o Description of any on-site wastewater treatment facilities and stormwater protection facilities/features (e.g. bunding, oil/water separators, etc).

- ***Service Wastewater (and Stormwater) Treatment Considerations***
  - o Investigate need for treatment, recycle/re-use and available options to achieve this.

In addition to the above, the following will also be provided:

- A preliminary water balance
- Identification of opportunities for improving integrated water management and promoting water conservation (if necessary)

10.1.2 Approach and Methodology

The objective of this study is to identify the significance of possible environmental impacts of (1) Water use, (2) Domestic sewage discharge, (3) Process wastewater discharge and (4) Stormwater discharge from the proposed site during construction, operation and decommissioning of the proposed Manganese Ore Export Facility and Associated Infrastructure.

The general approach used in this study was to gather all information and data available from the Coega IDZ, the Port of Ngqura and the proposed project, and to use this information to determine the significance of possible environmental impacts of water use, domestic wastewater discharge, process wastewater discharge and stormwater discharge of the proposed project. This included discussions with the project proponent, other project specialists and team members, and officials from Coega Development Corporation (CDC) and Nelson Mandela Bay Municipality (NMBM).

In addition, a site visit was conducted to the Coega IDZ on 24th April 2012, and potential sites for the stockyard, railway compilation yard and railway extension were examined. For security reasons, the port terminal area was not included within the site visit.

10.1.3 Assumptions and Limitations

The study is largely based on information provided by the project proponent and associated specialist studies conducted by other Coega IDZ project proponent or scientific studies undertaken within the Coega IDZ. The impact assessment conducted in this study is therefore reliant on the completeness and accuracy of these studies, and the verification thereof through the EIA process. The following assumptions are also noted:

- For water use calculations during the construction period, a 28 day working month is assumed.
- As noted in the Final Scoping Report, the terminal will operate on a 24-hour (3 x 8-hour shifts), 365 days per year basis.
- As noted in the Final Scoping Report, operation of the Manganese Ore Export Facility would require approximately 250 employees while the rail component would require approximately 370 employees during a 24 hour operation (***NOTE:*** This is subject to change based on actual operational requirements)

- As noted in the Final Scoping Report, the construction period is anticipated to be 36 months.

10.1.4 Source of Information

Information presented in this study is largely based on:

- Specific information supplied by the project proponent (technical details of the project).
- Specific information supplied by the Coega Development Corporation (CDC) (rainfall data, water quality monitoring data, water supply from NMBM).
- Information gathered/experience gained from previous Environmental Impact Assessments (EIAs) within the Coega IDZ.
- Available information from similar EIAs (i.e. manganese terminals, railways, ports and harbours, transportation) conducted in other parts of the world was also obtained and reviewed.
- Information provided by CDC regarding the availability of water/wastewater services for construction and operation of the proposed facilities. In addition, future infrastructure developments were also highlighted.
- Manganese ore analysis data and Toxicity Characteristic Leaching procedure (TCLP) test data provided by the team members.

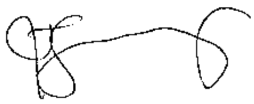
The above information was used to assess the impact associated with water use and wastewater generation/discharge. Based on the significance of impacts, recommendations have been made regarding mitigation measures, environmental management and monitoring.

10.1.5 Declaration of Independence

The declaration of independence by the Integrated Water Management specialist is provided in Box 10.1 below:

BOX 10.1: DECLARATION OF INDEPENDENCE FOR NOISE IMPACT ASSESSMENT

I, Philip de Souza, declare that I am an independent consultant and have no business, financial, personal or other interest in the proposed Manganese ore export Terminal, Port of Ngqura, application or appeal in respect of which I was appointed, other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of my performing such work.



Philip de Souza
BSc Eng (Chem), (BSc Eng Hons) Water Utilization
Registered with ECSA, SAIChE, WISA and IWA

10.2 DESCRIPTION OF PROJECT ASPECTS RELEVANT TO INTEGRATED WATER MANAGEMENT

10.2.1 Background

The proposed manganese ore stockyard and handling facility is located within both Zone 8 (Transnet National Ports Authority) and Zone 9 (CDC) of the Coega IDZ and Port of Ngqura (Figure 10.1). The proposed rail compilation yard and rail doubling are located within Zones 11 and 13 (CDC, Transnet Freight Rail) of the Coega IDZ and the remainder of Farm Tankatara Trust 643 (Tankatara Properties (Pty) Ltd) (Figure 10.2).

The project will include the construction and operation of a bulk terminal for handling manganese ore, and an associated rail compilation yard with a portion of the rail link line between the new Coega compilation yard and the existing marshalling yard being doubled to allow for transport of manganese ore to the port terminal. This will include the construction of two stormwater control dams (one near the stockyard and one at the quay) and two stormwater attenuation ponds at the rail compilation yard (one north of the staging lines and one towards the south), bulk services access roads, including a bridge over the Coega River for access to the compilation yard. A detailed project description is available in Chapter 2 of the EIA report.

Transnet National Ports Authority will provide bulk services connections at the proposed Manganese Ore Export Facility boundary for the area south of the N2 national road. Bulk services connections for the proposed Manganese Ore Export Facility, north of the N2 national road will be provided by the Coega Development Corporation (CDC) and the NMBM respectively.

The following section provides a brief description of water use and wastewater generation/discharge for each of the main components of the project. This assists with identifying potential sources of environmental impact.

Figure 10.1: Proposed location of Manganese ore stockyard in relation to N2 bridge with associated Coega River flowing underneath (at left – looking eastwards) and port in distance (at right – looking southwards)

Figure 10.2: New railway would be alongside existing railway (at left) and existing railway line within Coega IDZ (at right) (opposite proposed Manganese ore stockyard) where tippler will be located

10.2.2 Proposed Manganese Ore ExportTerminal

With regards to the integrated water management study:

- Stormwater control dam at the stockyard (refer to Figures 10-3)
  - Storage capacity of approximately 59 ML.
  - Free board of 800 mm at full capacity with an additional free board allowance for accommodating a 1:100 year fluid inflow.
  - The main function of the stormwater control dam will be to collect stormwater runoff from the stockyards and water from the tippler sump via pipes attached on the conveyor structure.
  - Water collected in the stormwater control dam will be re-used in the dust suppression system at the stockyard.
  - Two silt traps/settling ponds leading to the control dam will allow manganese ore dust particles and solids to settle out before entering the main dam. These ponds and the stormwater control dam will be cleaned regularly and the manganese ore mud from these ponds will be dealt with in terms of an onsite waste management policy.
- Stormwater control dam at the quay (refer to Figure 10-3)
  - Storage capacity of approximately 11 ML.
  - Designed for accommodating a 1:100 year fluid inflow.
  - The main function of the stormwater control dam will be to collect stormwater runoff from the quay.
  - Water collected in the stormwater control dam will be re-used in the dust suppression system at the stockyard.
  - The manganese ore dust and solids will settle in the control dam which will be cleaned regularly. The manganese ore mud from these ponds will be dealt with in terms of an onsite waste management policy.
- Provision has been made for the supply of water, stormwater drainage as well as sewage systems.

The Environmental Screening Study (CSIR, 2008) identified three different locations for the proposed manganese ore stockyard. Option 1 (North of the National Road N2) was selected as the preferred location. Similarly, five different layout options for the overland conveyor route were also assessed. Option 1A was selected as the preferred option. The remainder of this study therefore only considers these selected options. The presentation of different scenarios is therefore not necessary.

Note that the conveyor linking the stockyard to the shiploader does not cross the Coega River, and therefore this activity does not need a permit in terms of the National Water Act 36 of 1998.

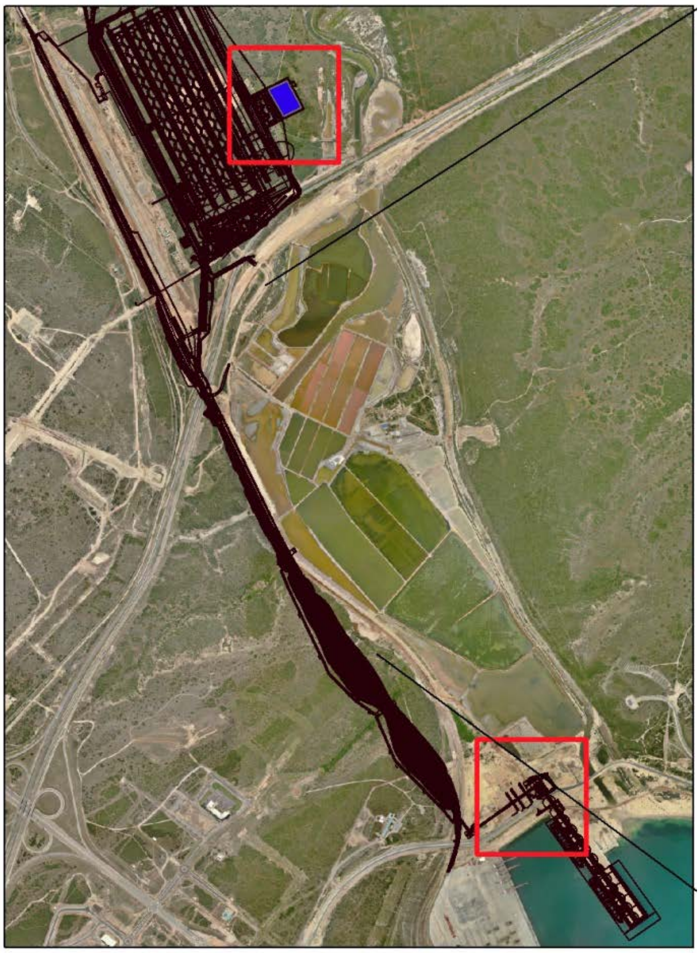


Figure 10.3: Location of the Stormwater Control Dam at the proposed manganese ore stockyard and at the quay (Hatch, 2012)

10.2.3 Proposed Rail Compilation Yard

With regards to the integrated water management study:

- Two attenuation ponds to collect all stormwater runoff from this area with a combined storage capacity of approximately 7.8 ML (refer to Figure 10.4). An attenuation pond (0.2

ML) will be located on the northern side of the compilation yard and the main attenuation pond (7.6 ML) will be located towards the south.

- A locomotive wash bay for the cleaning of the locomotives. Provision will be made for a dirty/oily water treatment facility (for dirty water generated from the wash bay as well as the maintenance facilities)
- The wash bay is not covered and therefore any rain that falls on the hardened surface will go through the oil/water separator and then overflow will be sent to the sewer. Only in the event of a major rainfall will that overflow go into the stormwater attenuation pond (i.e. only stormwater from the wash bay will go through the oil/water separator). If the quality of this water is still in question following treatment, it will be sent to the sewer system (if not damaging to the package plant system, and/or other municipal sewage systems).
- No stormwater from the roads, buildings roofs, etc. will be sent to the stormwater attenuation pond as this is considered clean, and will just be released in natural system. To ensure this, proposed site management practices (as noted in Section 10.8) will need to be strictly enforced. The only water that will hence go to the attenuation pond is the stormwater generated from the rail formation in the rail yard.
- Provision has been made for the supply of water, stormwater drainage as well as sewage systems.

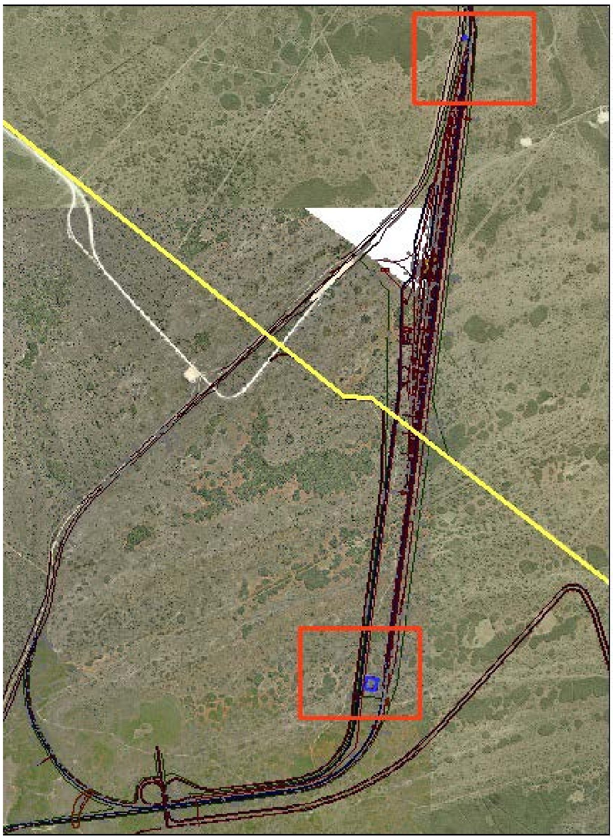


Figure 10.4: Location of the two Stormwater Attenuation Ponds at the proposed compilation yard (Hatch, 2012)

The two alternative locations of the proposed compilation yard do not impact on the integrated water management study (i.e. no difference between the two alternatives in terms of integrated water management). The presentation of different scenarios is therefore not necessary.

10.2.4 Proposed Doubling of Railway

The railway line between the proposed Coega compilation and the existing marshalling yard in Zone 9 of the Coega IDZ is planned to be doubled. This will serve as a dedicated railway line to allow for the transportation of the rakes between the proposed Coega compilation yard and the tippler. This new dedicated line is required given the use of the existing rail line for freight and other purposes. This second railway line will be constructed within the existing rail reserve; however additional rail reserve will be required to ensure that the reserve width is sufficient.

No alternatives exist. The presentation of different scenarios is therefore not necessary.

It is anticipated that water use and associated wastewater generation will only be applicable during the construction phase (i.e. when the railway is doubled), and not during operation for this component.

10.2.5 Water Balance – Water Used and Associated Wastewater Generated during Operation

Considering the information presented, proposed water use and associated wastewater generation (during operation) for the three components of the project (i.e. manganese ore export terminal, rail compilation yard, and doubling of railway) is largely captured within the following basic flow diagram (Figure 10.5).

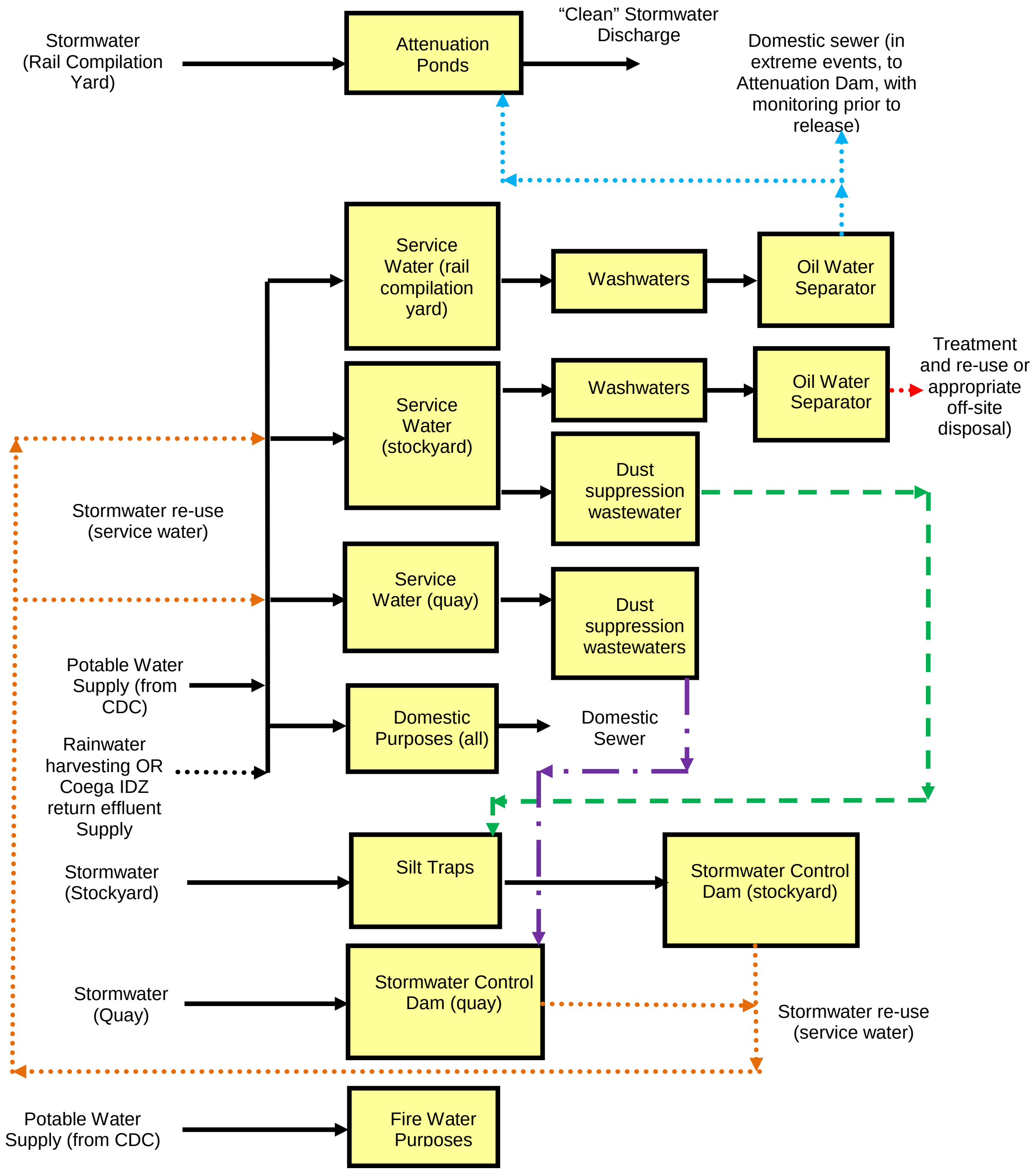


Figure 10.5: Basic Water Use and Wastewater Generation (Operation Phase) for the manganese ore export terminal and rail

With reference to the above diagram, the following is proposed by the project proponent:

- There will be an extensive drainage network throughout the site with:
    - The rail component will have open, self-cleaning style drainage (for aiding maintenance)
    - The terminal will have sub-surface drains leading to silt traps
    - Cleanout pits will be self-draining where possible to facilitate dry clean out
    - Cross drains to allow safe dozer crossing and ease of cleanout

- All water in the terminal site boundary will drain to the stormwater dams. For the rail component, clean water will drain naturally off site.

- Raw water storages shall be monitored for blue green algae detection for primary/secondary contact safety considerations.

- ***Potable water*** used in the project will be obtained directly from the CDC (via municipal supply).
    - Rail compilation yard
        - Drinking-water purposes 47 m³/day.
    - Manganese ore export terminal (stockyard and tippler)
        - Drinking-water purposes 7 m³/day.
    - Quay
        - Drinking-water purposes 5 m³/day.

  Although collected stormwater will be used for some on-site activities, it is anticipated that a shortfall of potable water will need to be provided to meet the water demand requirements (i.e. to meet anticipated shortfalls at the stockyard and the quay for use in dust suppression). Surfactants will be used that will further reduce potable water consumption.

  Other service water related to potable water requirements will be discussed under "Service Water".

- ***Service water*** will be obtained from both collected stormwater run-off (collected at various dams) and potable water supply from CDC where treated effluent is not available or of required quality (the balance). The collected stormwater run-off will go through silt-traps to remove solids (and could perhaps also include pH correction, if necessary) before it will be used as service water in the stockpile dust suppression system and/or for wash down purposes. Service water demands therefore include:

    - Rail compilation yard
        - General wash down
            - The wash bay will be uncovered and will be used for the cleaning of locomotives and provision will be made for a dirty/oily water treatment facility (for dirty water generated from the wash bay, as well as the maintenance facilities).
            - Although washing of vehicles is not in the current engineering scope for the rail compilation yard (there is little to no manganese ore in the rail compilation yard as the manganese ore is not handled at the yard), the operational Environmental Management Plan will require that if vehicles are dirtied by manganese ore they be washed and that no vehicles are allowed to leave the site unwashed. This is therefore an occasional activity that would happen at an average of once a week and the water demand for this activity is estimated to be below 200 L per activity. The water demand for this wash bay area needs to be catered for in addition to the potable demand for the facilities.

- General industrial facilities use.
- Water is supplied directly from the municipal system (i.e. no on-site storage reservoirs).
- Approximately 34 m^3/day is required for services.

- Manganese ore terminal
    - General wash down
        - A wash bay is available to wash off manganese ore from vehicles. This is an occasional activity that happens at an average of once a week and the water demand for this activity is estimated to be below 200 L per activity. The water demand for this wash bay area needs to be catered for in addition to the potable demand for the facilities.
        - The wash bay will not be covered. Provision will be made for an oil/water separator (for dirty water generated from the wash bay and from rainfall onto the hardened surface of the wash bay area).
    - Dust suppression (stockpile sprays, water addition to manganese ore unloading and loading streams)
        - The approach to dust suppression water usage is that there will initially be two sources of water namely: (1) water from stormwater run-off, and (2) water from the municipal water supply.
        - Water collected through the existing stormwater systems will be treated (via silt traps) and recycled for dust suppression.
        - The amount of water required for dust suppression will be dependent on the method employed, namely: (1) water only suppression or (2) water and surfactant suppression.
            - If water only suppression is utilised, approximately 895 m^3/day will be required for the dust suppression system (combined total for the stockyard and quay).
            - If water and surfactant suppression is utilised, approximately 306 m^3/day will be required for the dust suppression system (combined total for the stockyard and quay).
            - The above conservative estimates can be considered the worst case scenario of what might be required from the municipal potable water supply, given that:
                - These estimates do not consider the positive impact of (1) probable recycling from collected seepage from the stockpiles into the stormwater control dams and (2) the use of any collected stormwater (i.e. from rainfall events) which could contribute on average approximately 72 m^3/day (not guaranteed, as based on storm events):
                    - This could reduce municipal potable water requirements to approximately 823 m^3/day if water only suppression is utilised (total for the stockyard).
                    - This could reduce municipal potable water requirements to approximately 234 m^3/day if water and surfactant suppression is utilised (total for the stockyard).
            - As a requirement there will be water storage for 48 hours of normal hourly usage. The storage required for potable water to be used for drinking-water and water for dust suppression purposes at the stockyard side is therefore dependant on the proposed method of dust suppression, and could either be approximately 1 646 m^3 (~1.7 ML) if water only suppression is utilised (and assuming proposed recycling of water from the stormwater dam occurs) and

approximately 468 m³ (~0.5 ML) if water and surfactant suppression is utilised (and assuming proposed recycle occurs).
    - Therefore, considering the worst case scenario, a reservoir of approximately 2 000 m³ (~ 2 ML) is required for both drinking-water and service water purposes. ***NOTE:*** A separate 1.5 m^3 tank has already been provided for at the stockyard administration area as back-up water supply to the offices.
- Quay
  - Dust suppression (water addition to manganese ore unloading and loading activities)
    - As noted above, the approach to dust suppression water usage is that there will initially be two sources of water namely: (1) water from stormwater run-off, and (2) potable water from the municipal water supply.
    - Water collected through the existing stormwater systems will be pumped to the main dam for treatment (i.e. settling and recycled for dust suppression.
    - The inclusion of silt traps at the quay stormwater control dam is not considered as the project proponent is only expecting a small amount of silt. This is due to the fact that water collected in this dam will be from the hard surfaces around the shiplaoder rather than ore stockpiles. The dam will be lined, and any fine silt collected will be cleaned by hand for apporpriate disposal/use.
    - The amount of water required for dust suppression will be dependent on the method employed, namely: (1) water only suppression or (2) water and surfactant suppression.
      - If water only suppression is utilised, approximately 45 m³/day will be required for the dust suppression system (total for the quay).
      - If water and surfactant suppression is utilised, approximately 22 m³/day will be required for the dust suppression system (total for the quay).
      - As a requirement there will be storage for 48 hours of normal hourly usage. The storage required for potable water to be used for both drinking-water and dust suppression purposes at the quay side is therefore dependant on the proposed method of dust suppression, and could either be approximately 90 m³ if water only suppression is utilised (and assuming proposed recycle occurs) and approximately 44 m³ if water and surfactant suppression is utilised (and assuming proposed recycle occurs).
      - Therefore, considering the worst case scenario, a reservoir of approximately 100 m³ is required for both drinking-water and service water purposes.

- ***Domestic wastewater*** generated (from potable use) will be collected and treated on-site (as appropriate) and/or discharged to the CDC sewer system for off-site treatment.
  - Rail compilation yard
    - Sewage is to be treated on-site in a package plant.
    - A sewage pump station will be required at facilities and amenities where it cannot gravitate to the sewer treatment package plant. The package plant will be designed such that it will be able to link into and integrate with the CDC sewer reticulation system via a pump station.
  - Manganese ore terminal

    - Sewage generated will be collected in a conservancy tank system and pumped to the CDC sewer network and connected to the existing municipal sewer reticulation system for off-site treatment.
  - Quay
    - The quay sewer system will be connected to the existing sewer system.
    - No sewage removal is allowed for ships.

- ***Service wastewater*** generated will consist of:
  - Rail compilation yard
    - Rail car maintenance could include a high-pressure water wash which may contain residues from transported materials (i.e. Manganese ore), paint, oil and grease, and other contaminants. Various solutions (e.g. caustics or acids) are often used to remove grease and dirt from axles and other metal parts, rust removal, etc. The used wash water will be sent to the oil/water separator and thereafter to the on-site package plant and then associated sewer system (must meet agreed upon water quality requirements prior to discharge). If the water quality does not meet agreed upon requirements, additional treatment will be required or the option of carting these washwaters to an appropriate off-site treatment facility must be considered.
  - Manganese ore terminal
    - Truck washing could include a high-pressure water wash bay which may contain residues from transported materials (i.e. Manganese ore), paint, oil and grease, and other contaminants. The used wash water will be sent to the oil/water separator for treatment. The water will then be re-used as a service water (e.g. for dust suppression). If treatment is insufficient, additional treatment will be required or the option of carting these washwaters to an appropriate off-site treatment facility must be considered.
  - Quay
    - Spillage, wash down and stormwater for the entire length of the quay will be captured and returned to the stormwater control dam (for eventual re-use). If treatment is insufficient, additional treatment will be required or the option of carting these washwaters to an appropriate off-site treatment facility must be considered.

- ***Stormwater*** which is not polluted by industrial activities can be considered “clean” and can be discharged off-site without any treatment. For this project, the project proponent aims to collect and re-use “dirty” stormwater, as this will reduce the water demand for the facility. In order to do this, two stormwater collection dams have been proposed. All “dirty” (contaminated) stormwater (e.g. Manganese ore dust, oil, chemical spillages) will be separated from the “clean” stormwater and collected for treatment. Separate stormwater management systems are required for the rail compilation yard, marshalling yard, stockpile area and the shiploader berth due to the geographical nature of the project. In particular:
  - Rail compilation yard
    - For this component, the project proponent has indicated that stormwater would be clean, and can therefore be discharged off-site. Stormwater quality can easily be compromised by poor housekeeping, accidental release of service wastewaters, and even neighbouring industries. Although the facility designs include stormwater management and oil/water separators (where necessary), stormwater quality monitoring will be required to ensure that no contaminated stormwater leaves the site.

    - The capacity of the proposed stormwater attenuation dam, located to the south of the compilation yard is therefore 7 800 m³ (or ~7.8 ML). The stormwater attenuation pond located to the north of the compilation yard will be approximately 200 m^3 (0.2 ML).
- Manganese ore export terminal
    - Marshaling yard – stockpile area
        - Stormwater run-off from the marshalling yard is directed to the stockpile management system.
        - There are no particular substrata permeation problems at the yard and accordingly no impermeable layer has been provided.
        - The bathtub type manganese ore rail wagons preclude any possibility of manganese ore on the ground in this area.
    - Stockpile area
        - The stockpile area is underlain by an impermeable PVC layer, which is furthermore protected by selected layerings.
        - The stockpiles are sloped towards the two ends and stormwater and spray water is directed into two settlement ponds at these ends via subsurface drains.
        - The coarse manganese ore particles settle out in the ponds and overflow water enters a stormwater control dam with holding capacity sufficient for a 1:100 year storm. Spray water for dust mitigation purposes will be pumped from the catchment dam in a closed circuit system. In times of drought, make up water will be utilised to supplement the catchment dam water supply. It is anticipated that evaporation and spray water draw off will largely ensure that minimal overflow occurs from the catchment dam into the Coega River. Although an overflow is not anticipated, if this were to occur, the water quality will need to conform to applicable water quality regulations.
        - The stormwater control dam is sized to satisfy the Department of Water Affairs requirement to accommodate a storm with a return period of 1:100 years plus a free board of 800 mm.
        - The capacity of the proposed stormwater control dam is therefore 59 450 m³ (or ~59.5 ML).
        - Build-up of sediment from the settlement ponds will be regularly removed by mechanical means (the silt trap will be accessible with a bob cat) and disposed of at an approved waste disposal site or possibly re-used as a sacrificial layer for the stockpiles.
- Quay
    - The berth will be graded to drain all stormwater into a control dam north of the berth.
    - This dam will allow for coarse particles to settle. These particles will be periodically removed via mechanical means and disposed of at an appropriate waste facility or possibly re-used as a sacrificial layer for the stockpiles.
    - Water from the control dam will also be utilised for dust mitigation sprays.
    - The control dam has been sized to accommodate run off from a 1:100 year storm.
    - Any spillages that may occur will be immediately cleaned, and the manganese ore that has been spilt will be trucked back to the stockpile.
    - The capacity of the proposed stormwater control dam is therefore 10 125 m³ (or ~10 ML).

In terms of Department of Water Affairs (DWA) requirements, storage dams/ponds larger than 10 000 m^3 will need to be registered with the Department (i.e. this therefore applies to the stormwater dam at the stockyard area and at the quay).

- **Oil waste** (from oil drains and oil/water separation) and **oiled waste** (oiled water, oiled materials) will be collected and disposed of at an appropriate off-site processing facility.

Fire water will be stored in appropriate on-site reservoirs. The function of the fire protection water supply and storage system is to receive and store sufficient water for fires. Fire protection and emergency systems shall comply with required regulations/standards/insurance requirements. There will be separate fire water storage facilities from the normal water storage system for the rail compilation yard, stockyard/tippler and the quay area. The fire water system is separate to the site potable water supply reticulation system and will maintain a fail-safe fire fighting capability. The fire water system is anelectrically pumped system with a diesel pump on standby for emeregencies. The fire water system is fed from the potable water system and includes a reservoir on ground level with a 1 ML capacity. The volume of reserve for fire water is equivalent to a 1-hour fire duration at 1200 L/min. Fire water will be provided through the reservoir to all hydrants on the reticulation system at minimum pressure of 300 kPa and flow of 20 L/s. The required fire water storage for the various areas is noted below:

- o Rail compilation yard
  - Fire water storage of 1 ML.
- o Manganese Ore terminal (stockyard and tippler)
  - Fire water storage of 75 m^3.
- o Quay
  - Fire water storage of 36 m^3

The above information will be used to identify potential water related impacts from the proposed project.

10.3 DESCRIPTION OF THE AFFECTED ENVIRONMENT

In addition to information provided in Chapter 3, this section provides an overview of the surface water and groundwater environments of the Port of Ngqura, the Coega IDZ and the Farm of Tankatara Trust 643 in which the proposed Manganese Ore Export Facility and associated infrastructure is proposed. The majority of information used in this chapter was sourced from studies conducted by the Coega Development Corporation (CDC) and recent EIAs conducted in the Coega area.

10.3.1 Water Quality Monitoring

Since 2007, SRK Consulting has been appointed by the CDC to perform a water quality monitoring service for the CDC. The work programme includes the following monitoring activities:

- Groundwater monitoring 6 times a year at 6 boreholes
- Surface water monitoring 6 times a year at 12 points along the Coega River
- Sediment sampling once a year at 15 points along the Coega River

The monitoring points are indicated in the figure below (Figure 10.6).

A description of the surface water and groundwater environment can be found in Chapters 9 and 8 respectively.

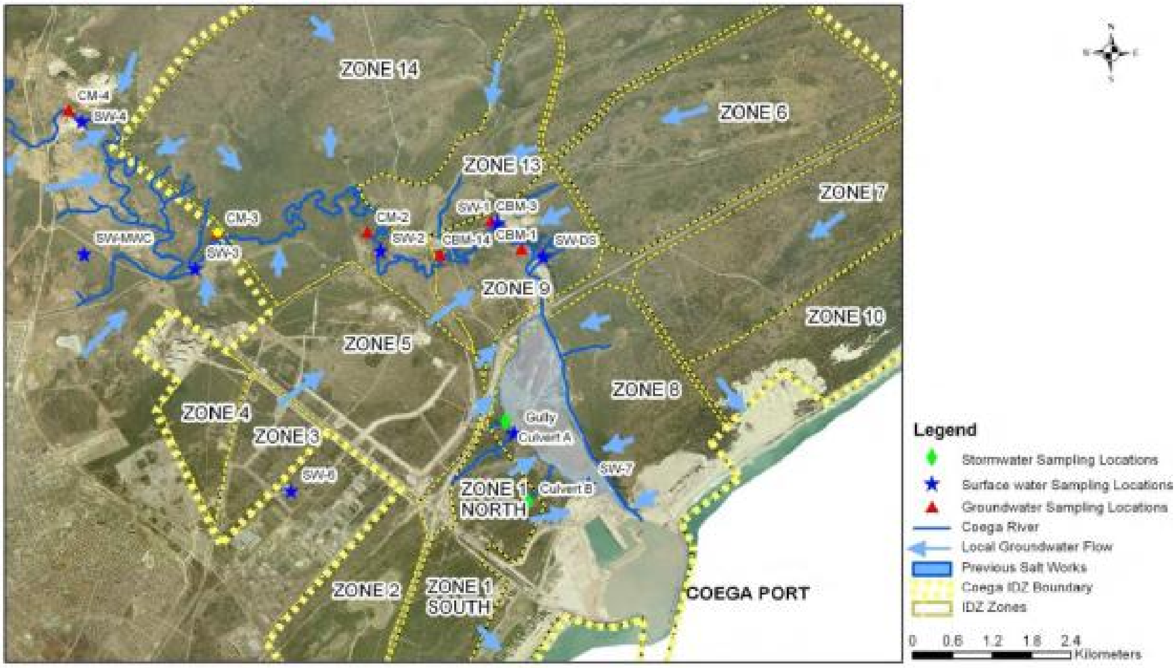


Figure 10.6: Location of current water quality monitoring points within the Coega IDZ (SRK Consulting, 2011)

10.3.2 Stormwater Environment

The following section describes typical rainfall characteristics for Port Elizabeth and for the proposed site, and also highlights current stormwater quality monitoring initiatives by the CDC within the Coega IDZ.

Rainfall data from the 1961 to 1990 dataset for Port Elizabeth supplied by the South African weather service is shown in Table 10.1 and Figure 10.7 below (Eskom, 2006).

Table 10.1: Rainfall data for Port Elizabeth (1961 – 1990) (Eskom, 2006)

	24 Hour Maximum [mm]	Monthly rainfall [mm]		
		Minimum	Mean	Maximum
Jan	68	6	36	122
Feb	121	6	40	138
Mar	224	5	54	309
Apr	105	12	58	148
May	76	6	59	154
Jun	60	4	62	210
Jul	99	3	47	215
Aug	77	5	64	183
Sep	429	3	62	468
Oct	46	18	59	147
Nov	52	10	49	112
Dec	95	7	34	137
Year	**429**	**406**	**624**	**1068**

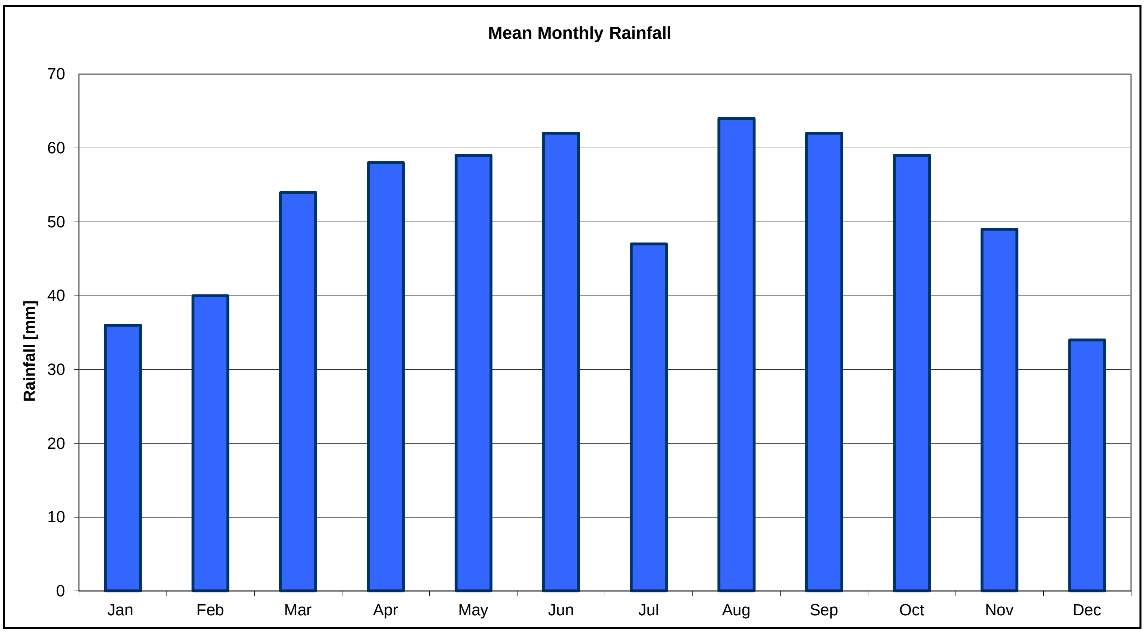


Figure 10.7: Monthly Rainfall for Port Elizabeth (1961 – 1990) (Eskom, 2006)

The above data shows that, in general: (i) rainfall occurs throughout the year, with no real dry spells, and (ii) heavy rainfall events have been recorded in the past. The above data highlights that storm events are likely and that it is therefore essential that adequate attention has been given to stormwater management systems.

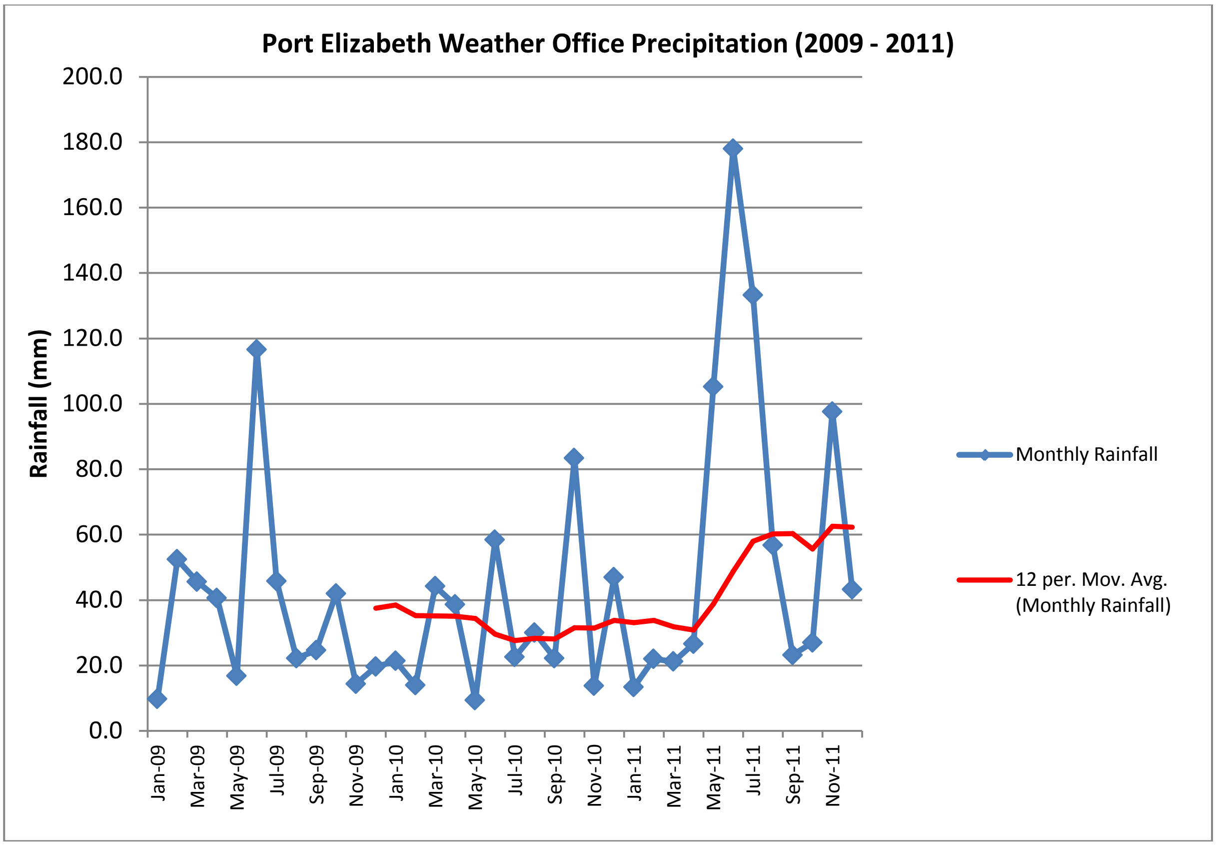


Figure 10.8: Rainfall Data for Port Elizabeth (2009 – 2011) (Pillay, 2012)

The above data (Figure 10.8) confirms that no real dry spells are evident, with rainfall events occurring throughout the year. ***NOTE:*** The design assumes that very little stormwater will be available for re-use, and therefore the design caters for a worst case scenario (with long dry spells/dry years being taken into account).

In addition to the above, the CDC has undertaken monitoring of rainfall events and established stormwater quality monitoring within the IDZ. This has helped to establish a baseline of information prior to the introduction of industries within the Coega IDZ. Considering the above, the following rainfall data from the South African Weather Service Station at Ngqura (near the TNPA offices) is presented in Table 10.2 and Figure 10.9. Importantly, data collection commenced in 2003, and 2008 - 2010 were noted as “drought” years, indicating the typical conditions where potable water demand for dust suppression would be greatest.

Table 10.2: Monthly Daily Rainfall data for station [0035288 9] - Ngqura (Coega) (CDC, 2012)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2003			51.8	84.2	85	9	24.4	21.2	16.4	40.4	5	18.6
2004	16	33	20.8	53.6	23.4	21.4	7	9.8	39	26	22.6	136.2
2005	53.4	48.6	53.2	31	10.6	9	2	0.8	23	16	82	21.4
2006	87.2	12	7.6	52.2	104	25.8	18.8	151.2	30.2	72.4	16	25.2
2007	13.8	12.4	87	23.8	65.4	19.6	2.2	16.8	6.8	41	22.4	81.6
2008	32.2	24	16.4	34.2	8.2	16.2	3.2	20.4	2.4	41.8	33.8	14.6
2009	7.6	41.4	7.8	24.2	3.6	38.4	29.8	6	14.8	45.4	12.4	15.2
2010	21.4	11.6	42.2	19.6	7.6	43.8	8.2	11.4	3.6	87.6	1.2	34.2
2011	10	26.2	31.6	20.8	95.2	148.6	91.2	27.8	3	13	80.8	40.8
2012	14	93.2	79.6	46.4	11.2	95.2						

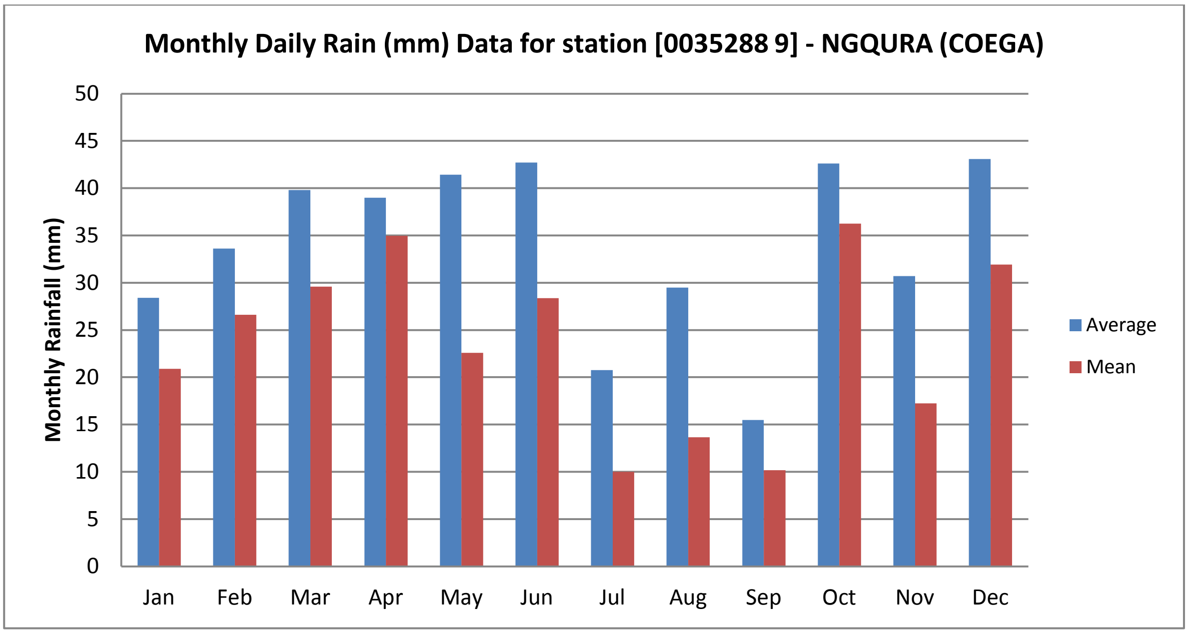


Figure 10.9: Rainfall Data for Ngqura (Coega) (CDC, 2012)

In addition, Figure 10.10 shows rainfall data collected at the Coega Brick Works.

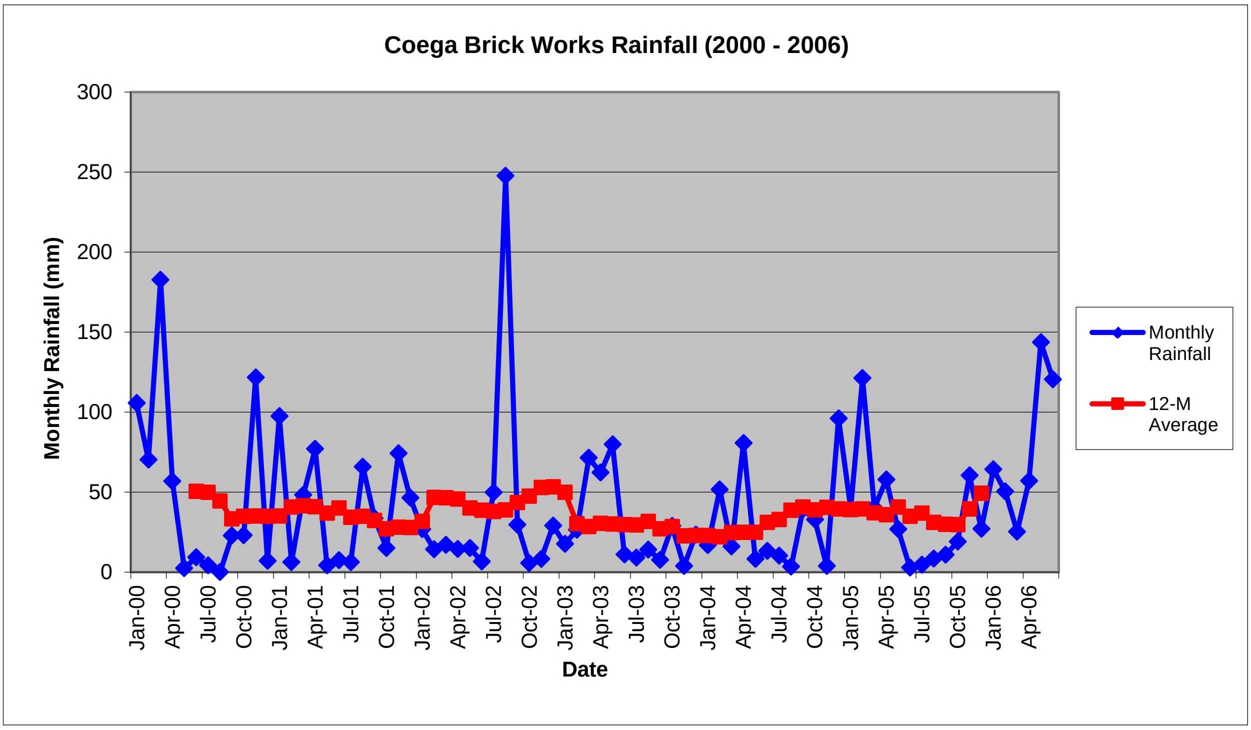


Figure 10.10: Rainfall Data for the Coega IDZ (2000 – 2006)(CDC, 2007)

The annual rainfall for the Ngqura area ranges from 250 mm to 320 mm, with an evaporation rate as high as 80%, while the average annual rainfall for PE is about 600 mm. This substantially reduces the initial estimate (based on Port Elizabeth rainfall and evaporation data) of the quantity of stormwater that could possibly be collected for use for dust suppression purposes, and has therefore increased the potable water required from the municipal water supply. These are, however, still conservative estimates, and the use of surfactant (which allows the water to bind more readily to dust particles and therefore forms a capping on the stockpiles, and can last between 14 to 21 days), can substantially reduce the water demands for the project (i.e. there is an approximate 60% reduction in potable water requirements when using surfactants).

In addition to the above, and as part of the Air Quality Specialist Study (Chapter 5) for the proposed Manganese ore Terminal in Coega IDZ in the Port of Ngqura, updated rainfall data was purchased by the Air Quality Specialist from the South African Weather Bureau (Pillay, 2012). An analysis of this raw rainfall data was conducted as part of this specialist study.

In addition, an analysis of daily rainfall data and dry spells was conducted for the proposed Alcan/Aluminium Pechiney smelter which provided useful insight into expected rainfall patterns within the Coega IDZ (Table 10.3).

Table 10.3: Analysis of dry periods for July 2003 to April 2005 (Coega IDZ) (CDC, 2007)

Dry Period (Days)	Number of Occasions Occurring in Period July 2003 to April 2005 (Coega IDZ)
5-10	28
11-15	9
16-20	8
21-25	0
>25	1

Table 10.3 shows that for the period July 2003 to April 2005 (i.e. 22 months) in the Coega IDZ, a dry period in excess of 10 days only occurred on 18 occasions. Furthermore a dry period in excess of 20 days only occurred on one occasion. This is a useful measure for dust suppression as even though the evaporation rate is high, the rainfall is relatively regular. A similar analysis has been repeated using more recent data.

Table 10.4: Analysis of dry periods for January 2009 to December 2011 (Uitenhage and Port Elizabeth) (Pillay, 2012)

Dry Period (Days)	Number of Occasions Occurring in Period January 2009 to December 2011 (Uitenhage)	Number of Occasions Occurring in Period January 2009 to December 2011 (Port Elizabeth)
5-10	43	46
11-15	15	12
16-20	7	2
21-25	0	0
>25	1	0

Table 10.4 above shows that more recently (January 2009 to December 2011 i.e. 36 months) a similar trend is evident, and confirms that regular rainfall events can be expected. With regards to stormwater quality, monitoring is currently conducted in two main culverts (labelled A and B) and a gully (Butterfly Valley) (see Figure 10.5 and Table 10.5). The manganese ore terminal is located above the N2, while these monitoring locations are below the N2. Review of the data provides an indication of current stormwater quality measured within the Coega IDZ.

Table 10.5: Closest stormwater monitoring points (SRK Consulting, 2011)

Name	˚S (decimal degrees)	˚E (decimal degrees)	Water level (mbgl)	Purpose	Status (June 2011)
Gully	33.7849	25.6705	N/A	Ephemeral surface water – monitoring site for planned aluminium smelter	In use
Culvert A	33.7833	25.6692	N/A	Storm water discharge from undeveloped portion of IDZ	In use
Culvert B	33.7941	25.6728	N/A	Storm water discharge from undeveloped portion of IDZ	In use
mbgl – metres below ground level					

To-date, the stormwater quality measured for trace metals and bacteriological indicators is very similar to results obtained from surface water/groundwater quality monitoring in the Coega IDZ. However, as expected, this "fresh water" has generally lower electrical conductivity and Na/Cl concentrations than surface water/groundwater monitoring has indicated.

10.4 APPLICABLE LEGISLATION AND PERMIT REQUIREMENTS

The purpose of this section is to give an overview of the legislation and highlight permit requirements relevant to aspects contained within the "Integrated Water Management" Specialist Impact Study.

10.4.1 National legislation

10.4.1.1 National Water Act, Act 36 Of 1998

The National Water Act (NWA) contains two provisions regarding the protection of water resources in South Africa from pollution. The Coega River is in the immediate vicinity of the project area and it is possible that underground water resources in the area could be polluted through surface pollution (aquifers are included in the definition of a water resource in Section 1 of the NWA). The NWA, with regard to this study, is a key document for the protection of water resources and the project must take cognisance of spill containment and pollution prevention in the design of the infrastructure as well as the management of waste storage and handling operations which may occur onsite.

In terms of Section 21 of the NWA (Act 36 of 1998)

- (a) and (b), abstractive use of water and storage. Any person or body storing water for any purpose in excess of 10 000 cubic meters or where the water area at full supply level exceeds 1 hectare in total on land owned or occupied by that person or body and not in possession of a permit or permission, e.g. stormwater control dams
- (c) and (i), impeding or diverting the flow of water in a watercourse and alterning the bed, banks, course or characteristic of a watercourse, i.e. watercourse crossings by, roads, railways or additional infrastructure
- (f), when discharging waste or water containing waste into a water resource through a pipe, canal or other conduit.
- (g) disposing of waste in a manner which may detrimentally impact on a water resource.

10.4.1.2 General Authorisation, GN 399 of 2004

As per the Department of Water Affairs (DWA) General Authorisation (2004), and draft amendments to DWA General Authorisation (2012), the following registration of water use, water storage and wastewater discharge requirements are noted.

Registration of water use
1.8 (1) A person who uses water in terms of this authorisation must submit to the responsible authority a registration form or any other further information requested in writing by the responsible authority for the registration of the water use before commencement of-
(a) taking more than 50 cubic metres from surface water or 10 cubic metres from groundwater on any given day; or
(b) a combined storage of more than 10 000 cubic metres of water per property.
(2) On written receipt of a registration certificate from the Department, the person will-
(a) be regarded as a registered water user; and
(b) be liable for water charges as per the Department's pricing strategy.
(3) All forms for registration of water use are obtainable from the Regional offices of the Department, as well as from the Departmental web-site at http:\\www.dwaf.gov.za

Precautionary practices
1.9 (1) The water user must ensure that any dam complies with the requirements of Chapter 12 of the National Water Act.
(2) The water user must follow acceptable construction, maintenance and operational practices to ensure the consistent, effective and safe performance of the taking and storage of water.
(3) Where water is stored in a watercourse, the water user must take reasonable measures to ensure that the movement of aquatic species is not prevented, including those species that normally migrate through the watercourse.
(4) Outlet pipes at the lowest practical level must be provided on all storage structures for Reserve releases.

Record-keeping and disclosure of information
1.10. (1) The water user must ensure the establishment of monitoring programmes to measure the quantity of water taken and/or stored, as follows -
(a) the quantity of groundwater or surface water abstracted must be metered or gauged and the total recorded as at the last day of each month;
(b) in the case of irrigation and where no meter or gauge is used, the quantity of water abstracted may be calculated according to methods set by the responsible authority; and
(c) the quantity of water stored must be recorded as at the last day of each month.
(2) Upon the written request of the responsible authority the water user must-
(a) ensure the establishment of any additional monitoring programmes; and
(b) appoint a competent person to assess the water use measurements made in terms of this authorisation and submit the findings to the responsible authority for evaluation.
(3) Subject to paragraph 1.10. (2) above, the water user must, for at least five years, keep a written record of all taking and storage of surface or groundwater. This information must be made available upon written request to the responsible authority.

Registration of wastewater storage
4.11.(1) A person who stores wastewater in terms of this authorisation must submit a registration form for registration of the water use before commencement of storage if more than 1 000 cubic metres are stored for disposal or if more than 500 cubic metres are stored for re-use.
(2) On written receipt of a registration certificate form the Department, the person will be regarded as a registered water user.
(3) All forms for registration of water use are obtainable from the Regional offices of the Department as well as from the Departmental web-site at http:\\www.dwaf.gov.za

Registration of wastewater disposal
4.12(1) A person who disposes of wastewater in terms of this authorisation must submit a registration form for registration of the water use before the commencement of the disposal if more than 50 cubic metres of domestic wastewater or biodegradable industrial wastewater is disposed of on any given day.
(2) The responsible local authority must submit a registration form obtained from the Department, to register the water use for disposal of domestic wastewater in-
(a) areas where more than 5 000 households are served by on-site disposal sites;
(b) areas where the density of on-site disposal sites exceeds 10 per hectare; or
(c) areas served by communal septic tanks.
(3) On written receipt of a registration certificate from the Department, the person will be regarded as a water user.
(4) All forms for registration of water use are obtainable from the Regional offices of the Department as well as from the Departmental web-site at http:\\www.dwaf.gov.za

Location of wastewater storage dams and wastewater disposal sites
4.13. Wastewater storage dams and wastewater disposal sites must be located-
(a) outside of a watercourse;

(b) above the 100 year flood line, or alternatively, more than 100 metres from the edge of a water resource or a borehole which is utilised for drinking water or stock watering, whichever is further; and
(c) on land that is not, or does not, overlie, a Major Aquifer (identification of a Major Aquifer will be provided by the Department upon written request).

Record-keeping and disclosure of information
4.14.(1) The water user must ensure the establishment of monitoring programmes to follows-
(a) for the storage of wastewater, the quantity must be recorded monthly; or
(b) for the disposal of wastewater, the quantity must be gauged or metered and recorded monthly.
(2) Upon the written request of the responsible authority, the water user must-
(a) ensure the establishment of any additional monitoring programmes; and
(b) appoint a competent person to assess the water use measurements made in terms of this authorisation, and to submit the findings to the responsible authority for evaluation.
(3) Subject to paragraph 4.14 (2) above, the water user keep a written record of the following wastewater storage or wastewater disposal and related activities-
(a) the location of the storage dam or wastewater disposal site;
(b) the quantity of wastewater stored or disposed of or re-used;
(c) the quality of wastewater stored or disposed of, where applicable;
(d) details of the monitoring programme;
(e) details of failures and malfunctions of any wastewater disposal system or wastewater storage dam that the registered user is responsible for, and such information must be made available upon written request to the responsible authority.
(4) Any information on the occurrence of any incident that has or is likely to have a detrimental impact on the water resource quality must be reported to the responsible authority.

Permits/Licences/Agreements

Considering the above, and the proposed water related processes, the following permits/licences/agreements that would in all likelihood be required are listed:

1. Water Use
   a) Potable water use – CDC/NMBM (agreement)
   b) Temporary surface water abstraction from Coega River for construction water - DWA
   c) Pipeline/road bridge crossing Coega River (Section 21 of NWA) – DWA
      Section *(c) Impeding or diverting flow of water in a watercourse* or Section *(i) Altering the bed, banks, course or characteristics of a watercourse*

2. On-site Water Storage (dams/ponds/tanks/vessels)
   a) The stormwater control dams (59 000 m^3) at the stockyard and at the quay (11 000 m^3) are larger than 10 000 m^3. DWA General Authorisation requirements (Schedule 1 – the taking of water from a water resource and storage of water) specifies that storage of 10 000 m^3 of water must be registered with DWA.

3. Liquid Wastes
   a) Domestic wastewater (sewage) – CDC/NMBM (agreement)
   b) Release of wastewater in sewerage system – CDC/NMBM (agreement)

4. Stormwater
   a) Uncontaminated stormwater – CDC/DWA

10.4.1.3 National Environmental Management: Waste Act, Act 59 of 2008

The National Waste Act makes provision for the minister to publish a list of waste management activities which may lead to a detrimental effect on the environment. These activities require a waste management license prior to commencement of the activity. In addition, this act also deals with specific requirements for the storage, collection and transportation, and disposal of waste. Where applicable, these requirements have been incorporated in the recommendations of this study.

a) List of Waste Management Activities that have, or are likely to have a Detrimental Effect on the Environment (GN 718 of 2009)

Government Notice GN 718 published on 03 July 2009 lists a number of activities which may lead to a negative effect on the environment and for which a license is required. The waste management activities at the proposed Manganese Ore Export Facility that accordingly require a waste management license are the following:

Table 10-6 List of waste management activities triggered

Category	Description	Applicability
A2	The storage including the temporary storage of hazardous waste at a facility that has the capacity to store in excess of 35 m^3 of hazardous waste at any one time, excluding the storage of hazardous waste in lagoons.	The refuelling and maintenance facilities at the compilation yard and terminal may have to store waste oils, filters, etc. from serviced locomotives. Wastewater from the wash bay facility will also require storage. Low grade manganese ore mud from the stormwater retention dam may be stored in the stockyard. These wastes may be considered hazardous and may exceed 35 m^3 at any given time.
A11	The treatment of effluent, wastewater or sewage with an annual throughput capacity of more than 2 000 m^3 but less than 15 000m^3.	Stormwater runoff from the stockyard, which eventuates into a stormwater retention pond, may need to be treated prior to being re-used in the dust mitigation system for the stockyard. Annual throughput may exceed 2 000 to 15 000 m^3.
A18	The construction of facilities for activities listed in Category A.	The construction of facilities for activities listed in Category A.

A waste license application has been lodged for the above mentioned activities with the National Department of Environmental Affairs and was acknowledged on 17 May 2012 (Reference number: 12/9/11/L920/1). Refer to Appendix B.

b) Minimum Requirements for the Handling, Classification and Disposal of Hazardous Wastes, DWAF, 1998

The general requirements for the handling, classification and disposal of hazardous waste, and the temporary storage thereof, is outlined in the Department of Water Affairs and Forestry's series of publications. The legislation provides the means of assessing the waste type and to classify it in order to plan a strategy for its safe disposal. Furthermore, it promotes environmentally acceptable technologies whereby waste can be prevented, minimized and recovered.

The types, classification, management and disposal methods of the wastes anticipated to be generated at the proposed facility are listed in Chapter 2, Table 2.2 to 2.4.

10.4.2 Provincial and local legislation

10.4.2.1 Nelson Mandela Bay Municipality Water and Sanitation Bylaw, PN 57, 2010

This bylaw outlines specific requirements pertaining to the receiving of water and the discharge of water to the municipal waste water treatment systems. In general permission is required for the disposal of any effluent or sewerage into the municipal treatment plants. The quality of the effluent is regulated and specific allowed limits are provided.

Wastewater generated at the proposed facility includes domestic wastewater (sewerage) and service wastewater at the compilation yard (overflow from the oil/water separator). No service wastewater is anticipated to be discharged at the proposed stockyard as it will be recycled via the stormwater control dam. Permission from CDC is required prior to discharging of the effluent into their effluent treatment plant. The quality of the effluent also has to be determined and it must be within the stipulated effluent limits.

Section 29 of the Waste Management By-Law requires the waste transporter to be registered with the local authority.

10.5 IDENTIFICATION OF KEY ISSUES

This section outlines the key issues identified for the following project phases:

- Construction phase
- Operations Phase
- Decommissioning Phase

10.5.1 Construction Phase

During the construction phase, water will be required for the preliminary earthworks (e.g. soil improvement activities, dust control), the construction of the various components of the manganese ore export terminal, rail compilation yard and railway line doubling (e.g. concrete mixing) and for domestic purposes. During the construction phase, pollution of water resources can result from release, accidental or otherwise, of contaminated runoff from construction sites and discharge of construction water contaminated by, for example, chemicals, oils, fuels, sewage, solid waste, litter, etc. Nevertheless, during construction increased turbidity and sedimentation (arising from erosion from construction areas) is likely to be the main water quality concern. During construction, adequate sanitation facilities (e.g. portable toilets) will be required. In summary:

- Water Use:
  - Preliminary earthworks
  - Manganese ore export terminal, rail compilation yard, railway line doubling, conveyors, pipelines, marine loading arms and associated infrastructure construction
  - Potable water (drinking water)
  - Fire fighting water
- Wastewater Discharge:
  - Domestic wastewater (sewage)
  - Construction runoff
  - Stormwater runoff (if contaminated, could be regarded as a wastewater)

- Wastes management

10.5.2 Operations Phase

During normal operation, water is required for potable purposes, for dust suppression, for truck washing and for fire-fighting purposes. During the operation phase, the main liquid discharges from the site will be domestic sewage. Treated service wastewater (from truck washing, dust suppression) and treated stormwater will be reused on the site for service water purposes, thereby reducing the need for potable water. A key issue related to wastewater discharges from the site is the risk of pollutants reaching the environment. In summary:

- Water Use:
  - Potable water (drinking water, safety showers, etc.)
  - Process water
  - Fire fighting water
- Wastewater Discharge:
  - Domestic wastewater (sewage)
  - Service wastewater (truck washing, run-off from dust suppression)
  - Oil wastes from oil/water separators (to disposal site)
  - Stormwater runoff (if contaminated, regarded as a wastewater)
- Wastes management

10.5.3 Decommissioning Phase

During the decommissioning phase, only problems related to containment and discharge of potentially contaminated stormwater and other runoff from decommissioning procedures are envisioned (e.g. fuel leakage, spills, improper disposal of demolition waste). In summary:

- Water Use: Decommissioning Phase
  - Potable water (drinking water)
  - Fire fighting water
- Wastewater Discharge: Decommissioning Phase
  - Domestic wastewater (sewage)
  - Stormwater runoff (if contaminated, regarded as a wastewater); Wastes handling and storage
- Wastes management

10.5.4 Comments Raised by Interested and Affected Parties

As captured in the Draft and Final Scoping Reports, a number of potential issues relating to potential ground and surface water impacts, and general project detail (and which may be of relevance to the integrated water management study) were raised by Interested and Affected Parties (I&APS).

In addition to the above, I&APs made reference to the existing export facilities at the Port Elizabeth harbour. In particular, the environmental pollution issues raised include air pollution by manganese ore dust, groundwater contamination from manganese ore storage, and contamination of the coastal environment by manganese ore (Olver *et al*, 2009). The concerns raised need to be considered for the proposed Manganese Ore Export Facility in the Coega IDZ and Port of Ngqura.

It has also been noted that the manganese ore that will be stored on the site may contain within its matrix heavy metal contaminants which are both hazardous to human health and the surrounding environment. Since these stockpiles are open to the weather, and if insufficient lining of the manganese ore stockyard is done, heavy metals could leach from the stockpiles and percolate down to the groundwater. Based on a spot sample of dust analysed in 2005 at the Port Elizabeth harbour, raised levels of chromium, copper, nickel, lead, selenium, thallium and zinc was present in addition to manganese (Shipley, 2005). The concentrations recorded are generally higher than what would be expected and indicates possible impact of these metals to the environment. Additional analysis has also recently been conducted (Zunckel, 2012), the results of which are discussed in Section 10.6 that follows). These concerns also need to be considered for the proposed Manganese Ore Export Facility in the Coega IDZ and Port of Ngqura.

10.5.5 Summary of Key Issues

As previously noted, and considering the above, impacts may arise if:

- Water use (during construction or operation) exceeds current spare capacity of existing water treatment facilities
- Water use (during construction or operation) stresses or exceeds current water resources availability in the specified area
- Domestic wastewater (sewage) discharged exceeds current spare capacity of existing wastewater treatment facilities
- Impact of discharged domestic wastewater (sewage) on the environment.
- Risk that service wastewater is not disposed of/discharged appropriately.
- Risk that oil/chemical wastes, solid wastes and manganese ore mud are not disposed of appropriately and are discharged into the environment.
- Discharge of contaminated stormwater due to on-site activities.
- Risk of inappropriate application or disposal of stormwater related sludge into the environment.

This EIA will determine if the noted possible impacts above are of concern, or whether they have been appropriately dealt with.

10.6 WATER USE IMPACTS

10.6.1 Background

During the construction phase, water will be required for the preliminary earthworks (site clearing, land cutting and filling, grading), the construction of the various components of the project and for construction personnel. During operation, most water for service and domestic purposes will be obtained from the CDC via a municipal supply, with some internal recycle (re-use of water collected in the stormwater dam) to reduce dependence on the municipal supply. Provision is also made for storage of water required for services and in emergencies (e.g. fire-fighting). The following table (Table 10.7) shows the expected water use for the various stages of the proposed project.

A condition of water use in the Coega IDZ is that potable water cannot be used for industrial purposes (i.e. as process water). The development of a Wastewater Treatment Works in the Coega IDZ (50 ML/day facility) that would process wastewaters originating from industry within the IDZ is currently being investigated. Funding options to develop this infrastructure is currently being investigated and discussions/negotiations between NMBM, CDC, DWA and DEAT regarding the above are on-going.

Given that the aforementioned effluent re-use facility has not yet been constructed, an agreement has therefore been reached whereby NMBM can supply potable water to the Coega IDZ for industrial purposes for an interim period of two (2) years (exact date of commencement is unconfirmed) (Groenewald, 2012).

Table 10.7: Water supply – volumes and quality required

Phase	Water Volume Requirement	Quality Requirement
Construction	• Preliminary Earthworks: o Compilation yard to rail ▪ The current schedule indicates earthworks being completed in 3 months (i.e. 0.2 ML/day (200 m^3/day)) ▪ CDC will be able to supply 16.8 ML (via municipal supply) o Stockyard to port ▪ The current schedule indicates earthworks being completed in 14 months (i.e. 0.03 ML/day (30 m^3/day)) ▪ CDC will be able to supply 11.8 ML (via municipal supply) • Construction: o Compilation yard to rail ▪ Construction period: 36 months ▪ 350 people on-site (max could be up to 1000 people) ▪ 25 litres/person/day = 8.75 m^3/day for domestic = 8 820 m^3 (over 36 months) ▪ Plus 316.5 m^3 day for earthworks, concrete, etc. = 319 000 m^3 (over 36 months) ▪ Total = 327 820 m^3 (or 327.82 ML) (over 36 months) ▪ CDC will be able to supply required volumes (via municipal supply) o Stockyard to port ▪ Although details are not finalised, quantities estimated are similar to above ▪ Construction period: 36 months ▪ 250 people on-site (max could be up to 1 000 people) ▪ 25 litres/person/day = 6.25 m^3/day for domestic = 6 300 m^3 (over 36 months) ▪ Plus 84.3 m^3 day for earthworks, concrete, etc = 85 000 m^3	Potable/Industrial (as received from NMBM via CDC and should be as per SANS 241)

Phase	Water Volume Requirement	Quality Requirement
	(over 36 months) ▪ Total = 91 300 m^3 (or 91.3 ML) (over 36 months) ▪ CDC will be able to supply required volumes (via municipal supply)	
Operation – drinking water	• Compilation yard to rail o 200 people on-site o 5 m^3/day (25 litres/person/day) o CDC will be able to supply required volumes (via municipal supply) • Stockyard to port o 300 people on-site o 12 m^3/day (40 litres/person/day) o CDC will be able to supply required volumes (via municipal supply)	Potable (as received from NMBM via CDC and should be as per SANS 241)
Operation – service water	• Compilation yard to rail o Washwater = 34 m^3/day o CDC will be able to supply required volumes (via municipal supply) • Stockyard to port o Dust suppression ▪ Water only suppression • Stockyard = ~895 m^3/day (worst case scenario, ignoring rainfall events which occur frequently, with very few long dry spells (i.e. don't need to use dust suppression water if it is raining), stormwater runoff and possible recycle) • Quay = ~45 m^3/day ▪ Water and surfactant suppression • Stockyard = ~306 m^3/day (worst case scenario, ignoring rainfall events which occur frequently, with very few long dry spells (i.e. don't need to use dust suppression water if it is raining), stormwater runoff and possible recycle) • Quay = ~22 m^3/day o Washwater = ~0.2 m^3/day o CDC will be able to supply required volumes (via municipal supply)	Industrial (as received from NMBM via CDC and should be as per SANS 241)
Fire fighting water	• Compilation yard to rail o 1000 m^3 (1 ML) (once-off fill, top up only in event of fire) o CDC will be able to supply required volumes (via municipal supply) • Stockyard o 75 m^3 (once-off fill, top up only in event of fire) o CDC will be able to supply required volumes (via municipal supply) • Quay o 36 m^3 (once-off fill, top up only in event of fire) o CDC will be able to supply required volumes (via municipal supply)	Not specified. Does not need to be of potable quality but as supplied via municipal supply will be of potable quality
Decommissioning	• No estimations have been provided at this stage, but it is anticipated that water use will be less than that required during construction (smaller quantity, shorter period).	Industrial (as received from NMBM and should be as per SANS 241)

The required quantities for the aforementioned water uses are summarised in Table 10.8:

Table 10.8: Summary of water supply volume requirements

Phase	Total Water Requirement	
Preliminary earthworks	28 560 m^3 (or ~230 m^3/day for months 1 – 3, and ~30 m^3/day for months 4 – 14)	
Construction water	404 000 m^3 (or ~401 m^3/day)	
Operation – drinking water	17 m^3/day	
Operation – service water	~974.2 m^3/day(*) (water only suppression)	~362.2 m^3/day(*) (water and surfactant suppression)
Operation – total	~991.2 m^3/day(*) (water only suppression)	~379.2 m^3/day(*) (water and surfactant suppression)
Fire fighting water	1 111 m^3 (once-off, unless top-up required)	
Decommissioning	No detail provided but anticipated to be lower than construction water requirements.	

(*)Note: This is worst case scenario and ignores collection of stormwater runoff and re-use, and more importantly rainfall events (which occur frequently, and with very few long dry spells in the area). When it rains, water is not needed for dust suppression purposes. Although it is difficult to predict the exact number of days that this quantity of water would be required, suffice to note that it will be considerably less than 365 days per year.

Water requirements are likely to be supplied from the nearby Nooitgedacht Water Treatment Works (an agreement has been reached between the Coega Development Corporation (CDC) and the Nelson Mandela Bay Municipality (NMBM) for the supply of potable water to the Coega IDZ) until such a time that alternative water use supplies of acceptable quality are identified and available. The typical potable water composition as produced at the Nooitgedacht Water Treatment Works, and as measured in the IDZ by the CDC is indicated in Table 10.9 (minor differences in water quality due to distribution through network).

Table 10.9: Typical potable water supply composition

	Nooitgedacht Final Potable Water Quality		CDC
Parameter	**Min**	**Max**	**Ave.**
pH	8	8.3	8.3
Electrical Conductivity (mS/m)	96	122	109
Turbidity (NTU)	0.10	4	
Total hardness (as $CaCO_3$) (mg/L)	172	233	184
Alkalinity (as $CaCO_3$) (mg/L)	219	263	
Sulphate (as SO_4) (mg/L)	80	110	
Chloride (mg/L)	115	170	
Cl content (mg/L)			98
Iron (mg/L)	0.01	0.11	
Manganese (mg/L)	0.003	0.025	

In general, the water supplied meets potable water quality requirements (i.e. SANS 241). In addition, the water can be considered moderately hard. Although a certain degree of calcium hardness may inhibit corrosion by forming a thin protective layer on the metal surface, hard waters can prove problematic in both the domestic and industrial water systems (excessive scale deposits on heat exchange surfaces and pipelines resulting in reduced heat exchange efficiency). However, considering the required water uses for the project, the water quality should be suitable to meet project requirements. In addition, it is noteworthy that in the recent Department of Water Affairs (DWA) Blue Drop Certification results, the Nooitgedacht Scheme obtained an assessment score of 90.13% (a score of 95% results in a Blue Drop Award), with microbiological compliance of

97.8%, chemical compliance of 99.6% and DWA categorisation as "the water complied excellently with standard, safe to drink" (DWA, 2012).

The Nooitgedacht Water Treatment Works currently has a pumping capacity of 90 ML per day. The transfer capacity is currently being upgraded (at a cost of R450 million) by an additional 50 ML/day (i.e. total capacity of 140 ML/day). This additional capacity should be available by September/October 2012, but specific allocations to users of the additional capacity is still being discussed (Groenewald, 2012). However, of importance to note is that the quality of the water produced at this stage may not always be ideal (i.e. might not always satisfy SANS 241 requirements), and that further upgrading to the Nooitgedacht Water Treatment Works will be required to ensure that an appropriate water quality can always be achieved. These additional upgrades (to works, pump station, reservoir) will require an estimated R350 million, and if this is realised the Nooitgedacht Water Treatment Works will have an average capacity of 160 ML/day and a peak capacity of 240 ML/day. Funding is being sought in this regard and discussions with relevant authorities are on-going (Groenewald, 2012).

Alternative water supplies to be investigated for the proposed Manganese Ore Export facility include:

- Return effluent of suitable/acceptable quality from the planned Wastewater Treatment Works in the Coega IDZ.
- Process/wastewater from other industries within the Coega IDZ should that water be of acceptable quality (e.g. distilled water from the Cerebos Saltworks).
- A further option that is being investigated is that in the future, the bulk of the process water required for the Coega IDZ could be reclaimed water supplied from the Fishwater Flats Wastewater Treatment Works near the Swartkops River mouth. The works has a capacity of 130 ML/day and is currently being upgraded to 170 ML/day (at a cost of R200 million) (Groenewald, 2012). The facilities for reclaiming treated wastewater do not presently exist, but are planned (depending on future demand). It is estimated that the proposed water return effluent scheme will cost approximately R700 million (Groenewald, 2012). These facilities will need to be able to produce acceptable quality water for local industry.

10.6.2 Impacts associated with Water Use

10.6.2.1 Water Use during Construction

Construction water is to be supplied by CDC from the NMBM. ***NOTE:*** Water could also be abstracted from the Coega River (if allowed by DWA, and if the required water quantity and water quality is acceptable) or from the Coega Kop Quarry dependant on quality and authorisation from applicable authority. Construction water is required for both preliminary earthworks and associated infrastructure construction. In particular:

- A maximum of ~400 m^3/day (or 0.4 ML/day) is required for construction purposes for the project, which represents 0.8% of the additional capacity to the upgraded Nooitgedacht Water Treatment Works (i.e. additional 50 ML/day).

As noted previously, water use during this phase is a small percentage of the additional capacity of the upgraded Nooitgedacht Water Treatment Works. In addition, it appears as though water availability for the Coega IDZ is not problematic at this stage.

Without mitigation, the significance of the negative impact of the use of water during the construction of the project is considered to be **medium**. If properly managed (refer to mitigation measures as stated in section 10.9.1 to 10.9.3), and if quantities required are as described in the preceding section, the **negative impact** of construction water use on the available capacity is mitigated to be of **low significance.**

10.6.2.2 Water Use during Operation

The following is noted:

- **Domestic Water Use**
  Domestic water is to be supplied by CDC from the NMBM. With regards to potable water requirements (for drinking water purposes), the amount of potable water required for staff at the facility is small. In particular:
  - ~12.5 m^3/day (or 0.012 ML/day) is required for potable purposes for the project, which represents 0.03% of the additional capacity to the upgraded Nooitgedacht Water Treatment Works (i.e. additional 50 ML/day).

- **Service Water Use**
  Service water is to be supplied by CDC from the NMBM. Service water is required for both dust suppression and truck washing. The design assumption of the volume of water required for dust suppression is that there will be very limited rainfall and also does not take the moisture content into consideration (i.e. conservative design). The stormwater data presented in the previous section also shows that the stockpiles should be exposed to regular rainfall (even in what is assumed to be a dry season). In light of this, the figures shown below are likely to be a worst case scenario water requirement. In particular:
  - If water only suppression is used:
    - A maximum of ~974 m^3/day (or 0.97 ML/day) is required for service water purposes for the project, which represents 1.95% of the additional capacity to the upgraded Nooitgedacht Water Treatment Works.
  - If water and surfactant suppression is used:
    - A maximum of ~362 m^3/day (or 0.36 ML/day) is required for service water purposes for the project, which represents 0.72% of the additional capacity to the upgraded Nooitgedacht Water Treatment Works.

- **Fire Water Use**
  Fire water will only be used in emergencies. Reservoirs will be filled and only topped up in the event of a fire. Fire water is to be supplied by CDC from the NMBM.

Considering the above, the total maximum (worst case) daily water use for the project during operation is expected to be approximately:

- ~991 m^3/day (i.e. 1.98% of the additional 50 ML/day capacity of the Nooitgedacht Water Treatment Works) if water only suppression is used.
- ~379 m^3/day (i.e. 0.76% of the additional 50 ML/day capacity of the Nooitgedacht Water Treatment Works) if water and surfactant suppression is used.

The above could potentially be further reduced by reusing collected stormwater and seepage from the stockpiles (estimated to be approximately 72 m^3/day).

Care should also be taken to ensure that necessary pipe infrastructure is equipped to convey the specified quantities of water for all future scenarios.

As noted before, increased demand as a result of the proposed project on the regional water budget is considered to be small. Without mitigation, the significance of the negative impact of the use of water during the operation of the project is considered to be **medium**. If properly managed (as already proposed by the project proponent), and if quantities required are as described in the previous sections, the **significance** of the **negative impact** of the use of water during the operation of the project is mitigated to be **low.** Despite the low negative impact, it is important to note that South Africa remains a water scarce country, and therefore following best practice and minimising water use is still a top priority. Water use during operation could therefore be further reduced with consideration of the following:

- Implementing the proposed surfactant and water dust suppression system (if the cost is not prohibitive and the surfactant has no other environmental impact, and which would reuce service water consumption by >60%).
- Effluent re-use (if the Coega IDZ effluent re-use facility is implemented and if the return effluent is of required quality)
- Possible use of groundwater for dust suppression (groundwater in the area has no potable value; dependant on quality requirements for dust suppression and impact on Manganese ore). Findings of this assessment will be included within the Groundwater Specialist Study (Chapter 9).

10.6.2.3 Water Use during Decommissioning

Although no details are provided at this stage, it is anticipated that water used during decommissioning will largely be for domestic (potable) purposes, that the number of staff on site will be less than that required for construction (i.e. water use should be less than that used on a daily basis during the construction period), and that the period for decommissioning will be shorter than the construction period. Despite the lack of detail at this stage, it is anticipated that the quantities required for the decommissioning phase will therefore be less than that required during the construction phase (the significance of this negative impact was rated as low). Considering this, the **significance** of the **negative impact** of the use of water during the decommissioning phase of the project is considered to be **low.**

10.6.3 Impacts associated with Liquid /Solid Wastes

Liquid wastewater generated will include:

- Domestic wastewater (construction, operations and decommissioning phases)
- Service wastewater (operations phase). During construction, no service wastewater will be generated.

In addition, stormwater will be generated which may potentially be polluted. This section also looks at impacts associated with solid wastes and hazardous materials as well as manganese ore mud that accumulated in the stormwater control dams during operation.

10.6.3.1 Wastewater Generated During Construction

During construction activities, wastewater may arise from mixing activities, washing of machinery, sanitary wastewater and sewerage wastewater. Inappropriate storage and disposal of those wastewaters can lead to soil and groundwater contamination. Uncontrolled dumping of wastewater onto soil or the use of inappropriate containers (leaking containers or containers not designed for that specific waste type) can also cause pollution to the environment.

- **Domestic Wastewater (Sewage)**

During construction, portable toilets will be provided by the contractor for sanitation purposes. If the toilets are not frequently cleaned and the sewerage waste not collected, spillages and disposal on-site can occur, which could result in soil and potentially groundwater pollution. In addition, domestic wastewater from offices and trailers will likely be collected in a sewage tank and pumped out at the same time as the portable toilets. A sewage truck (Honeysucker) will probably be used for pumping and transporting domestic wastewater.

Care must be taken to ensure that all personnel on-site during construction are aware of environmental requirements and only use the provided facilities for sanitation purposes. The typical composition of untreated domestic wastewater is shown in Table 10.10 (Metcalf and Eddy, 1991).

Table 10.10: Typical composition of untreated domestic wastewater

Parameter	*Concentration*
Total solids (mg/L)	720
Settleable solids (mg/L)	10
Biochemical oxygen demand (BOD) (mg/L)	220
Total organic carbon (TOC) (mg/L)	160
Chemical oxygen demand (COD) (mg/L)	500
Total nitrogen (mg/L)	40
Total phosphorous (mg/L)	8
Chlorides (mg/L)	50
Sulphate (mg/L)	30
Alkalinity as $CaCO_3$ (mg/L)	100
Grease (mg/L)	100
Total coliform (no./100 mL)	10^7 - 10^8
Volatile organic compounds (VOC's) (µg/L)	100 – 400

The contractor will be required to dispose of domestic wastewater (sewage) at an appropriate location (i.e. sewage water treatment works) for treatment.

As previously noted, the capacity of the Fishwater Flats Wastewater Treatment Works is currently being upgraded from 130 ML/day to 170 ML/day (i.e. additional 40 ML/day) Specific allocations to users of the additional capacity is still being discussed (Groenewald, 2012). During construction the amount of domestic wastewater produced would be approximately 8.75 m^3/day for construction of the compilation yard to rail component, and 8.75 m^3/day for construction of the stockyard to port component (i.e. total of 17.5 m^3/day or 0.0175 ML/day. This represents approximately 0.04% of the additional 40 ML/day available capacity.

Considering the additional 40 ML/day available capacity, at this stage there is therefore sufficient spare capacity to treat the quantities of effluent from the project (Groenewald, 2012; Olivier, 2012). In addition, as noted previously, investigations are currently underway to determine the feasibility of developing effluent reclamation facilities at the Fishwater Flats Wastewater Treatment Works and/or developing a new Coega Wastewater Treatment Works with effluent reclamation facilities within the Coega IDZ.

Without mitigation, the significance of the negative impact of domestic wastewater (sewage) during the operation of the project is considered to be **medium.** If properly managed (as already proposed by the project proponent), the **negative** environmental impacts associated with domestic wastewater (sewage) discharges are expected to be of **low significance**.

- **Stormwater**
  With respect to construction stormwater contamination could result from contact with, for example, chemicals, oils, fuels, sewage, solid waste, litter. However, during construction, erosion from construction areas resulting in increased turbidity and downstream sedimentation is likely to be the main water quality concern. If no controls are implemented, a negative impact of **medium** significance is anticipated.

  The project proponent has specified a number of best practice stormwater management measures that will be implemented during construction (see Section 10.9), and should include consideration of, for example:

  - Contouring and minimizing length and steepness of slopes
  - Grading of exposed soil surfaces to minimise runoff and increase infiltration/re-vegetating areas promptly
  - Installation of silt fencing at the perimeters of actively disturbed areas (as needed)
  - Reinforcement of soil slopes with suitable materials to minimise erosion (as needed)
  - Segregating or diverting clean water runoff to prevent it mixing with water containing a high solids content, to minimize the volume of water to be treated prior to release
  - Diversion of runoff to sedimentation basins or grit removal chambers (as needed)
  - Providing secure storage for oil, chemical and other waste materials to prevent contamination of stormwater runoff
  - Diverting stormwater runoff from uncovered bulk construction waste pile to suitable collection/treatment systems
  - Performing periodic inspections and maintenance of soil erosion measures and stormwater control structures
  - Construction work areas, including diesel storage tanks/ other chemical stores and heavy vehicle parking, should be situated as far as possible from surface water (e.g. Coega River) and groundwater (e.g. borehole) features.

  The above management measures (as already proposed by the project proponent) will ensure that the **negative impacts** associated with construction stormwater is of **low significance**.

10.6.3.2 Wastes Generated During Construction

- **General Solid Waste**
  Non-hazardous solid waste generated at construction (and when decommissioning sites) includes excess fill materials from grading and excavation activities, scrap wood and metals, and small concrete spills. Other non-hazardous solid wastes include office, kitchen, and dormitory wastes (when these types of operations are part of construction project activities).

  If not adequately stored, cement waste can leach into the soil in the event of rain, resulting in the potential change of the soils pH. Solid waste, if disposed of on-site or inappropriately stored on-site (e.g. open containers from where waste can be blown by the wind), can also create a negative visual impact.

  Without mitigation, the significance of the negative impact of construction solid waste of the project is considered to be medium. The project proponent has specified a number of best practice construction site management measures that will be implemented during construction (see Section 10.9). These management measures will ensure that the **negative impacts** associated with construction solid waste is of **low significance**.

- **Hazardous Materials/Wastes**
  Hazardous materials and solid wastes include empty containers for solvents, paints, (used) solvents, small amounts of machinery maintenance materials, such as oily rags, used oil filters, new/used oil and lubricants, spill clean-up materials from oil and fuel spills and contaminated soils, which could potentially be encountered on-site due to previous land use activities. Construction (and decommissioning) activities may pose the potential for release of petroleum based products, such as lubricants, hydraulic fluids, or fuels during their storage, transfer, or use in equipment. Techniques for prevention, minimization, and control of these impacts include:

  - Providing adequate secondary containment for fuel storage tanks and for the temporary storage of other fluids (e.g. lubricating oils, hydraulic fluids) and hazardous wastes.
  - Using impervious surfaces for refuelling areas and other fluid transfer areas.
  - Training workers on the correct transfer and handling of fuels and chemicals and the response to spills.
  - Providing portable spill containment and clean-up equipment on site and training in the equipment deployment.
  - Assessing the presence of hazardous substances in or on building materials and decontaminating or properly managing contaminated building materials.

  Should those wastes be inappropriately disposed of (e.g. on-site or at a general waste landfill site), hazardous compounds may accumulate in soil and groundwater and can therefore have long-lasting negative impacts on ecological systems. Depending on the nature of the contaminant the effect of soil and groundwater pollution can vary.

  Without mitigation, the significance of the negative impact of construction hazardous materials from the project is considered to be **medium**. The project proponent has specified a number of best practice construction site management measures that will be implemented during construction (see Section 10.9). In addition, use of an appropriate waste facility for disposal of hazardous waste (Aloes 2) has been noted. These measures, and the above management measures, will ensure that the **negative impacts** associated with construction hazardous materials are of **low significance**.

  In addition to the above, the following general recommendations are made:
  - Development and implementation of a waste management plan, in line with Transnet Standard Environmental Specifications and Construction EMP.
  - Establish a designated construction waste area with acceptable waste containers that will avoid spillages;
  - Segregate hazardous waste from general waste at the origin of waste generation;
  - Ensure waste contractors are approved by the proponent prior to their appointments;
  - Frequent collection and disposal of wastes to approved landfill sites. Keep record of collection;
  - Safe disposal certificates to be kept for each hazardous waste type collected and disposed of; and
  - Weekly audits on the building contractor at the building sites will impose the correct management of wastes.

10.6.3.3 Wastewater Generated during Operation

Sewerage and service wastewater will be produced during the operational phase and will need to be managed appropriately to avoid impacts on the environment and human health. The amount of service wastewater anticipated to be generated on-site (e.g. truck washing, floors cleaning, etc.) is estimated to be minimal and will be treated via an oil/water separator prior to be sent to the stormwater control dam for re-use. No other process/service wastewaters are anticipated.

Inappropriate disposal of wastewater on-site (e.g. spillages on soil or discharge into the stormwater system etc.) could lead to soil contamination (and associated disruption of natural growth of plants) or surface water pollution (and associated impact on the aquatic ecology).

- **Domestic Wastewater (Sewage)**
  During operation, domestic wastewater will be discharged via the TNPA/CDC sewage network except at the compilation yard where it will be collected in a septic tank and pumped away. As noted previously, the Fishwater Flats Wastewater Treatment Works is currently being upgraded by an additional 40 ML/day. Other options are currently also being investigated to ensure that sufficient wastewater treatment capacity exists for future industrial development within the Coega IDZ. Considering the above, it is noted that the proposed facility will generate very little domestic wastewater (sewage). In particular:
  - ~5 m^3/day (or 0.005 ML/day) will be produced from the compilation yard to rail component, which represents 0.01% of the additional capacity of the Fishwater Flats Wastewater Treatment Works (i.e. additional capacity of 40 ML/day). This wastewater will be stored in conservancy tanks for eventual pumping/transport to an appropriate wastewater treatment facility (via a sewage truck (Honeysucker) or direct connection to the municipal sewer).
  - ~7 m^3/day (or 0.007 ML/day) will be produced at the stockyard and ~5 m^3/day (or 0.005 ML/day) will be produced at the quay, the total of which represents which represents 0.03% of the additional capacity of the Fishwater Flats Wastewater Treatment Works (i.e. additional capacity of 40 ML/day). As noted above, this wastewater will be pumped to an existing CDC sump, and transferred to the main sump for eventual pumping/transport to an appropriate wastewater treatment facility.

  Without mitigation, the significance of the negative impact of domestic wastewater (sewage) for the compilation yard to rail component during the operation of the project is considered to be **medium**. Considering the very low volumes produced (total requirement is 0.01% of the additional capacity of the Fishwater Flats Wastewater Treatment Works), and if properly managed (as already proposed by the project proponent), the negative environmental impacts associated with domestic wastewater (sewage) discharges for this component are expected to be of **low significance**.

  Furthermore, without mitigation, the significance of the negative impact of domestic wastewater (sewage) for the stockyard and the quay components during the operation of the project is also considered to be **medium**. Again, considering the very low volumes produced (total requirement is 0.03% of the additional capacity of the Fishwater Flats Wastewater Treatment Works), and if properly managed (as already proposed by the project proponent), the negative environmental impacts associated with domestic wastewater (sewage) discharges for this component are expected to be of **low significance**.

- **Service Wastewater**
  At this stage, service wastewater will only be generated from truck washing as it is not anticipated to generate wastewater from dust suppression (i.e. it appears as though most water used for dust suppression will be absorbed in the Manganese ore and that the quantity used will not be sufficient to wet the ore to the point that seepage will occur). No other process wastewaters are anticipated. Truck washing water will be treated via

oil/water separators, and sent to the stormwater control dam for re-use. Likewise, dust suppression wastewater, if any, will also be sent to the stormwater control dam for re-use.

The permitted water quality for any discharge off-site (including oil content) will need to be clearly defined and adhered to. Considering this, the following effluent quality requirements are noted by the CDC (CDC, 2007):

Discharge Standards and Pre-treatment of Effluent
CDC may stipulate in a permit the standards in respect of:
(i) Quantity;
(ii) Rate of flow;
(iii) Quality, and
(iv) any other aspect it may deem fit,

- No person shall discharge effluent into the sewerage system which has –
  - A temperature at the point of entry in excess of 44ºC:
  - An electrical conductivity in excess of 500 milli-Siemens per m at 25ºC;
  - A pH greater than 12,0 or less than 6,0;
  - A permanganate value greater than 1 000 mg/l, or
  - A chemical oxygen demand greater than 10 000 mg/1

- No person shall discharge effluent into the sewerage system which contains a substance, either alone or in combination with other substances, having a concentration in excess of those listed below:

  - Chemical substances other than metals:

Fats, vegetable oils and like substances	400 mg/l
Sulphides, or substances from which hydrogen sulphide can be liberated (expressed as S)	5 mg/l
Cyanides or substances from which hydrogen cyanide can be liberated (expressed as HCN)	10 mg/l
Minerals oils and grease	50 mg/l
Sulphates (expressed as SO_4)	1500 mg/l
Fluorides of fluorine containing substances (expressed as F)	5 mg/l
Suspended solids	1000 mg/l
Tar products and distillates	50 mg/l
Chlorides (expressed as Cl)	1000 mg/l

  - Metals

Group 1

Chromium (expressed as CrO3)	20 mg/l
Copper (expressed as Cu)	20 mg/l
Nickel (expressed as Ni)	20 mg/l
Zinc (expressed as Zn)	20 mg/l
Total collective concentration of all metals in Group 1	50 mg/l

Group 2

Arsenic (expressed as As)	5 mg/l
Boron (expressed as B)	5 mg/l
Cadmium (expressed as Cd)	5 mg/l
Lead (expressed as Pb)	5 mg/l
Selenium (expressed as Se)	5 mg/l
Mercury (expressed as Hg)	5 mg/l
Total collective concentration of all metals in Group 2	15 mg/l

- Radio Active Waste
  Any radio-active waste or isotopes; such concentration as may be laid down by the Atomic Energy Corporation or any State Department. ***NOTE:*** **It is not anticipated that any radioactive waste will emanate from the project.**

The above tables clearly indicate the effluent quality that CDC will accept from the project. **The presence/absence of any of the other substances listed (e.g. chemical substances, metals) will be confirmed via on-site sample collection for testing and analysis at an appropriate laboratory.**

If the service wastewater generated through on-site activities is not of an acceptable quality to allow appropriate discharge, they will need to be disposed of at an appropriate facility. If this is not possible, additional and appropriate on-site treatment facilities to pre-treat the service wastewaters to an acceptable standard will need to be considered.

Considering the above, a conservative approach is recommended for on-site treatment systems (i.e. sufficient back-up, spare capacity, etc.) so as to ensure that the on-site water treatment facilities will always be in a position to treat service wastewater effectively. The treatment systems therefore need to be carefully designed, regularly inspected and maintained to ensure optimal operation. This is essential, as insufficient on-site storage exists for long-term storage of service wastewater streams. In addition, service wastewater will in all likelihood not be able to be pumped to the CDC stormwater system if associated CDC stormwater quality requirements are not maintained (see Section 10.6.3.4 below).

By following the above, **medium** significance negative impacts associated with service wastewater are negated (i.e. if required management procedures as already proposed by the project proponent are followed, negative environmental impacts associated with service wastewater are mitigated to be of **low significance.** However, should monitoring indicate a service wastewater of unsuitable quality, additional on-site pre-treatment facilities will need to be considered.

In addition to best practices already proposed by the proponent, the following additional recommendations are made in terms of wastewater and wastes generation during the operation phase:

- Obtain authorization from the CDC and the NMBM prior to discharging of effluent into the CDC waste water system;

10.6.3.4 Wastes Generated during Operation

- **Hazardous wastes**
  During the operational phase, it is anticipated that the following solid and liquid hazardous wastes be produced at the terminal: empty chemical containers, oily rags, used oils, lubricants, etc. Most wastes from railway operations (at the compilation yard) are generated as a result of maintenance and refurbishment of locomotives and, to a lesser

extent, from track maintenance. These wastes typically include solids from mechanical cleaning of rail cars; paint chips and sandblast grit; waste paint; spent solvent and solvent sludge (from painting and cleaning); sludge from cleaning and wastewater treatment; waste oil, hydraulic fluid, and other petroleum-based fluids; petroleum-contaminated solids (e.g. oil filters and saturated spill absorbent material); spent coolant; spent locomotive and signal batteries; etc.

Should those wastes, specifically liquid hazardous wastes, be inappropriately disposed of (e.g. on-site or at a general waste landfill site), hazardous compounds may accumulate in soil and groundwater and can therefore have long-lasting negative impacts on ecological systems. In addition, remediation of contaminated soil requires the soil to be removed and disposed of as hazardous waste or alternatively the soil can be remediated in-situ. Therefore, on-site spillage management is important to prevent possible environmental contamination resulting from hazardous wastes. It is anticipated that normal good practice will be followed at the site (e.g. containment and immediate clean-up of any spillages, appropriate storage and collection of hazardous (e.g. chemical/oil) wastes, disposal at an appropriate hazardous waste facility, etc.). Best practice recommendations for avoiding and managing spills are provided in section 10.9.

If no controls are implemented a negative impact of **medium** significance will be noted. However, if good practice is followed (as already proposed by the project proponent and as suggested in Section 10.9), the impacts associated with hazardous wastes will be mitigated to a **negative impact of low significance**.

- **General wastes**

  General wastes anticipated to be produced at the proposed Manganese Ore Export facility include paper, cardboards, plastic, tins, scrap metals, etc. If mechanisms are not in place to re-use or recycle potentially recyclable wastes (minimisation of wastes), these will be disposed of at a landfill site leading to the unnecessary utilization of landfill space. Recycling of paper, plastic and metals can also lead to resource conservation.

  If no controls are implemented a negative impact of **medium** significance will be noted. However, if good practice is followed (as already proposed by the project proponent and as suggested in Section 10.9), the impacts associated with general wastes will be mitigated to a **negative impact of low significance.** The recycling of general wastes also generates a **positive** impact of **low** significance.

In addition to best practices already proposed by the proponent, the following additional recommendations are made in terms of wastewater and wastes generation during the operation phase:

- o Establish a waste management plan, including a full characterization of the wastes anticipated to be generated on site (quantity and quality), proposed handling, storage and management methods;
- o Record waste quantities on a monthly basis;
- o Waste skips should be in good working order (i.e. free of holes) and in good condition;
- o All hazardous wastes that cannot be reused or recycled should be labeled correctly and stored in a secure area until collected for disposal;
- o Disposal of hazardous waste at a registered hazardous waste disposal facility. Obtain safe disposal certificates;

- o Only registered contractors, approved by the proponent, shall be used for the collection transporting and disposal of wastes; and
- o Undertake annual audits on the waste contractors (transport companies) and the landfill operators.

10.6.3.5 Stormwater

The stormwater management system will ensure that all "dirty" stormwater (that potentially contaminated by ore dust, oil, spillages, etc.) is completely separated from "clean" stormwater. At the stockyard, all "dirty" stormwater will be collected and pass through silt traps and then enter the stormwater control dam. A similar operation is noted at the quay, although the stormwater control dam at the quay will not be equipped with any silt traps. Proposed treatment methods (e.g. use of sedimentation basins, oil water separators, grease traps) are in-line with International Finance Corporation/World Bank guidelines (IFC, 2007). The permitted water quality (including oil content) will need to be clearly defined and adhered to.

Stormwater contamination could generally arise from:

- Accidental or other spillages of ore, materials, oils, chemicals, litter, etc.
- Accidental discharge of service wastewater into the stormwater system
- Deposition ("fallout") onto the site from emissions in the Coega IDZ

Inappropriate disposal of contaminated stormwater on-site (e.g. spillages on soil or discharge into the "clean" stormwater system etc.) could lead to soil contamination (and associated disruption of natural growth of plants) or surface water pollution (and associated impact on the aquatic ecology). The discharging of water containing pollutants or visible suspended materials directly into soil or stormwater system is therefore prohibited.

Considering the above, the following is noted:

- Although very limited particulate emissions are expected (use of appropriate dust control and suppression techniques), there still is a potential to contaminate stormwater from particulates, and therefore collection and containment of the "first flush" (most heavily contaminated stormwater obtained from the site after a period of time) via the stormwater control dams and associated systems is good practice. Caution, however, is required at areas where stormwater has been classified as "clean" and do not currently drain to the various stormwater control dams (e.g. at the compilation yard). It is clear that through careful on-site management, stormwater contamination could be largely minimised. However, considering practical realities, grease/oil and suspended matter/turbidity could be the main stormwater quality parameters of concern.
- ***NOTE:*** Although at this stage, no other large industries are operational within the Coega IDZ, careful consideration of possible future contamination of stormwater by other tenants must be considered. The precautionary approach utilised at the compilation yard (stormwater drains into two attenuation ponds and then into artificial wetlands), and at the port terminal (where the stormwater system is isolated and drains into two dams and is then treated) is welcomed.

The following main stormwater related components are noted:

- Compilation yard
    - o Two (2) attenuation ponds/artificial wetland areas – considered "clean" stormwater and can be discharged off-site (if meets stormwater quality requirements)

- Stockyard
  - Stormwater control dam – receives "dirty" stormwater
    - The stockpiles will be placed on compacted material (prepared surfaces) and no "soil" will remain inside the stockyards.
    - The stormwater control dam will collect runoff from the stockyards
    - Two silt traps leading to the control dam allows manganese ore dust and solids to settle out before entering the main dam
    - Wastewater (wash water) from the tippler facility will be sent to the stormwater control dam.
    - The stormwater control dam will not release water into the CDC/NMBM sewer system (and associated wastewater treatment works).
    - The dam may overflow in heavy rainfall events and this overflow will result in water entering the Coega River directly. This will, however, not be "first flush" and could be regarded as "clean" stormwater.
    - The project proponent has allowed a free board of 800 mm at full capacity and an additional free board for accommodating a 1:100 year fluid inflow, thus minimising the chance that the dam will overflow.
    - Ponds will be cleaned regularly and the waste from these ponds will be dealt with in terms of a waste management policy on site
    - Removal of the settled solids will require regular maintenance (i.e. cleaned once or twice a year)
    - The handling of the material cleaned out during maintenance may well result in a waste handling permit/license. The waste removed will either be temporarily stored or sent straight to a landfill. The project proponent are considering the use the removed waste as part of the sacrificial layer or mix it with a suitable grade stockpile.
    - Besides the various oil/water separators and silt traps, at this stage no additional water treatment unit processes are included within the design (as the water will not be discharged but contained on site).
- Quay
  - Stormwater control dam – receives "dirty" stormwater

NOTE: The project proponent has proposed the construction of a cleaning slabs under the entire length of the conveyor so that all stormwater (potentially contaminated) is collected. This stormwater will be sent to a sump and then pumped to the stormwater control dam at the quay. This good practice is commended.

Key features of the proposed stormwater attenuation ponds are noted below:

- The stormwater attenuation dams control surface water run-off as close to its origin as possible (i.e. source control). This minimizes changes in the volume and rate of surface run-off from developed sites and thereby minimizes flood risk and other environmental damage. Additionally, these dams offer an element of pollution control and attenuation where infiltrated water is stored before its controlled release.
- Trees (the urban forest) are an important element in the biodiversity of urban areas and improve amenity by providing enhanced aesthetics, cooling and shading. Stormwater attenuation dams can be designed to protect and enhance the health of existing and new trees by protecting the roots systems and providing irrigation and aeration to the soil (see Figure 10.11 below).

Figure 10.11: Typical stormwater attenuation pond (Hatch, 2013)

The following figures highlight the key stormwater infrastructure components.

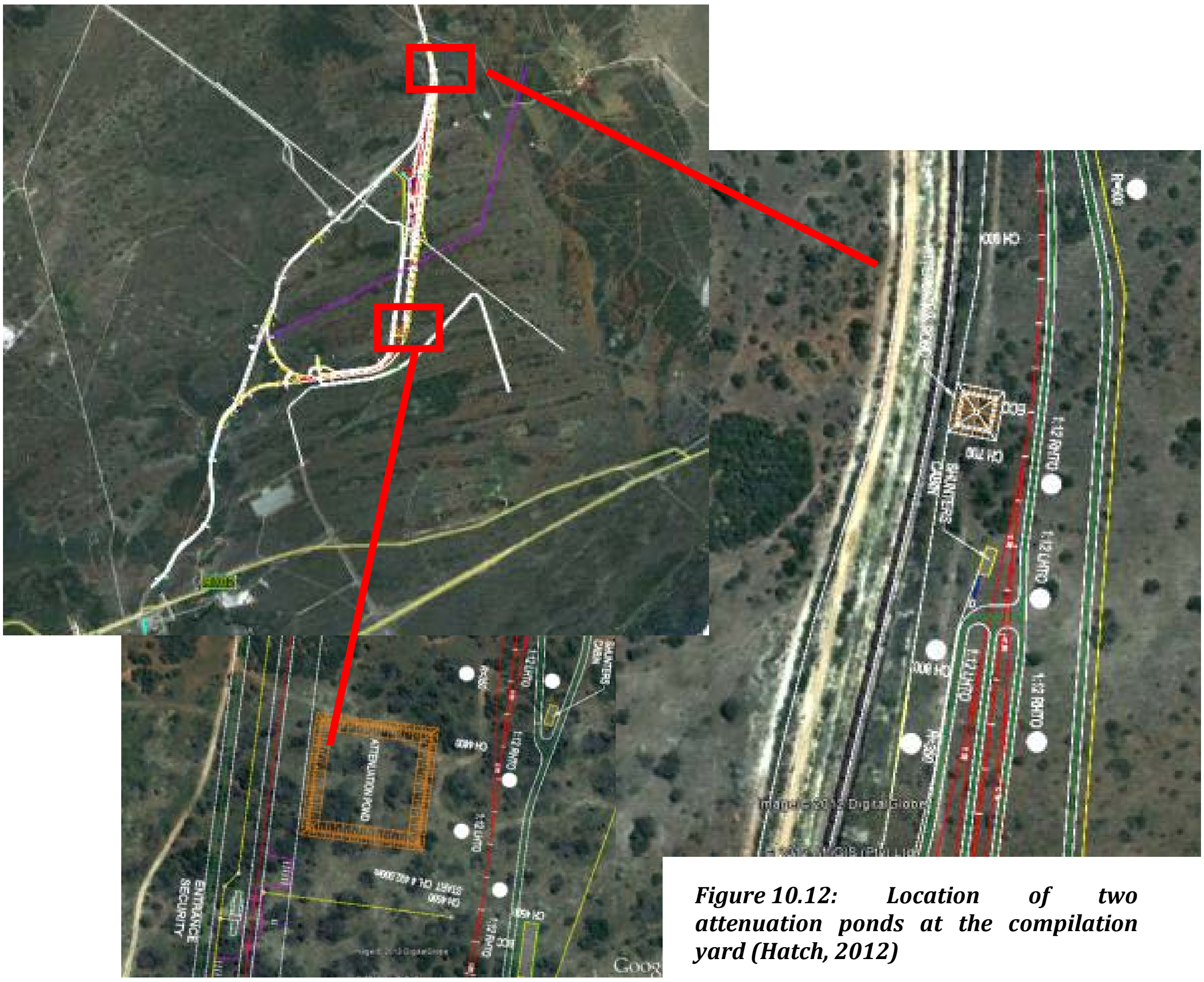


Figure 10.12: Location of two attenuation ponds at the compilation yard (Hatch, 2012)

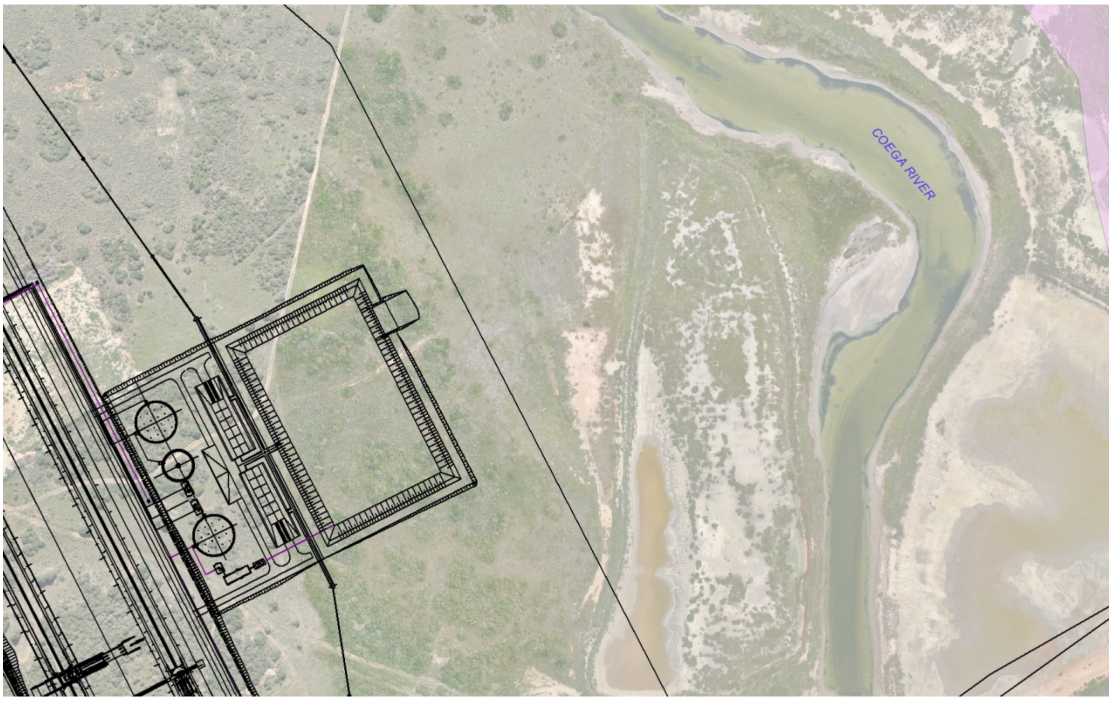


Figure 10.13: Location of stormwater control dam at stockyard and in relation to Coega River (Hatch, 2012)

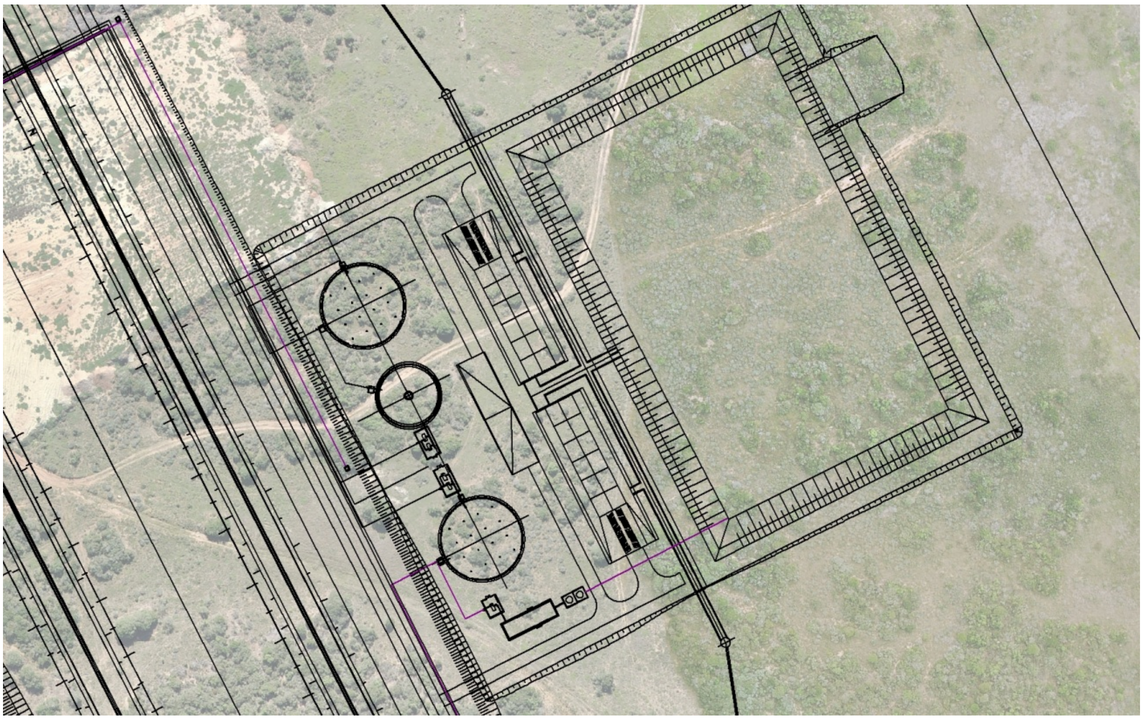


Figure 10.14: Associated detail of stormwater control dam showing silt traps (Hatch, 2012)

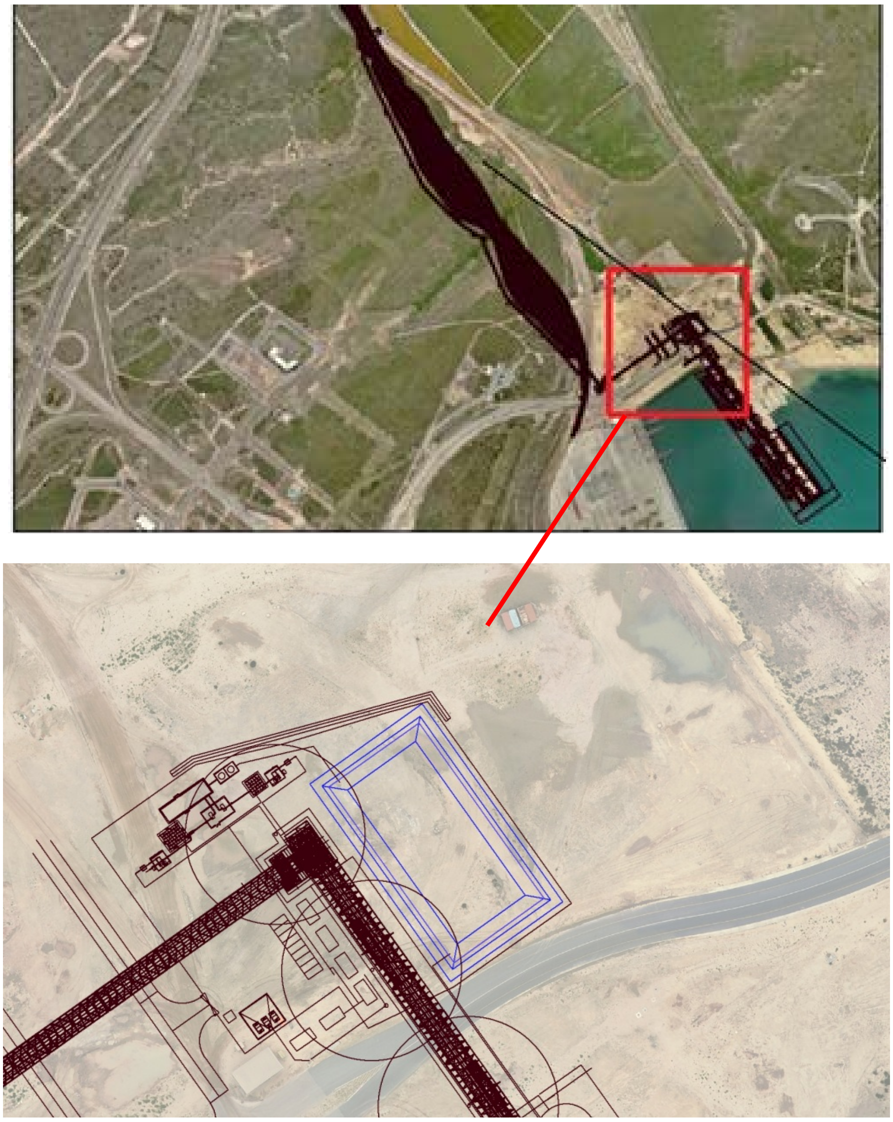


Figure 10.15: Location of stormwater control dam at quay (Hatch, 2012)

All "clean" stormwater will be disposed of into the CDC stormwater systems. Following a rainfall event, the stormwater quality will be monitored prior to discharge. CDC has provided the following table (Table 10.11) describing stormwater quality requirements (CDC, 2007).

Table 10.11: CDC specified stormwater quality requirements

Parameters	Units	SABS 241		DWAF Limits
		Acc.	Max	Gen.
Field Parameters				
pH	Standard Units	5-9.5	4.0-10	5.0-10.0
Conductivity At 25°C	ms/M	150	370	150
Physical Parameters				
pH	Standard Units	5-9.5	4.0-10	5.0-10.0
Conductivity At 25°C	ms/M	150	370	150
Turbidity	Ntu	1		10
Total Dissolved Solids At 180°C	mg/L	1 000	2400	N/S
Total Alkalinity As $Caco_3$	mg/L	N/S		N/S
Carbonate Alkalinity As Co_3	mg/L	N/S		N/S
Bicarbonate Alkalinity As Hco_3	mg/L	N/S		N/S
Carbonate Hardness As $Caco_3$	mg/L	N/S		N/S
Non-Carbonate Hardness As $Caco_3$	mg/L	N/S		N/S
Total Hardness As $Caco_3$	mg/L	300	650	650
Chemical Oxygen Demand	mg/L	N/S	N/S	75
Chemical Parameters				
Anions				
Chloride As Cl	mg/L	200	600	N/S
Sulphate As So_4	mg/L	400	400	N/S
Fluoride As F	mg/L	1.0	1.5	1.0
Cations				
Calcium As $Caco_3$	mg/L	N/S	N/S	N/S
Calcium As Ca	mg/L	150	300	N/S
Magnesium As $Caco_3$	mg/L	N/S	N/S	N/S
Magnesium As Mg	mg/L	70	100	N/S
Sodium As Na	mg/L	200	400	N/S
Potassium As K	mg/L	50	100	N/S
Phosphorus (Total)	mg/L	N/S	N/S	N/S
Iron (Total) As Fe	mg/L	0.05	0.1	0.30
Manganese (Total) As Mn	mg/L	0.100	1.00	0.10
Aluminium As Al	mg/L	3.00	5.00	N/S
Boron As B	mg/L	0.1	0.5	0.05
Chromium As Cr (Hexavalent)	mg/L	0.100	0.500	N/S
Chromium As Cr (Total)	mg/L	0.100	0.500	0.05
Mercury As Hg	µg/L	2.0	5.0	5.0
Lead As Pb	mg/L	0.050	0.100	0.01
Zinc As Zn	mg/L	5.00	10.0	0.1
Mercury As Hg	mg/L	0.002	0.005	0.0005

Parameters	Units	SABS 241		DWAF Limits
		Acc.	Max	Gen.
Nutrients				
Nitrate + Nitrite As N	mg/L	10.0	20.0	15.0
Ammonia As N	mg/L	1.00	2.00	3.00
Organic Parameters				
Diesel Range Organics	µg/L	N/S	N/S	N/S
Gasoline Range Organics	µg/L	N/S	N/S	N/S
Total Petroleum Hydrocarbons	µg/L	50	600	N/S
Total/Dissolved Organic Carbon	mg/L	10	20	15
Oil And Grease	mg/L	N/S	N/S	50
Volatile Organic Compound (VOC)	mg/L	N/S	N/S	200
Bacteriological Parameters				
Faecal Coliforms	Counts Per 100 mL	1	10	1000
E. Coli	Counts Per 100 mL	0	1	N/S
Total Bacterial Count	Counts Per mL	1 000	140	N/S

** N/S-No specification/standard*

Considering the above table, the following is noted:

- Reference is made to "SABS 241", and use of "Acceptable" and "Maximum" limits. This appears to be a reference to SABS 241-1984, which is a drinking water standard. This South African drinking water standard has been replaced a number of times, the most recent published version being SANS 241-2006. NOTE: SANS 241-2006 is currently being updated, and it is anticipated that SANS 241-2012 will be published during the course of 2012.
- Reference is made to "DWAF", and use of "Gen" limits. This appears to be a reference to DWA General Authorisation General Limits, which is a treated domestic wastewater standard.

The CDC required stormwater quality table therefore refers to a drinking water quality requirement and a treated domestic wastewater requirement, but does not specify what it requires its tenants to adhere to. This is confusing, and needs to be reviewed and amended as soon as possible, such that proper stormwater quality limits can be set for Coega IDZ tenants. Therefore, at this stage it is difficult to indicate what quality requirements liquid discharges from the project would need to adhere to.

In practice, "clean" stormwater may be compromised by poor housekeeping procedures which can introduce a previously unforeseen load of contaminants to the "clean" stormwater collection network. Strict operational housekeeping controls are therefore required to minimise these effects. If no such controls are implemented, a negative impact of **medium** significance is anticipated.

In order to ensure that "clean" stormwater is in fact clean, a suitable ***stormwater quality monitoring and management programme*** must be established. Monitoring should at least be conducted at all major site stormwater outlets, as this will allow tracing of problematic areas and required management interventions. It would therefore be necessary to have appropriate emergency procedures in place to deal with abnormal conditions. In the unlikely event that monitoring shows an unacceptable environmental impact associated with discharges of "clean" stormwater, implementation of "clean" stormwater recycling for on-site treatment should be fast tracked.

The above management measures (see Sections 10.9.1 to 10.9.5 for further detail) will ensure that the **negative impacts** associated with stormwater runoff during operation is of **low significance.**

10.6.3.6 Manganese Ore Mud Management

Manganese ore mud collected from the various on-site dams will need to be dewatered and may need to be disposed of at an appropriate waste site. The composition of the Manganese ore mud (quality) will determine if it has any potentially beneficial use. During commissioning, the mud will undergo a hazard classification rating to verify if the resultant mud is hazardous or not. If acceptable, the mud from the silt traps could be returned to the stockyards for shipping/use as a sacrificial layer at the stockyard.

Considering the above, the following options for the Manganese ore mud management are considered in this EIA:

- Disposal to an appropriate landfill site (i.e. the mud collected from the stormwater dams will need to be disposed of because the silt traps and control measures have removed the majority of usable product out of the system)
- Beneficial use, returned to the stockpile where the manganese ore is stored (as a sacrificial layer) (the environmental controls at the stockyard are in place and the mud is again re-used as a product).

Considering the above, this does still result in the fact that windblown dust (including manganese ore dust) and small amounts of silt that may enter into the stormwater dam over time would need to be cleaned out. This cleaned out residual mud will not have sufficient manganese ore quantities to return to the stockpile and this will need to be disposed of off-site. At this stage, this product will be assessed as if it is hazardous (but will need to be verified during operations).

If the Manganese ore mud is to be disposed/utilized off-site, it will need to be transported. Should the mud be classified as hazardous, it would need to be disposed of at a licensed hazardous waste site (i.e. Aloes 2 site is the closest licensed hazardous landfill). For transport, the following aspects will need to be considered (WRC, 2006; DWAF, 2005):

- Waste identification
- Appropriate documentation
- Hazchem placards fitted to vehicles
- Protection against potential accidents
- Notification of accidents.

At this stage, the quantity of Manganese ore mud that needs to be disposed of and the schedule for disposal (bi-annually, annually, etc.) is unknown. Once this is known, first-order estimates of potential area requirements for disposal can be calculated.

Although the Manganese ore mud will not be "disposed of on-site", but rather the project proponent aims to beneficially utilise the Manganese ore mud on-site, the following on-site waste disposal site management requirements must be noted (DWAF, 2005):

- Run-off (e.g. rain water) may be contaminated and must be collected and disposed (as per licence requirements)
  - In place
- Leachate (liquid originating from excess moisture in the sludge or from rainwater percolating through the disposal site) collection through use of a liner and a leachate collection system or appropriately monitoring soil profile.
  - No liner in place, but compacted ground, with assurances of no groundwater contamination (to be confirmed by the Groundwater Specialist Study (Chapter 9). Any run-off from all stockpiles is collected in the stormwater control dams.
- Surface water protection (e.g. cut-off trenches, bund walls, run-off interception, increased distance between disposal site and water body)
  - In place
- Groundwater protection (e.g. liners)
  - See above
- Monitoring, including:
  - Surface water quality
  - Groundwater quality
  - Sludge quality
  - Soil monitoring
  - Methane monitoring (if applicable).

In particular, environmental authorities may enforce monitoring requirements as part of beneficial use, to ensure appropriate environmental protection.

When considering utilization of Manganese ore mud (e.g. as is being proposed here – as a sacrificial layer at the stockpiles), the following constituents/properties of the Manganese ore mud require particular attention:

- Nutrients (probably not applicable)
- Metals
- Odours (nuisance conditions, public attention) (probably not applicable)
- Pathogens (probably not applicable)

Toxic compounds (such as heavy metals) could compromise the beneficial use of the mud and heavy metals could possibly arise (from manganese ore, other on-site activities, etc.). In particular, the South African Wastewater Sludge Classification System considers classification in terms of:

- Microbiological class (i.e. faecal coliforms, helminth ova) (probably not applicable)
- Stability class (i.e. stability of the sludge) (probably not applicable)
- Pollutant class (i.e. analysis of 8 potentially toxic metals and elements: arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc).

Considering the above, it is important to note that Pollutant class determination of a sludge is based on the Toxicity Characteristic Leaching Procedure (TCLP) test, with the results obtained compared to the following levels (Table 10.12)

Table 10.12: Pollutant classes for sludge disposal options (DWAF, 2009)

TCLP extractable metals	Pollutant class		
	a	b	c
	<AE mg/l	≥ AE and ≤ 10*AE mg/l	>10*AE mg/l
Arsenic (As)	<0.38	0.38 - 3.8	>3.8
Cadmium (Cd)	<0.031	0.031 - 0.31	>0.31
Chromium (Cr III))	<4.7	4.7 - 47	>47
Chromium (Cr VI)	<0.02	0.02 - 0.2	>0.2
Copper (Cu)	<0.13	0.13 - 1.3	>1.3
Lead (Pb)	<0.12	0.12 - 1.2	>1.2
Mercury (Hg)	<0.022	0.022 - 0.22	>0.22
Nickel (Ni)	<0.75	0.75 - 7.5	>7.5
Zinc (Zn)	<0.7	0.7 - 7	>7

AE : Acceptable exposure

A sludge classified as Pollutant class a (TCLP metal concentration ≤ Acceptable Exposure (AE)) could be disposed on land with minimal restrictions. If Pollutant class b or c is noted, more strict principles apply and use thereof is more restricted. In addition to the eight (8) metals and elements listed above, other pollutants of concern might be present, and therefore a full total elemental analysis is required for the preliminary classification of the Manganese ore mud.

Class	Management option	Appropriate Sludge Guideline	Appropriateness of this option?	What are the major restrictions in terms of the Pollutant class?
Pollutant class a	Agricultural use at agronomic rates	Volume 2	Yes (i)	No limitations apart from the sludge application rate should not exceed agronomic rates.
	On-site or off-site disposal	Volume 3	Qualified no (iv)	This sludge should not be disposed off as it is a high quality product that should be used beneficially.
	Beneficial use (other than agricultural use at agronomic rates)	Volume 4	Yes (i)	No limitations with regard to the pollutant class, for the beneficial uses identified in this Volume.
	Thermal treatment methods	Volume 5	Yes (i)	Thermal process will have limited environmental impacts in respect of the metals.
	Produce saleable products	Volume 5	Yes (i)	No limitations with regard to the Pollutant class. (This excludes the production of edible products from sludge).
Pollutant class b	Agricultural use at agronomic rates	Volume 2	Qualified yes (ii)	Additional analyses will be required to assess whether the receiving soil can accommodate the load.
	On-site or off-site disposal	Volume 3	May be (iii)	Delisting according to the Minimum Requirements will be required.
	Beneficial use (other than agricultural use at agronomic rates)	Volume 4	May be (iii)	High rate application of this sludge could cause long-term effects and source control should be implemented.
	Thermal treatment methods	Volume 5	Qualified yes (ii)	Emissions of gaseous contaminants and the ash should be monitored and managed.
	Produce saleable products	Volume 5	May be (iii)	This depends on the product.
Pollutant class c	Agricultural use at agronomic rates	Volume 2	No (v)	The sludge metal content is too high for agricultural use. Source control should be implemented.
	On-site or off-site disposal	Volume 3	May be (iii)	Delisting according to the Minimum Requirements will be required.
	Beneficial use (other than agricultural use at agronomic rates)	Volume 4	Qualified no (iv)	High rate application of this sludge could cause long-term effects and source control should be implemented.
	Thermal treatment methods	Volume 5	Qualified yes (ii)	Emissions of gaseous contaminants and the ash should be monitored and managed.
	Produce saleable products	Volume 5	May be (iii)	This depends on the product.

Figure 10.16: Using the preliminary pollutant classification to assess the appropriateness of a management option (DWAF, 2006)

Considering the above (Figure 10.16), it is noted that waste is generally divided into two classes in accordance with the risk it poses, namely (DWAF, 2005):

- ***General waste***
    - o Waste that does not pose a significant threat to public health or the environment if properly managed (e.g. domestic waste, builders rubble)

- ***Hazardous waste***
  - Waste that has the potential (even at low concentrations) to have a significant adverse effect on public health and the environment because of its inherent toxicological, chemical and physical characteristics.
  - Hazardous waste requires stringent control and management, and may only be disposed of on a hazardous waste landfill.

In all likelihood, chemical wastes and oil wastes will be classified as hazardous wastes. Dependant on the nature/composition of the Manganese ore mud, it may be considered hazardous. The pollutant class noted above will in all likelihood determine this. The four steps in the classification of a hazardous waste include:

- Identification of the waste as probably hazardous
- Testing and analysis to determine properties, characteristics and components
- Classification and treatment in accordance to relevant requirements (e.g. in South Africa SABS Code 0228 applies)
- Analysis and hazard rating of the waste to determine minimum requirements for disposal.

Options for disposal of hazardous generally include:

- Specialized landfill (dispose of waste on land) (i.e. at Aloes 2)
- Incineration (controlled combustion of waste materials to a non-combustible residue or ash and associated gaseous products – preferred as waste is destroyed and risk minimized).

The DWAF Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste classifies hazardous waste (Appendix 9.4), including acceptable environmental risk concentrations (e.g. mg/L) and disposal allowed (e.g. mass per area per time period) for each waste streams/compounds (DWAF, 2005). Note that concentrations (and importantly loads) of listed compounds contained within the Manganese ore mud need to meet specified requirements.

Considering the above, a sample was collected from the existing exporting facilities and analysed using the TCLP test (Zunckel, 2012). The following results are noted:

Request ID: 6047 **Sample ID:** 306790 **Received:** 2012-07-17 **Matrix:** Minerals **Page:** 1 / 1
Sample Number: PE/TERMINAL/MN/ORE/COARSE/DUST/SPLG/TCLP **Revision Number:** 1

Method: [1]UIS-AC-T100(Trace Elements by ICP-MS) **Completed:** 2012-07-31

Parameter	Value	Unit	Parameter	Value	Unit	Parameter	Value	Unit
[1]Ag	<0.001	ppm	[1]Al	0.01	ppm	[1]As	<0.001	ppm
[1]Au	<0.001	ppm	[1]B	0.26	ppm	[1]Ba	<0.001	ppm
[1]Be	<0.001	ppm	[1]Bi	<0.001	ppm	[1]Ca	834	ppm
[1]Cd	<0.0001	ppm	[1]Ce	<0.001	ppm	[1]Co	<0.001	ppm
[1]Cr	0.03	ppm	[1]Cs	<0.001	ppm	[1]Cu	<0.001	ppm
[1]Fe	0.13	ppm	[1]Ga	<0.001	ppm	[1]Ge	<0.001	ppm
[1]Hf	<0.001	ppm	[1]Hg	<0.0001	ppm	[1]Ho	<0.001	ppm
[1]Ir	<0.001	ppm	[1]K	24.9	ppm	[1]La	<0.001	ppm
[1]Li	0.02	ppm	[1]Mg	86.4	ppm	[1]Mn	0.78	ppm
[1]Mo	<0.001	ppm	[1]Na	1310	ppm	[1]Nb	<0.001	ppm
[1]Nd	<0.001	ppm	[1]Ni	0.04	ppm	[1]Pb	<0.001	ppm
[1]Pt	<0.001	ppm	[1]Rb	0.02	ppm	[1]Sb	<0.001	ppm
[1]Sc	0.02	ppm	[1]Se	<0.001	ppm	[1]Si	24.7	ppm
[1]Sn	<0.001	ppm	[1]Sr	3.36	ppm	[1]Ta	<0.001	ppm
[1]Te	<0.001	ppm	[1]Th	<0.0001	ppm	[1]Ti	<0.001	ppm
[1]Tl	<0.001	ppm	[1]U	<0.0001	ppm	[1]V	<0.001	ppm
[1]W	<0.001	ppm	[1]Y	<0.001	ppm	[1]Zn	0.01	ppm
[1]Zr	<0.001	ppm						

Figure 10.17: TCLP test from sample collect at the existing exporting facilities (Zunckel, 2012)

As per Table 10.15, the sludge could be potentially classified as Class a, however the acceptable environmental exposure limits specified within Appendix 9.4 DWAF Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste (DWAF, 2005), include other elements which may be of concern:

- Magnesium (86.4 ppm measured vs. 70 ppm)
- Sodium (1310 ppm measured vs. 148 ppm)
- Calcium (834 ppm measured vs. 150 ppm)
- Manganese (0.78 ppm measured vs. 0.30 ppm).

In light of the above and given the need to conduct a full total elemental analysis for the preliminary classification of the Manganese ore mud (once available), it is of importance to note that considering the Precautionary Principle, a waste stream will always be regarded as a hazardous waste where there is any doubt about the danger of the waste stream to the public or the environment. Considering the above, and unless proven to the contrary during operations via analysis and characterisation of the Manganese ore mud waste, the Manganese ore mud waste will initially be categorized as a hazardous waste. Although it is likely that the mud may not be hazardous, this needs to be proven. If however the mud is proven hazardous, the project proponent is committed to disposal thereof at an appropriate facility.

Therefore, at this stage, a **medium significance negative impact** with regards to the Manganese ore mud disposal is noted. If more clarity is obtained regarding the mud composition (quality) and disposal options (i.e. agreements with Authorities), the proposed impact could be reviewed and modified. If the Manganese ore mud can be used for beneficial purposes, the impact could be further reviewed/modified (e.g. potentially to **low negative impact** or even a **positive impact**).

10.6.3.7 Wastewater Generated during Decommissioning

- **Domestic Wastewater (Sewage) Generated during Decommissioning**

During decommissioning, domestic wastewater will either be discharged via the CDC/NMBM sewage network or portable chemical toilets will need to be provided (for disposal at a suitable discharge facility/wastewater treatment works). As previously noted, the estimated quantities of potable water to be used during decommissioning are low. Consequently, domestic wastewater generated is also anticipated to be low. Despite the lack of detail at this stage, it is anticipated that the quantities generated during the decommissioning phase will be less than that generated during the construction phase (the significance of this negative impact was rated as low). Considering this, the **significance** of the **negative impact** associated with domestic wastewater (sewage) discharges is expected to be **low.**

- **Decommissioning Stormwater**

With respect to decommissioning stormwater, contamination could result from contact with, for example, chemicals, oils, fuels, sewage, solid waste, litter. To minimise any impact associated with this, the previously noted stormwater management measures should be maintained and associated processes should be adhered to. This will ensure that the **negative impacts** associated with decommissioning stormwater is of **low significance**.

10.6.3.8 Wastes Generated during Decommissioning

- **General Solid Waste**

Non-hazardous solid waste generated during decommissioning/demolition is similar to that generated during construction and could include wood, metals, concrete, etc. The previously suggested best practice site management measures should also be followed during decommissioning. These management measures will ensure that the **negative impacts** associated with decommissioning solid waste is of **low significance**.

- **Hazardous Materials**

Decommissioning activities may pose the potential for leakage/spillage of petroleum based products (e.g. fuels, lubricants, hydraulic fluids) or chemicals. As previously noted, it is important that techniques for prevention, minimization, and control of these impacts are readily at hand. These techniques and associated good management practice (such as that already proposed by the project proponent), will ensure that the **negative impacts** associated with decommissioning hazardous materials are of **low significance.**

- **Disposal of redundant equipment that can be reused or recycled consumes resources**

During the decommissioning phase redundant equipment can possibly be left outside on the site. Resources are available in the redundant equipment such as metal and plastic that can be recycled. These resources are wasted if attempts to recycle the equipment are not in place. Storing of the equipment outside without protection may also result in the corrosion of the metallic parts. This can further have an effect on the environment by being a visual negative impact and possibly causing soil pollution.

The previously suggested best practice site management measures should also be followed during decommissioning. These management measures will ensure that the **negative impacts** associated with decommissioning solid waste is of **low significance**.

In addition to best practices already proposed by the proponent, the following additional recommendations are made in terms of wastes generation during the decommissioning phase:

- o Redundant equipment and machinery not to be stored outside or shall be protected from the weather. Identify a designated area for the storage of decommissioned equipment;
- o Investigate the recycling or re-use of redundant equipment; and
- o The equipment and machinery should be sold or removed within a reasonable time period.

10.6.4 Cumulative Impacts

- **Water Use**

All development projects require some water for construction, operation and decommissioning. The quantity required is dependent on the exact nature of the development and the impact of water use is generally highest when large quantities of water are required on and on-going basis (i.e. during operation) for cooling/heating, transport of materials, etc. In proposed Coega IDZ developments to-date, the relevant authorities influencing and operating within the Coega IDZ have made it clear to project proponent that the area is indeed a water scarce environment, and that industries should minimise water use and, where possible, maximise water conservation and associated recycling. This philosophy, combined with additional water allocations/treatment capacity noted by NMBM and the plans to possibly construct effluent recycling facilities with generation of water for industrial use, have made the area less susceptible to water stress as a result of industrial use. This by no means implies that authorities should relax, and the current established philosophies and processes need to be strictly followed and plans implemented to ensure sustainability. Depending on future developments, and considering the above, the cumulative impact associated with water use is currently noted as a **low** negative impact (with mitigation).

- **Domestic Wastewater**
  When water is used for potable purposes, a domestic wastewater will be produced. This wastewater needs to be treated and disposed of in an appropriate manner. NMBM have indicated that upgrades already underway will ensure that additional wastewater treatment capacity exists for domestic wastewater from the Coega IDZ and that investigations to ensure sufficient capacity in the future are on-going. This philosophy, combined with the possible construction of effluent recycling facilities with generation of water for industrial use, will result in beneficial use of domestic wastewater, thereby reducing the stress on regional water resources. Again, this by no means implies that authorities should relax, and the current established philosophies and processes need to be strictly followed and plans implemented to ensure sustainability. Depending on future developments, and considering the above, the cumulative impact associated with domestic wastewater is currently noted as a **low** negative impact (with mitigation).

- **Stormwater Discharge**
  Rainfall events in the area are common, and therefore stormwater generation is inevitable. Currently, stormwater monitoring indicates a very similar quality to surface water and groundwater in the areas (with generally lower electrical conductivity and Na/Cl concentrations). Where unpolluted, stormwaters can be discharged into the environment. However, where industry pollutes a stormwater, care should be taken to ensure that stipulated stormwater quality requirements are adhered to. CDC stormwater quality requirements are currently vague, and should be reviewed and amended as soon as possible. As noted previously, the relevant authorities have made it clear to project proponent that strict housekeeping, limiting particulates, gaseous emissions, etc are required to minimise the negative impact of polluted stormwater from all industries the area. Again, these established philosophies and processes need to be strictly followed and monitoring and management plans implemented to ensure sustainability. Depending on future developments, and considering the above, the cumulative impact associated with stormwater discharge is currently noted as a **low** negative impact (with mitigation)

- **Solid and Hazardous Wastes**
  All projects will produce solid waste, and some will produce a hazardous waste. The impacts of this waste are dependent on the quantity produced, the concentration of pollutants and whether appropriate facilities are in place for safe disposal thereof. the Recent upgrades (e.g. Aloes II) means that sufficient capacity for such waste presently exists, and the cumulative impact associated with both solid waste and hazardous waste is currently noted as a **low** negative impact (with mitigation). To ensure this low impact, strict controls need to be enforced, including appropriate characterisation of waste and monitoring.

10.6.5 Impact Summary

The impact assessment for issues related to water use and liquid waste generation and management are summarised in Table 10.13. (***NOTE:*** The environmental impacts associated with water use and liquid generation, of the various alternatives are not different)

Table 10.13: Summary of Impact Assessment of the proposed Manganese ore Export Facility

Construction Phase										
Direct Impacts										
Impact Description	**Mitigation**	**Spatial Extent**	**Intensity**	**Duration**	**Reversibility**	**Irreplaceability**	**Probability**	**Significance & Status**		**Confidence**
								Without Mitigation	***With Mitigation***	
Increased water use during construction impacts regional water balance	Small impact on available water resources, ensure stated quantities not exceeded. Water conservation should still be practiced.	Regional	Low	Short Term	Low, water used from the NMBM / CDC cannot be recovered	Low, unique resources not destroyed	Definite	Medium Negative	Low Negative	High
Domestic effluent collection in portable toilets/tanks for transport to appropriate treatment facility enters environment	Normal sewage management practises required (e.g. regularly empty toilets, safe transport and disposal of sewage, employee training, etc). Additional effluent treatment facilities / additional treatment capacity also planned by relevant authorities (CDC/NMBM).	Regional	Medium	Short Term	High, depending on the quality / quantity of the sewage, natural treatment processes could render this waste innocuous	Low, good domestic effluent collection practices are anticipated. If spillages occur, small amounts of waste are expected	Improbable	Medium Negative	Low Negative	High

Construction Phase

Direct Impacts

Impact Description	Mitigation	Spatial Extent	Intensity	Duration	Reversibility	Irreplaceability	Probability	Significance & Status		Confidence
								Without Mitigation	***With Mitigation***	
Construction stormwater discharge into environment during construction	Implement suggested management actions (as detailed within Section 10.8).	Local	Medium	Short Term	Low, it is not expected that there will be proper stormwater collection systems during construction, therefore erosion is likely	Medium, parts of this land is already transformed / degraded	Highly Probable	Medium Negative	Low Negative	Medium
Construction solid waste not appropriately disposed of	Implement proper construction site suggested management actions (as detailed within Section 10.8). If required containment structures, good on-site housekeeping, spillage management, appropriate collection and disposal, etc are followed, this impact will be mitigated.	Local	Medium	Short Term	High, as should be able to largely reverse impacts	Moderate, parts of this land is already transformed / degraded	Improbable	Medium Negative	Low Negative	Medium

Construction Phase

Direct Impacts

Impact Description	Mitigation	Spatial Extent	Intensity	Duration	Reversibility	Irreplaceability	Probability	Significance & Status		Confidence
								Without Mitigation	***With Mitigation***	
Construction hazardous materials/wastes not appropriately disposed of	Implement proper construction site suggested management actions (as detailed within Section 10.8).	Local	High	Short Term	Low, as impacts caused will be difficult to reverse	Moderate, parts of this land is already transformed / degraded	Improbable	Medium Negative	Low Negative	Medium

Operations Phase

Direct Impacts

Impact Description	Mitigation	Spatial Extent	Intensity	Duration	Reversibility	Irreplaceability	Probability	Significance & Status		Confidence
								Without Mitigation	***With Mitigation***	
Increased water used during normal operation impacts regional water balance	Small impact on available water resources, ensure stated quantities not exceeded. Water conservation should still be practiced. Also consider use of groundwater to further reduce potable water demands.	Local	Low	Long Term	High, water used will be available for other uses	Moderate, the area is water stressed and precautionary practices are encouraged	Definite	Medium Negative	Low Negative	High
Domestic effluent discharge into sewer enters environment	Normal sewage management practises required (e.g. regularly inspect systems, appropriate maintenance, employee training, etc). Additional effluent treatment facilities/additional treatment capacity also planned by relevant authorities (CDC/NMBM) (next to stockyard/stormwater control dam).	Local	Medium	Long Term	High, with good management and maintenance procedures effluent is less likely to disturb the environment	Low, with good management and maintenance effluent is less likely to disturb the environment	Improbable	Medium Negative	Low Negative	High

Operations Phase										
Direct Impacts										
Impact Description	**Mitigation**	**Spatial Extent**	**Intensity**	**Duration**	**Reversibility**	**Irreplaceability**	**Probability**	**Significance & Status**		**Confidence**
								Without Mitigation	***With Mitigation***	
Service wastewater discharge into environment	Contain service wastewaters and test for contaminants. Ensure robust treatment systems and good management to ensure that cannot be accidentally discharged. Re-use if quality acceptable. May need to consider additional treatment of service wastewaters if quality requirements cannot be readily achieved.	Local	Medium	Long Term	Low, service wastewaters would impact on surface or groundwater	High, if discharged service wastewaters are likely to have an impact on surface or groundwater	Improbable	Medium Negative	Low Negative	Medium
Contaminated stormwater discharge to environment	Clean stormwater will be discharged offsite Dirty stormwater will be contained and tested for contaminants and treated (if necessary) prior to release If still not acceptable will be disposed of at an appropriate facility Ensure robust treatment systems and good management to ensure that cannot be accidentally discharged Implement suggested management actions (as detailed within this report)	Local	Medium	Long Term	High, will be contained in stormwater ponds, but dependant on pond size/frequency of storm event	Low, stormwater could potentially be re-used	Probable	Medium Negative	Low Negative	Medium

Operations Phase

Direct Impacts

Impact Description	Mitigation	Spatial Extent	Intensity	Duration	Reversibility	Irreplaceability	Probability	Significance & Status		Confidence
								Without Mitigation	***With Mitigation***	
Hazardous wastes (e.g. chemical, oil waste) disposal into environment	Implement normal good practice including containment and immediate clean-up of any spillages, collection of chemical/oil wastes and other hazardous wastes, disposal at an appropriate hazardous waste facility, etc.	Local	Medium	Long Term	Low, although waste could be appropriately disposed of, site is in all likelihood critically modified, and could only be recovered at significant cost and could take considerable time.	Low, although waste could be appropriately disposed of, site is in all likelihood critically modified, and could only be recovered at significant cost and could take considerable time.	Improbable	Medium Negative	Low Negative	Medium
General solid waste disposal into environment	Implement proper site management actions (as detailed within Section 10.6). If required containment structures, good on-site housekeeping, spillage management, appropriate collection and disposal, etc are followed, this impact will be mitigated.	Local	Low	Long Term	High, as should be able to largely reverse impacts	Low, although waste could be appropriately disposed of, site is in all likelihood modified, and would require time and cost to recover.	Improbable	Medium Negative	Low Negative	Medium

Operations Phase										
Direct Impacts										
Impact Description	**Mitigation**	**Spatial Extent**	**Intensity**	**Duration**	**Reversibility**	**Irreplaceability**	**Probability**	**Significance & Status**		**Confidence**
								Without Mitigation	***With Mitigation***	
Manganese ore mud waste disposal into environment	Once operations commence, need to characterise sludge soonest (hazardous or non-hazardous). If non-hazardous, could potentially be used as a sacrificial layer at stockyard or disposed of off-site at an appropriate facility. If hazardous, stricter disposal requirements shall apply.	Local	Medium	Long Term	Low, at this stage don't know the sludge characteristics and whether it will be hazardous or non-hazardous (precautionary principle)	Moderate, site is in all likelihood critically modified, and could only be recovered at significant cost and could take considerable time.	Improbable	Medium Negative	Low Negative (dependant on actual characterisation)	Low

Decommissioning Phase

Direct Impacts

Impact Description	Mitigation	Spatial Extent	Intensity	Duration	Reversibility	Irreplaceability	Probability	Significance & Status: *Without Mitigation*	Significance & Status: *With Mitigation*	Confidence
Increased water used during decommissioning impacts regional water balance	Small impact on available water resources. Water conservation should still be practiced.	Local	Low	Very Short Term	High, water used will be available for other uses	Moderate, the area is water stressed and precautionary practices are encouraged	Definite	Low Negative	Low Negative	Medium
Domestic effluent collection in portable toilets/tanks for transport to appropriate treatment facility enters environment	Normal sewage management practises required (e.g. regularly empty toilets, safe transport and disposal of sewage, employee training, etc.)	Local	Medium	Very Short Term	High, depending on the quality / quantity of the sewage, natural treatment processes could render this waste innocuous	Low, good domestic effluent collection practices are anticipated. If spillages occur, small amounts of waste are expected	Improbable	Medium Negative	Low Negative	Medium

Decommissioning Phase

Direct Impacts

Impact Description	Mitigation	Spatial Extent	Intensity	Duration	Reversibility	Irreplaceability	Probability	Significance & Status		Confidence
								Without Mitigation	*With Mitigation*	
Contaminated stormwater discharge to environment	Implement suggested management actions (as per Section 10.8)	Local	Medium	Very Short Term	Medium, stormwater collection systems should be in place, and perhaps decommissioned last	Medium, parts of this land is already transformed	Probable	Medium Negative	Low Negative	Medium

Indirect Impacts

Impact Description	Mitigation	Spatial Extent	Intensity	Duration	Reversibility	Irreplaceability	Probability	Significance & Status		Confidence
								Without Mitigation	*With Mitigation*	
Demolition solid waste enters environment	Implement normal good practice (as noted in Section 10.8)	Local	Low	Very Short Term	High, as should be able to largely reverse impacts	Low, although waste could be appropriately disposed of, site is in all likelihood critically modified, and could only be recovered at significant cost and could take considerable time.	Probable	Low Negative	Low Negative	Medium

Hazardous waste spills (oil, chemicals, etc.) on site during decommissioning	Implement normal good practice including containment and immediate clean-up of any spillages, collection of chemical/oil wastes, disposal at an appropriate hazardous waste facility, etc. (as noted in Section 10.8)	Local	Medium	Very Short Term	Medium, significant quantities of chemicals/oil on-site during commissioning is not anticipated	Low, although fuel/oil/hazardous waste could be appropriately disposed of, site is in all likelihood critically modified, and could only be recovered at significant cost and could take considerable time.	Probable	Medium Negative	Low Negative	Medium

10.7 MONITORING RECOMMENDATIONS

Details of any proposed environmental water quality monitoring have not been provided. The following is noted:

- As previously noted, considering the proposed location of the proposed project, it must be noted that monitoring is currently conducted in two main culverts (labelled A and B) and a gully (Butterfly Valley) on the western side of the Coega River/salt pans. As stormwater discharges from the proposed project could have an impact on surface water, surface water monitoring is recommended. The present CDC surface water quality monitoring programme should be adequate.
- As per the above, the present groundwater monitoring programme is extensive. In addition, the project proponent has noted that he will conduct groundwater monitoring at the site. The findings and recommendation from the Groundwater Specialist Study should be incorporated into the monitoring programme (Chapter 8).

With regards to the ***Construction Phase***:

- Construction activities may lead to an increase in turbidity/suspended particles in stormwater runoff. The turbidity of the stormwater runoff should be monitored after a rainfall event to ensure that acceptable levels are maintained. As it is anticipated that stormwater will be discharged to the CDC stormwater system, the CDC stormwater quality requirements will need to be adhered to.

With regards to the ***Operation Phase***:

- Poor housekeeping (spillages of oil, chemicals, etc.) may lead to contaminated stormwater runoff. The quality of the stormwater runoff should be monitored after a rainfall event to ensure that an acceptable quality is maintained. Monitoring should at least be conducted at all major site stormwater outlets (if any), as this will allow tracing of problematic areas and required management interventions. It would therefore be necessary to have appropriate emergency procedures in place to deal with abnormal conditions. In the unlikely event that monitoring shows an unacceptable environmental impact associated with discharges of “clean” stormwater, implementation of “clean” stormwater recycling for on-site treatment should be fast tracked. As it is anticipated that stormwater could be discharged to the CDC stormwater system, the CDC stormwater quality requirements will need to be adhered to.

For other service wastewater discharges, water quality monitoring should include monitoring of all required parameters specified through the specified agreement (e.g. with CDC).

10.8 CONCLUSIONS

The following summary is presented:

Table 10.13: Summary of Impacts of the proposed Manganese ore terminal

Construction	Before Mitigation	After Mitigation
Water Use	Medium	Low
Domestic Wastewater Discharge (sewage)	Medium	Low
Construction Stormwater Discharge	Medium	Low
Construction Solid Waste Disposal	Medium	Low
Hazardous Waste Disposal	Medium	Low
Operations	**Before Mitigation**	**After Mitigation**
Water Use	Medium	Low
Domestic Waste Water Discharge (sewage)	Medium	Low
Service Wastewater Discharge	Medium	Low
Stormwater Discharge	Medium	Low
Chemical and Oil Wastes Disposal (hazardous)	Medium	Low
Railway Operations Waste Disposal (solid waste)	Medium	Low
Manganese Ore Mud Management	Medium	Low
Hazardous Waste Disposal	Medium	Low
Solid Waste Disposal	Medium	Low
Decommissioning	**Before Mitigation**	**After Mitigation**
Water Use	Low	Low
Domestic Wastewater Discharge (sewage)	Medium	Low
Stormwater Discharge	Medium	Low
Solid Waste Disposal (demolition rubble)	Low	Low
Hazardous Waste Disposal	Medium	Low

Considering the above, the following summary of proposed mitigation measures is noted (see Section 10.9 for further detail):

- Integrated Water Management Study related mitigation measures already proposed by the project proponent:

10.8.1 Quality Management System

- o Construction Environmental Plan and associated Standard Environmental Specification
- o Bunding
- o Emergency Systems (Fire)
- o Conveyor System optimisation/best practice measures
- o Dust Control optimisation/best practice measures
- o Stockyard, tippler and quay drainage optimisation/best practice measures
- o Stormwater control dams and associated stormwater reuse
- o Oily Waste Drains and Oil/Water Separator Systems
- o Manganese ore Spillage Management
- o Energy saving measures

- Integrated Water Management Study related additional mitigation measures (perhaps being planned, but not yet documented):

Stormwater Management Plan for Operations
Railway Operation Management Plan (procedures/protocols for day-to-day activities and similar to Stockyard and Quay Operation Management Plans)
Additional recommendations for Waste Management Plan
Water Conservation and possible use of groundwater for dust suppression

Considering the commitment by the project proponent to good practice, it is anticipated that the above items will receive the necessary attention.

Likely permits/licenses/agreements required from applicable authorities have also been noted. In particular, the Department of Water Affairs would require the project proponent to register the proposed stormwater dams/ponds, as their storage capacity exceeds 10,000 m^3. As it is proposed to construct a road bridge across the Coega River to access the stockyard, a permit for this activity will be required. Care should also be taken to ensure that other construction activities (e.g. construction of the stormwater control dam at the stockyard), does not impact on the Coega River.

10.9 BEST MANAGEMENT PRACTICES

The Best Practical Environmental Option (BPEO) is normally defined as “the option that provides the most benefit or causes the least environmental damage as a whole, at a cost acceptable to society, in the long and short-term”.

The sections below highlight typical best management practices for both construction and operation of manganese ore or similar bulk ore handling facilities. It should be noted that the project proponent is committed to environmental best practice.

The following systems/processes have already been included within the proposed construction and operations phase activities:

10.9.1 Quality Management System

Transnet utilise a Quality Management System compliant with the requirements of ISO 9001:2008, with all decision making based on the agreed quality policy and quality objectives, and covering all aspects of operations. The system contains the procedures, functional guidelines and associated tools required to execute quality Projects, and contains documentation for all functional groups and engineering disciplines.

10.9.2 General Construction Site Management Requirements

The project proponent has provided a detailed Construction Environmental Plan (Transnet, 2011) which describes the main environmental management requirements that the Contractor must comply with during the construction phase to ensure that the environment is considered, negative impacts avoided or minimized, and positive impacts optimized. The following key points are noted:

- The plan specifies different roles and responsibilities associated with environmental management, including both that of the project proponent and the appointed contractor.
- The Contractor will need to prepare Environmental Statements, and adhere to requirements stated therein.
- The standard also sets out actions required for various environmental incidents (major, medium and minor) and associated non-conformances.

- The Contractor will also be responsible for environmental induction of all management, foreman, general workers, suppliers and visitors to the site prior to any work on site.
- Weekly inspections and daily inspections are required at key work places.
- Both monthly and quarterly construction site audits need to be conducted of the entire site.

To minimise any negative environmental impact, the project proponent will need to ensure that the above requirements are strictly adhered to.

10.9.3 Standard Environmental Specification

The project proponent has developed a procedure which describes the minimum standards for environmental management to which Contractors and sub-Contractors on the construction suite must comply (generic for all Transnet Capital projects). Details related to this Integrated Water Management Specialist Study include:

- Water supply
    - Contractor must ensure safe, adequate water supply for all personnel on-site
    - Not permitted to abstract water for domestic purposes from river, groundwater, etc without proper approvals.
    - Provide potable water within 200 m of any point on the construction site (i.e. as per DWA basic service delivery requirements).
- Sewage and effluent management
    - Contractor is responsible for establishing and maintaining appropriate sewage facilities
        - Septic tanks and soak-aways (if > 800 m from natural water course/water retention system), or
        - Dry composting toilets (enviro loos), or
        - Chemical toilets
    - Only domestic type wastewater is allowed to be discharged into these systems and collected effluent needs to be transferred to a designated system
- Waste management
    - Contractor is responsible for removing all waste to an appropriate licensed waste management facility.
    - Waste is categorized as:
        - General waste (e.g. trash, food waste, domestic waste, waste plastic, scrap metal), and
        - Hazardous waste (e.g. waste oil, construction debris contaminated by oil or organic compounds)
- Vehicle and Equipment Refueling
    - Designated servicing and refueling locations required for all refueling, oil/lubricant changes, etc
    - Fuel and oil stored in secure area
    - Bunding required to contain 110% of total volume
    - Impervious layer/liner/paved surface to prevent spillage from entering the ground
    - Spill response plan required for spill events (fuel, oil, paints or other hazardous materials) and to contain mitigation measures
- Dust management
    - Load material in load bins of vehicle in such a way to prevent spillage onto roads (e.g. don't overfill, cover with tarpaulin, etc)
    - Dust control will be via use of sprayed water (e.g. spray truck on gravel roads)
- Stormwater and dewatering management
    - Aims to negate both contamination by oils, fuels, litter and other waste and prevent erosion

  - o Construction activities considered:
    - Runoff and percolation surface grading and excavation will disturb surface areas on site)
    - Dewatering activities (requires collection and sedimentation, and can affect groundwater quality and quantity if not handled appropriately)
    - Miscellaneous liquid wastes associated with construction activities (e.g. used solvents, used lubricating oils, chemical flushing agents, spill cleanup wastes, painting wastes, concrete mixing drum washings, sewerage from employee ablutions, excess fertilizer from rehabilitated areas)
  - o Contractor needs to establish temporary drainage until permanent drainage is established
  - o Good housekeeping to prevent contamination and clear stagnant water
  - o A number of structural and non-structural (vegetative) erosion control measures will be designed, implemented and maintained in accordance with best management practices.
- Environmental Awareness Training
  - o All construction personnel need to undergo environmental awareness training
- Handling and batching of concrete and cement
  - o Concrete batching will be done within a bunded, impervious area to prevent groundwater contamination, with drainage of the collection facility separated from infrastructure containing clean runoff (and water contained therein left to evaporate, with associated water level monitoring).
  - o Bulk and bagged cement stored in an appropriate facility and at least 10 m away from any water courses, gullies and drains.
  - o A washout facility will be provided (washing concrete associated equipment), with water used kept to a minimum.
  - o Hardened concrete from wash-out facility or concrete mixer can either be reused or disposed of at an appropriate licensed disposal facility.

The commitment to and required associated enforcement by the project proponent to the aforementioned best practices is welcomed.

With reference to the above, the following related good practice management aspects are also noted and have been presented by Transnet as part of the design:

10.9.3.1 Bunding

In terms of spill contingency, where appropriate, the facility will be equipped with appropriate bunding mechanisms (especially at any refuelling points). Although not specified, the bunding walls and floor should be composed of reinforced concrete, and sealed ensuring that any leak inside the bund does not come in contact with the soil. The drainage from the bund areas will be to an oil/water separator for treatment (i.e. not to drain to the stormwater system).

10.9.3.2 Oily Waste Drains and Oil/Water Separator System

Service wastewater includes that generated during wash downs, maintenance activities and other miscellaneous service water dependant activities. Drains also need to collect wastewater from diked/bunded containment areas around chemical and oil storage tanks, transformers and other equipment. Wastewater is collected from areas where there is a potential for oil contamination and transported to the oil/water separator system for treatment. Oil is removed via the difference in specific gravity (density) of oil and water. The oil collected will be pumped into appropriate containers for off-site disposal by a licensed waste management contractor (e.g. for disposal at an appropriate hazardous waste facility – probably Aloes 2 Hazardous Waste Disposal Site). If the treated water meets the necessary standards and specifications it could potentially be re-used (e.g.

for dust suppression). If the water quality is not appropriate, the treated water would need to be sent for off-site disposal at an appropriate facility (e.g. could be discharged into the Coega IDZ effluent water system) or it could be re-treated in the oil/water system until it meets quality requirements.

10.9.3.3 Emergency Systems

In addition to the previously noted fire water system, other fire and emergency related systems and equipment include a network of fire hydrants and fire hose reels, suitable fire extinguishers, alarm systems, smoke detectors, relevant signage, etc that will be located throughout the site. Emergency plans will be in place in the event of accidental spillages or leaks of hazardous material.

10.9.3.4 Conveyor System

The conveyor system shall incorporate:

- Consideration for ease of clean up after spillage at all parts of the conveyors, which shall be designed to give easy access for mechanical methods of spillage collection using “bobcats”, small front end loaders or vacuum collection, with a facility to return spillage to a the stockyard.
- Associated transfer chutes shall incorporate dust control via controlled water spray systems. Each chute will be provided with water sprays at the entry to the chute and a high pressure water fog system at the outlet.

10.9.3.5 Dust Control

Please refer to Chapter 5 Air Quality Specialist Study for the description of dust suppression techniques and associated impacts. The total requirement for the dust suppression system is approximately 940 m^3/day for the water only suppression system, and approximately 328 m^3/day for the water and surfactant suppression system (i.e. >60% reduction in water requirement). Approximately 72 m^3/day of water could be available from seepage through the stockpiles and stormwater (collected at the stormwater dams). The balance of required water will initially be fed from the municipal potable water system or from return effluent from CDC.

10.9.3.6 Stockyard Drainage

The stockyard terrace has been designed to take into consideration both stormwater and dust mitigation water overflows. The stockyard terrace drainage design incorporates a v-drain at the middle of each stockpile that collects the dust suppression water overflows and any stormwater run-off. This flows toward the stormwater control dam. The terrace surface flows will collect to the terrace road drainage system. This will eventually join with the stockpile drainage system and make its way to the stormwater control dam.

10.9.3.7 Tippler Drainage

The tippler drainage has been designed to take into consideration both stormwater and water spillage on to the apron slab. The apron slab around the tippler will slope towards the side drains available on either side of the existing railway line. Any drainage and wash down water in the building will be channelled to the sump and pumped out to the stormwater control dam.

10.9.3.8 Quay Drainage

At the quay, wash down systems are required for the quay conveyor gantry and for the shiploader. The quay has been designed to take into consideration both stormwater and dust mitigation water overflows. The approach to the quay drainage design is such that the access road will have a concrete lined side drain that flows into a pipe leading to the quayside stormwater control dam.

10.9.3.9 Manganese Ore Spillage Management

The following key points are noted:

- Primary clean-up of the following areas will be by dry methods:
  - Quay deck
  - Underground conveyor tunnels
  - Tipplers
  - Transfer towers; except immediately under the transfer points
- Where this is impractical, the fall back system will be wet clean-up.
- The following clean-up areas may be designated to be wet clean-up and will be concrete paved:
  - Stackers
  - Reclaimers
  - Shiploaders
  - Transfer points
- All other areas shall be considered to be dry clean-up areas only.
- Wet clean-up areas shall discharge to suitable pits located at key collection points (size not provided at this stage) for primary sedimentation of solids.
- Cleanout pits will be designed to be cleaned out using mechanical means, drive in style preferred.
- Effluent from these pits shall decant or be pumped for further treatment and reuse.
- Truck mounted vacuum systems will be utilised in areas not accessible via other equipment and where wash down is not employed.

In addition to the above, the project proponent has also indicated that an energy saving policy is already in place for the organization, and will be implemented as part of this project.

Although it is anticipated that the project proponent will follow good practice, the following items were not noted within the documents reviewed:

10.9.4 Wastewater/waste Management Plan for Operations

In addition to best practices already proposed by the proponent, the following additional recommendations are made in terms of wastewater and wastes generation during the operation phase:

- Establish a waste management plan, including a full characterization of the wastes anticipated to be generated on site (quantity and quality), proposed handling, storage and management methods;
- Record waste quantities on a monthly basis;
- Waste skips should be in good working order (i.e. free of holes) and in good condition;
- All hazardous wastes that cannot be reused or recycled should be labeled correctly and stored in a secure area until collected for disposal;
- Disposal of hazardous waste at a registered hazardous waste disposal facility. Obtain safe disposal certificates;
- Only registered contractors, approved by the proponent, shall be used for the collection transporting and disposal of wastes; and
- Undertake annual audits on the waste contractors (transport companies) and the landfill operators

10.9.5 Stormwater Management Plan for Operations

Although the project proponent has developed an Environmental Management Plan for the construction period (which includes water management aspects), it is suggested that a site Stormwater Management Plan that considers on-going operation also be developed. The plan should build upon Environmental Management Plan and ensure good practise is followed on-site to prevent stormwater contamination, examples of aspects for consideration include:

- Oil, chemical and waste storage containers or tanks should always be securely stored in or equipped with roofed, adequate, secondary containment to contain spills and leaks.
- **Any diesel driven pumps and diesel storage tanks should always be covered.**
- Discharges of oil, chemical or wastewaters to any "clean" stormwater discharge outlets will be prohibited.
- Periodic inspections should be conducted to check for leaks from equipment, storage containers and to observe the integrity of secondary containment structures.
- Preventative maintenance of equipment should be performed on a routine basis to reduce the potential for leaks

10.9.6 Railway Operation

During railway operation, the following measures are recommended to prevent and control impacts (IFC, 2007):

- Regular maintenance of vegetation within railway line is necessary to avoid interference with train operations. Vegetation management may include use of herbicides. If such methods are practiced, only approved/appropriate herbicides should be utilised, and application practices should be designed to reduce unintentional runoff.
- Untreated buffer zones or strips should be established along water sources, rivers, streams, etc to help protect water resources.
- Contamination of soils, groundwater, or surface water resources due to accidental spills during transfer, mixing, and storage of herbicides should be prevented by adhering to the specified hazardous materials storage and handling requirements

10.9.7 Water Conservation

Although detailed designs are not yet available, the project proponent is committed to water conservation within the project. During detailed design, it is recommended that the project proponent consider the following:

- Domestic
    - Implement water saving devices (dual flush toilets, automatic shut-off taps, etc).
    - Install self-closing taps, automatic shut-off valves, spray nozzles, pressure reducing valves, and water conserving fixtures (e.g. low flow shower heads, faucets, toilets, urinals; and spring loaded or sensored faucets)
- Pressure management
    - Process water system pressure management (i.e. lower pressure = lower flow = lower leakage/usage)
- Irrigation (if required)
    - As far as possible, potable water should not be used for irrigation purposes. Ideally, landscapes should be designed to absorb rainwater runoff (stormwater) rather than having to carry it off-site in stormwater systems. Furthermore, the following should be noted:
        - Proper irrigation scheduling will limit evaporation losses.

        - Indigenous plants generally require less water than alien species.
        - Gardens should be structured as to minimise surface run-off.
- Cleaning
    - Cleaning methods utilised for cleaning vehicles, floors, etc should aim to minimise water use (e.g. sweep before wash-down).
- Fire fighting
    - Proper pressure management within fire water systems will limit water use.
- Elimination of leakage
    - Regularly maintain plumbing, and identify and repair leaks
    - Shut off water to unused areas
    - Regular audits of water systems should be conducted to identify possible water leakages.
- Metering and measurement
    - Proper metering and measurement of water use and wastewater discharges will enable proper performance review and management.
- Education and awareness
    - Awareness campaigns focussing on spillages and the effects thereof on stormwater quality and the environment should be launched in all areas of the facility. These campaigns must be aimed at all levels of the organisation (including contractors). Furthermore, water system operating personnel need to have extensive knowledge of the various water control systems, to allow for optimum operation thereof.

Considering the commitment by the project proponent to good practice, it is anticipated that the above items will receive the necessary attention.

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