

NCWABENI: OFF-CHANNEL STORAGE DAM

ENVIRONMENTAL MANAGEMENT PROGRAMME

RE-ALIGNMENT OF D859

DRAFT

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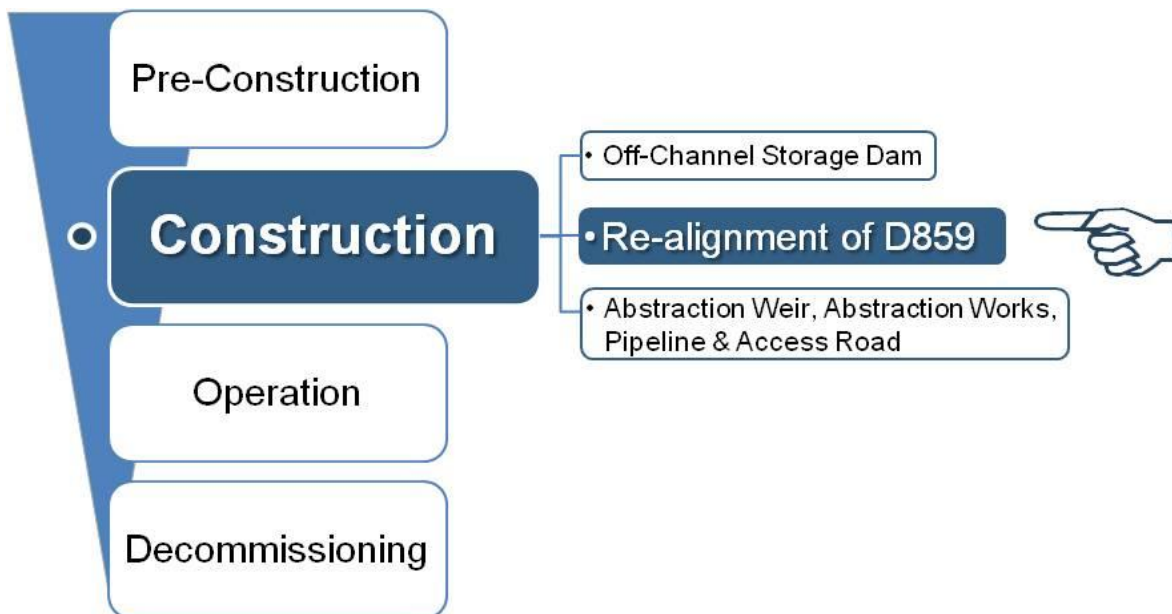


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LIST OF ACRONYMS & ABBREVIATIONS

DEA	Department of Environmental Affairs
DMR	Department of Mineral Resources
DWA	Department of Water Affairs
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
EMC	Environmental Monitoring Committee
GN	Government Notice
km	Kilometre
KZN	KwaZulu-Natal
m³/s	Cubic metre per second
MSDS	Material Safety Data Sheet
OCS	Off-Channel Storage
SANS	South African National Standards

DEFINITIONS OF KEY TERMS

Construction Area	<i>Immediate site influenced by specific construction activities, as approved by the Project Manager.</i>
Construction Domain	<i>Entire footprint required for the construction of the overall project components.</i>
Dam	<i>Any barrier dam and any other form of impoundment used for the storage of water.</i>
Environment	<i>The surroundings in which humans exist and which comprise:</i> <ul style="list-style-type: none"> • <i>The land, water and atmosphere of the earth.</i> • <i>Micro-organisms, plant and animal life.</i> • <i>Any part or combination of a) and b) and the interrelationships among and between them.</i> • <i>The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that can influence human health and well-being.</i>
Environmental Aspect	<i>Those components of the company's activities, products and services that are likely to interact with the environment.</i>
Environmental Feature	<i>Elements and attributes of the biophysical, economic and social environment.</i>
Environmental Impact	<i>The change to the environment resulting from an environmental aspect, whether desirable or undesirable. An impact may be the direct or indirect consequence of an activity.</i>
Environmental Management Programme (EMPr)	<i>A detailed plan of action prepared to ensure that recommendations for enhancing positive impacts and/or limiting or preventing negative environmental impacts are implemented during the life-cycle of a project.</i>
Environmental Objective	<i>Overall environmental goal pertaining to the management of environmental features.</i>
Environmental Target	<i>Performance requirement that arises from the environmental objectives and that needs to be set and met in order to achieve those objectives.</i>
Impervious	<i>Not permeable; not allowing liquid to pass through. Resistant to movement of water.</i>
Sensitive environmental features	<i>Environmental features protected by legislation (e.g. heritage resources), or identified during the EIA as sensitive through specialists' findings and input received from Interested and Affected Parties.</i>
Watercourse	<i>A geomorphological feature characterized by the presence of a streamflow channel, a floodplain and a transitional upland fringe seasonally or permanently conveying surface water. According to the National Water Act (Act 36 of 1998), a watercourse constitutes a river or spring, a natural channel in which water flows regularly or intermittently, a wetland, lake or dam into which, or from which, water flows, and any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.</i>

1. INTRODUCTION

This document serves as the Draft Environmental Management Programme (EMPr) for the re-alignment of the D859 as part of the overall Ncwabeni off-channel storage (OCS) Dam project, where the Department of Water Affairs (DWA) is acting as the project proponent.

Note that this EMPr is regarded as a sub-programme to the overall EMPr for the OCS Dam and should thus not be read in isolation. The EMPr for the OCS Dam (separate document) reflects how the programme aims to satisfy the requirements stipulated in section 24N of the National Environmental Management Act (No. 107 of 1998) (NEMA), and the associated regulation 33 of Government Notice (GN) No. R. 543 (18 June 2010).

1.1 Project Background

The Mzimkhulu Water Supply System (MWSS), which forms part of the KwaZulu Natal (KZN) Lower South Coast System, supplies water to all urban coastal towns from Hibberdene to Ramsgate, as well as to many rural inland settlements such as Fairview, Kwa-Madlala, Louisiana, Bhoboyi, Murchison, KwaNdwalane, Izontsha, Kwa Mavundla, Gamalakhe, etc, with a total estimated present rural population size of about 152 450. A significant growth in the water requirements for the system has been predicted through various previous studies, and a substantial portion of that growth can be associated with the increase of the level of service for the rural population as well as the planned extension of the system to cover additional rural areas, which are not presently supplied with water from the scheme.

DWA conducted various studies to determine the best options for providing the water requirements of all user sectors, including the Reserve. It was found that the construction of an off-channel storage (OCS) dam in one of the tributaries to the Mzimkhulu River should be considered. The reservoir can be filled from its incremental catchment, supplemented by pumping from the Mzimkhulu River during times of high river flows. During times of low flows water can be released back into the Mzimkhulu River for

abstraction downstream at the existing St. Helen's Rock abstraction works. From the various options investigated it was established that the D3A site on the Gugamela River and the D2 site on the Ncwabeni River were more favourable in terms of the location of the OCS Dam (see map contained in **Figure 1**).

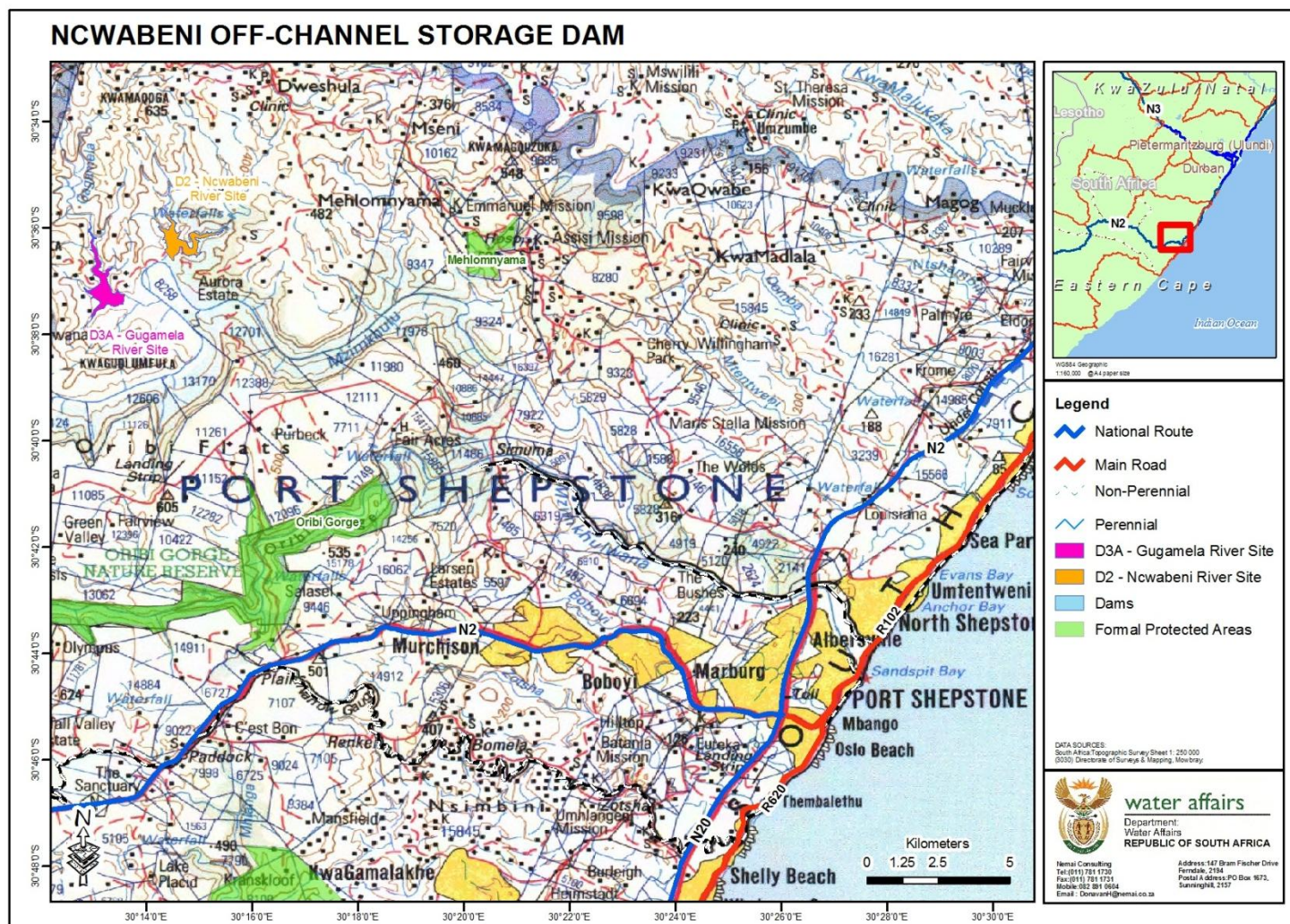


Figure 1: Regional Locality Map (site D2 – preferred site)

The project required authorisation from the Department of Environmental Affairs (DEA) in terms of NEMA, and the Environmental Impact Assessment (EIA) was undertaken in accordance the EIA Regulations (18 June 2010) contained in Government Notice (GN) No. R. 543, R. 544, R. 545 and R. 546. Based on the comparative analysis of the two alternative sites, as conducted as part of the EIA, site D2 was identified as the preferred option.

1.2 Overall Project Components

The proposed Ncwabeni OCS Dam project will consist of the following components (refer to layout map contained in **Appendix A**):

1. An OCS dam on the Ncwabeni River (site D2 – preferred site);
2. An abstraction / gauging weir on the Mzimkhulu River;
3. An abstraction works with a mechanism to remove silt;
4. A pump station and pipeline to deliver water to the dam; and
5. An outlet infrastructure to make measured releases back to the Mzimkhulu River.

1.3 EMPr Framework

Due to the extent of the overall project, the following suite of EMPrs was developed to deal with the various key components of the project:

1. Pre-Construction EMPr;
2. Construction EMPrs -
 - a. OCS Dam;
 - b. **Re-alignment of D859** (focus of this document); and
 - c. Abstraction weir, abstraction works, pipeline and access road; and

The following EMPrs will be developed as further information becomes available during the implementation of the project:

1. Search, Rescue and Relocation Management Plan for red data, protected and endangered species, medicinal plants, heritage resources and graves;
2. Ncwabeni OCS Dam Impoundment EMPr;
3. Rehabilitation Management Plan for disturbed areas outside of the dam inundation area; and
4. Operational EMPr.

1.4 Overview of the Re-Alignment of the D859

From Port Shepstone, the project area is accessed by travelling north-westwards on the P68-2 Main Road (St Faiths Road) and then turning southwards on a district gravel road (i.e. D859), which leads to the sites.

A re-alignment of the D859 is required to compensate for the section of the road that traverses the dam basin, which will become inundated. The re-alignment is also needed to facilitate access to the diversion weir and abstraction works. Refer to **Figures 2** and layout contained in **Appendix A**.

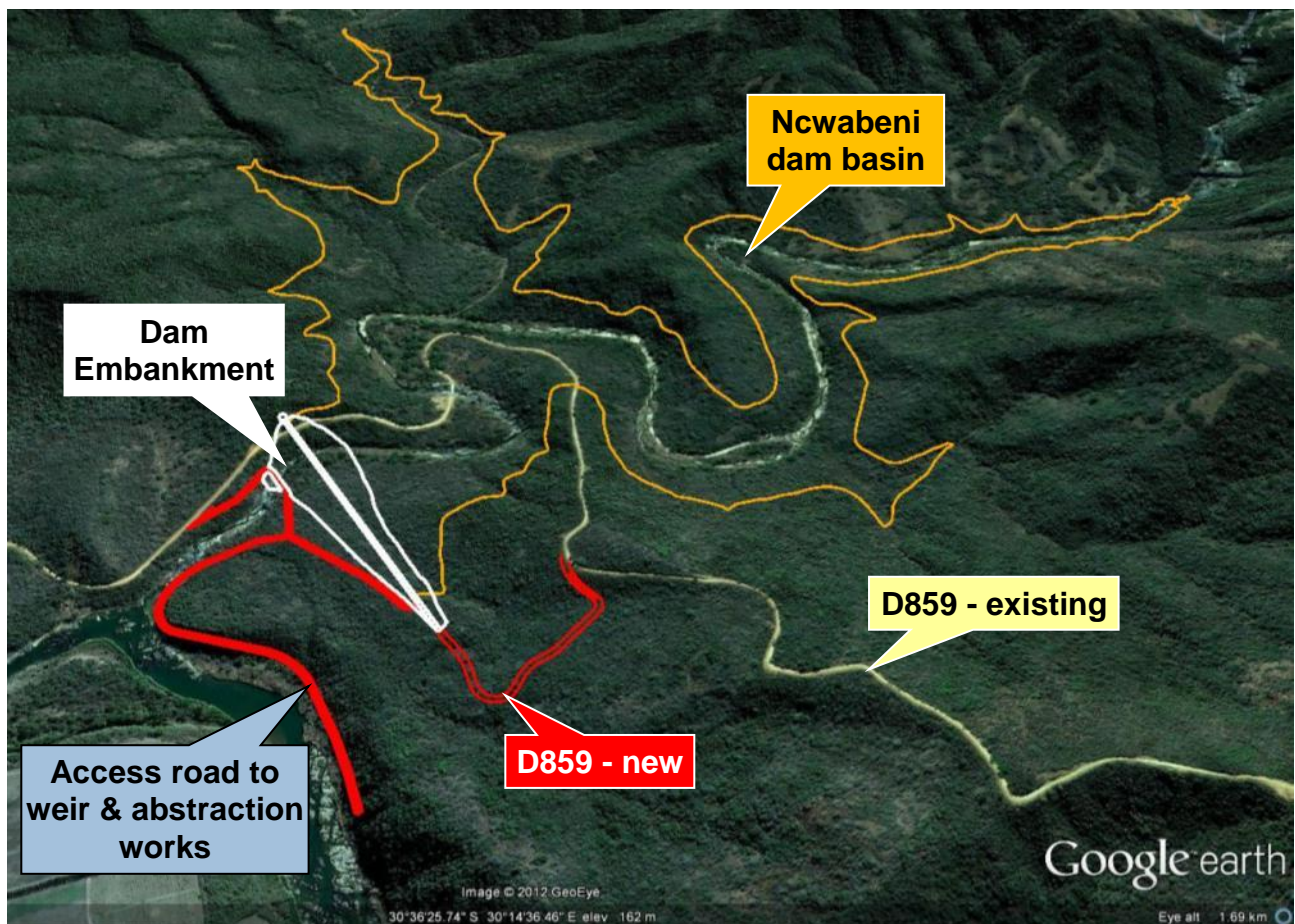


Figure 2: Re-alignment of D859 at site D2 (Google Earth image)

Approximately 1000 m of new road will be built to divert the D859 around the downstream side of the dam embankment. A further additional 800 m of road will also be built to provide access to the diversion weir and abstraction works (covered in a separate EMPr). The access road will be 6 m wide and will include a stormwater drain. Selective

improvements will also be undertaken to the D859 to facilitate the delivery of construction plant and materials to site.

2. OVERVIEW OF THE EMPr

This EMPr provides performance criteria required to address potential environmental impacts during the construction phase of the re-alignment of the D859, as part of the overall Ncwabeni OCS Dam project. This Report must be read in conjunction with the Ncwabeni Off-Channel Storage Dam EIA Report.

The scope of the EMPr for the re-alignment of the D859 is as follows:

- Establish management objectives during the construction phase in order to enhance benefits and minimise adverse environmental impacts;
- Provide targets for management objectives, in terms of desired performance;
- Describe actions required to achieve management objectives;
- Outline institutional structures and roles required to implement the EMPr; and
- Provide legislative framework.

3. ENVIRONMENTAL ACTIVITIES, ASPECTS AND IMPACTS

3.1 Project Activities and Environmental Aspects

The construction activities associated with the re-alignment of the D859 are tabulated below.

Table 1: Construction activities associated with the re-alignment of the D859

CONSTRUCTION PHASE
Project Activities
<ul style="list-style-type: none"> • Temporary accommodation of traffic
<ul style="list-style-type: none"> • Clearing of new road reserve
<ul style="list-style-type: none"> • Source and transport material from borrow area
<ul style="list-style-type: none"> • Install culvert at watercourse crossing

Environmental aspects are regarded as those components of an organisation's activities, products and services that are likely to interact with the environment and cause an impact. The following environmental aspects have been identified for the proposed re-alignment of the D859, which are linked to the project activities (note that only high-level aspects are provided):

Table 2: Environmental Aspects associated with the re-alignment of the D859

CONSTRUCTION PHASE
Environmental Aspects
<ul style="list-style-type: none"> • Lack of environmental awareness creation • Poor consultation with affected parties • Indiscriminate site clearing • Poor management of access and use of access roads • Poor transportation practices • Poor management of bitumen plant • Inadequate provisions for working on steep slopes • Disturbance of topsoil • Inadequate storage and handling of material • Inadequate storage and handling of hazardous material • Lack of equipment maintenance • Poor management of labour force • Pollution from ablution facilities • Poor waste management practices • Poor management of pollution generation potential • Damage to significant flora • Damage to significant fauna • Influence to drainage lines at crossing points and where activities occur in the riparian zone (and a buffer area of 50m) • Environmental damage of sensitive areas • Disruption of archaeological and cultural features • Poor reinstatement and rehabilitation

3.2 Potential Significant Environmental Impacts

Environmental impacts are the change to the environment resulting from an environmental aspect, whether desirable or undesirable. Refer to **Table 3** for the potential significant impacts associated with the preceding activities and environmental aspects.

Table 3: Potential Significant Environmental Impacts associated with the re-alignment of the D859

CONSTRUCTION PHASE	
Feature	Potential Impact
Geology and Soil	<ul style="list-style-type: none"> Impacts associated with the sourcing of construction material Soil erosion (land clearance, construction activities on steep slopes) Blasting-related impacts
Topography	<ul style="list-style-type: none"> Visual impact in river valley Erosion of affected areas on steep slopes
Surface Water	<ul style="list-style-type: none"> Adverse effects to resource quality (i.e. flow, in-stream and riparian habitat, aquatic biota and water quality) of the Mzimkhulu River Impacts to drainage line traversed by the re-aligned D859.
Flora	<ul style="list-style-type: none"> Loss of vegetation of conservation significance Proliferation of exotic vegetation in disturbed areas Loss of medicinal plants Loss of firewood
Fauna	<ul style="list-style-type: none"> Damage / clearance of habitat of conservation importance Loss of fauna species of conservation significance
Socio-economic	<ul style="list-style-type: none"> Relocation of access road Nuisance from dust and noise Damage to property, including structures, livestock, etc.
Air Quality	<ul style="list-style-type: none"> Excessive dust levels
Archaeological and Cultural Features	<ul style="list-style-type: none"> Damage to heritage resources and graves
Infrastructure	<ul style="list-style-type: none"> Damage to infrastructure
Transportation	<ul style="list-style-type: none"> Re-alignment of D859 Construction-related traffic on D859 Safety risks to pedestrians and existing road users Slipping of heavy vehicles on steep slopes Dangerous access onto D859 from P68-2 Main Road Improvements to the D859 and provision of stormwater system*
Aesthetics	<ul style="list-style-type: none"> Reduction in visual quality of area

*: Positive impacts

4. IMPLEMENTATION PROGRAMME

The framework for the subsequent management measures consists of the following:

- **Management objectives** – i.e. desired outcome of management measures for mitigating negative impacts and enhancing the positive impacts related to project activities and aspects (i.e. risk sources);
- **Targets** – i.e. level of performance to accomplish management objectives; and
- **Management actions** – i.e. practical actions aimed at achieving management objectives and targets;

- **Responsibilities**; and
- **Monitoring requirements.**

4.1 Construction Site Planning and Layout

Management Objective:

Planning and layout of construction site to ensure protection of sensitive environmental features.

Target:

No impacts to sensitive environmental features as a result of construction site planning and layout.

Management Actions:

- Conduct pre-construction survey of area to be affected by the re-alignment of the D859 (refer to requirements contained in the Pre-Construction EMPr).
- Suitable specialist(s) to identify sensitive environmental features (including fauna, flora and heritage sites) where special care needs to be taken and implement suitable mitigation measures to safeguard these features (e.g. barricading, signage and awareness creation).
- Suitable specialist to identify protected plants and trees. Any protected plants or trees in proximity to the construction servitude that will remain, should be marked clearly and must not be disturbed, defaced, destroyed or removed, unless otherwise specified by the Project Manager. Acquire the necessary permits under the National Forests Act (No. 84 of 1998) if avoidance of protected trees is not possible.
- Contractor to produce a site plan for the approval of the Project Manager prior to the establishment of the site, which aims to identify construction activities, facilities and structures in relation to sensitive environmental features. This plan will serve as a spatial tool that facilitates the execution of the construction phase with due consideration of sensitive environmental features. The plan must make provision for the activities associated with the re-alignment of the D859.

Responsibilities:

- Proponent - acquire permits.
- Project Manager and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- Photographic record of pre-construction survey of area to be affected by the re-alignment of the D859.
- Approved site plan.
- Barricading and signage.
- Records of awareness creation.

4.2 Site Clearing

Management Objective:

- Manage environmental impacts associated with site clearing required for the re-alignment of the D859 (e.g. grading of new road).

Target:

No damage to sensitive environmental features outside of construction servitude, including marked and barricaded heritage resources, protected trees, watercourses, structures and infrastructure.

Management Actions:

- Restrict site clearing activities to construction servitude for the D859.
- Method Statement to be developed, which will provide the details of how site clearing will be executed. Where possible, clearing by hand is recommended in order to create employment opportunities.
- Maintain barricading around sensitive environmental features.
- Avoid any disturbance to demarcated sensitive environmental features.

- Suitably experienced personnel (relevant to the potentially affected environmental features) to monitor the clearing activities, with particular focus on heritage resources and graves, as well as protected fauna and flora species.

Responsibilities:

- Project Manager and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- No clearing outside of construction domain.
- Intact barricading.
- Public complaints register.
- Contractor's method statement.

4.3 Site Establishment

Management Objective:

Minimise environmental impacts associated with site establishment.

Target:

1. No deviations from agreements made with individual landowners and community members.
2. No damage to sensitive environmental features outside construction footprint during site establishment.
3. No access or encroachment into no-go areas.
4. No justifiable complaints regarding general disturbance and nuisance received from the affected landowners and community members.

Management Actions:

- Positioning of the storage and lay-down areas for the re-alignment of the D859 should aim to minimise visual impacts.

- Maintain barricading around sensitive environmental features until the cessation of construction works.
- Control the movement of all vehicles and plant (including suppliers), such that they remain on designated routes and comply with relevant agreements.
- Ensure noise levels are within their lawfully acceptable limits as per SANS 10103.

Responsibilities:

- Project Manager and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- Intact barricading.
- Public complaints register.
- Contractor's method statement.

4.4 Management of Access and Traffic

Management Objective:

- Ensure that all construction vehicles use only dedicated access routes to construction sites, with the D859 as the main road.
- Ensure that the community have reasonable access to the land during construction.
- Ensure proper access control.
- Prevent unlawful access to construction domain.
- Adhere to agreements made with individual landowners and community members regarding access.

Target:

1. No reports of construction vehicles using other unauthorised routes.
2. No complaints regarding blocking of access to dwellings in tribal area.
3. No direct harm to livestock and wild animals due to inadequate access control.
4. No carrying of unsafe loads. Obtain a permit from the KZN Department of Transport for abnormal loads.

5. No speeding.
6. No accidents.

Management Actions:

- Undertake negotiations and confirm arrangements with the Cele K Tribe regarding the use of the D859 and traffic arrangements.
- Determine and document the road conditions of the D859.
- Selective upgrade of the D859 to ensure that it is capable of accommodating the type of vehicles and/or mechanical plant using the road.
- Any clearing for access or haul roads outside the demarcated works area shall only be undertaken after approval from the Project Manager.
- Temporary access roads outside of dam basin to be suitably rehabilitated.
- Ensure temporary accommodation of traffic, where the D859 is being worked on.
- Make provision for community members to access their homesteads.
- Speed limit of 40km/h on public and other roads within the project area to be adhered to.
- Ensure appropriate traffic safety measures are implemented to make provision for blind rises and sharp bends on the D859.
- Permission required from the Project Manager for the movement of any vehicles and/or personnel outside of designated working areas.
- Access roads to be maintained in a suitable condition.
- Suitable erosion protective measures to be implemented for access roads during the construction phase.
- Traffic safety measures (e.g. traffic warning signs, flagmen) to be implemented.
- Clearly demarcate all access roads.
- Clearly mark pedestrian-safe access routes.
- Proper access control to be maintained to prevent livestock from accessing construction area.
- Consult with property owners, local authorities and communities to ensure that all affected parties are informed of the timing and extent of any disruptions.
- Ensure that service nodes such as schools, clinics, places of worship, etc. remain easily and safely accessible at all times.

- Ensure safe access onto the D859 from the P68-2 Main Road (including suitable signage and road condition).
- Implement measures (e.g. water tanker) to manage dust from access roads, as necessary.

Responsibilities:

- Project Manager and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- Public complaints register.
- Signage displayed.
- Contractor's method statement.

4.5 Management of Labour Force

Management Objective:

- Ensure suitable management of labour force to prevent security-related issues or disturbance to landowners and community members.
- Optimise use of local labourers.
- Provide a work environment that is conducive to effective labour relations.

Target:

1. No complaints from landowners and community members regarding trespassing or misconduct by construction workers.
2. All unskilled labour to be sourced from local communities.

Management Actions:

- Prevent trespassing of construction workers on private property (Camro Estates).
- Construction workers to clearly identifiable.

- Make suitable provision for accommodation of workforce. Onsite accommodation to be arranged in consultation with the Cele K Tribe.
- Provision to be made for families of employed workers during the construction phase.
- Creating nuisances and disturbances in or near communities shall be prohibited.
- Machine / vehicle operators shall receive clear instructions to remain within demarcated access routes and construction areas.
- Designated smoking areas should be provided, with special bins for discarding of cigarette butts.
- Establish a 'labour and employment desk', which is not to be situated at the site.
- Create opportunities for the employment of women.
- Where possible use labour-intensive methods of construction.
- Use local labour as far as possible.
- Develop a community labour agreement with targets for employment and for progression.
- Training of labour to benefit individuals beyond completion of the project.
- Implement an STD and HIV/AIDS awareness and prevention programme amongst labourers.

Responsibilities:

- Proponent – employment targets.
- Project Manager and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- Public complaints register.
- Labour-related targets.

4.6 Management of Ablution Facilities

Management Objective:

- Minimise environmental impacts associated with ablution facilities.

Target:

1. No environmental contamination associated with ablution facilities.
2. Minimise visual impact associated with ablution facilities.

Management Actions:

- Provide sufficient ablution facilities (e.g. mobile / portable / VIP toilets), at the construction areas for the re-alignment of the D859, which conform to all relevant health and safety standards and codes.
- Toilets may not be situated within 100 meters of any water body or within the 1:100 year flood line.
- A sufficient number of toilets shall be provided to accommodate the number of personnel working on the D859. Toilets may not be further than 100m from this area.
- Toilet facilities supplied by the Contractor for the workers shall occur at a maximum ratio of 1 toilet per 15 workers.
- All temporary / portable / mobile toilets shall be secured to the ground to prevent them from toppling over due to wind or any other cause.
- Ensure utilisation, maintenance and management of toilet, wash and waste facilities.
- The entrances to the toilets will be adequately screened from public view.
- Toilet facilities to be maintained in a hygienic state and serviced regularly.
- Toilet paper to be provided.
- The Contractor will ensure that no spillage occurs when the toilets are cleaned or emptied and that a licensed service provider removes the contents from site. Disposal of such waste is only acceptable at a licensed waste disposal facility.

Responsibilities:

- Project Manager and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- Public complaints register.
- Maintenance register for ablution facilities.

- Disposal certificates.
- Contractor's method statement.

4.7 Management of Topsoil

Management Objective:

- Ensure suitable removal, storage, transportation of topsoil for reuse during rehabilitation.

Target:

1. >95% of recovered topsoil from area disturbed by the grading of the new section of the D859 to be stored for future use.
2. No visual evidence of erosion from topsoil stockpiles.
3. No visual evidence of erosion from areas where topsoil has been reinstated.

Management Actions:

- Determine the average depth of the topsoil prior to construction activities.
- Identify suitable areas to store topsoil.
- Remove topsoil from areas to be affected by construction activities for the re-alignment of the D859.
- Prevent mixing of topsoil with subsoil.
- Topsoil to be adequately protected from contamination from construction activities and material.
- Protect stored topsoil from compaction.
- Wind and water erosion-control measures to be implemented to prevent loss of topsoil.
- Following the construction phase, the topsoil should be placed in the areas affected by the construction activities for the re-alignment of the D859 as the final soil layer prior to seeding.

Responsibilities:

- Project Manager and ECO - checking.

- Contractor to implement management actions.

Monitoring Requirements:

- Topsoil stockpiles.
- Dust monitoring.
- Rehabilitated areas along the new sections of the D859.
- Contractor's method statement.

4.8 Management of Excavations

Management Objective:

- Minimise environmental impacts associated with building the stormwater drains along the D859.

Target:

1. No damage to sensitive environmental features outside construction servitude during excavations.

Management Actions:

- Construction activities to remain within the construction servitude.
- Subsoil and overburden should be stockpiled separately to be returned for backfilling in the correct soil horizon order.
- Suitable barricading to be erected around open excavations / trenches.
- Divert runoff away from stormwater trench, where necessary.
- Trench lengths will be kept as short as practically possible.
- Trench walls are to be stabilised using battering, shoring and bracing or similar techniques depending on the stability of the trench sides.
- Inspect open trenches at least daily basis to ensure that animals have not become trapped. Such animals will be removed and released. Special equipment for handling of venomous snakes should be available on site to ensure safe removal.
- Filing of trenches to make provision for subsidence.

Responsibilities:

- Project Manager and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- Barricading of trenches for stormwater drains.
- Excavation register.
- Contractor's method statement.

4.9 Management of Storage and Handling of Non-Hazardous Material

Management Objective:

- Effective and safe management of materials on site, in order to minimise the impact of non-hazardous materials on the environment.

Target:

1. No pollution due to handling, use and storage of non-hazardous material.

Management Actions:

- Materials to be suitably stored to prevent environmental contamination and visual impacts. Storage requirements to be determined based on chemical qualities of material and Material Safety Data Sheets (MSDS).
- Where required, stored material to be protected from rain and run-off to avoid environmental contamination.
- Materials to be appropriately transported to avoid environmental contamination. Loose loads (e.g. sand, stone chip, refuse, paper and cement) to be covered.
- Suitable remedial measures, depending on the nature of the contaminant and the receiving environment, to be instituted for spillages.
- Materials to be suitably used to prevent environmental contamination.

Responsibilities:

- Project Manager and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- Evidence of spillages.
- MSDS register.
- Contractor's method statement.

4.10 Management of Storage and Handling of Hazardous Material

Management Objective:

- Ensure the protection of the natural environment and the safety of personnel on site, by the correct management and handling of hazardous substances.

Target:

1. No pollution due to handling, use and storage of hazardous material.
2. In the event of a spill, appropriate containment, clean up and disposal of contaminated material. Spills to be cleaned within 24 hours.

Management Actions:

- Hazardous substances must be stored and handled in accordance with the appropriate legislation and standards, which may include the Hazardous Substances Act (Act No. 15 of 1973), the Occupational Health and Safety Act (No. 85 of 1993), relevant associated Regulations, and applicable SANS and international standards.
- Storage and use of hazardous materials will be strictly controlled to prevent environmental contamination.
- Where flammable liquids are being used, applied or stored the workplace must be effectively ventilated.
- No person may smoke in any place in which flammable liquid is used or stored.

- Install an adequate number of fire-fighting equipment in suitable locations around the flammable liquids store.
- Where flammable liquids are decanted, the metal containers must be are bonded or earthed.
- No flammable material (e.g. paper, cleaning rags or similar material) may be stored together with flammable liquids.
- Staff that will be handling hazardous materials must be trained to do so.
- Any hazardous materials (apart from fuel) must be stored within a lockable store with a sealed floor.
- All storage tanks containing hazardous materials must be placed in bunded containment areas with impermeable surfaces. The bunded area must be able to contain 110% of the total volume of the stored hazardous material.
- MSDSs, which contain the necessary information pertaining to a specific hazardous substance, must be present for all hazardous materials stored on the site.
- Spill kits must be available for the cleanup of hazardous material spillages.
- Provide secondary containment where a risk of spillage exists.
- Drip trays to be placed under parked heavy vehicles, equipment and other receptacles of hazardous material to prevent spillages.
- In the event of spillages of hazardous substances the appropriate clean up and disposal measures are to be implemented.
- Hazardous materials will be disposed of at registered sites or handed to registered hazardous waste disposal facilities for disposal / recycling.
- Proper and timeous notification of any pollution incidents associated with hazardous materials.

Responsibilities:

- Project Manager and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- Evidence of spillages.
- MSDS register.
- Training register.

- Safe disposal certificates.
- Contractor's method statement.

4.11 Management of Waste

Management Objective:

- Minimise environmental impacts associated with waste.
- Apply waste management principles of prevent, minimise, recycle or re-use, with disposal as a last option.

Target:

- No littering on construction site.
- Maintain a clean and tidy construction site.
- 100% record of all waste generated and disposed at waste disposal facilities.
- Valid disposal certificates for all waste disposed.
- Provision of adequate waste containers that are easily accessible and maintained.
- Waste bins to be removed and cleaned weekly.

Management Actions:

- Waste management activities must comply with the National Environmental Management: Waste Act (No. 59 of 2008).
- Vermin / weatherproof bins will be provided in sufficient numbers and capacity to store domestic waste. These bins must be kept closed to reduce odour build-up and emptied regularly to avoid overfilling and other associated nuisances.
- Where possible, waste must be separated at source (e.g. containers for glass, paper, metals, plastics, organic waste and hazardous wastes).
- Provide waste skips at the construction area of the re-alignment of the D859. These skips should be sufficient in number, the skip storage area should be kept clean, skips should be emptied and replaced before overflowing or spillage occurs.
- Ensure suitable housekeeping. .

- The Contractor will ensure that no burying, dumping or burning of waste materials, vegetation, litter or refuse occurs. All waste will be disposed of at suitable licensed disposal sites, based on the waste type (general versus hazardous).
- Ensure that solid waste is transported so as to avoid waste spills en-route.

Responsibilities:

- Project Manager and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- Public complaints register.
- Waste disposal certificates.
- Recycling targets.
- Contractor's method statement.

4.12 Management of Equipment

Management Objective:

- Minimise environmental impacts associated with equipment use.

Target:

1. No environmental contamination associated with equipment use.

Management Actions:

- Maintenance of equipment and vehicles will be performed in such a manner so as to avoid any environmental contamination (e.g. use of drip trays).
- No washing of plant may occur on the construction site.
- Drip trays will be provided for the stationary plant and for the "parked" plant.
- All vehicles and equipment will be kept in good working order and serviced regularly. Leaking equipment will be repaired immediately or removed from the site.
- Suitable storage and disposal of hydraulic fluids and other vehicle oils.

Responsibilities:

- Project Manager and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- Evidence of spillages.
- Training register.
- Contractor's method statement.

4.13 Management of Pollution Generation Potential

Management Objective:

- Ensure that all possible causes of pollution are mitigated as far as possible to minimise impacts to the surrounding environment.

Target:

1. No complaints regarding pollution.
2. No measurable signs of pollution.
3. Dust fallout -
 - a. Fenceline sites = Industrial Band (600 to 1200 mg/m²/day);
 - b. Community sites = Residential Band (< 600 mg/m²/day);
 - c. Comply with ASTM D1739; SANS 1929, SANS 69.
4. Particulate matter (PM₁₀) -
 - a. 24 hr = 120 µg/m³ (more than four times a year);
 - b. Annual = 50 µg/m³;
 - c. Comply with the National Ambient Air Quality Standards.
5. Noise -
 - a. L_{Aeq} (equivalent continuous sound level) during daytime hours (07:00 to 22:00) = 45 dBA;
 - b. L_{Aeq} during night-time hours (22:00 to 07:00) = 35 dBA;
 - c. Comply with SANS 10103:2008.

6. Water quality – construction activities may not cause an adverse impact that results in more than a 10% change in baseline values.

Management Actions:

- **Noise** -

- The provisions of SANS 10103:2008 will apply to all areas at the perimeter of the site, within audible distance of residents.
- Working hours to be agreed upon with Project Manager, so as to minimise disturbance to landowners and community members.
- No amplified music will be allowed on the site. The use of radios, tape recorders, compact disc players, television sets etc. will not be permitted unless at a level that does not serve as an intrusion to adjacent land-owners.
- Construction activities generating output levels of 85 dB or more will be confined to the hours during normal working hours.
- The Contractor will take preventative measures (e.g. screening, muffling, timing, pre-notification of affected parties) to minimise complaints regarding noise and vibration nuisances from sources such as power tools.

- **Dust** -

- Note that all dust suppression requirements should be based on the results from the dust monitoring and the proximity of construction activities to sensitive receptors.
- Appropriate dust suppression measures or temporary stabilising mechanisms to be used when dust generation is unavoidable (e.g. dampening with water, chemical soil binders, straw, brush packs, chipping), particularly during prolonged periods of dry weather. Dust suppression to be undertaken for all bare areas, including construction servitude, access roads, borrow pits, site yard, etc.
- Speed limits to be strictly adhered to.
- The Contractor will take preventative measures to minimise complaints regarding dust nuisances (e.g. screening, dust control, timing, pre-notification of affected parties).

- **Erosion** -

- Protect areas of the construction site that are susceptible to erosion (e.g. steep sections along the D859, drainage lines), through suitable measures (e.g. watering, planting, retaining structures, commercial anti-erosion compounds).
- Any erosion channels caused by construction activities to be suitably stabilised and rehabilitated.
- All efforts to prohibit ponding on surface and ensure stormwater runoff is channelled from the site must be made. The method used will be appropriate to the expected stormwater flows and the topography and geology of the site.
- **Asphalt / Bitumen Plant -**
 - Comply with the requirements of the National Environmental Management Air Quality Act (Act No. 39 of 2004).
 - Storage of bitumen drums on an impermeable surface with suitable secondary containment.
 - Contaminated water will not be discharged to the environment.
 - Cleaning of equipment will not result in pollution, with all contaminated wash water entering the waste water collection system.
 - All spillages to be removed and disposed of in an acceptable manner.

Responsibilities:

- Project Manager and ECO - checking.
- Contractor to implement management actions.
- Contractor to conduct environmental monitoring for air quality (dust and PM₁₀), noise and water quality.

Monitoring Requirements:

- Evidence of pollution.
- Review periodic results from environmental monitoring (water quality, air and dust).
- Contractor's method statement.

4.14 Management of Flora

Management Objective:

- Preserve protected flora species outside of construction footprint.
- Control alien plants and noxious weeds.

Target:

1. Ongoing eradication of alien plants and noxious weeds.
2. No disturbance to protected flora species.

Management Actions:

- Comply with the requirements of the National Environmental Management: Biodiversity Act (No. 10 of 2004), National Forests Act (No. 84 of 1998) and Natal Nature Conservation Ordinance 15 of 1974.
- Compile and implement search, rescue and relocation plan for protected flora species.
- Search, rescue and relocation to be undertaken by a specialist.
- Ongoing identification of protected plants and trees.
- Any protected plants or trees in proximity to the construction servitude (outside of dam basin) that will remain, should be clearly marked and must not be disturbed, defaced, destroyed or removed, unless otherwise specified by the Project Manager.
- Acquire the necessary permits under the National Forests Act (No. 84 of 1998) if avoidance of protected trees is not possible.
- Control of alien invasive species and noxious weeds for disturbed areas outside of the dam basin, in accordance with the requirements of the Conservation of Agricultural Resources Act (No. 43 of 1983). Eradication method to be approved by the Project Manager and ECO.
- Implement a monitoring programme for eradication of alien invasive plants and noxious weeds.
- Retain vegetation within the construction site (outside of dam basin), wherever possible.
- Where possible, transplant plant material to designated areas.

- Rehabilitation Management Plan to be developed for disturbed areas outside of the dam inundation area.
- No construction equipment, vehicles or unauthorised personnel will be allowed onto areas that have been rehabilitated outside of dam basin. Only persons / equipment required for maintenance thereof will be allowed to operate on rehabilitated areas.
- Removal of medicinal plants by construction workers will not be allowed. Programme to be implemented to source medicinal plants, in consultation with the relevant authorities and the Cele K Tribe.
- No trees to be felled for fuel purposes.
- Felled timber to be made available to the local community.
- Branches, leaves and non-useable wood to be chipped and used as mulch during rehabilitation.
- Contractor to test top 15 cm soil at predetermined distances for fertilizer requirements. All testing to occur at SANS 17025 (Agrilasa) laboratory.
- All reseeded activities will be undertaken at the end of the dry season (middle to end September) to ensure optimal conditions for germination and rapid vegetation establishment.
- The rehabilitated and seeded areas outside of dam basin must be harrowed after spreading the topsoil and fertilizer uniformly.
- Inspect rehabilitated area at three monthly intervals during the first and second growing season to determine the efficacy of rehabilitation measures.
- Take appropriate remedial action where vegetation establishment has not been successful or erosion is evident.
- Only locally indigenous vegetation is to be used for rehabilitation.

Responsibilities:

- Proponent - acquire permits.
- Project Manager and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- Permits.

- Search, Rescue and Relocation Plan.
- Barricading of protected flora species.
- Encroachment of alien invasive plants and noxious weeds.
- Successful rehabilitation.
- Contractor's method statement.

4.15 Management of Fauna

Management Objective:

- Ensure the protection of animals (including livestock).
- Adhere to agreements made with landowners and community members regarding animals.

Target:

1. No direct / indirect harm to animals from construction activities.
2. No deviations from agreements made with individual landowners and community members regarding animals.

Management Actions:

Note: Refer to sections on construction site planning and layout, site establishment and management of blasting for additional control measures for the protection of animals.

- Comply with the requirements of the National Environmental Management: Biodiversity Act (No. 10 of 2004), Natal Nature Conservation Ordinance 15 of 1974 and Animal Protection Act (No. 71 of 1962).
- Compile and implement search, rescue and relocation plan for protected fauna species.
- Proper access control to be maintained to prevent livestock from accessing construction areas.
- Stringent and dedicated control of poaching.
- No wilful harm to any animals, unless a direct threat is posed to a worker's health or safety.
- Captured animals to be safely released to a similar habitat.

- Prepare emergency response procedure for dealing with snake bites, as venomous species such as green and black mamba occur in the area.

Responsibilities:

- Proponent - acquire permits.
- Project Manager and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- Permits.
- Contractor's method statement.

4.16 Management of Watercourses

Management Objective:

- Ensure that the watercourses (including the Mzimkhulu River, Ncwabeni River, natural channels, drainage lines) are protected and incur minimal negative impact to resource quality (i.e. flow, water quality, riparian habitat and aquatic biota).

Target:

1. Unaltered downstream flow regime.
2. Downstream water quality to remain within acceptable ranges, as determined through baseline monitoring.
3. Ecological category not to be influenced by construction activities.

Management Actions:

- **Flow** -
 - Minimise construction footprint where the D859 traverses drainage lines and runs alongside the Mzimkhulu River.
 - Where construction work occurs in proximity to a watercourse (see above), topsoil and excavated material should be stored in such a manner as to prevent siltation.

All diffuse pollution sources to be managed to prevent pollution of the watercourses in the project area.

- Prevent erosion on steep slope, where the D859 runs alongside the Mzimkhulu River.
- Storage area and ablution facilities to be located 50m from edge of riparian habitat.
- Do not hinder flow in natural drainage lines.

- **River morphology** -

- Select most appropriate point for the D859 to cross drainage lines – consider geotechnical conditions, sensitivity of riparian habitat (e.g. protected trees, large trees that afford bank stabilisation) and instream habitat, depending on technical feasibility.
- Reinststate (shaping) and rehabilitate (indigenous riparian vegetation) affected areas outside of dam basin. Install suitable buttressing to prevent future erosion, if required.
- No construction facilities (including storage areas, containers, chemical toilets, etc.) to be located within natural drainage lines.

- **Water quality** -

- All diffuse pollution sources to be managed to prevent pollution of the watercourses in the project area.
- Storage area and ablution facilities not to be located closer than 50m from edge of riparian habitat.
- Where necessary, install instream silt traps during construction within the watercourse channel and along the riparian habitat. Instream silt traps are to be maintained and serviced on a regular basis. The style of silt trap will depend on materials used and the water movement patterns. If silt traps are not deemed feasible, other suitable measures need to be taken to limit unnaturally high sediment volumes in the stream.
- Implement suitable stormwater measures during construction to manage ingress of runoff into watercourses.
- No waste water to be released to natural drainage lines.
- Ensure proper storage of material (including fuel, paint) that could cause water pollution. Ensure proper storage and careful handling of hazardous substances with spill prevention materials at hand.

- Reduce sediment loads in water from dewatering operations. All dewatering should be done through temporary sediment traps (e.g. straw bales). These are to be serviced regularly and removed when no longer in use. Materials can be re-used.

Responsibilities:

- Project Manager and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- Review periodic results from water quality environmental monitoring.
- Erosion monitoring.
- Contractor's method statement.

4.17 Management of Archaeological and Cultural Features

Management Objective:

- Ensure that archaeological and cultural resources, as well as graves are protected.

Target:

1. No archaeological and cultural resources or graves to be damaged during construction.

Management Actions:

- Compile and implement search, rescue and relocation plan for graves.
- For any chance finds, all work will cease in the area affected and the Contractor will immediately inform the Project Manager. A registered heritage specialist must be called to site for inspection. The relevant heritage resource agency (i.e. Amafa aKwaZulu-Natali) must be informed about the finding.
- Permits to be obtained in terms of the KZN Heritage Act (Act No. 04 of 2008) if heritage resources are to be impacted on and for the removal of graves.

- Exhumation and relocation of graves once families and affected communities have been consulted and permission received for relocation. All cultural practices in terms of removal of graves as requested by family / community to be complied with.
- All homesteads and graves situated in close proximity to the construction areas to be protected by a 20m buffer in which no construction can take place. The buffer to be highly visible to construction crews.
- Under no circumstances may any heritage material be destroyed or removed from site.
- Should any remains be found on site that is potentially human remains, the South African Police Service should also be contacted.

Responsibilities:

- Proponent - acquire permits.
- Proponent - appoint archaeologist.
- Project Manager and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- Permits.
- Contractor's method statement.

4.18 Management of Emergency Procedures

Management Objective:

- Minimise environmental impacts associated with emergency procedures.

Target:

1. No site fires to be caused by construction activities and workers.
2. Approved emergency response procedures, where relevant.

Management Actions:

- **Fire** -

- Comply with the National Veld and Forest Fire Act (No. 101 of 1998).
- Work closely with the local fire protection association. Determine requirements and add to list of emergency telephone numbers. Keep a fire danger index displayed on site and comply with requirements. Fire breaks are to be agreed with neighbours and the local fire protection association.
- Proper emergency response procedure to be in place for dealing with fires.
- Burning of waste is not permitted.
- Suitable precautions will be taken (e.g. suitable fire extinguishers, water bowsers, welding curtains) when working with welding or grinding equipment.
- All fire control mechanisms (fire fighting equipment) will be routinely inspected by a qualified investigator for efficacy thereof and be approved by local fire services.
- All staff on site will be made aware of general fire prevention and control methods, and the name of the responsible person to alert to the presence of a fire.
- No fires are allowed on site, unless in dedicated areas approved by the Project Manager.
- Firebreaks to be made for construction areas, as required.
- Dedicated smoking areas to be provided. Sigarette butts may not be disposed of onsite.

- **Accidental Leaks and Spillages** -

- Proper emergency response procedure to be in place for dealing with spills and leaks.
- Ensure that the necessary materials and equipment for dealing with spills and leaks are available on site, where practicable.
- Remediation of the spill areas will be undertaken to the satisfaction of the Project Manager.
- In the event of a hydrocarbon spill, the source of the spillage will be isolated and contained. The area will be cordoned off and secured. The Contractor will ensure that there is always a supply of an appropriate absorbent material readily available to absorb, breakdown and where possible, encapsulate a minor hydrocarbon spillage.
- All staff on site will be made aware of actions to be taken in case of a spillage.

- Provide contact details of person to be notified in a case of spillages – signage to be displayed at strategic points within the construction domain (e.g. workshop, fuel storage area, hazardous material containers).

Responsibilities:

- Project Manager and ECO - checking.
- Contractor to implement management actions.

Monitoring Requirements:

- Approved Emergency Response Plan.
- Training and awareness creation records.
- Signage displayed.
- Contractor's method statement.

4.19 Management of Reinstatement and Rehabilitation

Note: *Reinstatement and rehabilitation only refer to areas outside of the dam basin that will not be inundated or used for operational purposes.*

Management Objective:

- Adequate reinstatement and concurrent or progressive rehabilitation of construction site (outside dam basin) following the re-alignment of the D859.

Target:

1. Complete site cleanup.
2. Reinstatement and rehabilitate entire construction site (outside dam basin) associated with the re-alignment of the D859.

Management Actions:

- **Removal of structures and infrastructure**
 - After the construction phase, the area outside of the dam basin must be rehabilitated by appropriate landscaping, levelling, topsoil dressing, land preparation, alien plant eradication and vegetation establishment.
 - Clear and completely remove from site all construction plant, equipment, storage containers, temporary fencing, temporary services, and fixtures.
 - Ensure that all access roads utilised during construction which are outside of the dam basin and not earmarked for use during the operational phase, are returned to a usable state and/or a state no worse than prior to construction.
- **Inert waste and rubble**
 - Clear the site outside dam basin of all inert waste and rubble, including surplus rock, foundations and batching plant aggregates. After the material has been removed, the site shall be re-instated and rehabilitated.
 - Load and haul excess spoil and inert rubble to fill in borrow pits/dongas or to dump sites indicated/approved by the Project Manager.
 - Remove from site all domestic waste and dispose of in the approved manner at a registered waste disposal site.
- **Hazardous waste and pollution control**
 - Remove from site all pollution containment structures.
 - Remove from site all temporary sanitary infrastructure and waste water disposal systems. Take care to avoid leaks, overflows and spills and dispose of any waste in the approved manner.
 - Comply with relevant provisions under the following EMPr sections: *Management of Storage and Handling of Hazardous Material, Management of Water, Management of Waste, Management of Pollution Generation Potential*.
- **Final shaping**
 - Make safe all borrow pits, quarries and dangerous excavations outside of the dam basin by backfilling, grading and blasting as required.
 - In general, no slopes steeper than 1(V):3(H) are permitted, unless otherwise specified by the Project Manager. Steeper slopes require protection. New slopes must mimic the natural slopes and topography, where possible.

- Programme the backfill of excavations so that subsoil is deposited first, followed by the topsoil. Compact in layers for best results.
- Monitor backfilled areas for subsidence (as the backfill settles) and fill depressions using available material.
- Shape all disturbed areas outside of the dam basin to blend in with the surrounding landscape, where possible.
- Ensure that no excavated material or stockpiles are left on site (outside of the dam basin) and that all material remaining after backfill is landscaped to blend in with the surrounding landscape.
- **Topsoil replacement and soil amelioration**
 - Execute top soiling activity prior to the rainy season or any expected wet weather conditions.
 - Execute topsoil placement only after all construction work has ceased.
 - Replace and redistribute stockpiled topsoil together with herbaceous vegetation, overlying grass and other fine organic matter in all disturbed areas of the construction site, including temporary access routes. Replace topsoil to the original depth.
 - Place topsoil in the same area from where it was stripped. If there is insufficient topsoil available from a particular soil zone to produce the minimum specified depth, topsoil of similar quality may be brought from other areas of similar quality.
 - The suitability of substitute material will be determined by means of a soil analysis addressing soil fraction, fertility, pH and drainage.
 - Do not use topsoil suspected to be contaminated with the seed of alien vegetation (e.g. black wattle). Alternatively, the soil is to be appropriately treated.
 - Ensure that storm water run-off is not channelled alongside the gentle mounding, but that it is taken diagonally across it.
 - Shape remaining stockpiled topsoil not utilised elsewhere in an acceptable manner so as to blend in with the local surrounding area.
 - After topsoil placement is complete, spread available stripped vegetation randomly by hand over the top-soiled area.
- **Ripping and scarifying**

- Rip and/or scarify all areas following the application of topsoil to facilitate mixing of the upper most layers. Whether ripping and/or scarifying is necessary will be based on the site conditions immediately before these works begin.
- Rip and/or scarify all disturbed (and other specified) areas of the construction site (outside of the dam basin), including temporary access routes and roads, compacted during the execution of the works.
- Rip and/or scarify along the contour to prevent the creation of down-slope channels.
- Do not rip and/or scarify areas under wet conditions, as the soil will not break up.

- **Planting**

- Transplanted plants
 - All planting work is to be undertaken by suitably experienced personnel, making use of the appropriate equipment.
 - Transplanting entails the removal of plant material and replanting the same plants in another designated position.
 - Transplant trees and shrubs into designated positions.
 - Establish further specifications for transplanted plants.
- Nursery plants
 - All planting work is to be undertaken by suitably experienced personnel, making use of the appropriate equipment.
 - Plant all trees, shrubs and individual plants in designated positions.
 - Planting should preferably be done during the rainy season.
 - After planting, each plant must be well watered, adding more soil upon settlement if necessary.
 - Establish further specifications for nursery plants.
- Seeds and seedlings
 - All planting work is to be undertaken by suitably experienced personnel, making use of the appropriate equipment.
 - Tree seedling material should be fresh and of local origin. Resist using plants from far afield as they may not be best suited to local climatic or soil conditions.
 - Small seedlings are likely to transplant more successfully than will large ones. These should be potted and kept under nursery conditions until they are large enough to plant out.

- Establish further specifications for seeds and seedlings.

- **Grassing**

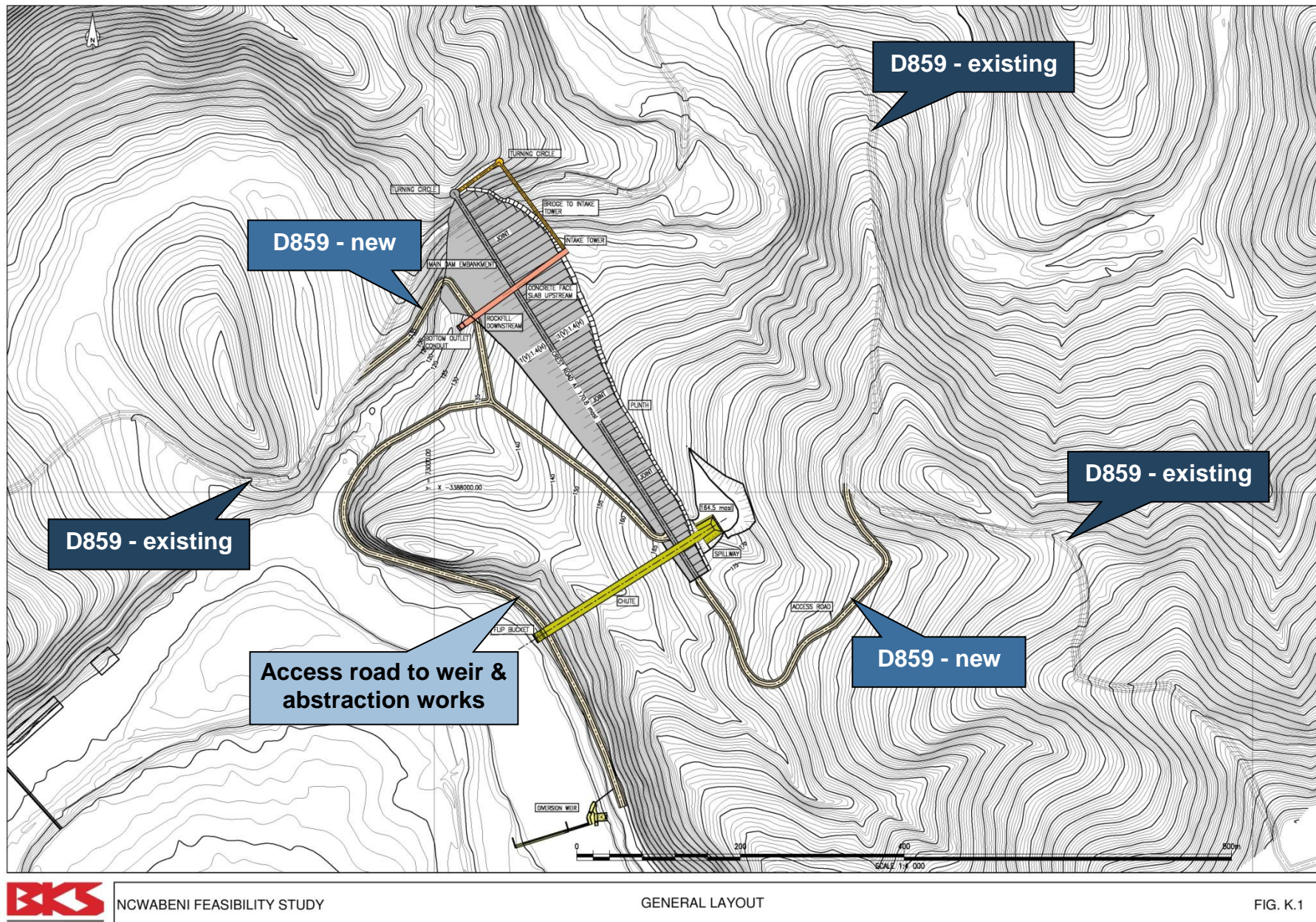
- Suitably trained personnel must undertake grassing by making use of the appropriate equipment and grass species as specified by the terrestrial ecologist.
- Sodding may be done at any time of the year, but seeding must be done during the summer when the germination rate is better.
- Hydroseeding with a winter mix will only be specified where regrassing is urgent, and cannot wait for the summer.
- Establish further specifications for sods, runners and hand seeding.

- **Maintenance**

- Monitor the re-growth of invasive vegetative material (outside of the dam basin).
- Cordon off areas that are under rehabilitation as no-go areas.
- Revegetation must match the vegetation type, which previously existed, unless otherwise indicated by a suitable specialist.
- Control invasive plant species and noxious weeds by means of extraction, cutting or other approved methods.
- For planted areas that have failed to establish, replace plants with the same species as originally specified.
- Establish further specifications for maintenance.

APPENDIX A

LAYOUT MAP



GENERAL LAYOUT OF MAIN DAM EMBANKMENT SHOWING RE-ALIGNMENT OF D859 AT SITE D2

