NORTHERN NETWORK ALLIANCE

MANAGEMENT PLAN

Soil and Water Management Plan

Document number: NNA001-A-PLN-011

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Date	Reason for Issue	Revision	Originator	Signature	Checked By	Signature	Approved By	Signature
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1 INTRODUCTION

This Soil and Water Management Plan is one component of the Construction Environmental Management Plan (EMP) which provides a system and procedures to ensure that Northern Network Alliance (NNA) establishes and maintains best practice controls to manage potential environmental impacts during the construction of the Northern Pipeline Interconnector and associated infrastructure (hereafter referred to as the 'Project') and, wherever practicable, realise opportunities for enhanced environmental outcomes.

The NN Alliance consists of the following partners:

- LinkWater
- Abigroup Contractors Pty Ltd
- McConnell Dowell Constructors (Aust) Pty Ltd
- Kellogg Brown & Root Pty Ltd

NN Alliance (referred to as the Alliance) is committed to providing the services it offers in a manner that conforms to the contractual requirements and to all relevant regulatory and legislative requirements. To achieve this, the Alliance will plan, implement and control an integrated management system that achieves the stated environmental outcomes.

The Alliance will ensure that controls are properly implemented and regularly monitored and audited to assess their effectiveness. Changes to the controls will be instigated if they are not achieving their objectives.

1.1 Project Description

NPI Stage 2 forms part of the drought contingency pipeline to connect existing and future water infrastructure on the Sunshine Coast with the Brisbane network. The NPI will be constructed in two stages and will allow the transfer of up to 65 ML/d of potable water between the Sunshine Coast and Brisbane. Stage 1 of the NPI project—between Landers Shute water treatment plant (WTP) and Morayfield—is due for completion by 31 December 2008.

The completed NPI (Stage 1 and Stage 2) will supply a target volume of 65 ML/d of potable fresh water to existing facilities at Caboolture for distribution to localities in the greater Brisbane region. NPI Stage 2 will have the capacity to deliver up to 18 ML/d (under existing utilized entitlements for the Noosa Shire).

Subsequent interconnection of Stages of the NPI may be constructed to link with the proposed Traveston Crossing Dam and/or other bulk water sources proposed for the Sunshine Coast. These subsequent Stages are not considered in this report. However, the use of a large diameter pipe capable of transporting bulk water is a basis for the design of both Stages 1 and 2 of the NPI.

The key components of the NPI Stage 2 project are as follows:

- approximately 48 km of underground pipe between Noosa water treatment plant (WTP) and the termination point of NPI Stage 1 at Eudlo;

- a balance tank with a 5 ML capacity;
- three new pump stations; and
- a new water quality management facility (WQMF) and upgrades to an existing WQMF at Landsborough.

A number of additional above-ground facilities would be required for commissioning, operation and maintenance of the system. These include:

- Water quality maintenance structures
- Water branch mains
- Cleaning and communications stations

1.2 Purpose and Scope

Linkwater is committed to conserving and enhancing the biological environment where possible for the duration of the Project while achieving positive environmental, commercial and social outcomes.

The purpose of this Soil and Water Management Plan (SWMP) is to describe how the Alliance proposes to manage water quality and the associated erosion and sediment control risks during construction of the Project. Related management plans include erosion and sedimentation control plans (ESCPs) which will contain detailed erosion and `sediment control information for each construction stage (e.g. location of sediment fences, drainage systems, discharge and monitoring specifications, sediment basins size and operation etc). Section 5.3 provides further details.

This Plan will address the requirements of the applicable legislation and aims to ensure that the commitments made by the Alliance with regard to soil and water management are met.

1.3 Objectives and Targets

Objectives:

- Minimise impacts on water quality in creeks or drainage lines adjacent to the proposed development, caused by erosion or sedimentation from construction activities
- Comply with the EPA Act and the EPP (Water)

Targets:

- Compliance with water quality discharge criteria
- No deterioration in water quality in creeks or drainage lines adjacent to the proposed development caused by erosion from construction activities
- No incidents resulting in environmental harm

Minimise environmental impact by maintaining water quality/quantity entering and discharging from project sites, in particular, the disposal of water used for commissioning and maintenance of the pipeline.

The above performance criteria have been developed for this MP to assist to deliver desirable outcomes. The performance criteria will be linked to Key Performance Indicators (KPIs) for the Project.

2 LEGISLATION AND REGULATORY REQUIREMENTS

2.1 Licences/Permits

The following permits apply to soil and water management for the Project:

- A Riverine Protection Permit under the *Water Act 2000* will be required for any riparian vegetation destruction or to excavate or place fill in a watercourse. The Department of Natural Resources, Mines and Water will be the concurrence agency for these permits.

The clearing of remnant vegetation will require a permit, which is detailed within the Vegetation Management Plan (NNA001-A-PLN-013)

2.2 Guidelines / References

Key legislation relevant to soils and water management includes:

- *Environmental Protection Act 1994*(Qld)
- Environmental Protection (Water) Policy 1997 (Qld)
- *Water Act 2000*
- *Fisheries Act 1994*
- Maroochy Manual for Erosion and Sediment Control, Maroochy Shire Council, 2007.
- Soil Erosion and Sediment Control, Engineering Guidelines for Queensland Construction Sites (1996) – *Institution of Engineers Australia* [*IEAUST*, now Engineers Australia], Queensland.
- Soil Management Guidelines - Potential Acid Sulfate Soils (2002) – (*Dear SE, Moore NG, Dobos SK, Watling KM and Ahern CR*). Department Natural Resources, Mines and Water, Queensland.
- The Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000) - *Australian and New Zealand Environment and Conservation Council (ANZECC).*

2.3 Commitments

The *Environmental Impact Statement* for the proposed NPI Stage 2 has several commitments for the management of Soil and Water. Table 1 identifies examples of these key commitments.

Table 1. Soil and Water Commitments (refer NNA EIS 2008, Appendix E for final commitments)

Document	Section	Requirement/Commitment
	3.1	Construction will not result in significant long-term erosion and sedimentation impacts.
	3.2	Geotechnical investigations will identify and inform soil-specific plans to manage potential impacts.
	3.2	A range of soil conservation strategies will be employed to mitigate potential erosion and scour issues.
	3.2	All trenched water crossings will be completed using an industry best practice approach.
	3.2	All cleared sites will be reinstated with appropriate species following construction.
	3.2	Banks and landforms will be reinstated as near as practicable to their original profile.
	3.3	Topsoil will be removed and stockpiled separately for reuse during reinstatement.
	3.3	Construction work methods will include specific strategies to manage impacts on the aquatic and riparian environment. Crossing methods will be selected to have manageable impacts on aquatic systems and water quality.
	3.4	Construction will not result in contamination of groundwater sources.
	3.4	Hydrotest water will not be released directly to natural watercourses. Test waters will only be released under strategies developed in consultation with relevant government agencies.
	3.4	Alternative methods for reuse or storage of commissioning waters will be investigated.
	3.4	At crossings, construction will not result in significant long-term impacts on water quality.
	3.8	All vehicles and equipment will be required to adhere to the approved access routes and the ROW.
	3.12	Any hydraulic studies undertaken for the Caboolture River will also consider the potential cumulative impact of the future road bridge proposed by Caboolture Shire Council.

3 EXISTING ENVIRONMENT

The pipeline will have a length of approximately 42.5 km from Landers Shute heading north to the Noosa WTP. Approximately two thirds of the preferred corridor makes use of an existing cleared easement maintained by Energex, or previously established by the now-defunct Gympie to Gatton gas pipeline.

There will also be an additional pipeline from Landers Shute heading west to Image Flat WTP (approximately 8.5 km in length). A description of key site features relating to soil and water management is provided in this section.

Further desktop studies, investigation/surveys may be undertaken prior to construction, as required to satisfy this MP.

3.1 Topography, Geology and Soil Characteristics

The NPI Stage 2 project area takes in the eastern edge of the Blackall Range, traversing a number of ridges which extend west-east towards the coast. The main line extends in a north-south direction, commencing in the rolling hills around Lake Macdonald and descending onto the floodplain of the North Maroochy River. To the west of Eumundi, the route crosses a steep ridge adjacent to the Bruce Highway, and traverses the western edge of Yandina township onto the South Maroochy river floodplain. South of Yandina, the route crosses two high coastal ridges and the middle reaches of Petrie and Paynter creeks. The corridor rises again before descending onto the flats around Eudlo Creek and ascending steeply to connect with the Stage 1 works at Nobels Road.

The proposed pipeline and associated infrastructure locations range in topography, geology and soil types.

Table 2 Summary of land resource areas along the NPI Stage 2 route (Capelin 1987)

Location	Geology	Landform	Vegetation
Stream alluvia and flood plains	Undifferentiated Quaternary alluvium of gravel, sand, silt and clay	Level to undulating plains and rises	Forest red gum open forest and tea-tree open forest
South of Nambour to Eudlo	Laterised Triassic to Jurassic Landsborough Sandstone	Undulating to steep low hills and hills	Blackbutt and bloodwood open forest
Southwest and northwest of Landsborough to Eudlo	Triassic to Jurassic Landsborough Sandstone	Undulating to steep hills	Blackbutt and bloodwood open forest
Between Eumundi and North Arm	Laterised Triassic rhyolite	Gentle undulating and rolling hills	Remnants of grey gum and tallowwood open forest

Location	Geology	Landform	Vegetation
North of Nambour	Triassic andesite and rhyolite; diorite and tonalite intrusions	Undulating low hills	Blackbutt and grey gum open forest
North of Eumundi	Miscellaneous Palaeozoic metamorphics and volcanics	Undulating low hills	Spotted gum and ironbark open forest

The alignment from Landers Shute heading north to the Noosa WTP traverses the six main soil types:

- **Alluvial soils** within the flood plains of the main watercourses are variable in depth, texture, fertility and drainage characteristics.
- **Gravelly loams** can be prevalent in the narrow flood plains adjacent to lower order streams in the upper catchment areas while deep uniform textured or gradational clays (including black earths and prairie soils) are common in the broad flood plains of the major streams. Most alluvial soils are relatively resistant to erosion, due primarily to the low gradient position in the landscape, but may be prone to stream bank erosion.
- **Gleyed podzolic and humic gleys** (poorly drained acid soils) are found in some of the lower terraces of the alluvium. However, drainage works undertaken in the past—mainly as part of development for sugar cane production—may have improved the profile drainage characteristics
- **Red and yellow podzolic soils** are texture contrast soils generally associated with Landsborough Sandstone parent material. The soils have a sandy or loam surface horizon with a clay subsoil and there may be a significant gravel component in the subsoil. These soils are highly susceptible to erosion, particularly where slopes exceed 8%. Red and yellow earths are uniform textured soils also associated with Landsborough Sandstone parent material. While still erosion-prone, they are generally less susceptible than red and yellow podzolic soils.
- **Krasnozems** are deep uniform or gradational soils which, within the project area, are confined mainly to the land around Eumundi and North Arm. These soils are relatively resistant to erosion and are used for growing ginger.
- **Lithosols** (mainly shallow gravelly soils with minimal profile development) are common in steeper sections of the project area where grades exceed 10%. They are highly susceptible to erosion although the severity of this risk may be mitigated by the significant stone component within the soil matrix.

3.2 Receiving Waters

The project area is located primarily within the Maroochy River catchment also extending into a small area of the Mary River catchment. Investigations detailed in the NPI Stage 2 EIS found that waterway health is generally in fair condition for the Maroochy catchment. Much of the current degradation of

waterway health is due to the change of land use within the catchment area since European settlement including urbanisation.

The waterways of interest include freshwater, brackish and estuarine environments. The general poor quality and connectivity of riparian vegetation along these waterways reflects the impact of existing and past land uses.

3.3 Sensitive Environmental Features

3.3.1 Flora and Fauna

Impacts on flora and fauna generated by the construction of the pipeline will be related primarily to the clearance of vegetation adjacent to the proposed alignment and consequent habitat loss. It must be noted that vegetation clearance will be only be undertaken as required given that approximately two thirds of the preferred corridor makes use of an existing cleared easement which is generally maintained as low grass.

Further details are provided in the Vegetation MP (NNA001-A-PLN-013) and Fauna MP (NNA001-A-PLN-007).

3.3.2 Impacts on Watercourse Crossings

The project area is located primarily within the Maroochy River catchment, also extending into a small area of the Mary River catchment. Within these two catchments, the proposed corridor traverses the principal waterway systems; South Maroochy River; North Maroochy River; Six Mile Creek; and Petrie Creek. A summary description of the site characteristics and ecological condition is provided below (Table 3) for anticipated watercourse crossings.

Grab samples will be undertaken prior to construction at various creeks and rivers on the ROW to determine the background levels of Acidity (pH), Turbidity (NTU) and Total Suspended Soils (TSS) by a water quality specialist. From their analysis criteria will be set for use during the construction phase and for monitoring program. All sampling will comply with the “The Water quality sampling manual: for use in testing for compliance with the Environmental Protection Act 1994”, EPA 1994.

Table 3 Watercourse Crossings

River/ Creek	Project Area	Current Condition	Riparian Vegetation
Eudlo Creek (freshwater)	300	Freshwater, permanent water, smaller channels, extensive flood plain, remnant rainforest vegetation in riparian zone, significant habitat values, regional corridor values	N/A. Very disturbed vegetation
Paynter Creek (estuarine)	301	Estuarine, permanent, narrower channel, extensive flood plain, tidal vegetation associations	12.3.1
Petrie Creek (estuarine)	302	Estuarine, permanent, wide channel, extensive flood plain, tidal vegetation associations, significant aquatic habitat	12.3.1

River/ Creek	Project Area	Current Condition	Riparian Vegetation
South Maroochy River (freshwater)	305	Freshwater, permanent water, smaller channels, extensive flood plain, remnant rainforest vegetation in riparian zone, significant habitat values, regional corridor values	12.3.1
North Maroochy River (freshwater)	307	Freshwater, permanent water, smaller channels, extensive flood plain, remnant rainforest vegetation in riparian zone, significant habitat values, regional corridor values	12.3.1
Six Mile Creek	309	Freshwater, permanent water, smaller channels, extensive flood plain, remnant rainforest vegetation in riparian zone, significant habitat values, regional corridor values	12.3.1

4 PROJECT POTENTIAL IMPACTS

This section identifies impacts with respect to soil and water which have the potential to occur during the construction period.

4.1 Environmental Aspects

The aspects of the project works that could contribute to erosion, off-site sedimentation and impact on downstream water quality include the following:

- clearing of vegetation
- stripping of topsoil
- bulk earthworks
- working in waterways (including temporary creek crossings)
- piling and associated platforms, adjacent to and within watercourses
- trenching
- micro-tunnelling and shaft sinking
- traffic access and egress points
- disturbance of contaminated soils
- construction works in high rainfall periods
- slow or ineffective design and/or installation of erosion and sediment control measures or surface water management measures
- ineffective maintenance of environmental control measures
- slow rehabilitation/re-vegetation of works
- fuel and chemical storage and handling
- nutrients from fertilisers, herbicides and pesticides used in landscaping
- pollutants from plant wash down activities
- litter
- oil, grease and fuel from equipment operation and maintenance
- effluent from site offices and compounds.
- water discharge from hydro testing

4.2 Potential Environmental Impacts

Potential environmental impacts are summarised in Table 4 below.

Table 4 Potential Environmental Impacts

Soil Erosion and Sedimentation	
1	Accelerated erosion may result from vegetation removal and soil loosening.
2	Higher sediment loads may result from accelerated erosion, and sediment could enter local watercourses, raise turbidity, and adversely affect aquatic flora and fauna.
3	Stormwater flows may become more intense because of a decrease in natural vegetation cover.
4	If intense rainfall were to occur during the construction phase, there is potential for extensive sheet and gully erosion.
5	Re-vegetation may be slow because of loss of topsoils and high dispersive soils.
Access Tracks	
1	Access tracks being constructed over waterways may result in sedimentation within creeks or rivers.
Pipe Flush Water	
1	Pipe flush water (hydrotest) may be contaminated and inappropriate disposal may cause environmental harm. .
Water Quality and Flow Regime	
1	Water which enters excavated areas is contaminated from upstream sources (i.e. not as a result of construction works) and must be treated and disposed.
2	Discharge of untreated water from construction excavation works may travel downstream causing adverse impacts to any oyster leases, farm users or conservation areas that may be located downstream from the works.
3	Alteration to channel morphology or introduction of structures associated with piling may potentially alter surface water flow, resulting in morphological impacts or increased flood risk.
Construction Techniques	
1	**Piling:** • clearing of riparian vegetation for access tracks and pile installation • erosion and sedimentation resulting in increased turbidity and suspended solids • exposure of acid sulfate soils (ASS) during earthworks • disturbance to fauna as a result of construction noise • possible hydrocarbon spills from construction machinery and vessels working within the watercourse introduction of weed species and management of existing weed infestations.
2	**Trenching:** • clearing of riparian vegetation for access and construction • erosion and sedimentation resulting in a reduction in water quality (increased turbidity and suspended solids) • disturbance of benthic fauna and physical habitat structures within the stream bed • disturbance to aquatic fauna due to construction activities forming a barrier to longitudinal movement • potential for the exposure of ASS • disturbance to fauna as a result of construction noise • hydrocarbon spills from construction machinery working within the watercourse • introduction of weed species.
3	**Micro-tunnelling and shaft sinking:** • clearing of riparian vegetation for access tracks and excavation of the shafts • drilling fluids spillage and 'frac-out' through rock fissures into surface and groundwater

Soil Erosion and Sedimentation	
	causing pollution of waters • erosion and sedimentation resulting in a reduction in water quality (increased turbidity and suspended solids) • potential for the exposure of ASS during shaft excavation • disturbance to fauna as a result of construction noise • hydrocarbon spills from construction machinery working adjacent to the water course • introduction of weed species.
Geotechnical Aspects	
1	Shallow rock conditions may mean that blasting is required, which could result in structural disturbance, noise and air pollution, and increased site disturbance.
2	Shallow rock conditions at river crossings may make normal directional drilling difficult, prolonging construction time and increasing disturbance of soil and geological properties including an increased risk of acid sulfate leaching.
3	Poor rock foundations may make normal piling technologies difficult to implement. Piles may therefore need to be placed deeper, which may trigger an increase in acid sulfates into the river system.
4	Active clays may lead to differential settlement and expansion, putting the structural integrity of the pipeline at risk.
5	Loose material and steep slopes may lead to slope instabilities.
6	Shallow groundwater levels may lead to the collapse of trench and bore walls.
Use of Good Quality Agricultural Land and Ongoing Farming Practices	
1	A temporary impact on the land and its agronomic systems as the site is disrupted and then rehabilitated.
2	A permanent impact on the type of agronomic production system that can be utilised within the pipeline easement. Although the right to farm is not removed, the application of production systems may be limited.
3	A soil erosion and sedimentation hazard through the construction and rehabilitation phase as the site is cleared, excavated and then settles after construction.
Contaminated Land	
1	Contaminated soils encountered during the construction period may be mixed with clean material.
2	During and after construction, the increased permeability of the pipeline trench means that contaminants may migrate much more easily to surface groundwater systems.

5 ENVIRONMENTAL MITIGATION MEASURES

Strategies for the management of water and soil issues are outlined in this section. Mitigation measures for soil and water quality impacts during construction are discussed.

5.1 Water Management Strategy

The proposed water management strategy during the construction of the pipeline and associated infrastructure includes:

- surface water management
- groundwater management
- sewage treatment and disposal
- hydrotest disposal.

Site-specific strategies for water management are detailed in the relevant Work Method Statements (WMSs) and site-specific Erosion and Sedimentation Control Plans (ESCPs).

5.1.1 Surface Water Management

As stated in Section 4 above, there are significant and varying surface water impacts which have the potential to occur throughout the construction period. The effective control of surface water will be achieved through the use of erosion and sediment control (including use of bunding and/or barriers around the construction work site when working within floodplains) and mitigation measures which are discussed in detail in Section 5.3 below. Where possible, water will be diverted around the construction site to minimise the amount of water to be captured and managed. Erosion and sediment controls will be designed and operated to ensure they do not exacerbate existing flood conditions. Permanent drainage systems will be developed where required to ensure that permanent construction features do not cause an adverse flooding effect.

Table 5 in Section 5.8 'Soil and Water Impact Mitigation Measures' provides a summary of the proposed mitigation measures to be implemented to manage surface water throughout the construction period.

Alliance team members and sub-contractors, particularly those who undertake activities that generate or handle potential pollutants will be made aware of their environmental responsibilities during the induction and regular inspections will be undertaken to ensure that they are complying with all relevant legislation. All potentially contaminated wastewater will be contained and disposed of in accordance with industry best practice to ensure no environmental harm is caused, as outlined under section 319 of the EPA Act 1994.

Where Acid Sulfate Soil (ASS) or potential ASS is identified, reference will be made to the ASS MP. Pipe flush wastewater associated with commissioning will be dealt with in a separate plan to be developed during the commissioning period.

5.1.2 Groundwater Management

Works associated with the Project are not anticipated to adversely impact groundwater quality or levels, although trenching, piling and micro-tunnelling may result in a collective need to dispose of groundwater. If groundwater accumulates in construction features (e.g. excavation of shafts, or piling) it will be pumped and appropriately treated or run through existing controls to ensure it does not pose a pollution hazard to any waterways before discharge.

In addition to groundwater being encountered during construction, and although the use of recycled water is the preferred option (due to the drought conditions in Queensland), there is a potential that groundwater (amongst other alternatives) may be sourced for dust suppression provided that it is considered sustainable. Any relevant licences and approvals required for groundwater extraction will be considered and sought prior to potential use of groundwater.

5.1.3 Sewage Treatment and Disposal

Site amenities will either be connected directly to the sewerage system or to holding tanks for removal by a licensed contractor. Sites not in close proximity to compound areas may be provided with a port-a-loo that will be serviced by a licensed contractor. These facilities will be located/positioned with consideration of vicinity of water courses, sensitive flora/fauna habitats or residents.

5.2 Hydrotest

Various sections or segments of the pipe once connected and laid in the trench will be tested under pressure to gauge if there are any leakages. This water will need to be accessed and disposed of in an environmentally satisfactory way.

Special provisions will be required to manage this aspect of the construction activities, to treat the water to an acceptable standard before release, refer to operational guidelines for water discharge report.

The following procedures will be applied:

- Test water shall be sourced from, and discharged to land in compliance with all regulatory and landholder requirements
- Ensure reagents in hydrotest water are reactive and degrade under aeration or can be treated to comply with water quality objectives for the receiving waters. Otherwise discharge water will have to be held in a receiving dam until appropriately treated (Hydrotest water typically contains high levels of chlorine)
- After appropriate treatment, the hydrotest water released between pipe sections will be discharged onto undisturbed and stable ground in such a way as to prevent flooding or erosion (e.g. against a splash plate or other dispersive device in order to aerate, slow and disperse the flow), and where it will be allowed to aerate and evaporate
- Appropriate controls like inlet and discharge pipe filters will be used to prevent weed infestation from hydrotest practices
- Relevant permits to draw water shall be obtained and the source of hydrostatic test water shall be approved in advance by the Environmental Manager, who will also check and approve the

test water discharge procedures. Prior to discharge of hydrotest water, the Environmental Manager shall be consulted about requirements for water quality testing

- The risk of transferring aquatic weeds from affected to unaffected catchments will be assessed before deciding on whether hydrotest water should be re-used between pipe sections or supplied afresh.

5.3 Erosion and Sediment Control Strategy

Erosion and sedimentation control plans will be developed for the construction period to be consistent with the requirements in the Maroochy Manual for Erosion and Sediment Control and where necessary the IEAUST's Soil Erosion and Sediment Control, Engineering Guidelines for Queensland Construction Sites 1996. Where possible controls will be installed prior to the commencement of construction. The following typical controls may be used by the Alliance:

- minimising disturbance as much as possible in the first instance and ensuring progressive rehabilitation
- sediment fences
- catch drains or cross berms
- stabilised site accesses
- earth bunds
- diversion embankments
- use of imported and natural materials for sediment control (eg mulch)
- rock check dams
- sand bags
- sediment ponds and basins, mainly used near compound sites for tunnelling, major road/rail/river crossings or at the end of a steep erodible slope.

Key controls will be installed during site establishment and, as the site evolves and changes, sediment controls will be adjusted accordingly. The Project Engineers, Environmental Officer and Site Superintendent will liaise to ensure that appropriate controls are always in place and working effectively.

5.3.1 Minimising Disturbance

Erosion will be reduced through the minimisation of the cleared footprint and, where feasible, progressive clearance of vegetation. Where possible, progressive revegetation will occur to minimise the area of exposed surfaces following completion of works. Rehabilitation/Revegetation of work areas will be undertaken in accordance with the Rehabilitation and Revegetation MP (NNA001-A-PLN-010).

Watercourses requiring works will be left undisturbed until construction has commenced to maximise stream bank stability and to prevent sediment loading in storm waters passing through the watercourse.

5.4 Water Reuse

Stormwater collected in sediment basins and compound tanks will, where possible, be reused on site, primarily for dust suppression. Systems will include pump and sprinkler systems for static dust sources and tanker sprays for larger areas. Treated wastewater from local treatment plants will also be considered for dust suppression.

5.5 Site Drainage

During design, the Alliance will endeavour to keep clean water separated from turbid runoff from exposed areas. Where possible, clean water will be diverted around the exposed areas and directed to stormwater. Drainage construction will form an integral part of controlling water movement on site and the early construction of semi-permanent drainage structures (if required) will be undertaken where necessary.

5.6 Chemical and Fuel Storage and Wastewater Management

The storage and handling of fuels, chemicals and wastewater has the potential to pollute surface waters and contaminate soils.

Storage areas for fuels, oils and chemicals used during construction will be covered and contained within an impervious bund to retain any spills of more than 120% of the volume of the largest container in the bunded area. Any spillage will be immediately contained and absorbed with a suitable absorbent material. Storage will comply with the relevant Queensland EPA requirements for bunding and spill management and AS 1940-1993 – *The Storage and Handling of Flammable and Combustible Liquids*.

Materials Safety Data Sheets for all chemicals stored onsite will be made available to site personnel. Site personnel will be informed of their location as a part of the site induction.

Refuelling of mobile vehicles, plant and equipment will be undertaken no closer than 50 m from a watercourse and using approval failsafe couplings in hoses.

The Emergency Management Plan outlines contingency plans in the event of a chemical spill. In the event water is polluted by chemicals and/or fire fighting materials (e.g. foams) the water will be contained where possible and disposed of appropriately.

5.7 Water Usage

Water consumption will be minimised through the use of water saving devices. Where possible construction operations will reuse water from sediment basins and excavations for dust suppression, or consider the use of recycled treated Waste water from Council treatment plants.

A water efficiency plan will be implemented through the life of the Project. This plan will be reviewed to identify where efficiencies may be gained, and changes in work practices can be implemented. Where potable water is required, the Alliance Project Manager / Alliance Project Management Team will be responsible for approving this use, subject to a cost-benefit analysis.

Management shall also encourage other water minimisation construction practices (e.g. turning off water when not specifically required).

5.8 Soil and Water Impact Mitigation Measures

The below table provides a summary of the proposed mitigation measures to be implemented to manage soil and water impacts throughout the construction period.

Table 5 Soil and Water Impact Mitigation Measures

Activity / Construction Item or Detail	Management Mitigation Measures	Responsibility	Timing
General Construction			
	All personnel are to be inducted, and receive ongoing training via toolbox talks, regarding their responsibilities related to soil conservation issues, erosion and sediment control systems and the need for ongoing maintenance to prevent land degradation and water pollution.	Environmental Manager /OH&S Training Manager	Pre-construction and Ongoing
	Specific training will be provided to engineers and labour teams responsible for construction and maintenance of drainage, erosion and sediment controls.	Environmental Manager	Pre-construction and Ongoing
	Contact established with the Bureau of Meteorology (by web, fax or email) to ensure that weather forecasts are obtained. Works will need to be scheduled based on weather forecasts. The Site Superintendent must ensure that an inspection of all erosion and sediment controls is undertaken if a significant rain event is forecast.	Environmental Officer/ Construction Manager/ Site Superintendent	Prior to the commencement of construction and ongoing throughout construction
Sediment and Erosion Control			
	Sediment and erosion controls will be implemented and in place in accordance with any relevant ESCP.	Environmental Officer/ Site Superintendent	Pre-Construction
Area with highly erodible soils	Keep the clearing area to a minimum so that the smallest possible ground area is disturbed.	Environmental Officer/ Site Superintendent	As required
	Place erosion control structures such as diversion drains, rock check dams and silt fences at key locations (swales, stormwater pit inlets, around stockpiles) to capture the suspended sediment.	Project Engineer/ Environmental Officer/ Site Superintendent	As required
	Conduct weekly inspections of all erosion control structures to ensure they are in place and operating efficiently. Additional inspections should be conducted after storm events.	Environmental Officer/ Project Engineer	Weekly
	Divert stormwater away from exposed soil areas to reduce overland flow or channel flow on the vulnerable soils.	Site Superintendent/ Environmental Officer	As required
	In areas where the risk of soil erosion is medium or high, the seeding of appropriate grass species may be required.	Environmental Officer/ Site Superintendent	As required
Acid sulfate soils	Where ASS or potential ASS are identified, reference should be made to the Acid Sulfate Soil Management Plan.	Environmental Manager/ Environmental Officer/ Site Superintendent	As required
Stockpiling	Provide bunding or sediment controls around stockpiles to prevent the material from being washed away. The height of the bund /containment will depend on the site location, the volume and type of material being	Project Engineers/ Environmental Officer/ Site Superintendent	As required

Activity / Construction Item or Detail	Management Mitigation Measures	Responsibility	Timing
	stockpiled, and the topography.		
	If stockpiling for more than 30 days is proposed, consider stabilising the stockpile with appropriate vegetation. Alternatively, if the stockpile is small, it may be covered instead.	Site Superintendent/ Environmental Officer	As required
	Where practicable, locate the stockpile at least 50 metres away from watercourses. Where less than 50 metres is achievable (eg for river crossing sites etc) then ensure that appropriate containment is implemented.	Site Superintendent/ Environmental Officer	As required
Stormwater drainage pit and drainage channels	Place erosion control structures such as silt fences and sand bags at key locations to capture the suspended sediment and gross litter prior to entering the drainage system.	Site Superintendent/ Environmental Officer	As required
	Conduct weekly inspections of all erosion control structures to ensure that they are in place and operating efficiently. Additional inspections should be conducted after storm events. Reinstate all drainage pits and clean out accumulated sediment or leaf litter in pits. Reinstate all existing erosion control structures	Environmental Officer /Site Superintendent	Weekly/ On completion of works
	Minimise disturbance to the existing drainage channels. Divert stormwater away from disturbed channels or swales to minimise the flow of water and chance of erosion If flow modification is necessary during construction, reinstate the drainage channel on completion of works..	Environmental Officer/ Site Superintendent	As required On completion of works
Construction access	Where temporary construction roads and site access points cross channels, erosion control structures should be placed in channels, as appropriate, to capture suspended sediments.	Environmental Officer/ Site Superintendent	As required
	Protect batters and disturbed areas from erosion by constructing small diversion/contour banks on the batter. This prevents sheet flow eroding the soil on the batter.	Environmental Officer/ Site Superintendent	Ongoing
	Stabilise soils by revegetating exposed surfaces. This will be undertaken in accordance with the Rehabilitation and Revegetation MP..	Environmental Officer/ Site Superintendent	On completion of works
Excavations / Trenching / Piling / Micro-tunnelling	Consider meteorological conditions prior to commencement of excavation or trenching works. Where possible works should not be undertaken during inclement weather as it will increase the potential for sediment laden runoff.	Site Superintendent/ Environmental Officer	Ongoing
	Conduct weekly inspections of all erosion control structures to ensure they are in place and operating efficiently. Additional inspections should be conducted after storm events.	Site Superintendent/ Environmental Officer	Weekly
	Any water contained within piles will be pumped, as required, to a holding pit or tank on the bank of the river or equivalent as agreed. Testing will be undertaken to ensure compliance with discharge criteria prior to disposal.	Environmental Officer/ Site Superintendent	During piling
	All drill sites to have an appropriate approved	Environmental Manager /	Approved prior to

Activity / Construction Item or Detail	Management Mitigation Measures	Responsibility	Timing
	Work Method Statement which outlines use, storage, chemical nature and disposal of drilling fluids, procedures in the event of Frac-out, and measures to stop fluids entering drains or water courses.	Site Superintendent	drilling
	Fluid plants to be used for micro-tunnelling construction must be appropriately bunded. Discharge of fluid must be at least 25m from any water course, held in a storage pit and regularly monitored to ensure it does not enter watercourse. Spoil stockpiling and laydown areas will be clearly defined. Crews will be instructed to be mindful of a drop in pressure and the risk of a resultant leak ('frac-out') into the environment.	Environmental Officer/ Site Superintendent	During micro-tunnelling
	Any potential release of bentonite to the environment will be managed in accordance with Emergency Response protocols.	Environmental Manager/ Site Superintendent	During micro-tunnelling
	During micro-tunnelling beneath water courses, periodically inspect water for evidence of 'frac-out'.	EnvironmentalOfficer / Site Superintendent	During micro-tunnelling
	Where ASS or potential ASS is identified during excavation, reference will be made to the Acid Sulfate Soil Management Plan.	Environmental Manager / Site Superintendent	During excavation
	Where spoil is to be replaced, it should be stored on the upslope side of excavation. If any sediment is washed away it will collect in the excavation rather than be transported off-site.	Environmental Manager / Site Superintendent	As required
Maintenance of Erosion and Sediment Controls	Conduct weekly inspections of all erosion control structures to ensure they are in place and operating efficiently. Silt built up behind controls should be removed regularly. Additional inspections should be conducted after storm events.	Site Superintendent/ Environment Officers	Weekly
	Prior to weekend periods, the Site Superintendent will review all erosion and sediment controls on site to ensure they are adequate. The Site Superintendent needs to ensure that adequate materials are available on site should additional controls need to be implemented over a weekend period.	Site Superintendent	At all times throughout construction
	A call out system will be established to ensure that any incidents which occur over the weekend period (including significant rain events) can be responded to within the appropriate timeframe.	Site Superintendent/ Environmental Manager	At all times throughout construction
	All sediment basins will be located and constructed within the pipeline alignment and will be appropriately secured to ensure public access is not possible.	Project Engineers/ Site Superintendent	On-going
	Sediment basins will be constructed as designed (in accordance the 'Institute of Engineers Erosion and Sediment Control Manual') and located as specified in the relevant ESCP.	Environmental Officer /Project Engineer/ Site Superintendent	At all times
	Sediment basin water will only be discharged to	Environmental Officer/	At all times

Activity / Construction Item or Detail	Management Mitigation Measures	Responsibility	Timing
	receiving waters when confirmed as complying through field tests/observations/ laboratory analyses) tests with discharge guidelines (>50ppm & pH 6.5 – 8.5). The laboratory analysis will be used to validate the field testing methods and results.	Site Superintendent	
	Sediment basins will be de-silted as required to ensure design storage capacity is maintained.	Project Engineer/ Site Superintendent	As required
Water disposal	Do not dispose of water unless it is uncontaminated. If uncertain of contamination, testing may be necessary to determine the most suitable method of disposal refer to operational guidelines for water discharge.	Site Superintendent/ Environmental Officer	Ongoing
	When releasing uncontaminated waters, spread flows over a large area rather than concentrating in channels, which tends to induce erosion.	Site Superintendent/ Environmental Officer	Ongoing
Sensitive land/aquatic areas	Refer to procedures in Water Crossing Management Plan. Monitor water quality at intervals to ensure that the existing water quality does not significantly decrease as a result of construction activities. Should turbidity rise more than 10-15% above background then halt works until levels subside.	Environmental Officer/ Site Superintendent	Ongoing
	Where appropriate, a geotextile underlay will be used in riparian zones under work areas such as piling platforms and access tracks.	Environmental Officer/ Project Engineers/ Site Superintendent	On-going
	When working near waterways, sediment fences may be placed not at the foot of the bank, but either on top or as high up on the bank as possible. Furthermore, there shall only be minimal clearing and soil disturbance when erecting sediment fences within the riparian zone.	Environmental Manager / Project Engineers	On-going

6 CORRECTIVE AND PREVENTATIVE ACTIONS

6.1 Community liaison and complaint management

Complaints represent an opportunity to enhance project environmental performance. All project complaints, including those from members of the public, stakeholder groups and Government agencies, will be managed via the NNA 1800 243 998 phone number to be listed in the Inquiry and Complaints Management Procedure, contained in the Community and Stakeholder Management Plan.

Complaints from any source must be registered using the QESE complaint record section. Where the complaint is environment-related, the complaint will be investigated by the Environmental Manager or Environmental Officer in consultation with the Site Manager or delegate and action/s taken to enable satisfactory closure.

Feedback to relevant personnel will be managed by the community relations team. As required, complaint details (including type and preventative/corrective actions) will be advised to field staff via pre-start meetings, toolbox talks or the Health, Safety and Environment Committee as appropriate.

6.2 Environmental incident/emergency reporting

All project staff and subcontractor personnel shall report all environmental incidents to the Environmental Manager, although initial response may go via the Site Manager/Spread Supervisor or Environmental Officer.

6.3 Incident/emergency preparedness and response

An Incident Response Plan will be prepared for the project. This plan documents suitable incident procedures to ensure effective response in the event of an emergency (including environmental emergencies such as fire, flood and large fuel spills).

The emergency procedures shall be tested on a six-monthly basis. Records are to be maintained of all site emergencies and results of emergency practice drills. The Emergency Response Controller for the project will be defined within the Incident Response Plan.

The key to effective prevention of incidents is monitoring, surveillance and training. During construction activities, inspections and preventative action to be performed by the Alliance will include:

- daily inspections of active worksites and completion of routine environmental checklists
- issue and quick close-out of NCR/EIN
- maintenance of constant supervision on site
- ongoing environmental training
- environmental audits of worksites, subcontractors and compliance issues.

Environmental and safety information on hazardous substances (e.g. Material Safety Data Sheets [MSDS]) will be available at the main site office, including information on where and how such substances are to be stored. An up-to-date list of emergency response personnel and organisations will be maintained at the main office and compounds. A list of key environmental personnel will also be included with their contact details.

Specific measures will also be implemented to minimise the risk of an incident occurring due to spillage, storage of hazardous materials or fire. Further information will be detailed in the Incident Response Plan.

6.4 Incident investigation

All incidents will be documented, investigations conducted and action plans (if required) developed to ensure no repetition of the event. Where current procedures are identified as being ineffective, the CEMP and any relevant WMS will be revised by the Environmental Manager and/or Health and Safety Manager.

An environmental investigation includes the following basic elements:

- advising the environmental authority(ies) if any substantial pollution has occurred
- identifying the cause and extent of and responsibility for the incident
- identifying and implementing the necessary corrective action
- identifying the personnel responsible for carrying out the corrective action
- implementing or modifying controls necessary to avoid a repeat occurrence of the incident
- recording any changes required to written procedures.

All personnel are required to report all incidents, as incident reporting is regarded as a valuable method of addressing shortcomings in procedures, training or equipment, and is an opportunity for improvement. It is also an offence not to report to the EPA any incident causing serious environmental harm.

6.5 Non-conformances

Non-conformances may occur in the following circumstances:

- exceedance of water quality objectives
- visible pollution of a waterway
- controls not maintained in good condition
- sediment basins not managed within required timeframe
- complaints received.

Non-conformances will be resolved according to the Quality Management Plan. The Environmental Manager or delegate will issue a Non-conformance Report (NCR) or an Environmental Improvement Notice (EIN) in response to inappropriate or non-conforming work methods, equipment selection, maintenance of controls or other identified concern.

In the event of a non-conformance:

- the nature of the event will be investigated by the Environmental Manager
- advice may be sought from a specialist
- monitoring may be undertaken
- the effectiveness or need for new/additional controls will be reviewed
- an appropriate preventative and corrective action will be implemented
- strategies will be identified to prevent reoccurrence
- the NCR will be closed-out
- environmental documentation/WMS will be reviewed and revised
- will be documented on QESE.

7 INSPECTION AND MONITORING

7.1 Inspections

A regular auditing, monitoring and reporting program for soil and water management will be conducted in accordance with the specifications of the relevant site WMSs as follows:

- Daily visual inspections of all erosion and sediment control measures by the Site Superintendent and/or Environmental Officer to ensure that controls are functioning correctly.
- Weekly routine inspections by the Environmental Officer and reported on the Weekly Site Inspection Checklist (G-FRM-001). Any issues that are detected will be reported immediately to the Environmental Manager. No work will be permitted that further exacerbates any issues of non-conformance until corrective actions are prescribed and implemented.
- Inspections after each significant rainfall event (i.e. >20mm/24 hours); additional inspections after rainfall events less than 20mm/24hr if the event caused damage or could reasonably be assumed to breach the integrity of the sediment controls. Observations will be recorded on the Weekly Inspection Checklist (G-FRM-001).
- Post construction - all remaining erosion control measures will be monitored for their effectiveness for at least 12 months. Remedial measures will be put in place should any controls fail.

7.2 Water Quality Monitoring

A water quality monitoring program will be established and implemented to measure performance against the set targets and to ensure compliance with the relevant legislation. The monitoring will be primarily focused on assessing the quality of surface waters, including upstream and downstream of the corridor.

A summary of the water quality parameters that will be tested are outlined in Table 6 below.

Table 6 Water Quality Testing

Parameters	Sampling Method	Analytical Method
Acidity (pH)	Grab Sample	Field Analysis and confirmed as required with lab assessment
Turbidity (NTU)	Grab Sample	Field Analysis
Total Suspended Soils (TSS)	Grab Sample	Laboratory Analysis (as required to calibrate field analyses)

Monitoring will be completed by appropriately qualified personnel who have training and expertise in water sampling techniques.

Monitoring equipment will be operated and maintained according to the manufacturer's guidebook. Monitoring criteria will be in accordance with legal requirements and laboratory analysis will be sought if necessary i.e. should an environmental incident be suspected. Results of any water testing will be recorded on form G-FRM-002.

8 DEFINITIONS AND ACRONYMS

Acronyms	Glossary
ANZECC	Australian and New Zealand Environment and Conservation Council
ASS	Acid Sulphate Soils
CAR	Corrective Action Request
DNR&W	Department of Natural Resources Mines and Water
IEAUST	Engineers Australia (previously Institution of Engineers, Australia)
ESCP	Erosion and Sedimentation Control Plan
EIN	Environmental Improvement Notice
EIR	Environmental Inspection Report
EIS	Environmental Impact Statement (Draft) as prepared by SRWP Co. April 2006
EMP	Construction Environmental Management Plan
EMR	Environmental Management Register (administered by the EPA)
EPA	Queensland Government Environment Protection Agency
ESCPs	Erosion and Sediment Control Plans
Linkwater	SRWPCo now trades as Linkwater, which is 100 per cent owned by the Queensland Government
MSC	Maroochy Shire Council
NNA	Northern Network Alliance
NPI	Northern Pipeline Interconnector
PASS	Potential Acid Sulphate Soils
QESE	Quality Environmental Safety Engineering Database
SEIS	Supplementary Environmental Impact Statement
Sensitive receivers	Inhabitants or occupants of residential or institutional land uses (eg health care and educational facilities)
SRWP Co.	Southern Regional Water Pipeline Company
SWMP	Soil and Water Management Plan (NPI001-A-PLN-011)
WMS	Work Method Statement

9 REFERENCE DOCUMENTS

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Environmental Protection Act 1994.

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