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IRON GATES DRIVE

STORMWATER MANAGEMENT PLAN

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Incorporating Hyder

IRON GATES DRIVE

STORMWATER MANAGEMENT PLAN

Author	Gerard Dick	
Checker	Darlan Castro	
Approver	Lachlan Prizeman	
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CONTENTS

1 EXECUTIVE SUMMARY

Gold Coral Pty Ltd has commissioned Arcadis to prepare a Stormwater Management Plan (SMP) for the road widening proposed for the Iron Gates Drive which provides access from Evans Head to the Iron Gates Residential Development.

This report forms an addendum to the existing Engineering Services and Civil Infrastructure Report (ESCIR) previously submitted for the Development Application. (ESCIR) Sections 7 Water Quality and Section 8 Sediment and Erosion Control deal with the Water Quality Management for the development both during construction and on establishment of the Development.

This report applies to the proposed road widening which will be constructed and operated in accordance with The Northern Rivers Local Government - Development Design and Construction Manuals - Erosion Control and Stormwater Management and general Water Sensitive Urban Design (WSUD) requirements of Council. The primary objectives of this SMP are achieved as follows:

Lawful Point of Discharge (LPoD)

The road widening construction proposes to maintain the existing LPoD, being 2x2100x750 box culverts under Irongates Drive. The site proposes to maintain the discharge of stormwater to the existing stormwater infrastructure using enhanced quality treatment via a sediment trap at the entrance to each of the culvert headwalls.

Stormwater Quality

Due to limitations using the 'Model for Urban Stormwater Improvement Conceptualisation (MUSIC)' for the modelling of the road pavement widening site, a Risk Assessment based evaluation has been undertaken. A stormwater quality feasibility assessment undertaken which demonstrates that specially tailored treatment systems will be best suited in order to meet the Water Quality objectives during the operational phase of the proposed road widening. The proposed treatment system features enhanced bio-retention swales and a small sediment trap construction prior to the culvert inlet. All the stormwater quality controls proposed in this document are contained within the road reserve of Iron Gates Drive and will remain above the existing water table levels. Regular maintenance of the treatment devices will be undertaken to ensure the continuing performance of the stormwater quality treatment train.

Erosion and Sediment Control

Construction phase sediment control devices are to be implemented during construction works. An Erosion and Sediment Control Plan will form part of the documents submitted for the Construction approvals. In general, The E&SC Plan will include the following strategies:

1.Site works will not start until the erosion and sediment control works outlined in clauses 2 & 3, below, are installed and functional.

2. The entry to and departure of vehicles from the site will be confined to one stabilised point. Sediment or barrier fencing will be used to restrict all vehicular movements to that point. Stabilisation will be achieved by constructing a stabilised site access or other suitable technique approved by the Council.

3. Sediment fences and barrier fences will be installed along the perimeter of the road widening construction zone.

4. Topsoil from the work's area will be stripped and stockpiled for later use in landscaping the site.

5. All stockpiles will be placed in the locations to be shown on the ESCP and at least 2 metres clear of all areas of possible concentrated water flow, including the existing culverts.

6. Land on the opposite side of the road widening and, on the footpath, will not be disturbed during works except where essential. Where works are necessary, they will be undertaken in such a way to minimise the occurrence of soil erosion, even for short periods. They will be rehabilitated (grassed) as soon as possible.

7. Topsoil will be respread, and all disturbed areas will be stabilised within 20 working days of the completion of works.

8. All erosion and sediment controls will be checked at least weekly and after rain to ensure they are maintained in a fully functional condition.

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2 EXISTING SITE CHARACTERISTICS

2.1 SITE DESCRIPTION

The existing Iron Gates Drive is just on 1000 metres in Length, with 6.5 to 7.5m sealed bitumen carriageway with gravel shoulders. The proposed widening to facilitate the Iron Gates residential development will be undertaken over 460 metres in length.

The total area of the existing pavement is approximately 7-7500m^2 the area widening is approximately 690m^2.

The road is raised approximately 1 to 1.5m from above the surrounding terrain, which is described as sandy, silty- sandy soils, exhibiting pervious characteristics typical of the sandy soils.

Figure 2-1 Iron Gates Drive Existing Imagery

2.2 EXISTING TOPOGRAPHY

The road topography consists of low grading slopes (<1%). The site generally grades towards the Evans River to the South East. The road has a high point of approximately RL3.2m and low point of RL2.3m. Drainage from the upstream catchment discharges to the Evans River South East mainly through the major waterway adjacent to Mangrove Street. Two smaller culvert structures convey smaller flows beneath Iron Gates Drive, at chainages 600 and 800.

Figure 2-2 Iron Gates Drive Stormwater Culverts

3 STORMWATER QUALITY

3.1 OBJECTIVES

The water quality objectives are set out as follows:

- Protect natural ecosystems;
- Integrate stormwater treatment into the urban landscape;
- Protect water quality;
- Reduce runoff and peak flows; and
- Add value while minimising development costs.

3.2 PROPOSED STORMWATER TREATMENT DEVICES

WSUD aims to minimise the impact of a development on the natural water cycle by reducing the export of pollutants, sediments and nutrients from the site into the natural watercourse. In order to treat the stormwater runoff from the road widening, the proposed treatment devices can be integrated into the overall design of the road widening layouts, road cross sections, existing stormwater construction without interfering with the areas outside the existing road reserve. Stormwater from each installation will provide for a stormwater quality treatment train prior to discharge from the site, which will ensure compliance with the water quality objectives.

The below nominated treatment devices are shown in the attached Access Road Stormwater Plan in Appendix A.

3.2.1 SWALE DRAIN PLANTING AREAS

A bio-retention area is a vegetated region where runoff is filtered through a filter media layer (e.g. sandy loam) as it percolates downwards to receiving underlying drainage. Specific vegetation will be incorporated into the landscaping of swale drains areas which will effectively reduce nutrient loads. The existing sandy soils will provide the required filtration.

3.2.2 SEDIMENT TRAP FOREBAY

A sediment trap forebay will be constructed upstream of the culvert headwall discharging underneath Iron Gates Drive. The sediment trap forebay will be installed to capture any suspended sediments from the existing swale drains flows. Construction will be in accordance with the Development Design Specification D7 – Erosion Control and Stormwater Management section D7.12.

The removal of sediments prior to discharge will provide enhanced Water Quality treatment to the existing Road runoff.

3.3 MODELLING OF THE DEVELOPED SITE (MUSIC)

Modelling of the site was not undertaken using the ‘Model for Urban Stormwater Improvement Conceptualisation (MUSIC)’ due to restrictions within the software. However the following impacts and site conditions are noted.

The existing shoulder to the roadway is currently exposed to rainfall and runoff, the road widening and sealing of this area will reduce the sediment runoff from this area.

The existing terrain and surrounding sandy soil conditions do not generate high runoff flows nor erosive conditions. The existing grassed verges already provide excellent stormwater Quality Treatment to the existing bitumen road carriageway.

3.4 COMPLIANCE

To comply with the water quality objectives mentioned above and reduce the water quality impacts associated with the Iron Gates Drive road widening works, the following can be seen:

- Reduction of exposed gravel shoulder areas and potential sediment runoff will be achieved by the sealing of the pavement widening – i.e bitumen surface in place of existing exposed gravel.
- Reduction of total nutrient pollutants will be achieved by enhanced planting in the table drain approaches to the culvert inlets.
- Reduction of total suspended solids will be achieved by the installation of a sediment trap forebay entry to the existing culvert inlet.
- Reduction of sediment and pollutant runoff during construction by the implementation of the site based Erosion and Sediment Control Plan.

4 STORMWATER QUALITY CONSTRUCTION PHASE

4.1 WATER QUALITY OBJECTIVES

Table 4-1 Construction Phase Quality Objectives

Pollutant	Criteria
Drainage Control	Design life and design storm of temporary drainage works: **1.** Disturbed area open for <12 months—1 in 2 ARI; **2.** Disturbed area open for 12-24 months—1 in 5 ARI; **3.** Disturbed area open for > 24 months—1 in 10 ARI;
Erosion Control	**4.** Minimise exposure of disturbed soils at any time; **5.** Avoid or minimise large construction activities in the wet season; **6.** Divert water run-off from undisturbed areas around disturbed areas; and **7.** Use erosion risk ratings to determine appropriate erosion control measures.
Sediment Control	Use soil loss rates to determine appropriate sediment control measures Design storm for sediment control basins should be based on retaining the maximum sediment quantity for the maximum volume of water run-off Site discharge during sediment basin dewatering should not exceed 50 mg/L TSS and pH between 6.5–8.5
Stormwater Drainage / Flow Management	Hydraulics and hydrology—Take all reasonable and practicable measures to minimise significant changes to the natural waterway hydraulics and hydrology from: • peak flow for the one-year and 100-year ARI event (respectively for aquatic ecosystems and flood protection); • run-off frequency and volumes entering receiving waters; and • Uncontrolled release of contaminated stormwater.
Water Quality Outcomes	Stormwater flows from undisturbed and disturbed areas—manage to help protect environmental values Coarse sediment—coarse sediment is retained on site Fine sediment—Site discharge during sediment basin dewatering has a TSS concentration less than 50 mg/L Turbidity—Site discharge during sediment basin dewatering has a turbidity (NTU) less than 10% above receiving waters turbidity— measured immediately upstream of the site Nutrients (N & P)—Nitrogen and phosphorus are managed through sediment control. pH—Site discharge during sediment basin dewatering has a pH range 6.5–8.5 Litter and other waste—Prevent litter/waste entering the site, the stormwater system or watercourses that discharge from the site. Also minimise or sufficiently contain on-site litter and waste production and regularly clear waste bins Hydrocarbons and other contaminants—Hydrocarbons and other contaminants are prevented from entering the stormwater system or internal watercourses that discharge from the site. Wash down water—Wash down water is prevented from entering the stormwater system or internal watercourses that discharge from the site Cations and anions—Cations and anions including aluminium, iron and Sulfate are managed as required under an approved acid Sulfate soil management plan

4.2 EROSION AND SEDIMENT CONTROL PLAN PURPOSE

During the construction phase it shall be the Principal Contractor's responsibility to ensure the objectives of Table 4-1 are achieved.

The following section of this report provides a suggested framework for an Erosion and Sediment Control Plan. This includes recommended actions and responses for specific activities; monitoring and reporting; and construction of specifically designed site-specific sediment basins.

4.3 SPECIFIC ACTIVITIES

4.3.1 EROSION AND SEDIMENT CONTROL OF DISTURBED LAND

During the construction phase it shall be the Principal Contractor's responsibility to ensure the following:

- Diversion of any clean water runoff that may interfere with land disturbance by the use of earth bunds, or other control devices deemed appropriate by a suitable supervisor;
- Reduction of sediment migration from disturbed land parcels by implementing silt fences, sediment basins or other control devices as deemed appropriate by a suitable supervisor;
- Where cut to fill operations produce a spoil it is recommended that the excess material be placed upstream of the excavation location to ensure any sediment runoff is directed back into the trench. Earth bunds or sediment fences may be required to control direction of sediment flow should the spoil be placed on the downstream side of the excavation site;
- Control measures such as a gully pit sediment barrier (see Arcadis drawings attached) shall be installed around inlet pits where required reducing the potential for sediment discharge into the surrounding stormwater system;
- Any sediment deposited from construction vehicles will be swept up and removed; and
- Erosion and sediment control devices may only be removed once disturbed lands which they are protecting are rehabilitated and capable of resisting further erosion.

4.3.2 SPOIL AND STOCKPILE MANAGEMENT

It shall be the Principal Contractor's responsibility to oversee the following controls during the construction phase unless otherwise specified:

- The placement of spoil and stockpile material shall be kept at a maximum distance from stormwater inlets, gutters and stormwater pipes to reduce unnecessary sediment migration into nearby infrastructure;
- Spoil and stockpile material shall be placed in a way that reduces the likelihood of sedimentation, erosion and slippage. Advice from an appropriate project manager/representative shall be sought in this instance;
- Spoil or stockpile material that is deemed a contaminant shall be placed on a designated zone of either fill material, plastic or concrete with the installation of appropriate containment devices. Advice from an appropriate project manager/representative shall be sought in this instance as the resulting control will be highly dependent on the severity of contamination; and
- It shall be the Project Manager's responsibility to foresee and develop appropriate control measures to prevent the impacts of spoil and stockpile material prior to construction

activities. Monitoring and reporting shall also be required during the implementation of any given device associated with spoil and stockpile management.

4.3.3 EROSION CONTROL

It shall be the Principal Contractor's responsibility to oversee the following controls during the construction phase:

- Traffic of any type shall be kept away from areas of rehabilitation to promote stabilisation of the zone;
- Where wind and water are acknowledged as potential erosion sources temporary protection shall be installed. Such measures only apply to zones of spoil, stockpile and land disturbance which are unlikely to receive works within a period of 6-8 weeks. Further advice from an appropriate project manager/representative shall be sought in this instance as the resulting control will be highly dependent on the disturbance type and erosion source; and
- Once viable, final landscaping shall be undertaken on applicable zones to increase stability.

4.3.4 PERSONNEL TRAINING

It shall be the Principal Contractor's responsibility to oversee the following training protocols during the construction phase:

- Environmental management and incident reporting is to be included on all site induction courses; and
- All personnel are to receive adequate training in; work place health and safety issues, environmental management, best practice erosion and sediment control practices, incident reporting procedures and where applicable site inspection and maintenance procedures.

4.3.5 MISCELLANEOUS

- It is the Principal Contractor's responsibility to ensure erosion and sediment controls are operated and maintained in an effective operational condition. These structures are not allowed to accumulate sediment volume in excess of 70% sediment storage design capacity as per Section 6 of the Urban Stormwater Quality Planning Guidelines 2010;
- Sediment removed from control measures must be disposed of in a manner approved by the local Council that does not cause pollution and forms part of the Contractor's obligation;
- Any chemicals, fuel or oil stored on site shall be stored under cover in a bounded area or placed sufficiently above ground level to prevent contamination of surface water;
- A waste concrete receptor (disposal area) must be established if significant concreting is to occur on site. The site must be surrounded by perimeter bunds and be clearly signed; and
- A general waste collection area shall be established which is to include appropriate pollutant runoff controls, dependent on the nature of the waste.

4.4 PROJECT PERSONNEL RESPONSIBILITIES

A description of the key personnel involved with implementing the Erosion and Sediment Control Plan are listed in Table 4-2. It is recommended that all parties involved attend a pre-construction

conference to discuss and clarify all issues associated with sediment and erosion control as well as this plan.

Table 4-2 Project Personnel Responsibilities

Project Role	Responsibilities
Superintendent	• Authorisation of this plan; and • Review and monitoring of this plan.
Contractor / Site Manager	• Implementation of this plan; • Monitoring of this plan; • Supervising any activities or requirements required by this plan; • Ensuring all personnel are aware of the contractual agreements associated with this plan.
All Personnel	• Ensuring they are aware of the contractual agreements associated with this plan; and • Informing appropriate personnel of any issues that may arise with respect to the desired sediment and erosion control measures.

4.5 MONITORING AND RESPONSIBILITY

4.5.1 ALL PERSONNEL

It is the obligation of all personnel to report any failures in the erosion and sediment control works utilised during the projects life cycle. Any identified errors within the sediment and erosion control system shall be reported in writing to a relevant project manager. A formal inquiry shall be undertaken in accordance with the reported issue as well as the relevant party procedures (i.e. Principal Contractor).

4.5.2 CONTRACTOR/CONTRACTOR'S FOREMAN

It shall be the responsibility of the Contractor and Contractor's Foreman to monitor and report on the erosion and sediment control measures utilised in the construction phase. Inspections are to be undertaken:

- On a daily basis during earthworks, land disturbance, spoil or stockpile activities and rain events;
- Weekly during site inactivity; and
- Within 24 hours prior to expected rainfall and 18 hours prior to intense rainfall events.

The following shall be inspected or reported on:

- Erosion and sediment control devices are in the correct location and are working as defined by this plan;
- Drainage systems both internal and external to the site are operating effectively or to pre-construction efficiencies;
- Spilled material is removed if it can potentially mobilise via stormwater runoff or wind;
- Stabilisation of disturbed land parcels has been undertaken in an effective manner;
- Excess sediment has been removed from erosion and sediment measures appropriately if the device is operation ineffectively or requires decommissioning.; and
- It is understood that repairs, maintenance or reinstallation may be required if any control measures are operating inadequately, or if infrastructure is damaged due to inefficient operation of the outlined measures.

4.5.3 ENVIRONMENTAL REPRESENTATIVE

It shall be the responsibility of the environment representative to periodically inspect and report on the effectiveness of the erosion and sediment controls during the construction phase of the project. Technical advice shall be given to personnel outlying any uncertainty with regards to the; applicability, installation, operation, maintenance, removal or rehabilitation of any sediment and erosion control.

5 CONCLUSION

This SMP has been prepared to provide a design proposal and guide to the stormwater quality management techniques for the site of the Iron Gates Drive.

The primary objectives of this Stormwater Management Plan (SMP) are achieved as follows:

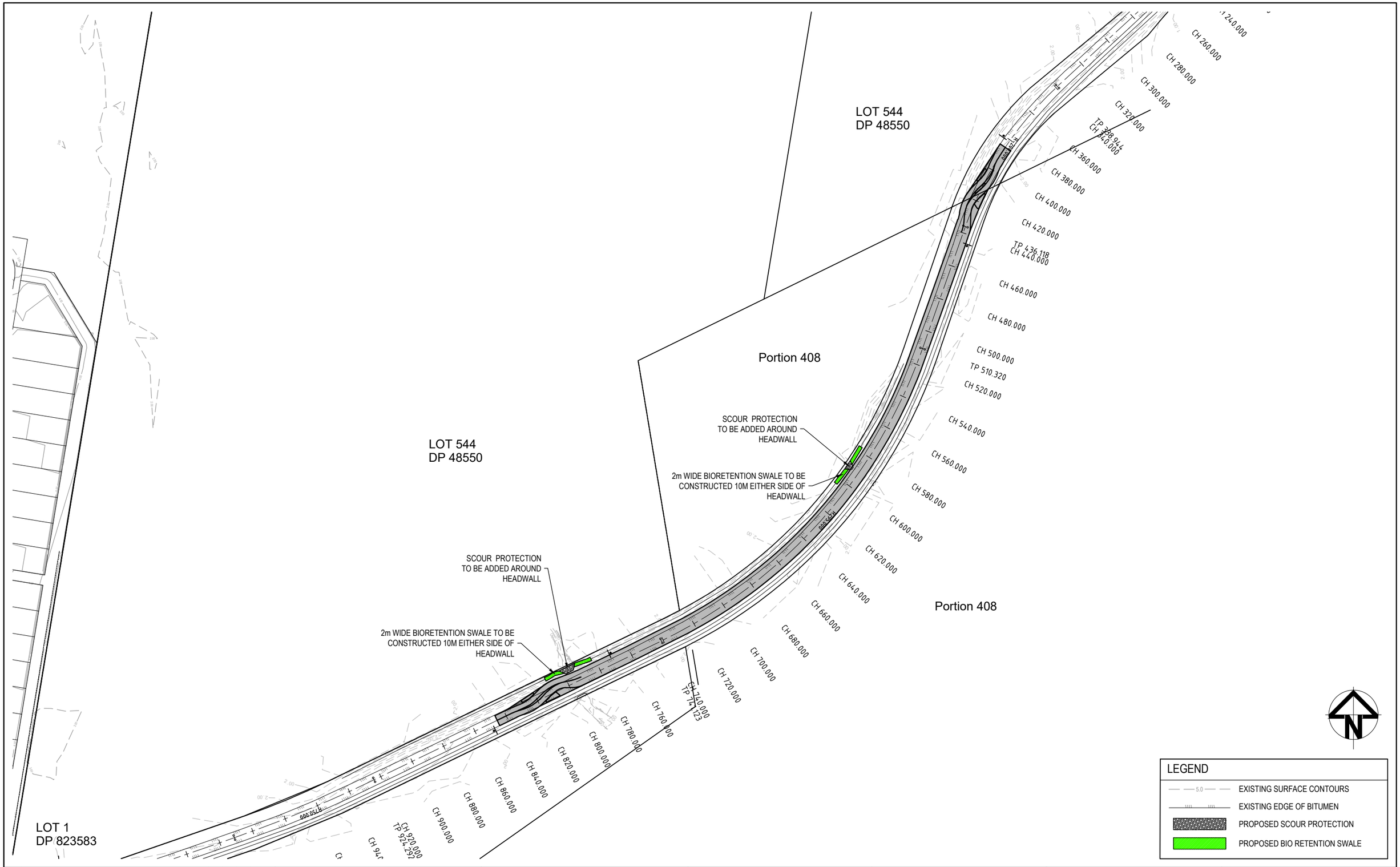
Stormwater Quality

A stormwater quality assessment is provided which demonstrates that a specially tailored treatment system will be required in order to minimise the impacts of the Road widening, in comparison to the existing site runoff scenario. This treatment system is demonstrated in Appendix A.

Erosion and Sediment Control

Construction phase sediment control devices are to be implemented during construction works in accordance with requirements associated with Type 3 sediment discharge zones, comprising of a vehicle shakedown, sediment fences and culvert inlet protection.

APPENDIX A – ENGINEERING PLANS



Issue	Description	By	Ckd	RPEQ	Date
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100mm on Original

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Surveyor: ROBERT A HARRIES SURVEYOR

Architect:

Filename K220-AA007094-GCD-00-ACCESS ROAD STORMWATER PLAN.dwg

Client: GOLDCORAL PTY LTD

Status: PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Approved: R.P.E.Q No :

		Original Issue Signatures	
Scales	1:1000	Drawn S. HEYWARD	
Original Size	A1	Designed L. PRIZEMAN	
Height Datum	AHD	Project Manager G. DICK	
Grid		© Copyright reserved	

Project: LOT 277 IRON GATES ROAD
EVANS HEAD
ACCESS ROAD

Title: ACCESS ROAD STORMWATER PLAN

ARCADIS
Arcadis Australia Pacific Pty Limited
P O Box, 1653
Southport QLD 4215
ABN 76 104 485 289
Tel No: +61 7 5532 3933
Fax No: +61 7 5591 4778
www.arcadis.com

Drawing No.	Project No.	Issue
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