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MEDQ

Stormwater Management Plan

Proposed Service Station Development at proposed Lot 28, Grosvenor Estate, Moranbah

For SP Moranbah Joint Venture

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APPENDIX A

PRELIMINARY PROPOSED SITE PLAN, DRAWING NO. 1000, ISSUE A PREPARED BY PUSH

CONTOUR AND DETAIL SURVEY PLAN PREPARED BY SKYLINE SURVEYORS DATED 04 AUGUST 2014

APPENDIX B

B14312-CSK01 CONCEPT BULK EARTHWORKS LAYOUT PLAN

B14312-CSK02 CONCEPT CIVIL SERVICING PLAN

APPENDIX C

MUSIC MODELLING RESULTS

APPENDIX D

MAINTENANCE DETAILS

Document Control Page

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1.0 INTRODUCTION

Lambert & Rehbein (SEQ) Pty Ltd was commissioned by SP Moranbah Joint Venture to develop a conceptual Stormwater Management Plan (SMP) (Quality and Quantity) for a service station development at proposed Lot 28 within the next stage of Grosvenor Estate, Moranbah. The proposed service station development comprises roofed car and truck refuelling facilities, underground fuel storage tanks, carpark facilities, a retail facility and landscaped areas. The site is located within the Isaac Regional Council Local Government Area, however the site is located within a Priority Development Area identified by the Queensland Department of State Development, Infrastructure & Planning (DSDIP), Economic Development Queensland (EDQ).

1.1 OBJECTIVE

It is the objective of this report to ensure that the principles of Water Sensitive Urban Design (WSUD) are applied as required. This report has been compiled to address the stormwater quality and quantity requirements of the Queensland Urban Drainage Manual (QUDM), the Queensland DSDIP *State Planning Policy 2014*, the *Environmental Protection Act 1994* and the associated *Environmental Protection (Water) Policy, 2009*.

The aim of this Conceptual SMP is to identify any stormwater detention requirements (if necessary) and an appropriate level of stormwater quality improvement that achieves the Water Quality Objectives (WQOs) as detailed in this report.

This report presents the results of the site based SMP utilising the Model for Urban Stormwater Improvement Conceptualisation (MUSIC) to model an appropriate stormwater treatment approach for the proposed development.

1.2 SCOPE

The scope of this report primarily addresses requirements for the operational phase of the development. However, the construction phase water quality is briefly addressed.

An appropriate treatment train of Stormwater Quality Improvement Devices (SQIDs) for the proposed development was determined based on Lambert & Rehbein's understanding of the Queensland DSDIP EDQ's requirements. Specific tasks for the SMP included:

- Initial liaison with EDQ;
- Review proposed site concept layout;
- Develop concept layout for SQIDs;
- Model establishment using MUSIC version 6.0.4;

- Run Model incorporating concept SQID layout;
- Review MUSIC output results; and
- Import modelling results into final SMP for the proposed development.

2.0 SITE DESCRIPTION

2.1 SITE LOCATION

The site is located at proposed Lot 28 within the next stage of Grosvenor Estate, Moranbah. The site is adjacent to the partially constructed Grosvenor Estate residential subdivision development located on Goonyella Road in the southern region of Moranbah.

The site fronts Goonyella Road to the east and is adjacent to a McDonalds restaurant to the north. A concrete vehicle access easement utilised by the McDonalds development is located along the northern boundary of the site. To the south of the site is vacant property and to the east of this site is the unconstructed Meinga Crescent road reserve. The site location is presented below in **Figure 1**.

Figure 1 Site Location Plan

Source: Google Maps 2014

2.2 TOPOGRAPHY

A Contour and Detail Survey Plan prepared by Skyline Surveyors dated 04 August 2014 enclosed in **Appendix A** of this report indicates that site elevations range from approximately RL 223.2 m AHD to RL 224.0 m AHD. The survey indicates that a small portion of the site falls towards the vehicle easement with the majority of the site generally falling towards the existing Goonyella Road driveway crossover.

2.3 EXISTING LAND USE

The site is currently vacant and has recently been subjected to bulk earthworks as a part of the Grosvenor Estate Development. Seattleite imagery suggests the site is poorly vegetated.

2.4 PROPOSED LAND USE

The proposed service station development comprises roofed car and truck refuelling facilities, underground fuel storage tanks, carpark facilities, a retail facility and landscaped areas. A Preliminary Proposed Site Plan, Drawing No. 1000, Issue A prepared by Push enclosed in **Appendix A** of this report displays the proposed configuration of the development.

2.5 RECEIVING ENVIRONMENT

The site is located approximately 300 metres to the north of Grosvenor Creek which is a direct tributary of the Isaac River, which discharges to the Fitzroy River. The Fitzroy River catchment, estuary and tributaries cover nearly 140,000 km^2.

3.0 STORMWATER QUANTITY

It is proposed for the development to connect to the proposed stormwater drainage pipe within the future extension of Meninga Crescent. These pipes are then planned to run south within the future road reserve before discharging to Grosvenor Creek.

This arrangement has been discussed with the design engineers for the surrounding subdivision, CLA Consultants, and we understand that the future drainage design for the subdivision will accommodate the developed stormwater flows from the subject site.

The proposed development will increase the amount of impervious areas from the pre-developed condition and will therefore increase the amount and rate of stormwater runoff discharged from the site. This increase in flows is normally mitigated by providing stormwater detention and limiting the flows to the pre-developed condition.

Downstream of the subdivision drainage outlet, stormwater runoff from the proposed development is very unlikely to worsen peak flood levels at Grosvenor Creek. This is due to substantially differing catchment sizes and associated times of concentration between the local catchment at the entire catchment of Grosvenor Creek.

Based on the above it proposed not to provide on-site stormwater detention measures to mitigate runoff flows from the proposed development

3.1 FLOODING

Lambert and Rehbein met with DSDIP on 14 August 2014 and were advised that various conflicting flood reports exist for the area surrounding the proposed service station. The subject site is a new lot within a new estate so it is anticipated that the development has the adequate flood immunity. However, DSDIP was not able to release any flood information for the area. Lambert & Rehbein request that DSDIP review the conceptual levels displayed on the Concept Bulk Earthworks Layout Plan, Drawing No, B14312-CSK01 presented in Appendix B and advise if they have any flooding concerns.

3.2 LAWFUL POINT OF DISCHARGE

This report assumes that the proposed Meninga Crescent road extension and associated stormwater infrastructure will be completed prior to the construction of the development. The proposed lawful point of discharge for the subject development is a proposed stormwater manhole within Meninga Crescent.

4.0 STORMWATER QUALITY

4.1 STORMWATER QUALITY OBJECTIVES

In accordance with the Queensland DSDIP *State Planning Policy* (2014) the required operational phase water quality objectives are provided in **Table 1** below.

Table 1 Operational Phase Water Quality Objectives:

Pollutant	WQO Percentage Load Reductions
Total Suspended Solids (TSS)	85%
Total Phosphorous (TP)	60%
Total Nitrogen (TN)	45%
Goss Pollutants (GP)	90%

4.2 POTENTIAL WATER QUALITY IMPACTS

4.2.1 CONSTRUCTION PHASE

Potential exists during the construction phase of development for sediment (from exposed soil areas and stockpiles) to become mobilised by stormwater. This results in suspended solids entering waterways. Suspended solids can also potentially enter waterways as a result of spillages from construction and plant operations.

Table 2 below details the typical stormwater pollutants which may be generated during the construction phase of a development.

Table 2 Typical Construction Phase Pollutants

Pollutant	Sources
Litter	Paper, construction packaging, food packaging, cement bags and off-cuts.
Sediment	Unprotected exposed soils and stockpiles during earthworks and building.
Hydrocarbons	Fuel and oil spills and leaks from construction equipment.
Toxic Materials	Cement slurry, asphalt prime, solvents, cleaning agents and wash waters.
pH altering substances	Cement slurry and wash waters.

Stormwater quality during the construction phase of the development should be addressed in an Erosion and Sediment Control Plan. The plan should address construction phase erosion and sediment control issues in accordance with the Institute of Engineers Australia (Qld) *Erosion and Sediment Control Guidelines*. The Erosion and Sediment Control Plan should also be in accordance with Isaac Regional Council guidelines.

The following measures should be implemented prior to the commencement of construction:

- Education of all site workers in sediment and erosion procedures;
- Specified storage areas for construction materials and plant that are bunded to prevent any spillages from escaping; and
- Construction of silt fences and catch drains adjacent to the downstream boundaries to divert runoff to temporary sediment basins.

The following measures should be implemented during the construction phase of the project:

- Staging the development to minimise large exposed areas of soil;
- Silt fences should be erected downstream of all disturbed areas; and
- All erosion and sediment control devices should be regularly inspected and maintained following storm events.

However, the most effective course of action will be to minimise the construction footprint and stabilise the site as soon as possible with the ultimate building and landscaped furnishes.

4.2.2 OPERATIONAL PHASE

During the operational phase of the development, the following impacts have been identified in relation to stormwater runoff and water quality of the receiving waterways:

- Potential exists for gross pollutants, which include human derived litter, coarse sediment and vegetation, to affect the drainage capacity of stormwater systems. Gross pollutants may physically affect the downstream waterway habitats and organisms such as entangling birds and aquatic animals. Gross pollutants are also typically unsightly and reduce the visual amenity of the site;
- Sediment can become mobilised by stormwater as suspended solids from the erosion of exposed soil areas, un-mulched garden beds, sediment deposited on car park and hardstand areas by vehicles and by atmospheric deposition of sediment. Suspended solids can be used as a transport medium resulting in nutrients and heavy metals making their way into waterways. Suspended solids can block stormwater systems leading to local flooding and can also affect receiving waterways physically through smothering aquatic flora and fauna; and
- Nutrients can enter waterways in stormwater runoff through many sources including detergents used in car washing, fertilizers from landscaping and lawn areas, nitrous oxide deposition from vehicle exhausts, and organic waste. High nutrient levels can lead to eutrophication of the receiving waterways resulting in algal blooms (toxic in some cases) and excessive macrophyte growth.

Implementation of the appropriate SQIDs would ensure that stormwater discharge from the site would adhere to EDQ's requirements and objectives. Furthermore, implementation of the appropriate SQIDs would reduce the chance of these previously mentioned pollutants from reaching the waterways.

4.3 STORMWATER QUALITY ASSESSMENT

The potential impact and effectiveness of the proposed SQIDs was assessed using MUSIC Version 6.0.4. MUSIC is a software tool that simulates stormwater runoff quality from different sources and the effectiveness of SQIDs.

The MUSIC modelling program is able to simulate the quantity and quality of stormwater runoff from Catchment sizes which range from a single house lot up to 100 km^2. The program is able to report on the pollution uptake efficiencies of a wide range of treatment measures.

The model can be used to generate both pollutant concentrations and long term pollutant loads and is recognised as the most appropriate modelling software for the planning of stormwater treatment measures for urban catchments. The model can generate pollutant loads and event

mean concentrations for TSS, TP and TN. Current versions are limited to modelling only these pollutants together with gross pollutants. Other pollutants can be substituted, such as heavy metals or oils and greases, however long term statistical data on the generation of these pollutants is required.

4.3.1 GENERAL MUSIC MODELLING APPROACH

The Isaac Regional Council does not have any MUSIC Modelling or Stormwater Quality Guidelines. In the absence of local guidelines, EDQ has accepted that MUSIC modelling will be conducted generally in accordance with the Healthy Waterways Water by Design "*MUSIC Modelling Guidelines for South East Queensland, Version 1.0, 2010*".

The MUSIC guidelines suggest that the timestep of each model should match the time of concentration of the smallest source node and the smallest detention time of any treatment devices. As WSUD principles are to be applied, a six (6) minute timestep should be adopted to match the range of treatments incorporated and the low time of concentrations expected from the Catchment.

Six (6) minute rainfall data was sourced from the Bureau of Meteorology for Moranbah Water Treatment Plant Rainfall Station (Stn. Number: 034038) for 1990-1999 and was used for all modelling scenarios.

Table 3 below details the MUSIC parameters utilised in running the model.

Table 3 MUSIC Model Hydrological Parameters

Parameter	Description
Meteorological Data	Moranbah Water Treatment Plant Rainfall Station (034038) 1990 to 1990
Source Node	Industrial – Road, Roof, Ground
Modelling Time Step	6 minute
Drainage Link	No Routing
Pollutant Concentration	Industrial – Roof, Ground, Roads
Soil Properties	Industrial

The MUSIC model defaults of k and C* assist in the definition of treatment performance and are based on research and judgement by academics and industry leaders assisting the eWater Cooperative Research Centre (CRC). The k constant is used in a first order kinetic model to simulate the removal of pollutants within the treatment system. C* values represent the

background concentrations of pollutants for end of line treatment measures. All modelling for this study has used the default values for k and C*.

4.3.2 DEVELOPED SITE CATCHMENTS

A review of the Preliminary Proposed Site Plan, Drawing No. 1000, Issue A prepared by Push enclosed in **Appendix A** was carried out to determine an appropriate stormwater quality modelling approach. Three SQID catchments were identified and are shown on the Concept Civil Servicing Layout Plan, B14312-CSK02 enclosed in **Appendix B** of this report.

MUSIC models the rainfall-runoff and pollutant generation processes within a source node with unique pollutant export parameters for each different land use type. The following sub catchments were identified based on their relevance for each source node:

- **Roads** - This includes all impervious concrete pavement areas exposed to rainfall. These areas were modelled as roads given their consistent exposure to vehicles;
- **Ground** - All garden areas have been modelled as source nodes with 100 % pervious area;
- **Roofs** - This includes all roofed areas, including the shop roof and refuelling area canopy roofs.

A breakdown of the proposed developed catchment is presented in **Table 4** below:

Table 4: Proposed Developed Catchment Areas

Catchment	Area		
	Catchment A	Catchment B	Catchment C
Roof	NIL	0.041 ha	0.028 ha
Roads	0.043 ha	0.154 ha	0.091 ha
Ground (100% Pervious)	0.020ha	0.015 ha	0.024ha

It should be noted that the fuel bowser areas are to be roofed and sheltered from rainfall. These areas are to be separated from the rest of the catchment to contain any spill or contaminated waters in these areas. The treatment and water quality management of these areas is beyond the scope of this Stormwater Management Plan.

Given the extent of impervious areas and exposure to vehicle and pedestrian traffic, the proposed development was modelled as with industrial source node parameters as per the Healthy

Waterways Water by Design "*MUSIC Modelling Guidelines for South East Queensland Version 1.0, 2010*". These parameters presented in Table 5 and Table 6 below:

Table 5 MUSIC Rainfall-Runoff Parameters

Pollutant	Industrial Land Use Parameter:
Rainfall Threshold (mm)	1
Soil Storage Capacity (mm)	18
Initial Storage (%)	10
Field Capacity (mm)	80
Infiltration Capacity Coefficient a	243
Infiltration Capacity Exponent b	0.6
Initial Depth (mm)	50
Daily Recharge Rate (%)	0
Daily Baseflow Rate (%)	31
Daily Deep Seepage Rate (%)	0

Source: Water by Design "*MUSIC Modelling Guidelines for South East Queensland", Version 1.0, 2010*

Table 6 Pollutant Export Parameters Adopted in the MUSIC model

Pollutant			Industrial Land Use	
			Mean	Standard Deviation
Total Suspended Solids	Roof	Base Flow	N/A	N/A
		Storm Flow	1.30	0.44
	Roads	Base Flow	0.78	0.45
		Storm Flow	2.43	0.44
	Ground	Base Flow	0.78	0.45
		Storm Flow	1.92	0.44
Total Phosphorous	Roof	Base Flow	N/A	N/A
		Storm Flow	-0.89	0.36
	Roads	Base Flow	-1.11	0.48
		Storm Flow	-0.30	0.36
	Ground	Base Flow	-1.11	0.48
		Storm Flow	0.59	0.36
Total Nitrogen	Roof	Base Flow	N/A	N/A
		Storm Flow	0.25	0.32
	Roads	Base Flow	0.14	0.20
		Storm Flow	0.25	0.32
	Ground	Base Flow	0.14	0.20
		Storm Flow	0.25	0.32

Note: Parameters are shown as Log_{10} of Concentration in mg/L

***Source**: Water by Design "MUSIC Modelling Guidelines for South East Queensland", Version 1.0 2010*

4.4 ADOPTED STORMWATER TREATMENT TRAIN

4.4.1 STORMWATER QUALITY TREATMENT OPTIONS

When locating the devices, the principal consideration is to ensure that stormwater leaving the site is treated to a satisfactory level in accordance with EDQ's requirements.

Based on the understanding of the EQQ's requirements for stormwater treatment for the subject site, the following SQID's have been identified for consideration:

- **Bioretention System:** Provides stormwater treatment for removal of suspended solids, nitrogen, phosphorous and hydrocarbons (where attached to fine sediments) and transport functions. They operate by passing the treatable flow through a prescribed filtration media, the system should be planted with vegetation which will provide treatment through filtration, extended detention and biological uptake. Plants with extensive fibrous or a spreading, rhizomatous root system, able to withstand periods of

inundation, are preferred in bioretention systems. A sandy loam filtration media with a hydraulic conductivity of approximately 200mm/hr will ensure that filtration media does not become waterlogged

- **Trash Racks**: A trash rack is designed to collect gross pollutants, such as human derived litter, coarse sediment and vegetation. Trash racks provide a screening mechanism which removes gross pollutants from stormwater flows.

4.4.2 ADOPTED STORMWATER SYSTEM

To treat stormwater runoff from the proposed development, all stormwater runoff except for the bowser canopy roofs will be directed via overland flow and piped drainage towards three separate bioretention basins.

The total filtration area of the bioretention basins, in line with the outcomes of the MUSIC modelling, will be 73 m^2. The bioretention basins shall be fitted with field inlets set at 200 mm above the surface of the filter media to drain flows greater than the treatment efficiency of the bioretention basins.

All flows collected from bowser canopy roofs are to be directed to trash racks. These have been modelled in MUSIC with a treatment efficiency of 90 % removal of gross pollutants but no other pollutant removal. It is anticipated that these racks will be incorporated at the base of the bowser canopy roof downpipes or within a pit below the connection point into the stormwater drainage system.

Refer to **Table 7** below for the bioretention dimensions and Concept Civil Servicing Layout Plan, B14312-CSK02 enclosed in **Appendix B** of this report for conceptual treatment device locations.

Table 7: MUSIC Model Stormwater Treatment Device Details

Treatment Train Adopted	Details
Catchment A	
• Bioretention Basin	• Total Surface Area – Approx. 18 m2; • Total Filter Area – 15 m2; • High Flow Bypass – 100 m3/s; • Extended Detention Depth – 0.2 m; • Filter Media Depth – 0.4 m; • Transition Layer – 0.1 m; • Drainage Layer – 0.2 m; • Saturated Hydraulic Conductivity – 200 mm/hr.
Catchment B	
• Bioretention Basin (landscaped and paved sub catchments only)	• Total Surface Area – Approx. 42 m2; • Total Filter Area – 35 m2; • High Flow Bypass – 100 m3/s; • Extended Detention Depth – 0.2 m; • Filter Media Depth – 0.4 m; • Transition Layer – 0.1 m; • Drainage Layer – 0.2 m; • Saturated Hydraulic Conductivity – 200 mm/hr.
• Trash rack (bowser pump roofs sub catchments only)	• 90 % gross pollutant removal only
Catchment C	
• Bioretention Basin	• Total Surface Area – Approx. 27.6 m2; • Total Filter Area – 23 m2; • High Flow Bypass – 100 m3/s; • Extended Detention Depth – 0.2 m; • Filter Media Depth – 0.4 m; • Transition Layer – 0.1 m; • Drainage Layer – 0.2 m; • Saturated Hydraulic Conductivity – 200 mm/hr.

Note: The surface area has been assumed to be approximately 20 % greater than the proposed filter area. This is to allow for the likely inclusion of batters adjacent to the filter media.

Provisions should be taken at the detailed design phase to minimise the possible extent of scouring on the bioretention basins. Such provisions may include 'coarse sediment' forebays, stone pitching and a dense well selected planting arrangement.

The treated flow will be cleansed as it passes down through the filtration media. A 100mm diameter slotted pipe will run longitudinally along the base of the bioretention basin to collect the treated flows. The slotted pipe will connect into the side of the field inlet to convey the treated flow to an appropriate discharge point.

To assist with uptake of identified pollutants, it is recommended that plants with extensive fibrous or a spreading, rhizomatous root system, able to withstand periods of inundation, are used in bioretention systems. Specific species include *Isolepis inundata* commonly known as Swamp Club Rush and *Lomandra* species. It is recommended that a variety of appropriate plant species are used as each species has slightly differing pollution reduction capabilities and also increases aesthetic value.

4.5 STORMWATER QUALITY MODELLING RESULTS

The predicted MUSIC pollutant concentrations are provided in **Table 8.**

Table 8 MUSIC Model Results

	Initial Pollutant Concentration	Residual Pollutant Concentration	Water Quality Objectives	Reduction Achieved
Total Suspended Solids (TSS)	626 kg/yr	73 kg/yr	85%	88.3 %
Total Phosphorous (TP)	1.05 kg/yr	0.308 kg/yr	60%	70.6 %
Total Nitrogen (TN)	4.15 kg/yr	2.26 kg/yr	45%	45.6 %
Gross Pollutants (GP)	40.6 kg/yr	0.465 kg/yr	90%	98.9 %

(Refer to **Appendix C** for MUSIC Model Output Details).

As shown above, MUSIC predicts that the proposed treatment train will meet the DSDIP *State Planning Policy* Water Quality Objectives for key pollutants including TSS, TP, TN and GP. An electronic copy of the MUSIC models has been provided as part of this submission. Copies of the model outputs are also attached in **Appendix C.**

5.0 STATE PLANNING POLICY (JULY 2014) – WATER QUALITY

A single State Planning Policy (SPP) document came into effect in July 2014. The SPP replaces the SPP for Healthy Waters (SPP 4/10) and aims to ensure that the quality of Queensland waters are protected and enhanced.

The SPP has a Water Quality Code to ensure development is planned, designed, constructed and operated to manage stormwater in ways that support the protection of environmental values identified in the *Environmental Protection (Water) Policy 2009* (DSDIP, 2014).

The SPP has developed Performance Outcomes to address Urban Stormwater Outcomes.

Table 9 includes a summary of the three (3) Performance Outcomes that are relevant to stormwater quality for the project and an assessment of this proposal against the Acceptable Outcomes.

Table 9: *State Planning Policy* Code: Water Quality

Performance Outcomes	Acceptable Outcomes
Performance outcome PO1 The development is planned and designed considering the land use constraints of the site for achieving stormwater design objectives.	**Acceptable outcome AO1.1** A site stormwater quality management plan (SQMP) is prepared, and: a. is consistent with any local area stormwater water management planning; and b. provides for achievable stormwater quality treatment measures meeting design objectives listed in Table A (construction phase) and Table B ((post construction phase) of the SPP), or current best practice environmental management, reflecting land use constraints, such as: - erosive, dispersive and/or saline soil types; - landscape features (including landform); - acid sulfate soil and management of nutrients of concern; and - rainfall erosivity. **Comment: - This proposal achieves the Acceptable Outcome.** The quality of the treatable stormwater flow is treated via bioretention systems or trash racks prior to release from the site. This SQMP achieves both Point a. and Point b. above. Acid sulphate soils are not anticipated at the site.

Performance Outcomes	Acceptable Outcomes
Performance outcome PO6 Construction activities for the development avoid or minimise adverse impacts on stormwater quality.	**Acceptable outcome AO6.1** An erosion and sediment control plan (ESCP) demonstrates that release of sediment-laden stormwater is avoided for the nominated design storm, and minimised when the nominated design storm is exceeded, by addressing design objectives listed in Table A ((construction phase) of the SPP)) or local equivalent, for: a. drainage control; b. erosion control; c. sediment control; and d. water quality outcomes. **Acceptable outcome AO6.2** Erosion and sediment control practices (including any proprietary erosion and sediment control products) are designed, installed, constructed, operated, monitored and maintained, and any other erosion and sediment control practices are carried out, in accordance with local conditions and appropriate recommendations from a suitably qualified person or **Acceptable outcome AO6.3** The ESCP demonstrates how stormwater quality will be managed in accordance with an acceptable regional or local guideline so that target contaminates are treated to a design objective at least equivalent to Acceptable Outcome AO6.1. **Comment: -** This SQMP deals in the main with the operational phase of the development. However the proposal achieves the Acceptable Outcome AO6.1, AO6.2 and AO6.3 as the SQMP recommends the incorporation of comprehensive erosion and sediment control planning and implementation during the construction phase.

Performance Outcomes	Acceptable Outcomes
Performance outcome PO7 Operational activities for the development avoid or minimises changes to waterway hydrology from adverse impacts of altered stormwater quality and flow.	**Acceptable outcome AO7.1** Development incorporates stormwater flow control measures to achieve the design objectives set out in Table A and Table B (of the SPP (construction phase)). Both the construction and operational phases for the development comply with design objectives in Table A (construction phase) and Table B (post construction phase), or current best practice environmental management, including management of frequent flows, peak flows, and construction phase hydrological impacts. **Comment**: - This SQMP deals in the main with the operational phase of the development. However the proposal achieves the Acceptable Outcome AO7.1 as this Stormwater Management Plan suggests that stormwater detention is not required, incorporates bioretention and trash racks treatment measures and recommends the incorporation of comprehensive erosion and sediment control planning and implementation during the construction phase. The proposal also meets the operational phase reduction requirements in mean annual load from TSS, TP, TN and GP.

Source: DSDIP, *State Planning Policy*, effective July 2014.

6.0 MAINTENANCE

The following maintenance protocols for bioretention trenches have been adapted from *Healthy Waterways Water Sensitive Urban Design Technical Design Guidelines for South East Queensland, 2006.*

6.1 COARSE SEDIMENT FOREBAY (IF IMPLEMENTED)

Coarse sediment forebays are designed to capture coarse sediments generated from the impervious areas of the propose development. Coarse sediment forebays should be cleaned out at least annual and on observation of significant sediment build up within the forebay.

6.2 BIORETENTION GARDEN

The following points should be adopted as standard maintenance procedures upon construction of bioretention gardens:

- Regular collection of any litter build up in bioretention gardens;
- Bioretention trenches should be routinely inspected to identify areas of obvious increase in sediment deposition, scouring of the trench invert resulting from storms, rill erosion of swale batters from lateral inflows or damage to the swale profile from vehicular traffic;
- Surface tilling of bioretention trenches should be undertaken if there is evidence of clogging;
- Re-setting (i.e. complete reconstruction) of bioretention elements will be required if the available flow area of the overlying trench is reduced by 25% (primarily due to accumulation of sediment) or if the bioretention trenches fails to drain adequately following tilling of the surface;
- Routine inspection of inlet points such as field inlets to identify blockages, scour areas or build up of litter;
- Conventional surface mulching of bioretention trenches with organic material, such as tanbark, should not be undertaken. Typically, organic mulches float causing them to be washed downstream and block drains;
- High density planting should be undertaken to combat the establishment of weeds;
- Removal of sediment or blockages which impede the conveyance of the bioretention trench and if necessary re-profiling and re-vegetating to the original design specification;
- Removal of plants that die from any cause and replace with plants of equivalent size and

species;

- Pruning to remove dead or diseased vegetation to stimulate new growth;
- The following watering program should generally be adequate for plant establishment, however the program should be adjusted dependent on site conditions and water restrictions:
  - Week 1-2 3 visits / week;
  - Week 3-6 2 visits / week; and
  - Week 7-12 1 visit / week.
- Watering may still be required after the initial three (3) month period, particularly during winter. Watering intensity to sustain healthy vegetation should be determined during regular maintenance visits; and
- Healthy Waterways operation and maintenance checklist for bioretention trenches is attached in **Appendix D**. This form may be adopted for SQID maintenance on this site.

6.3 TRASH RACKS

The following points should be adopted as standard maintenance procedures upon installation of trash racks:

- Regular cleaning of bowser roof canopies and roof gutters; and
- Visual inspection and removal of debris from trash racks on a regular basis and after rainfall events.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Lambert & Rehbein (SEQ) Pty Ltd was commissioned by SP Moranbah Joint Venture to develop a conceptual Stormwater Management Plan (SMP) (Quality and Quantity) for the proposed service station development at proposed Lot 28 within the next stage of Grosvenor Estate, Moranbah. The proposed development comprises roofed car and truck refuelling facilities, underground fuel storage tanks, carpark facilities, a retail facility and landscaped areas. The aim of this conceptual SMP was to identify any stormwater detention requirements and to appropriately achieve the operational phase WQOs.

Given the site's proximity to Grosvenor Creek and the differing time of concentrations between Grosvenor Creek catchment and the local catchment, it is very unlikely that increased runoff from the proposed development will increase Grosvenor Creek peak flood levels. Subsequently no site specific detention system is proposed for the developed site.

Bioretention treatment systems and trash racks are proposed to achieve the stormwater quality treatment requirements for the development. MUSIC modelling results indicate that the proposed treatment systems of SQIDs will adequately achieve the operational phase WQOs to EDQ's requirements. Proposed SQIDs are illustrated on Concept Civil Servicing Layout Plan B13621-CSK02 enclosed in **Appendix B** of this report.

Adherence to the maintenance measures detailed in **Section 6** will ensure the ongoing effectiveness and longevity of the proposed SQIDs.

Lambert & Rehbein considers that the proposed stormwater treatment methods detailed in this report will satisfy EDQ requirements for stormwater quality treatment and stormwater detention for the proposed service station development at proposed Lot 28 within the next stage of Grosvenor Estate, Moranbah.

8.0 REFERENCES

Department of Energy and Water Supply (2013). *Queensland Urban Drainage Manual Third Edition 2013,* Queensland Government, Brisbane.

Department of Infrastructure and Planning (2014). State Planning Policy, 2014. Queensland Government, Brisbane

EPA/Queensland Government (2006). *Queensland Water Quality Guidelines*.

Healthy Waterways (2010) Water by Design Draft MUSIC Modeling Guidelines for South East Queensland, Version 1.

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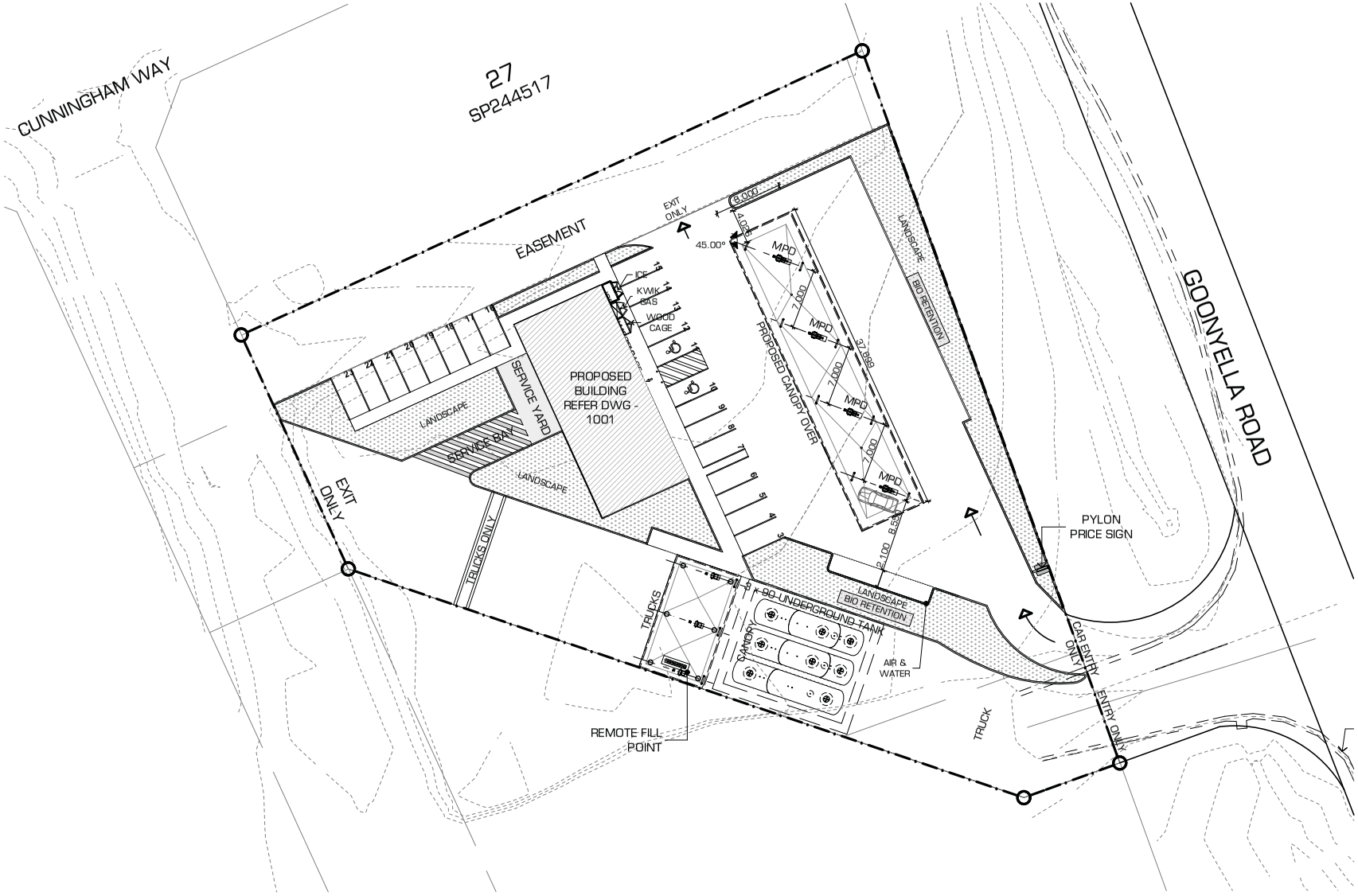
APPENDIX A

PRELIMINARY PROPOSED SITE PLAN, DRAWING NO. 1000, ISSUE A PREPARED BY PUSH
CONTOUR AND DETAIL SURVEY PLAN PREPARED BY SKYLINE SURVEYORS DATED 04 AUGUST 2014



1 PROPOSED SITE PLAN
1:500

MORANBAH PUMA SERVICE STATION

LOT 28, 9002 GROSVENOR ESTATE MORANBAH

EVANSLONG PTY LTD

Push
t. 617 3252 0949 f. 617 3252 2636 e. info@push.net.au

PROPOSED SITE PLAN

Scale	Date	Job Number
1:500@A3	14.08.14	853.14
Drawn	Stage	Drawing No.	Issue
AE	DA	1000	A

NOT FOR CONSTRUCTION

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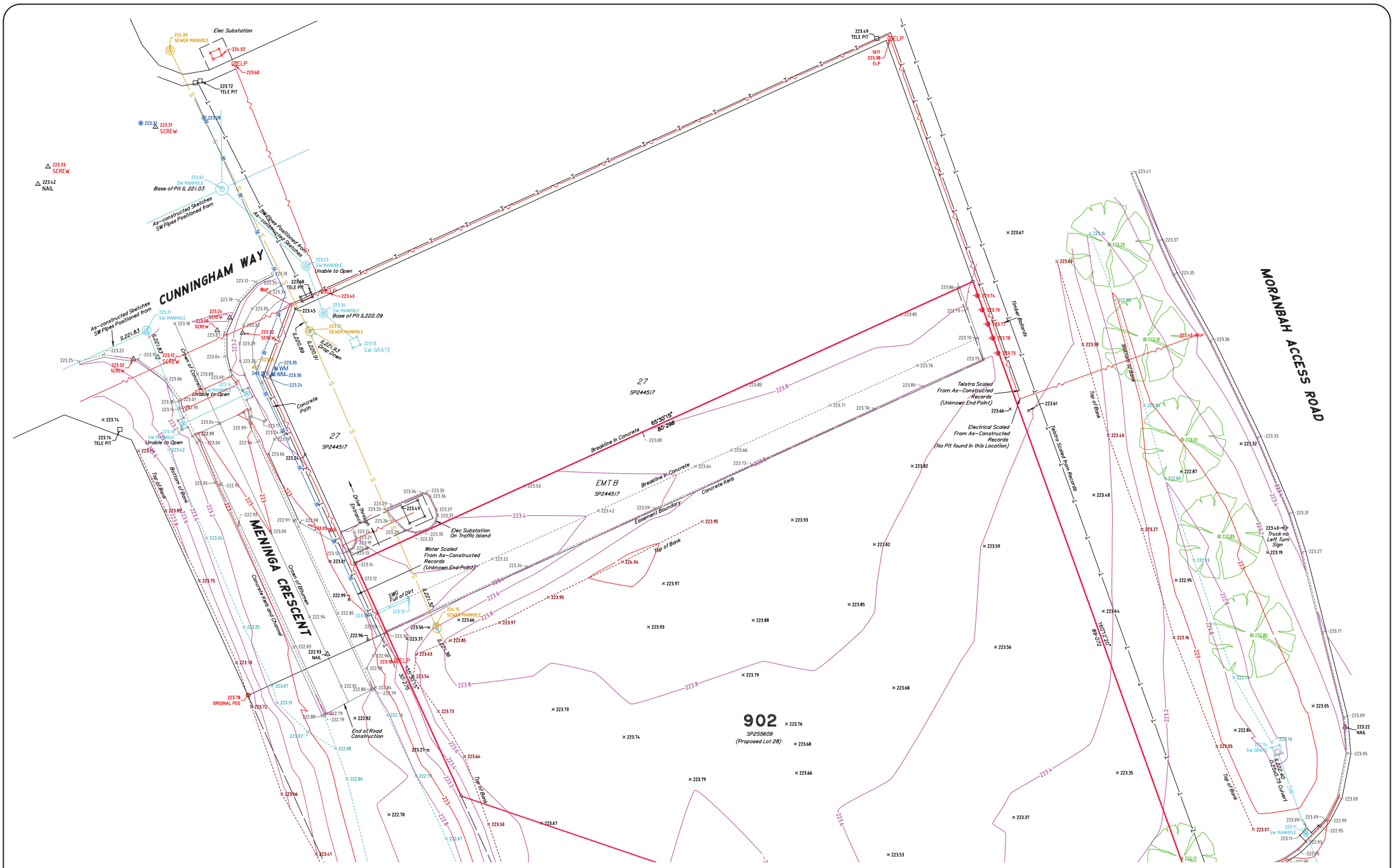

Client:	**EVANS LONG**		
CONTOUR AND DETAIL SURVEY			
Over Part of Lot 902 on SP255609			
Proposed Lot 28			
Moranbah Access Rd, Moranbah			
PARISH: **MORANBAH**	COUNTY: *Grosvenor*		
Plan No: 6305DET Sheet 1/2	Scale: 1:200@A1		
Prepared By: AWJ	Date: 04/08/2014		

Skyline Surveyors

Suite 8, Dwyer House
256 Nicklin Way
WARANA QLD 4575

PHONE 07 5493 4877
FAX 07 5493 4899

Property Boundaries have been derived from RPS proposal plan only

Note: Levels are to AHD Derived from PSM64242 (RL226.770)

Services shown hereon have been located where possible by field survey.
Prior to any demolition, excavation or construction on the site, the relevant authority should be contacted for possible location of further underground services and detailed locations of all services.

LEGEND

- SW STORM WATER
- S SEWER MAIN
- G GAS MAIN
- W WATER MAIN
- C COMMUNICATION CABLES
- T TELSTRA CONDUIT
- ELECTRICITY
- FIRE HYDRANT
- SIGN
- PALM TREE
- TREE
- WM WATER METER
- SURVEY STN
- PERMANENT SURVEY MARK
- PP POWER POLE
- LP STREET LIGHT
- E ELECTRICITY MARKER
- ELP ELECTRICITY PILLAR
- T TELECOMMUNICATIONS MARKER
- G GAS LINE MARKER
- W WATER LINE MARKER
- STORMWATER M/H
- WATER VALVE
- S SEWER MANHOLE
- TRAFFIC LIGHTS
- TRAFFIC SIGNAL CONTROL BOX
- TELSTRA PIT

Scale 1:200 – Lengths are in Metres.

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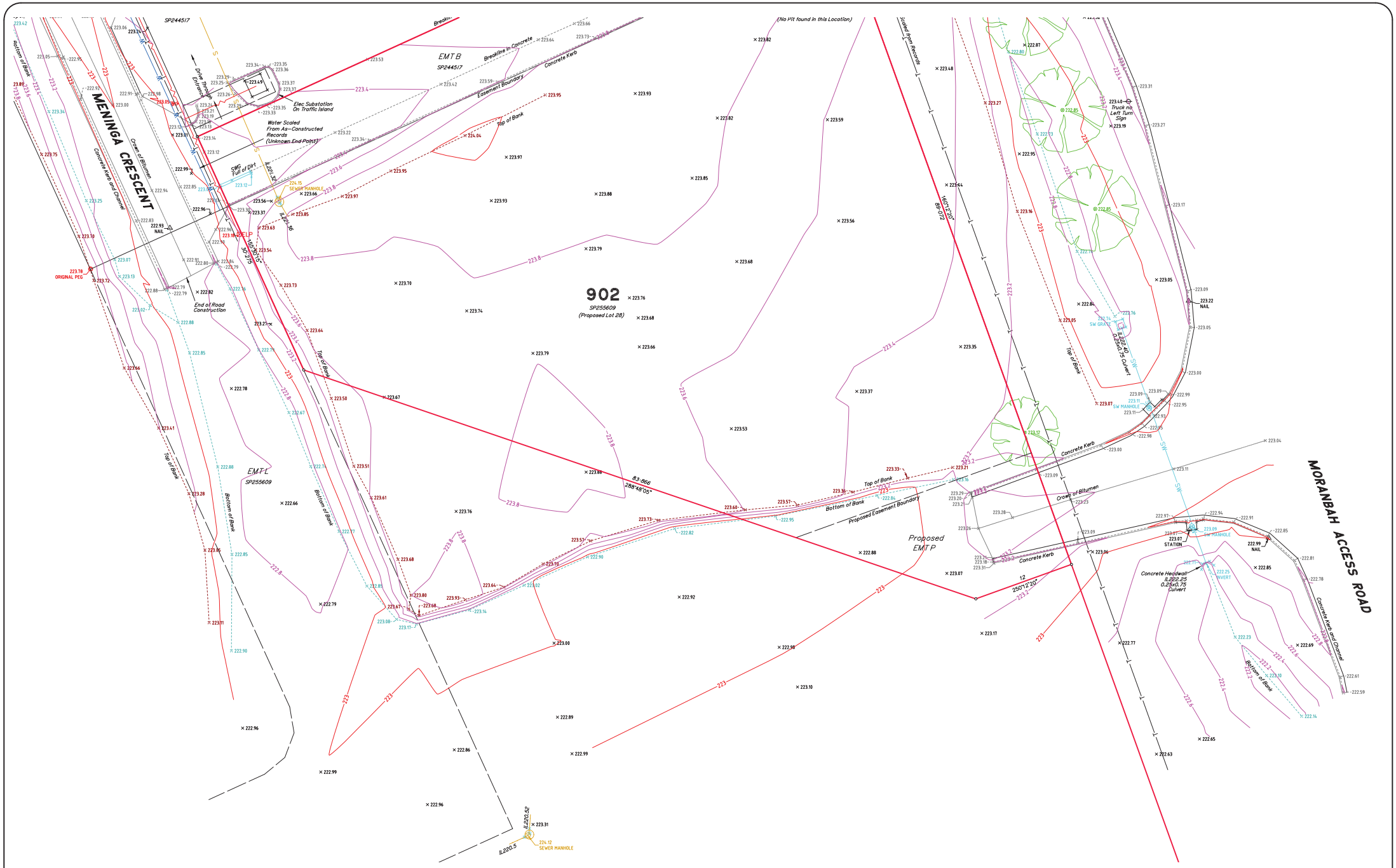

Client: **EVANS LONG**

CONTOUR AND DETAIL SURVEY

Over Part of Lot 902 on SP255609
Proposed Lot 28
Moranbah Access Rd, Moranbah

PARISH: **MORANBAH** COUNTY: **Grosvenor**

Plan No: 6305DET Sheet 2/2 | Scale: 1:200@A1 | Date: 04/08/2014

Prepared By: AWJ

Skyline Surveyors

Suite 8, Dwyer House
256 Nicklin Way
WARANA QLD 4575

PHONE 07 5493 4877
FAX 07 5493 4899

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LEGEND

- SW STORM WATER
- S SEWER MAIN
- G GAS MAIN
- W WATER MAIN
- C COMMUNICATION CABLES
- T TELSTRA CONDUIT
- ELECTRICITY
- FIRE HYDRANT
- SIGN
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- SW STORMWATER M/H
- WATER VALVE
- S SEWER MANHOLE
- TRAFFIC LIGHTS
- TRAFFIC SIGNAL CONTROL BOX
- TELSTRA PIT

Scale 1:200 – Lengths are in Metres.

2 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28

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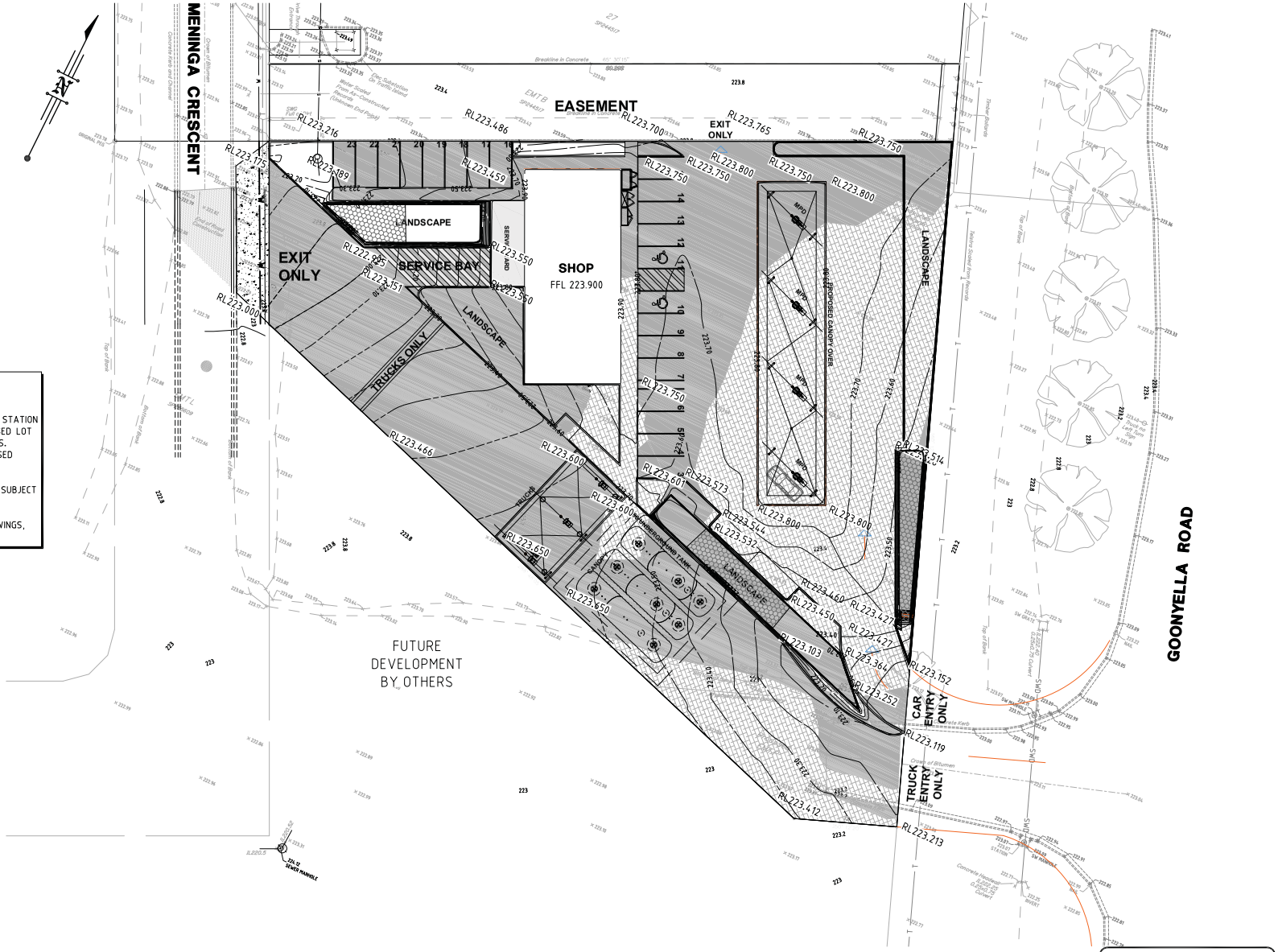
APPENDIX B

B14312-CSK01 CONCEPT BULK EARTHWORKS LAYOUT PLAN
B14312-CSK02 CONCEPT CIVIL SERVICING PLAN



NOTES:- PROPOSED SITE DEVELOPMENT

1. ALL DESIGN AND CONSTRUCTION OF WORKS EXTERNAL TO THE PROPOSED SERVICE STATION SITE, EXCEPT OTHERWISE SHOWN, WHICH ARE NECESSARY TO CREATE THE PROPOSED LOT ARE TO BE UNDERTAKEN BY THE DEVELOPER OF THE OVERALL SUBDIVISION WORKS. SERVICES AND LEVELS INDICATED ON THIS DRAWING ONLY RELATE TO THE PROPOSED SERVICE CENTRE.
2. ALL DETAILS SHOWN ON THIS DRAWING ARE PRELIMINARY ONLY - AND SHALL BE SUBJECT TO DETAIL DESIGN.
3. THESE DRAWINGS MUST BE READ IN CONJUNCTION WITH ALL OTHER RELATED DRAWINGS, REPORTS AND DOCUMENTATION.

LEGEND:

- PROPOSED RETAINING WALL
- PROPOSED EDGE OF PAVEMENT
- PROPOSED EARTHWORKS CUT
- PROPOSED EARTHWORKS FILL
- FFL 44.50 — PROPOSED BUILDING FINISHED FLOOR LEVEL
- RL 44.20 — PROPOSED ROAD LEVELS

LEGEND - LINEWORK (existing)

- S — EXISTING SEWER RETICULATION
- SWD — EXISTING STORMWATER DRAINLINE
- W — EXISTING WATER MAIN
- EXISTING ROADWAY KERB / K&C
- 11.00 — EXISTING SURFACE CONTOUR
- E — EXISTING ELECTRICAL MAINS
- HVOH — EXISTING OVERHEAD ELECTRICAL
- T — EXISTING TELSTRA/COMMUNICATIONS MAINS

EXISTING SERVICES

NOTWITHSTANDING THAT EXISTING SERVICES MAY OR MAY NOT BE SHOWN ON THESE DRAWINGS, NO RESPONSIBILITY IS TAKEN BY THE ENGINEER OR THE PRINCIPAL FOR THIS INFORMATION WHICH HAS BEEN SUPPLIED BY OTHERS. THE DETAILS ARE PROVIDED FOR INFORMATION ONLY. THE CONTRACTOR SHALL ASCERTAIN THE POSITION OF ALL UNDERGROUND SERVICES PRIOR TO EXCAVATION AND SHALL BE RESPONSIBLE FOR THE COST OF REPAIRS TO DAMAGES CAUSED AS A RESULT OF THE WORKS.

NOTE:
LOCATION OF EXISTING SERVICES & LEVELS ARE BASED ON DETAILED SURVEY PROVIDED BY SKYLINE SURVEYORS DRG NO. 6305DET DATED 04/08/14.

CONCEPT BULK EARTHWORKS LAYOUT PLAN

0 5 10m
SCALE 1 : 250

PRELIMINARY "CONCEPT" DRAWING ONLY NOT FOR CONSTRUCTION

Associated Consultants:
EVANS LONG PTY LTD
PO BOX 1755
BUDERIM QLD 4556
Ph; 07 5353 5050
Email: admin@evanslong.com.au

R.P.D.
Lot 902 on SP255609
PROPOSED LOT 28

LEVEL DATUM
A.H.D.

No.	Date	By	Amendment	Checked
B	27.08.14	S.G.	MINOR REVISIONS	
A	23.07.14	S.G.	ORIGINAL ISSUE	

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FACSIMILE (07) 3250 9001
EMAIL mail@lar.net.au

Project: PROPOSED MORANBAH SERVICE STATION
MENINGA CRESCENT,
MORANBAH

Title: CONCEPT BULK EARTHWORKS LAYOUT PLAN

Client: *SP MORANBAH JOINT VENTURE*

Draftsperson: S.G.	Checked: D.L.	Sheet Size	Drawing No.
Designer: S.G.	Approved: T. CHAN RPEQ No: 4048	A1	B14312-CSK01
Scale: AS SHOWN	Date: JULY 2014	A	B

CAD FILE->F:\Jobs\B14300\B14312\Drawings\Civil\B14312-CSK01 CSK02.dwg
PLOT DATE-> 27 Aug, 2014 - 12:30pm

SEWER CONNECTION
PROVIDE NEW PROPERTY CONNECTION AT EXISTING MANHOLEAPPROX I.L. 221.32m AHD.

WATER MAIN CONNECTION
EXTEND WATERMAIN ALONG FRONTAGE OF SITE (BY OTHERS)

WATER MAIN CONNECTION
NEW WATER METER. SIZE & ARRANGEMENT SUBJECT TO HYDRAULIC SERVICES DESIGN.

STORMWATER
TRENCH GRATE TO ALL ENTRY/EXIT POINTS

STORMWATER CONNECTION
CONNECT TO FUTURE MANHOLE. CONSTRUCTED BY OTHERS. APPROX IL 221.65m AHD

EXISTING ROAD TO BE EXTENDED BY OTHERS

CATCHMENT C
PROPOSED BIO-RETENTION BASIN. REFER STORMWATER MANAGEMENT PLAN B14312CR001 FOR DETAILS. EXACT SIZE TO BE CONFIRMED AT DETAILED DESIGN STAGE.(MIN. 23m2)

STORMWATER
TRENCH GRATE TO ALL ENTRY/EXIT POINTS

SHOP ROOF DOWNPIPES TO CONNECT TO CATCHMENT C BIO BASIN.

NOTE:
LOCATION OF EXISTING SERVICES & LEVELS ARE BASED ON DETAILED SURVEY PROVIDED BY SKYLINE SURVEYORS DRG NO. 6305DET DATED 04/08/14.

EXISTING SERVICES
NOTWITHSTANDING THAT EXISTING SERVICES MAY OR MAY NOT BE SHOWN ON THESE DRAWINGS, NO RESPONSIBILITY IS TAKEN BY THE ENGINEER OR THE PRINCIPAL FOR THIS INFORMATION WHICH HAS BEEN SUPPLIED BY OTHERS. THE DETAILS ARE PROVIDED FOR INFORMATION ONLY. THE CONTRACTOR SHALL ASCERTAIN THE POSITION OF ALL UNDERGROUND SERVICES PRIOR TO EXCAVATION AND SHALL BE RESPONSIBLE FOR THE COST OF REPAIRS TO DAMAGES CAUSED AS A RESULT OF THE WORKS.

MENINGA CRESCENT

GOONYELLA ROAD

EASEMENT

EXIT ONLY

SERVICE BAY

SHOP
FFL 223.900

LANDSCAPE

TRUCK ONLY

CAR ENTRY ONLY

TRUCK ENTRY ONLY

BOWSER ROOF DOWNPIPES TO CONNECT TO PIPED STORMWATER DRAINAGE SYSTEM AFTER PASSING THROUGH TRASH RACK WITH MINIMUM 90% GROSS POLLUTANT REMOVAL.

RESIDENTIAL DEVELOPMENT BY OTHERS

CATCHMENT A
PROPOSED BIO-RETENTION BASIN. REFER STORMWATER MANAGEMENT PLAN B14312CR001 FOR DETAILS. EXACT SIZE TO BE CONFIRMED AT DETAILED DESIGN STAGE.(MIN. 15.0m2)

STORMWATER
TRENCH GRATE TO ALL ENTRY/EXIT POINTS

CATCHMENT B
PROPOSED BIO-RETENTION BASIN. REFER STORMWATER MANAGEMENT PLAN B14312CR001 FOR DETAILS. EXACT SIZE TO BE CONFIRMED AT DETAILED DESIGN STAGE. (MIN. 35.0m2)

EXISTING KERB TO BE DEMOLISHED & RECONSTRUCTED TO SUIT TRAFFIC ENGINEER'S REQUIREMENTS

EXISTING GULLY PIT TO BE RECONSTRUCTED TO SUIT PROPOSED KERB ALIGNMENT

LEGEND:

- PROPOSED EDGE OF PAVEMENT
- BUNDED/ISOLATED AREA TO BLIND SUMP AS PER PUMA REQUIREMENTS
- PROPOSED INTERNAL PAVEMENT
- PROPOSED PUBLIC ROAD (BY SP MORANBAH JOINT VENTURE)
- SWD — PROPOSED STORMWATER DRAINLINE
- S — PROPOSED SEWER MAIN
- W — PROPOSED WATER MAIN

LEGEND - LINEWORK (existing)

- S — EXISTING SEWER RETICULATION
- SWD — EXISTING STORMWATER DRAINLINE
- W — EXISTING WATER MAIN
- EXISTING ROADWAY KERB / K&C
- 11.00 — EXISTING SURFACE CONTOUR
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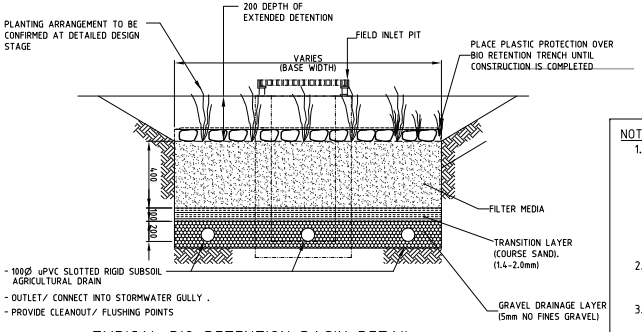
- HVOH — EXISTING OVERHEAD ELECTRICAL
- T — EXISTING TELSTRA/COMMUNICATIONS MAINS



TYPICAL BIO-RETENTION BASIN DETAIL
NOT TO SCALE

NOTES:- PROPOSED SITE DEVELOPMENT

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CATCHMENT AREA BREAKDOWN

SUB CATCHMENT	CATCHMENT A AREA (Ha)	CATCHMENT B AREA (Ha)	CATCHMENT C AREA (Ha)
ROOF	0.000	0.041	0.028
LANDSCAPE	0.020	0.015	0.024
ROADS	0.043	0.154	0.092
TOTAL	0.065	0.213	0.145

CONCEPT CIVIL SERVICING LAYOUT PLAN

0 5 10m
SCALE 1 : 250

PRELIMINARY "CONCEPT" DRAWING ONLY NOT FOR CONSTRUCTION

Associated Consultants:
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PO BOX 1755
BUDERIM QLD 4556
Ph: 07 5353 5050
Email: admin@evanslong.com.au

R.P.D.
Lot 902 on SP255609
PROPOSED LOT 28

LEVEL DATUM
A.H.D.

No.	Date	By	Amendment	Checked
C	18.09.14	S.J.	OUTLET LEVEL RAISED	
B	27.08.14	S.G.	MINOR REVISIONS	
A	23.07.14	S.G.	ORIGINAL ISSUE	

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EMAIL mail@lar.net.au

Project: PROPOSED MORANBAH SERVICE STATION
MENINGA CRESCENT,
MORANBAH

Title: CONCEPT CIVIL SERVICING LAYOUT PLAN

Client: *SP MORANBAH JOINT VENTURE*

Draftsperson: S.G.	Checked: D.L.	Sheet Size: A1	Drawing No.: B14312-CSK02
Designer: S.G.	Approved: T. CHAN RPEQ No: 4048		
Scale: AS SHOWN	Date: JULY 2014	A B C	

PLOT DATE:- 19 Sep, 2014 - 2:19pm CAD FILE:-F:\Jobs\B14300\B14312\Drawings\Civil\B14312-CSK01 CSK02.dwg

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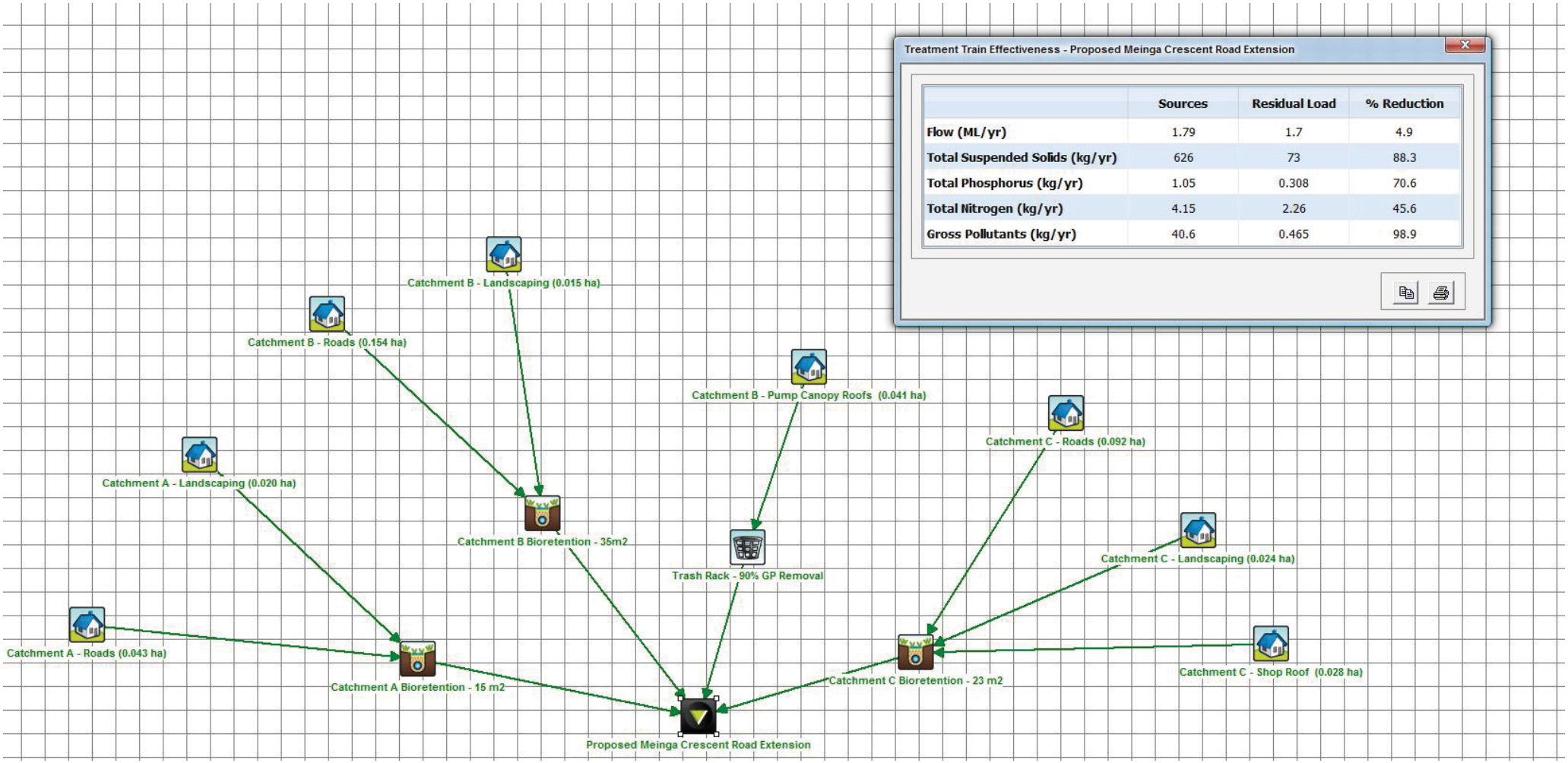
APPENDIX C

MUSIC MODELLING RESULTS


Treatment Train Effectiveness - Proposed Meinga Crescent Road Extension
Sources
Residual Load
% Reduction
Flow (ML/yr) 1.79 1.7 4.9
Total Suspended Solids (kg/yr) 626 73 88.3
Total Phosphorus (kg/yr) 1.05 0.308 70.6
Total Nitrogen (kg/yr) 4.15 2.26 45.6
Gross Pollutants (kg/yr) 40.6 0.465 98.9
Catchment B - Landscaping (0.015 ha)
Catchment B - Roads (0.154 ha)
Catchment B - Pump Canopy Roofs (0.041 ha)
Catchment C - Roads (0.092 ha)
Catchment A - Landscaping (0.020 ha)
Catchment B Bioretention - 35m2
Trash Rack - 90% GP Removal
Catchment C - Landscaping (0.024 ha)
Catchment A - Roads (0.043 ha)
Catchment A Bioretention - 15 m2
Catchment C Bioretention - 23 m2
Catchment C - Shop Roof (0.028 ha)
Proposed Meinga Crescent Road Extension

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APPENDIX D

MAINTENANCE DETAILS

Bioretention Swale Maintenance Checklist				
Inspection Frequency	**3 Monthly ***	**Date of Visit**		
Location				
Description				
Site Visited by				
Council Officer	**Contact Details**			
Inspection Items		**Yes**	**No**	**Action Required**
Sediment accumulation at inflow points?				
Litter in swale?				
Erosion at inlet or other key structures (e.g. cross overs)?				
Traffic damage present?				
Evidence of dumping (e.g. building waste)?				
Vegetation condition satisfactory (density, weeds etc)?				
Replanting Required?				
Mowing Required?				
Sediment accumulation at outlet?				
Clogging of drainage points (sediment or debris)?				
Damage / vandalism to structures present?				
Surface clogging visible?				
Drainage system inspected?				
Remulching of trees and shrubs required?				
Evidence of ponding?				
Soil additives or amendments required?				
Pruning and / or removal of dead or diseased vegetation required?				
Resetting of system required?				
Comments:				

* Inspections should be made not less than 24 hours and not more than 72 hours after the cessation of rainfall if the total rainfall on any day exceeds 30 mm.