WESTERN CORRIDOR

RECYCLED WATER PROJECT

LUGGAGE POINT

Stormwater Management Plan

(Operations)

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ABBREVIATIONS

Abbreviations	
ALT	Alliance Leadership Team
AMT	Alliance Management Team
AWTP	Advanced Water Treatment Plant
BCC	Brisbane City Council
DA	Development Application
DO	Dissolved Oxygen
EMP	Environmental Management Plan
EMS	Environmental Management System
EPA	Environmental Protection Agency
EPBC	*Environmental Protection and Biodiversity Conservation Act 1999 (C'th)*
EPP	Environmental Protection Policy
EPR	*Environmental Protection Regulation 1998*
ERA	Environmentally Relevant Activity under Schedule 1 of the *Environmental Protection Regulation 2008*
ERA 7	Environmentally Relevant Activity 7 – Chemical Storage
ERA 16	Environmentally Relevant Activity 16 – Water Treatment
JSEA	Job Safety and Environmental Analysis
LPA	Luggage Point Alliance
LP ATWP	Luggage Point Advanced Water Treatment Plant
ML/d	Megalitres per day
MSDS	Material Safety Data Sheet
NTU	Nephelometric Turbidity Units
OH&S	Occupational Health and Safety
PASS	Potential Acid Sulphate Soil
QLD	Queensland
RFI	Request for Information
SBMP	Site Based Management Plan
SCP	State Coastal Plan
SEQ	South East Queensland
SFMP	Stormwater and Floodplain Management Plan
SOP	Standard Operating Procedure
TWA	Trade Waste Approval
WCRW	Western Corridor Recycled Water Pty Ltd

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Abbreviations	
WCRWP	Western Corridor Recycled Water Project
WMP	Waste Management Plan
WSUD	Water Sensitive Urban Design
WWTP	Waste Water Treatment Plant
Team Binder	A web based document management system accessible from the Alliance intranet or over the Internet.

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1 Introduction

This report outlines the Stormwater Management Plan for the operational area of the Luggage Point Advanced Water Treatment Plant (LP AWTP) site. Drainage design and water quality measures for the construction phase of this project are detailed in the Construction Stormwater and Floodplain Management Plan (LUGG-R-PL-0002-01).

The stormwater management for the adjacent construction areas are addressed as part of the updated Construction Environment Management Plan (CEMP). Refer to Figure 2-1 below for the boundary around the operational activities on site which applies to this Stormwater Management Plan. All drainage from the construction activities is separated from the operational activities. Once construction has been completed, the stormwater management for the two areas will be integrated.

Figure 1-1 – Operational Area for LP AWTP (area contained within red dashed line)

The purpose of this document is to:

- Outline stormwater monitoring and management activities that will prevent and/or minimise contamination of stormwater with potential pollutants due to operational activities
- Establish water quality targets for the stormwater leaving the site to assess the effectiveness of stormwater management activities
- Outline mitigation measures in the event that the water quality targets are not met

- Establish erosion controls and sediment management measures prior to, and concurrent with, any excavation completed as part of maintenance activities to provide protection against siltation of surface waters
- Maintenance requirements associated with operational stormwater quality improvement devices

1.1 Description of Development

The LP AWTP is part of the Western Corridor Recycled Water Project (WCRWP) and will provide up to 70 ML/d of treated recycled water to the Western Corridor Recycled Water (WCRW) pipeline. Preconstruction on the LP AWTP started in March 2007 with the plant operational in September 2008.

Secondary treated effluent from the Luggage Point Wastewater Treatment Plant (WWTP) is transferred for further treatment at the LP AWTP via a raw water pump station and pipeline. This advanced treatment and purification at LP AWTP of the recycled water is achieved through chemical dosing, microfiltration and reverse osmosis.

The stormwater collection and drainage network for the LP AWTP site has been designed to comply with the requirements stipulated in the Water Sensitive Urban Design (WSUD) Technical Design Guidelines for South-East Queensland. WSUD elements incorporated in the site include buffer strips and swales, bioretention and oil and water separators.

Stormwater is discharged from the LP AWTP site from the southeast corner to the Brisbane River via an engineered open stormwater channel. This channel transfers stormwater collected on the site as well as treated process flows during the commissioning and proving period.

1.2 Objectives of the Operations Stormwater Management Plan

The objectives of Operations Stormwater Management Plan are to:

- Maximise the containment of sediment on the LP AWTP site
- Prevent release of sediment to surface water and wetlands adjacent to the site
- Prevent or minimise occurrence of erosion on site
- Minimise water quality impacts from contaminated stormwater on the Brisbane River
- Minimise the flooding impact to the site, surrounding local catchments, and the Brisbane River during flood events

This Stormwater Management Plan will be reviewed regularly (six monthly), to ascertain its applicability and efficiency.

Stormwater management during the construction phase of the AWTP is addressed separately in the Construction Phase Stormwater and Floodplain Management Plan (LUGG-C-PL-5501-02).

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1.3 Regulations and Other Requirements

The following regulations and requirements were considered in the generation of this Stormwater Management Plan (Operations) and should be referred to if additional information is required:

- Queensland Water Quality Guidelines (EPA 2006)
- Guidelines for Fresh and Marine Water Quality (Australia and New Zealand Environment and Conservation Council (ANZECC 2000).
- Soil Erosion and Sediment Control – Engineering Guidelines for Queensland Construction Sites (IE Aust. 1996)
- Queensland Urban Drainage Manuals, Environmental Best Practices 1996 Volume 1 – Erosion and Sediment Control (BCC 1996)
- Environmental Protection Act 1994
- Environment Protection Regulation 2008
- Environmental Protection (Water) Policy
- Brisbane City Council – Erosion and Sediment Control Standard
- Brisbane City Council – Filling and Excavation Code
- Brisbane City Council - Stormwater Management Code
- Australia TradeCoast Local Area Plan
- Brisbane City Council - Brisbane River Flood Study 2003

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2 Site Description

2.1 Site Location and Overview

The LP AWTP is located within the suburb of Myrtletown south of the existing Luggage Point WWTP. The site is bounded by Main Beach Road, Piped Road and private property which fronts onto Marine Road. Main access to LP AWTP will be via Marine Road.

The site is surrounded by industrial, airport and port related land uses and also includes environmental reserve areas. Brisbane Airport is located to the west of the site. Located to the north is the existing Luggage Point WWTP and coastal wetlands including wetlands protected by the Moreton Bay Marine Park and Ramsar Wetland Convention. South of the proposed site is a mix of commercial and industrial areas with some isolated residences. The Brisbane River is approximately 100 m to the east of the site along with the Port of Brisbane.

The business premises of Aussie Excavators are approximately 150 m from the eastern boundary of the LP AWTP.

The undeveloped land immediately adjacent to the LP AWTP is designated public open space. (Refer to Figure 2-1.)

Figure 2-1 – Location of Site

2.2 Site Topography and Soils

The topography of the site is generally flat with a slight depression to the west of the LP AWTP. The site survey plan details the topography of the site (finished levels) (refer Appendix A).

A geotechnical investigation has been undertaken for the LP AWTP site and detailed information regarding the subsurface conditions is reported in the Geotechnical Factual Report (LUGG-T-RE-0001-01). Generally, the soils for the site are alluvial deposits and comprise of soft to very soft silts, with some clay and loose silty sands.

Some areas of the site have been identified as having acid sulphate soils (ASS); however these are not expected to pose any problem during the operational phase of the LPAWTP. LPA has developed an Acid Sulphate and Groundwater Management Plan (ASSGMP) (LUGG-R-PL-0003-01) which should be referenced during any excavation completed as part of maintenance activities.

2.3 Climatic Conditions

Southeast Queensland traditionally experiences wet summers and low winter rainfall, however, as the site is close to Moreton Bay it experiences wetter conditions than would be found inland, along with a more stable temperature range. Mean maximum daily air temperature is approximately 25°C with the minimum daily temperature at approximately 16°C. The average annual rainfall for the coastal area is approximately 1200mm.

The site can experience seasonal cyclonic conditions and it has been noted from historic data that storm surge tide events experienced in the Brisbane River can affect land up to 86km upstream from the mouth of the Brisbane River. During such events, the regional wind speed is approximately 60 m/s.

The following tidal levels were obtained from the semidiurnal tidal planes chart 2007 for the Brisbane Bar station and are in Australian Height Datum (AHD).

- Mean High Water Spring (MHWS): 0.917m AHD
- Mean Low Water Spring (MWLS): -0.893m AHD
- Highest Astronomical Tide (HAT): 1.467m AHD

The site conditions are detailed further in the General Specification Project Design Criteria (LUGG-D-TS-0001-01) and also the Site Based Management Plan (SBMP).

2.4 Historical Drainage Patterns through the Site

Surface water runoff previously drained to a low-lying marshy area west of the LP AWTP site. During rainfall events, surface runoff in this area was able to pool before flowing through an existing culvert under Main Beach Road and discharging to Moreton Bay via Jubilee Creek. This creek also collects rainfall runoff from Brisbane Airport.

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This low-lying area, indicated on Figure 2-2, is a natural depression and as such experiences marsh conditions given that any collected water below 1.6m AHD is not free draining to the Main Beach Road culvert. When the water level reaches an approximate level of 1.75 m AHD, water also begins to discharge to southeast along a natural drainage line. This drainage line runs adjacent to Marine Road and drains by overland flow to the Brisbane River flood plain.

Stormwater runoffs from the Luggage Point WWTP, as well as the small private property areas along the northern side of Marine Road, also discharge to this area.

Figure 2-2 - Previous surface water flow paths near the Luggage Point AWTP

2.5 Watercourses and Receiving Environment

Within the LP AWTP site there are no defined watercourses. Currently, stormwater from the area discharges to the Brisbane River along the main stormwater channel.

2.6 Previous Waterway Studies

Previous waterway studies have been carried out on the Brisbane River and include:

- http://www.epa.qld.gov.au/environmental_management/water/water_quality_monitoring
- Brisbane River Flood Study (BCC, September 2003)

- Northern Australia TradeCoast Drainage and Fill Study Final Report (Connell Wagner, Jan 2007). Note: This report is confidential and as such only an extract of the report was provided to LPA.

2.7 Brisbane River Water Quality

Water quality data has been obtained for Brisbane River from the Department of Environment and Resource Management (DERM, formerly Environment Protection Agency (EPA)). DERM has been recording data since 1994. An improvement in water quality has been observed in recent years and as such a summary of water quality data sampled from January 2004 to January 2007 is provided Table 2-1. Also included for comparison are the ANZECC (2000) Guidelines default trigger values for SE Australia (Lowland River) for the corresponding analytes.

Table 2-1 - Brisbane River – Water Quality Data in Vicinity of Luggage Point

Parameter	Water quality data (mg/L)	ANZECC (2000) Lowland River
Nitrogen (Total) as N	0.35	0.5
Nitrogen (ammonia) as N	0.02	0.02
Nitrogen (organic) as N	0.23	na
Nitrogen (oxidised) as N	0.10	0.04
Phosphorus (Total) as P	0.10	0.05
Phosphorus (dissolved reactive) as P	0.07	0.02

Source: EHMP average water quality data taken from 16 Jan 2004 to 16 Jan 2007

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The LPA is currently undertaking additional water quality sampling and analysis in the Brisbane River within the vicinity of the stormwater channel outlet as part of the Receiving Environment Management Program (REMP).

2.8 Brisbane River Water Quality Objectives

Water quality objectives (WQO) exist for specific waterways under Schedule 1 of the state government Environmental Protection (Water) Policy 1997, (EPP (Water)).

The receiving waterway for the LP AWTP development is within the lower estuaries of the Brisbane River. Subsequently, the relevant water quality objectives applicable to this development have been derived from the EPP (Water) for the Lower Estuaries of the Brisbane River (refer to Table 2-2).

Table 2-2 - WQO for Lower Estuaries of the Brisbane River (EPP (Water), 1997)

Parameter	Concentration
Turbidity	<6 NTU
Total Suspended Solids	<15 mg/L
Total Phosphorous	<0.02 mg/L
Total Nitrogen	<0.2mg/L
DO	90 – 105% saturation
pH	8.0 –8.4 pH
Secchi Depth	>1.5m

Source: Environmental Protection (Water) Policy 1997, Queensland Government.

The WQO for the Lower estuaries of the Brisbane River represent pollutant concentration targets to maintain the environmental values of the river. Any stormwater discharges should not compromise these objectives.

2.9 Hydrologic and Hydraulic Data

Hydrological data for the site has been obtained from records held by the Australian Bureau of Meteorology. Secondary data on hydrologic flows have been taken from the Brisbane River Flood Study completed 3 September 2003, which assessed the design flood flows and levels in the Brisbane River. Consideration has also been given to the Australia TradeCoast (ATC) local area plan. This plan details the proposed future drainage channels and fill extent for the Myrtletown river front industrial area.

The tidal nature of the Brisbane River affects the surface water drainage of the LP AWTP site and was a key consideration in the final stormwater design. Table 2-3 details the design flood levels for the mouth of the Brisbane River, which were obtained from the BCC customer service centre. These flood levels are associated with tidal storm surge events and indicate that the site previous to filling would be inundated during significant storm surge events.

Table 2-3 - Brisbane River Flood Levels – 200 Main Beach Road (BCC)

	100 yr ARI	50 yr ARI	20 yr ARI	10 yr ARI	5 yr ARI
	m (AHD)	m (AHD)	m (AHD)	m (AHD)	m (AHD)
Existing Tailwater Levels	2.5	2.2	2.1	2.0[1]	1.9
Design Tailwater Levels including sea level rise.	2.8	2.5	2.4	2.3[1]	2.2

1. The 10 year ARI flood levels have been linearly interpolated.

The tide levels adopted to model the mouth of the Brisbane River have typically incorporated the highest astronomical tide (HAT) level at Brisbane Bar (1.467m AHD) as a reference.

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The following rainfall stations were used to calculate design stormwater flows for the LP AWTP site:

- Reference Weather Station – Brisbane Airport Station No. 040223, data available from June 1949 to February 2000
- Reference Weather Station – Brisbane Airport Station No. 040842, data available from July 1994 to Current

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3 Site Activities and Drainage Areas

3.1 Summary of Key Developed Site Characteristics/Activities

Stormwater generated from the LP AWTP site and discharged to the Brisbane River will be from the sources listed below and illustrated in Figure 3-1:

- Internal roads
- Perimeter roads
- Carparking
- Roof drainage
- Chemical storage areas (limited to manually initiated discharge after testing from chemical east area and chemical west area storage bunds)
- Electrical Substation B and C areas (limited to manually initiated discharge after testing from Substation B and substation C bunds)
- Electrical Substation A area – flows through oil water separator prior to discharge to stormwater
- Proving and commissioning flows (limited to period prior to full operation)

As the development occurred on a Greenfield site it is understood that:

- There would be an increase in impervious surface area of the site
- There would be potential for increased volume and intensity of runoff from the site
- There would be potential for stormwater pollution
- Raised site levels may impact on the flooding potential for surrounding areas

This report addresses these issues and mitigation measures to manage impacts on the local environment in relation to stormwater discharges.

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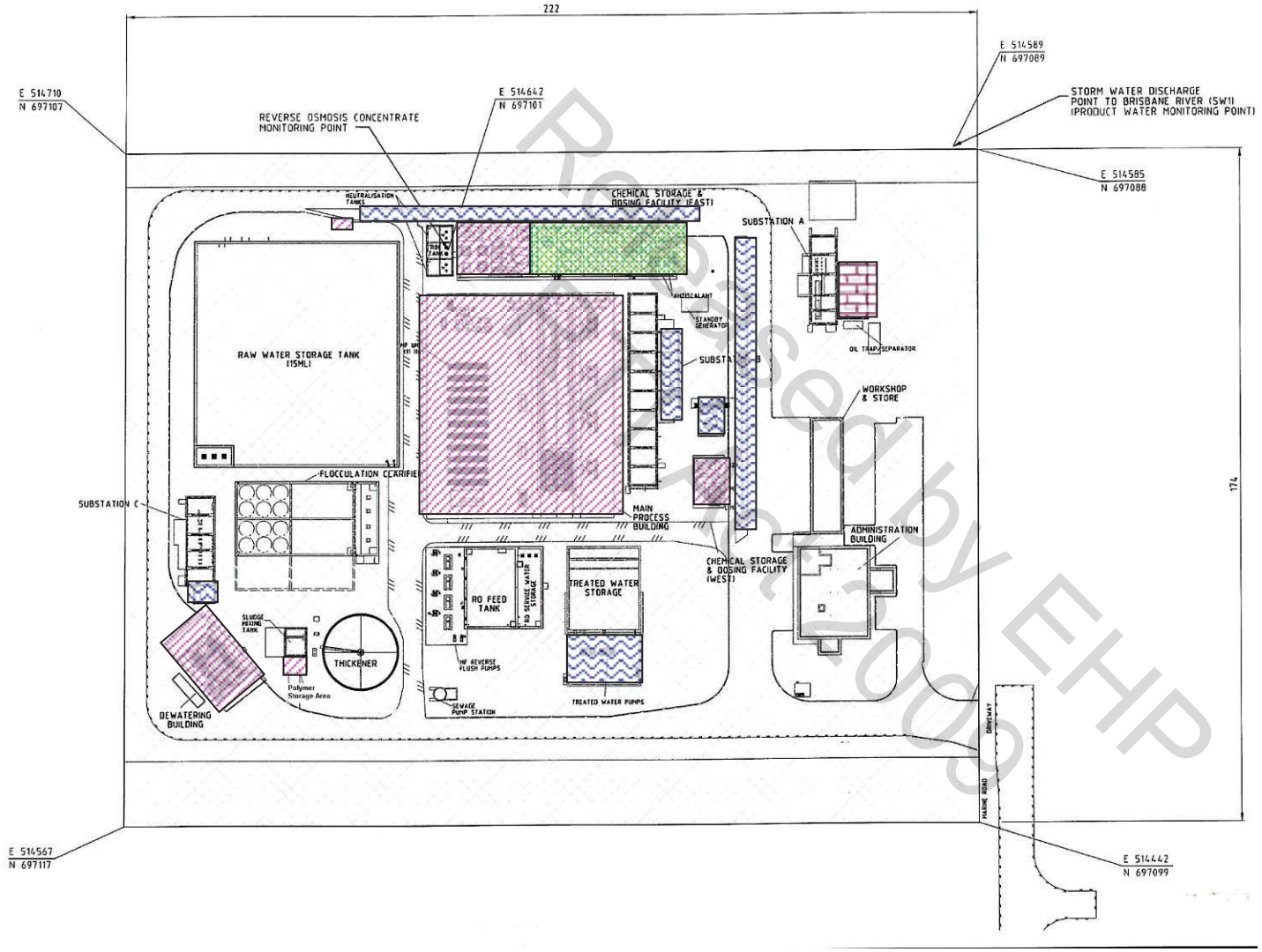

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Figure 3-1 - Site Plan of Internal Stormwater System

3.2 Site Drainage Design Summary

A holistic approach has been taken in the design of the stormwater network for the LP AWTP site. Integration of WSUD practices allows for sustainable treatment of the stormwater in accordance with guidelines as published by Brisbane City Council.

3.2.1 Fill Levels

Prior to development, a large portion of the LP AWTP site was below the Brisbane River storm surge flood levels. The LP AWTP site has since been filled and raised above the design 100 year ARI flood level plus 300 mm to incorporate the expected sea level rise as required by BCC. A cross fall of 1:200 has been incorporated to facilitate the internal drainage network (from east to west of the site), with another cross fall of 1:500 from the north towards the south of the site. The final drainage levels for the site are given in Appendix A.

The design Brisbane River flood level for the 100 year average recurrence interval (ARI) flood event is 2.5 mAHD, as prescribed by the Brisbane City Council (BCC) and the Scope of Work and Technical Criteria (SWTC) for Luggage Point. This flood level is the storm surge flood level caused by high tailwater levels at the mouth of the Brisbane River. The Project has adopted a sea level rise of 300 mm for the 50 year design life, in accordance with BCC guidelines. This sets the 100 year ARI design flood level as 2.8 mAHD.

3.2.2 Internal Roads

The site roads provide vehicle access to the LP AWTP facilities. Internal roads for the site are sealed asphalt. Surface water runoff from the internal roads, drain to a vegetated swale surrounding the perimeter of the site, before discharging to the external drainage system.

Internal roads will remain operational for up to a 10 year ARI rainfall event. Flow rates for the design of the internal road drainage infrastructure were calculated using the rational method as detailed in the Queensland Urban Drainage Manual (QUDM).

A suitable site evacuation procedure for flooding was developed for the LP AWTP site and addressed in the site's Incident and Emergency Response Plan (PL-GWA-WC-900) as prepared by Veolia Water.

3.2.3 Perimeter Roads

The site perimeter roads are sealed asphalt and grade towards the buffer strips and vegetated swales, which run parallel to the site perimeter roads before discharging to the external drainage system.

Site roads may become inundated in events greater than a 10 year ARI rainfall event; however these site roads provide an overland flow path to the outlet channel and Brisbane River. This will prevent flooding of buildings up to the 100 year ARI rainfall event.

3.2.4 Car Parking

A total of 24 car parks are provided both within the LP AWTP site and outside the site administration building. The car parking facilities are sealed asphalt with surface water runoff discharging into the perimeter swale drainage system.

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3.2.5 Roof Drainage

A number of roofed areas are contained in the site to house plant and protect bund areas from stormwater ingression. These areas include:

- Administration building
- Workshop and store
- Substation A, B and C (excluding transformers which are located in bunds outside each substation and are not roofed)
- Chemical storage and dosing facility (East)
- Main process building
- RO feed tank
- Dewatering building
- RO service water storage
- Treated water storage

Roof run-off from adjacent buildings is directed into underground pipes before being discharged into the perimeter vegetated swales.

3.2.6 Chemical Storage and Unloading Areas

There are two chemical storage areas within the LP AWTP site. These include Chemical Storage and Dosing Facility (East) and Chemical Storage and Dosing Facility (West). Both contain a number of different bulk chemicals tanks, each in separated bund areas. Runoff from the chemical delivery area is physically isolated to eliminate the risk of pollutants entering the stormwater drainage system.

The bund sizing is a function of the largest tank stored within the bund plus an additional 10% capacity. Speed humps on the entrance and exit from the unloading areas have been included to achieve this volume.

The design features to manage stormwater flows from Chemical Storage and Dosing Facility (East) are as follows;

- A roof that extends over the chemical delivery area to prevent stormwater ingress into the bund
- A sump located at the southern and northern ends are provided in the unloading area to contain liquids in the event of a chemical spill during unloading activities
- An isolation valve in the sumps are closed and will only be opened to release stormwater once the water has been assessed to be free of contamination and to meet the release limits indicated in Table 3-1.

If the water does not meet these requirements, the water is transferred to the neutralisation tanks or a tanker is used to remove and dispose of the contaminated water in accordance with the development approval.

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Table 3-1 - Release Limits from Bund Areas (as per ERA7 Approval)

Parameter	Permitted Release Limit
pH	6.5 to 8.5
Turbidity	25NTU
Total Chlorine	0.7 mg/L

Source: EPA Development Approval – ERA7 Chemical Storage for Luggage Point AWTP

Chemical Storage and Dosing Facility (West) is not roofed due to the height of the chemical tanks stored in this area. The facility is bunded with an isolation valve to allow stormwater to discharge from the sump once the water has been assessed to be free of contamination and to meet the release limits indicated in Table 3-1.

Bund inspection and valve operation related to the Chemical Storage and Dosing Facility bunds is governed by standard operational procedure (SOP for Emptying Bunds and Sumps LUGG-R-PX-6901-02). This will reduce the likelihood of the valves being opened and potentially contaminated stormwater being discharged prior to the water quality being tested.

Inspection is undertaken frequently during precipitation events especially for Chemical Storage and Dosing Facility (West) as it is unroofed and is likely to fill with stormwater after each precipitation event.

3.2.7 Substations

There are three substations located within the LP AWTP site, Substations A, B and C. Each substation includes transformers located outside the substations and contained in dedicated transformer bunds. Bunding is required to contain transformer oil in the event of an oil leak. The insulation oil is classified as combustible, but not flammable.

Substation A has sixteen transformers which each require 6,700 L of oil. Stormwater from Substation A transformer bunds is discharged to a 10,000 L capacity oil/water separator for treatment, before being discharged to the swale system.

Substation B has three transformers and Substation C has one transformer. Each transformer requires approximately 1,670L of oil and is contained within individual bunds with a capacity of at least 6,000L. Bunding provides storage for 100% of the oil within each transformer as required by Australian Standards AS1940-2004. The bund storage also allows for leakage of the transformer oil coincident with a 10 year ARI 24 hour rainfall event. The isolation valves on each sump are closed to contain any contamination. The isolation valve will only be opened to release stormwater once the water has been visually assessed to be free of hydrocarbons. If the water has visible hydrocarbons present, a licensed tanker will collect and dispose of the contaminated water off site at a licensed facility.

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4 Stormwater Management

4.1 General

The drainage design and design methodology for the LP AWTP has been developed in accordance with the stormwater management principles detailed in the WSUD Technical Guidelines: Stormwater Brisbane City Council June 2006, Australian Rainfall and Runoff, and the Queensland Urban Drainage Manual.

The pollutant and hydraulic modelling of the preliminary drainage design indicates the discharge water quality objectives and drainage design criteria can be achieved. Hydraulic investigations indicate that flooding in the LP AWTP area is dominated by storm surge levels at the mouth of the Brisbane River, which will be unaffected by the LP AWTP. The LP AWTP may affect lower flood levels during minor rainfall events, although flooding would be below the level of adjacent buildings.

4.2 Water Quantity Controls

4.2.1 Selection

The use of vegetated buffer/filter strips and swales instead of hard infrastructure maximises infiltration and reduce the volume of surface water runoff during rainfall events.

The vegetated swales collect all the run-off from the site and convey this to the southeast corner of the site before it enters the open lined stormwater outlet channel, which transfers the water to the Brisbane River.

The entire stormwater drainage design for LP AWTP has been designed to convey stormwater associated with a 10 year ARI event. In accordance with the Queensland Urban Drainage Manual the system will limit the velocity of stormwater discharge such that it should not exceed 0.6 m/s in the vegetated swale during a 10 year ARI event.

4.2.2 Assessment

The drainage design has been designed according to the Queensland Urban Drainage Manual and subsequently assessed under a 10 year and 100 year ARI rainfall event.

4.2.3 Integration with Waterway Corridor

The Brisbane City Plan 2000 is a comprehensive statement of the intentions of BCC in relation to the future development of Brisbane. Codes are provided within the Brisbane City Plan 2000 each of which gives guidance on specific aspects of development.

The waterway corridor code applies in assessing any development where;

- It is located in a waterway corridor or the Brisbane River Corridor, as defined, or as indicated on the planning scheme maps
- On land subject to storm surge
- On land subject to flooding in a 100 year ARI event

For the purposes of stormwater quantity the waterway corridor code is applicable to the LP AWTP in two respects:

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- Ensuring that the development (LP AWTP) is not at unreasonable risk of flooding
- Maintaining or enhancing flood carrying capabilities of waterways and the Brisbane River in a manner that achieves an acceptable balance between risk and cost

The internal drainage system has been designed to fully contain a 10 year ARI rainfall event within the drainage infrastructure and that there will be no flooding of plant facilities in a 100 year ARI flood event (inclusive of sea level rise) through the provision of flow paths along the perimeter and then to the outlet channel and Brisbane River.

The external drainage network design has been undertaken to minimise the impact of the proposed development on the flood risk to external properties in two situations; a tidal surge event and fluvial flooding. The system should not cause flooding of adjacent buildings or infrastructure in a 100 year ARI event.

Given the design criteria, it is considered that the proposed strategy upholds the purpose of the waterway corridor code with respect to water flows.

4.3 Water Quality Ccontrols

4.3.1 Selection

Achieving pollutant load reductions in line with the EP (Water) WQOs (refer Section 2.8) is a principle objective of the stormwater management strategy design and a number of different components and controls have been proposed in order to achieve the WQOs.

The major components of the stormwater management strategy designed to promote improved water quality are summarised in Table 4-1. These have been selected and configured to provide the maximum pollutant removal.

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Table 4-1 - Summary of the Proposed Stormwater Quality Controls

Component	Specification	Pollutant Removal
Buffer/filter strips	Grassed strips, 1.5 m in width, located on the external road boundary prior to run-off entering the swale system.	Filters medium to coarse sediment.
Vegetated swales	Main vegetated swale system that will convey run-off from the site to a lined discharge channel at the southeast corner of the site.	Settlement of pollutants and suspended solids. Some uptake of pollutants by vegetation.
Oil/water separator	Oil/Water separator to be located on the drainage line from electricity substation A to catch any oils and hydrocarbons that may have leaked into the system.	Removal of oil and hydrocarbons.
Concrete substation transformer bunds	Each transformer is contained within a bund able to contain 100% of the oil. An isolation valve is from each bund is closed under normal operating conditions.	Prevention of oil spills from transformers entering the receiving environment.
Concrete chemical storage bunds	Concrete bunds to house the chemical storage tanks, dosing facility and delivery area. In accordance with AS1940 – 2004 total bund capacity will be an approximate volume of 22,000 L.	Prevention of chemical spills and chemical tank leaks from entering the receiving environment.
Open stormwater channel to the Brisbane River	An open stormwater channel with scour protection at the outfall. Designed to transfer stormwater from the perimeter of the site to the Brisbane River.	Attenuated flow and decreased velocity will lead to further suspended solids removal.

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4.3.2 Integration with Waterway Corridor

The BCC waterway corridor code for water quality stipulates that discharges from the development should protect or enhance the quality of the receiving environment.

Pollution load requirements, as given in Table 5-1 will be achieved such that the existing water quality of the Brisbane River will not be compromised by stormwater discharges from LP AWTP.

4.4 Stormwater Management Strategy

A summary of each key component of the stormwater management strategy along with the actions and responsibilities are outlined in Table 4-2.

Table 4-2 - Outline of Actions and Responsibilities for Implementation of the Strategy

Component	Action	Project Stage	Responsibility
Buffer/filter strips	Lay the buffer/filter strips	Construction phase	Principal contractor
Vegetated swales	Excavate and line the swale	Construction phase	Principal contractor
	Commence vegetation of the swale	Construction phase	Principal contractor
	Plant commissioning flow to be drained through the swale system	Commissioning phase	Contractor/plant operator
Open stormwater channel to the Brisbane River	Excavate the channel	Construction phase	Principal contractor
	Appropriately line the channel	Construction phase	Principal contractor
	Plant commissioning flow to be drained through the channel to the Brisbane River outfall	Commissioning phase – Expected to be completed by June 2010	Contractor/plant operator
Concrete Bunds	Construct the chemical storage bunds	Construction phase	Principal contractor
Oil/water separators	Install the oil/water separator	Construction phase	Principal contractor
Monitoring Plan	Implement the monitoring plan after the first rainfall event	Operational phase	Plant operator
Maintenance Plan	Implement the plan once the plant becomes operational	Operational phase	Plant operator

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5 Water Quality Monitoring Program

5.1 Stormwater Quality Targets

The stormwater quality targets adopted for LP AWTP are outlined in Table 5-1 and are in line with the limits prescribed in the ERA64 approval for discharge of the product water as well as considering the EP(Water) WQOs discussed previously in Section 2.8.

Table 5-1 - Stormwater Quality Targets

Parameter	Target WQO limit	Type of limit
Total Chlorine	0.1mg/L	Maximum
Total Phosphorous	0.7mg/L 2.0mg/L	Long term 50th%tile Maximum
Total Nitrogen	1.5mg/L	Maximum
Turbidity	10NTU 5NTU	Maximum Short term 50th %tile
pH	6.5 – 8.5	Range (min:max)
Dissolved Oxygen	2.0mg/L	Minimum
Hydrocarbons	No visible hydrocarbons	
Stormwater Flow	No limit	NA

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5.2 Monitoring Programme

In accordance with BCC's Water Quality Management Guide, stormwater discharge monitoring for the analytes in Table 5-1 will occur in the commissioning and operational phase of LP AWTP and will continue for 12 months. Monitoring of the operational phase will commence once commissioning has been completed. During the operational phase approximately 10, samples from 10 distinct run-off events will be collected during this period. However, this will be dependent on a sufficient number of suitable run-off events occurring over the 12 month period.

The location of the sampling point, SW1, is located at the boundary of the site in the stormwater channel located in the southeast corner of the site and is accessible by a small footbridge.

5.3 Field Quality Controls

To ensure stormwater is collected without the potential presence of cross contamination, all sampling equipment will be decontaminated in accordance with the procedure and methods described in Australian/New Zealand Standard Water Quality Sampling. Part 1 (AS/NZS5667.1:1998).

5.4 Responsibilities

During the commissioning phase, the LPA is responsible for ensuring the monitoring programme outlined in Section 5.2 is completed. Once the LP AWTP becomes operational, the plant Operator will undertake all monitoring responsibilities for stormwater discharges

prior to the water leaving the site. The Operator will be able to delegate and sub contract any aspect of the monitoring regime to a competent third party.

5.5 Data Management and Performance Criteria

Each sample will be analysed at a NATA accredited laboratory to ensure accuracy and consistency in the reporting of stormwater quality. The party responsible for undertaking the monitoring will interpret results of analysis.

A hard copy and electronic copy of all results and records from stormwater monitoring will be kept at the site for a period of 5 years.

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6 Stormwater Maintenance Program

6.1 Maintenance Responsibilities

During the commissioning phase the LPA shall be responsible for undertaking maintenance the key drainage infrastructure and stormwater treatment devices. During the operational phase, this will become the responsibility of the plant Operator. The LPA and Plant Operator will be able to delegate and sub contract any aspect of the maintenance activities to a competent third party.

The LPA/Plant Operator are responsible for the stormwater management infrastructure within the site boundary. The open stormwater channel will initially be lined for the commissioning and proving flows. However the final landscape of the outlet channel will be decided by the Plant Operator. Once the vegetation is established, it is proposed to negotiate handover with BCC. In the event that this proposition is not acceptable to BCC the plant Operator will maintain the open stormwater channel.

6.2 Maintenance Plan and Inspection Forms

6.2.1 Background

Maintenance inspections for swales and bunds have been included in the daily and weekly environment inspection checklists (refer to SBMP - Appendices).

Major components that constitute the stormwater pollution retention system for LP AWTP are as follows:

- Buffer/filter strips
- Vegetated swales
- Oil/water separator
- Chemical storage bunds
- Lined discharge channel to the Brisbane River

Each component is addressed in the following subsections and the maintenance regime outlined. The maintenance regime draws upon guidance given in the Water Sensitive Urban Design Technical Design Guidelines for South East Queensland.

6.2.2 Vegetated Swales and Buffer Strips

Vegetated swales and buffer strips play an important part in stormwater conveyance around the site and to the point of discharge to the open stormwater channel and therefore require comprehensive vegetation coverage. This vegetation needs to be maintained if the performance efficiency of the swales and buffer strips is to be maintained.

The principle maintenance activities involves regular mowing and the intermittent removal of weeds and sediment to maintain free flow paths and enhance channel conveyance.

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6.2.3 Oil/Water/Sediment Separator

An oil/water/sediment separator, that is a CDS unit, is included on the drainage line from electricity sub-station A and will pass through the CDS unit prior to entering the stormwater channel and being discharged from the site.

Inspection of the CDS unit is undertaken along with the inspections of the other stormwater treatment devices. Maintenance of the CDS unit involves frequent cleaning to keep accumulated oil from escaping during storms.

Cleaning operations shall be undertaken by a licensed contractor where the effluent shutoff valve will be closed and waste oil and residuals will be disposed of and sent to a suitably licensed waste management facility.

Any standing water that is removed will be replaced with clean water to prevent oil carryover through the orifice.

6.2.4 Chemical Storage Bunds and Chemical Offloading Areas

The chemical storage bunds and chemical offloading areas provide essential secondary containment should any of the chemical tanks leak or rupture or should any spillage occur. In such instances, the storage bunds prevent potentially hazardous chemicals from entering the vegetated swales and potentially the lined discharge channel leading to the Brisbane River.

Routine inspection of the storage bunds is essential to ensuring that they continue to be fit for purpose and of sufficient integrity to provide the necessary containment of chemicals in the event that a leak from a chemical tank was to occur. The chemical tanks are also assessed for signs of any damage.

Any water collected inside the bunds are routinely removed so that the storage volume is not compromised. During instances when a routine inspection identifies the need to remove rainwater and it is not suitable for discharge to the stormwater system the storage bunds are either pumped into IBCs for transfer to the neutralisation tanks or pumped out into a tanker by a licensed contractor and taken off site for appropriate disposal.

6.2.5 Open Lined Stormwater Outlet Channel to the Brisbane River

The open lined stormwater outlet channel conveys stormwater from the perimeter of the site to final discharge at the Brisbane River. The key maintenance activity associated with the discharge channel to the Brisbane River will involve removing, if necessary, weeds; debris and any sediment build up, particularly if it is impeding stormwater flow out to the Brisbane River.

Given the relatively exposed nature of the discharge channel, it is necessary to regularly monitor for damage and erosion along the length of the channel and recommend repair and reconstruction works to be carried out where necessary.

6.3 Summary

The key features of stormwater infrastructure maintenance at LP AWTP are summarised Table 6-1.

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Table 6-1 - Key Features of Stormwater Infrastructure Maintenance at LP AWTP

Stormwater Component	Actions	Frequency	Data Collection Requirements	Environmental Management and waste disposal issues	Access/Stakeholder notification/Safety issues
Vegetated swales and buffer strips	Routine inspection (included in Environment Inspection Checklist)	Weekly	A note taken of the general appearance and perceived performance of the filter strips	None	None
	Removal of sediment where it effects the removal capability	As required. Guided by the findings of the routine inspection	A note taken of each time when sediment is removed	Disposal of sediment by waste management company	None
	Mowing of turf to preserve the optimal design height for the vegetation	As required. Guided by the findings of the routine inspections	None	Disposal of turf cuttings	Care to be taken when using cutting equipment
	Removal of invasive weeds etc	As required. Likely to be most intensive in the first two years	A note taken of the species of weeds removed	Ensure weeds are properly disposed of to avoided wider ecological contamination	Care to be taken if using any cutting equipment
	Pruning to remove dead vegetation and stimulate new growth	As required. Likely to be most intensive in the first two years	Comment on whether any significant replanting may be required	Ensure cuttings are properly disposed of to avoided wider ecological contamination	Care to be taken if using any cutting equipment
	Addition of soil additives	As required. Likely to be most intensive in the first two years	Comment on the amount and type of soil additives used	The use of soil additives can pose a risk to human health and ecology. Such additives should be stored according to manufacturers instructions and only used in the appropriate areas of the site	Care to be taken when handling and applying soil additives
	Erosion and damage repair	As required	Note the nature of any repairs due to erosion and/or damage	Dependent upon the nature of repairs	Dependent upon the nature of repairs

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Stormwater Component	Actions	Frequency	Data Collection Requirements	Environmental Management and waste disposal issues	Access/Stakeholder notification/Safety issues
	Litter and debris removal	As required and guided by the routine inspections. Checks should be made on at least a weekly basis	Comment on any significant pieces of litter (i.e. if it is particularly big or hazardous)	Development of a procedure for the removal of litter and be sure of the correct disposal routes	Only remove litter/debris if it is safe to do so. Only remove hazardous litter/debris if suitably qualified to do so and with the correct equipment and controls in place
Oil/Water separator	Routine Inspection (included in environment inspection checklists)	Weekly	Determine the amount of contamination within the separator. Make recommendations for cleaning as appropriate	None	None
	Cleaning of the device	As required. Possibly after a major storm event.	Record the number of cleaning events.	Ensure shut off valve is closed and wastes are disposed of to a suitably licensed waste management facility. Any contaminated standing water should be replaced with clean water to prevent oil carryover.	Cleaning should only be carried out by a suitably licensed waste management contractor
Chemical storage bunds	Routine Inspection (included in environment inspection checklists)	Weekly	A note taken of the integrity of the bund structure and any rainwater build up	None	None
	Pumping out of rainwater build	After a significant rainfall event	Maintain a record of all pumping activities.	Duty of care to ensure that liquid waste is handles as per SOP	Supervision of pumping contractor
	Structural repairs to the bund	As required.	Maintain a record of any bund repairs	Dependent upon the nature of repairs	Dependent upon the nature of repairs
Lined discharge channel to the Brisbane River[1]	Inspection (included in environment inspection checklists)	Weekly	A note taken of the state of the lined discharge channel. In particular any significant erosion and/or damage.	None	None
	Erosion and damage repair	As required	Note the nature of any repairs due to erosion and/or damage	Dependent upon the nature of repairs	Dependent upon the nature of repairs

1 - Responsibility for maintaining vegetation and removing debris within the open stormwater channel shall be BCC

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7 Communication and Documentation

All records of inspections and water quality monitoring will be kept on file for later access and reference. These records will be summarised for inclusion in the Environmental Management Review, which will be submitted to the Western Corridor Project Office.

Any occurrence of non-compliant water quality will be investigated and an incident report completed outlining the potential reasons for the non-compliance.

All surface water quality complaints and remedial actions undertaken will be conveyed to all site personnel in toolbox meetings. A summary of each complaint will also be recorded in the site complaints register and included in the Environmental Management Review submitted to the Western Corridor Project Office.

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8 Corrective Actions

Damaged or non-functional drainage or erosion control structures will be highlighted during weekly site inspections and recorded on the Weekly Inspection Checklist (LUGG-R-FM-0007-01). Corrective action items will be provided to the Operations Manager and Site Superintendent for completion.

Where monitoring of discharge water indicates that the Stormwater Quality Targets have been exceeded, an incident investigation will provide a root cause analysis of where the non-compliant water quality parameter originated from, what controls were in place at the time of the non-compliance and what was done to reduce the non-compliant water quality being discharged.

An incident register will be maintained in the site based share drive (link: 2008-2009 Register). The register will include when the incident occurred, the general nature of the incident, a brief description of the actions completed, and the date that the incident investigation was closed.

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9 References

Guidelines for Pollutant Export Modelling in Brisbane Version 7 – Draft, Brisbane City Council October 2003.

Draft WSUD Engineering Guidelines: Stormwater, Brisbane City Council, 2005.

Queensland Urban Drainage Manual (QUDM), 1994

WSUD Technical Design Guidelines for South East Queensland Version 1, Healthy Waterways, June 2006.

Brisbane City Council Local Area Plan, Myrtletown

SEQWater Report for Luggage Point Wastewater Treatment Plant, Conceptual Stormwater Management Plan, August 2006

EPA, Environmental Protection (Water) Policy of 1997, Brisbane River Environmental Values and Water Quality Objectives, Basin No. 143 (part), March 2006

Healthy Waterways, Water Sensitive Urban Design, Technical Design Guidelines for South East Queensland, Version 1, June 2006

Australian Rainfall and Runoff, 1999

Water Sensitive Urban Design in Industrial Areas; Healthy Waterways Fact Sheet

Acid Sulphate and Groundwater Management Plan (ASSGMP) (LUGG-R-PL-0003-01)

Construction Phase Stormwater Management Plan (LUGG-R-PL-0002-01).

Geotechnical Factual Report (LUGG-T-RE-0001-01)

Site Conditions Technical Specification (LUGG-C-TS-0002-01)

Australian Bureau of Meteorology. http://www.bom.gov.au/

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Appendix A
Site Survey Plans with Final Drainage Level

File D

16-066

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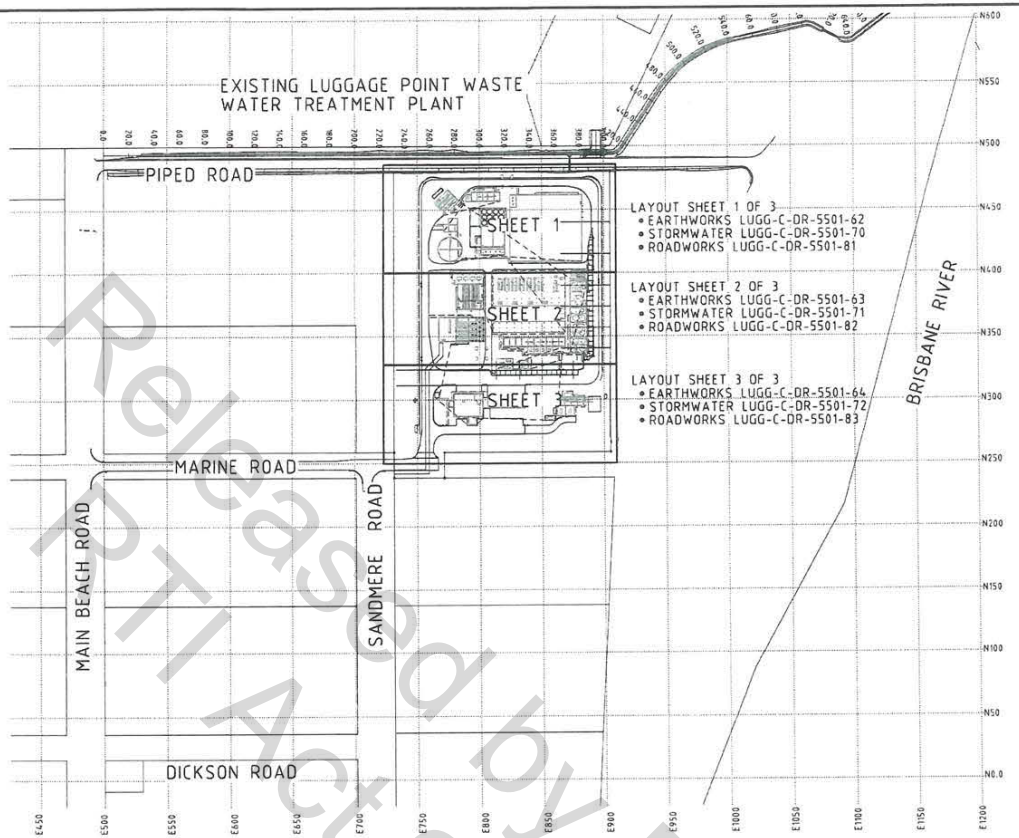
TRUE NORTH
PLANT NORTH

EARTHWORKS, ROADWORKS & DRAINAGE DRAWING INDEX

DRAWING No.	DESCRIPTION
LUGG-C-DR-5501-60	LOCALITY PLAN & DRAWING INDEX
LUGG-C-DR-5501-61	CIVIL WORKS GENERAL NOTES
LUGG-C-DR-5501-62	LAYOUT AND LEVEL PLAN SHEET 1 OF 3
LUGG-C-DR-5501-63	LAYOUT AND LEVEL PLAN SHEET 2 OF 3
LUGG-C-DR-5501-64	LAYOUT AND LEVEL PLAN SHEET 3 OF 3
LUGG-C-DR-5501-65	SECTION SHEET 1 OF 3
LUGG-C-DR-5501-66	SECTION SHEET 2 OF 3
LUGG-C-DR-5501-67	SECTION SHEET 2 OF 3
LUGG-C-DR-5501-69	EARTHWORKS SETOUT TABLES
LUGG-C-DR-5501-70	STORMWATER PLANS SHEET 1 OF 3
LUGG-C-DR-5501-71	STORMWATER PLANS SHEET 2 OF 3
LUGG-C-DR-5501-72	STORMWATER PLANS SHEET 3 OF 3
LUGG-C-DR-5501-73	STORMWATER DRAINAGE LONGITUDINAL SECTIONS SHEET 1 OF 2
LUGG-C-DR-5501-74	STORMWATER DRAINAGE LONGITUDINAL SECTIONS SHEET 2 OF 2
LUGG-C-DR-5501-75	STORMWATER DRAINAGE SETOUT DETAILS
LUGG-C-DR-5501-76	STORMWATER DRAINAGE DETAILS SHEET 1 OF 2
LUGG-C-DR-5501-77	STORMWATER DRAINAGE DETAILS SHEET 2 OF 2
LUGG-C-DR-5501-78	STORMWATER OUTFALL LAYOUT PLAN
LUGG-C-DR-5501-79	STORMWATER OUTFALL DETAILS
LUGG-C-DR-5501-80	OIL / WATER SEPARATOR DETAILS
LUGG-C-DR-5501-81	ROADWORKS PLAN SHEET 1 OF 3
LUGG-C-DR-5501-82	ROADWORKS PLAN SHEET 2 OF 3
LUGG-C-DR-5501-83	ROADWORKS PLAN SHEET 3 OF 3
LUGG-C-DR-5501-84	ROADWORKS KERB SETOUT TABLES
LUGG-C-DR-5501-85	PAVEMENT LAYOUT & DETAILS
LUGG-C-DR-5501-86	LINEMARKING & SIGNAGE LAYOUT & DETAILS
LUGG-C-DR-5501-87	ROADWORKS DETAILS
LUGG-C-DR-5501-88	FENCING & GATE PLAN
LUGG-C-DR-5501-89	FENCING & GATE DETAILS
LUGG-C-TS-5502-01	INTERNAL ROADWORKS SPECIFICATION



LOCALITY PLAN
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LEGEND

PROPOSED SURFACE FEATURES

- EDGE OF PAVEMENT KERBING
- EDGE OF PAVEMENT, NO KERB
- -3.0- MAJOR DESIGN CONTOUR
- -2.9- MINOR DESIGN CONTOUR
- SETOUT POINT
- FIRE HYDRANT LOCATION WITH BOLLARDS EITHER SIDE
- ASPHALT FOOTPATH REFER UMS 745
- CONCRETE FOOTPATH REFER LUGG-C-D2-5501-87
- SCOUR PROTECTION SLAB REFER LUGG-C-DR-5501-76
- DP9/1 DOWN PIPE
- FIELD INLET
- ROOFWATER PIT SEE DETAILS ON LUGG-C-DR-5501-76
- TYPE A GULLY PIT
- DF1/11 DRAINAGE FITTING
- IOS INSPECTION OPENING TO SURFACE
- EDGE OF PAVEMENT 230X230 EDGE RESTRAINT (UMS 211)

NOTES:

1. REFER TO LUGG-C-DR-5501-61 FOR CIVIL WORKS GENERAL NOTES.

REFERENCED STANDARD DRAWINGS

BCC URBAN MANAGEMENT DIVISION:-

UMS153 BIORETENTION DRAIN.
UMS211 KERB AND CHANNEL PROFILES
UMS221 VEHICLE CROSSING (SLAB).
UMS231 CONCRETE FOOTPATH 1.2m WIDE
UMS241 GALVINISED TUBULAR HANDRAIL
UMS243 CHAIN WIRE FENCING 1.8m HIGH
UMS261 SIDE DRAINS AND MITRE DRAINS
UMS321 STORMWATER MANHOLE DETAILS
UMS337 FIELD INLETS TYPE1 AND TYPE 2
UMS745 PATH-ASPHALT
UMS841 PAVEMENT MARKING, LONGITUDINAL LINES
UMS842 PAVEMENT MARKING, TRANSVERSE LINES
UMS843 PAVEMENT MARKING, TYPICAL MINOR ROAD NON-SIGNALISED INTERSECTION
UMS846 PAVEMENT MARKING, PAVEMENT ARROWS AND GIVE WAY SYMBOL

OTHER
LUGG-S-DR-5500-12 CONCRETE STANDARDS,
MISC DETAILS

SPECIFICATIONS

LUGG-C-TS-0001-01 EARTHWORKS TECHNICAL
LUGG-C-TS-0005-01 DRAINAGE INFRASTRUCTURE
LUGG-C-TS-5502-01 INTERNAL ROADS
LUGG-C-TS-5503-01 UNDERGROUND PIPEWORK AND FITTINGS INSTALLATION
LUGG-C-TS-5504-01 UNDERGROUND PIPEWORK AND FITTINGS SUPPLY
LUGG-C-TS-5901-01 FIRE SYSTEM SUPPLY AND INSTALLATION
LUGG-S-TS-0001-01 TECHNICAL SPECIFICATION FOR CONCRETE
LUGG-S-TS-5501-01 TECHNICAL SPECIFICATION FOR STEELWORK

AS BUILT

0 20 40 60 80 100
SCALE IN METERS
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PLOT SCALE	
SCALE USED	AS NOTED
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DRAWING NO. | TITLE
REFERENCE DRAWINGS

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REV	DATE	DESCRIPTION	DRN	CHKD	ENG	APP
ABO	10-12-08	AS BUILT	CD		WT	UOT
1	04-06-08	RF 667	HLP	DB	SC	
0	16-11-07	ISSUED FOR CONSTRUCTION	HLP	DB	SC	MD

REVISIONS

DESIGNED BY	A.McCreath	17.11.07
DRAWN BY	M.Palin	16.11.07
CHECKED BY	D.Berry	16.11.07
LEAD DISC. ENGR.	S.Clarke	16.11.07
APPROVED	M.Duvandeck	20.11.07
OWNER APPROVED		
	NAME	DATE

WESTERN CORRIDOR RECYCLED WATER PROJECT LUGGAGE POINT

LUGGAGE POINT AWTP

TITLE:
EARTHWORKS, ROADWORKS AND DRAINAGE
LOCALITY PLAN AND DRAWING INDEX

DRAWING NO. LUGG-C-DR-5501-60 | REV. ABO

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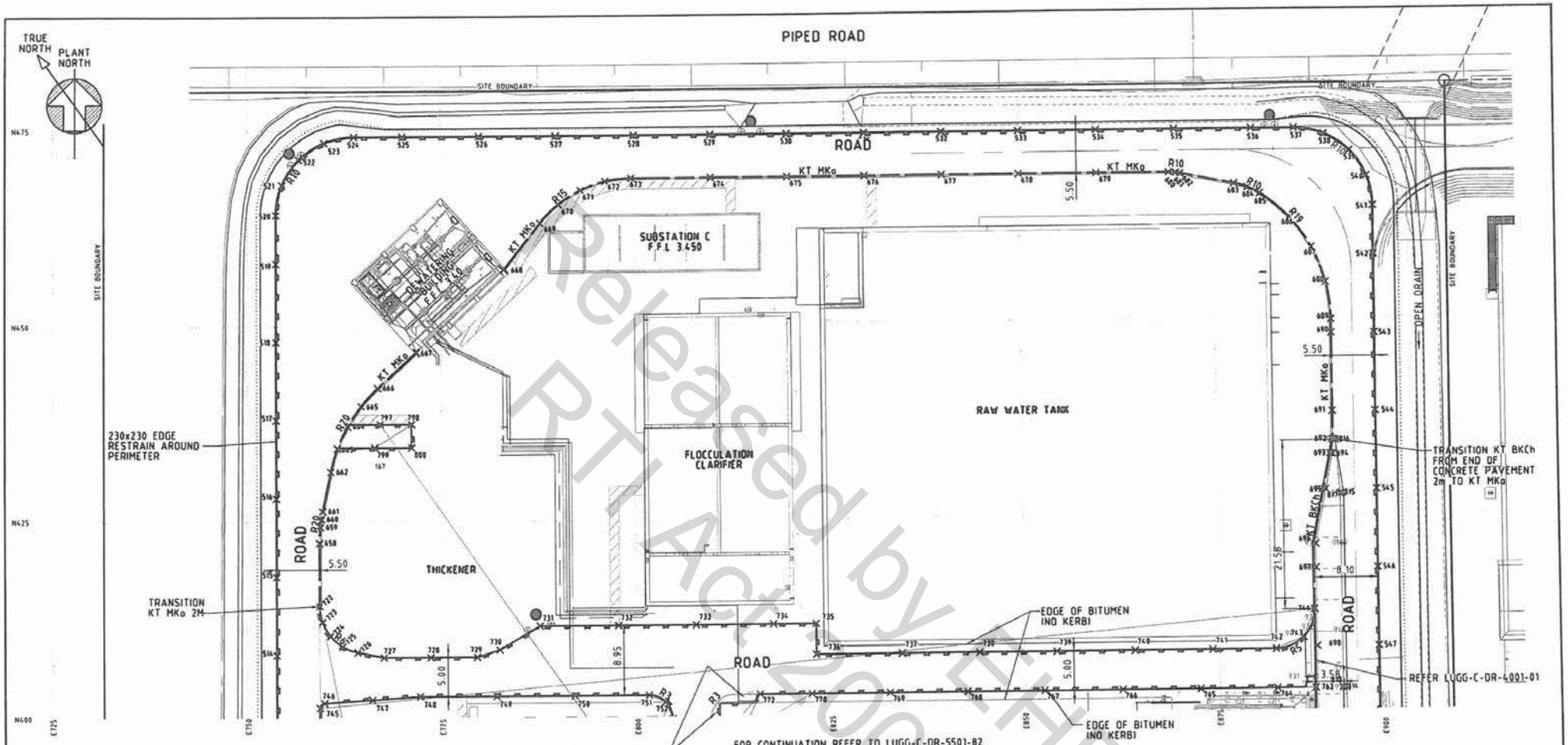

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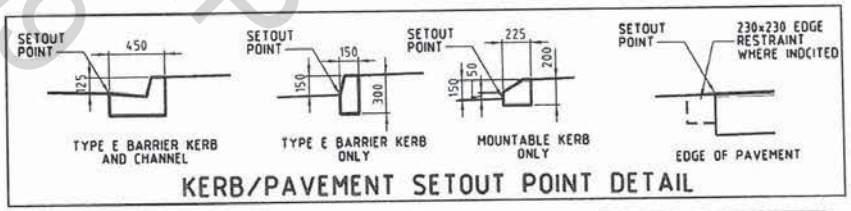
PLAN
1:250

NOTES:

1. REFER TO LUGG-C-DR-5501-60 FOR LOCALITY PLAN AND LEGEND.
2. REFER TO LUGG-C-DR-5501-61 FOR GENERAL NOTES.
3. DRAWING TO BE READ IN CONJUNCTION WITH LUGG-C-DR-5501-31 TO 36(INCL.) FOR UNDERGROUND SERVICES AND TRENCH CORRIDOR INFORMATION.
4. REFER LUGG-C-DR-5501-84 FOR PAVEMENT SETOUT TABLES.
5. REFER LUGG-C-DR-55001-85 FOR PAVEMENT DETAILS.

KERB TYPE LEGEND (REFER BCC STD DRG UMS211)

KT MKo	MOUNTABLE KERB ONLY (225mm WIDE x 200mm HIGH)
KT BKCh	BARRIER KERB AND CHANNEL (STANDARD TYPE E)
KT BKo	BARRIER KERB ONLY (STANDARD TYPE E)
KT MKCh	MOUNTABLE KERB AND CHANNEL (TYPE D)
	= NO KERB
	= 230x230 EDGE RESTRAINT



KERB/PAVEMENT SETOUT POINT DETAIL

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AS BUILT

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PLOT SCALE	
SCALE USED	1:250
CONSULTANT	

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REFERENCE DRAWINGS

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1	14-05-08	RFI 667	MLP	PP	OGT	MRD
0	16-11-07	ISSUED FOR CONSTRUCTION	MLP	SC	SC	MRD

REVISIONS

DESIGNED BY	D Thomas	12-11-07
DRAWN BY	M Palm	12-11-07
CHECKED BY	D. Berry	20-11-07
LEAD DISC. ENGR	S. Clarke	20-11-07
APPROVED	MRD	21-11-07
OWNER APPROVED		
	NAME	DATE

WESTERN CORRIDOR RECYCLED WATER PROJECT
LUGGAGE POINT

LUGGAGE POINT AWTP

TITLE
EARTHWORKS, ROADWORKS AND DRAINAGE ROADWORKS PLAN SHEET 1 OF 3

DRAWING NO. LUGG-C-DR-5501-81 | REV. AB0

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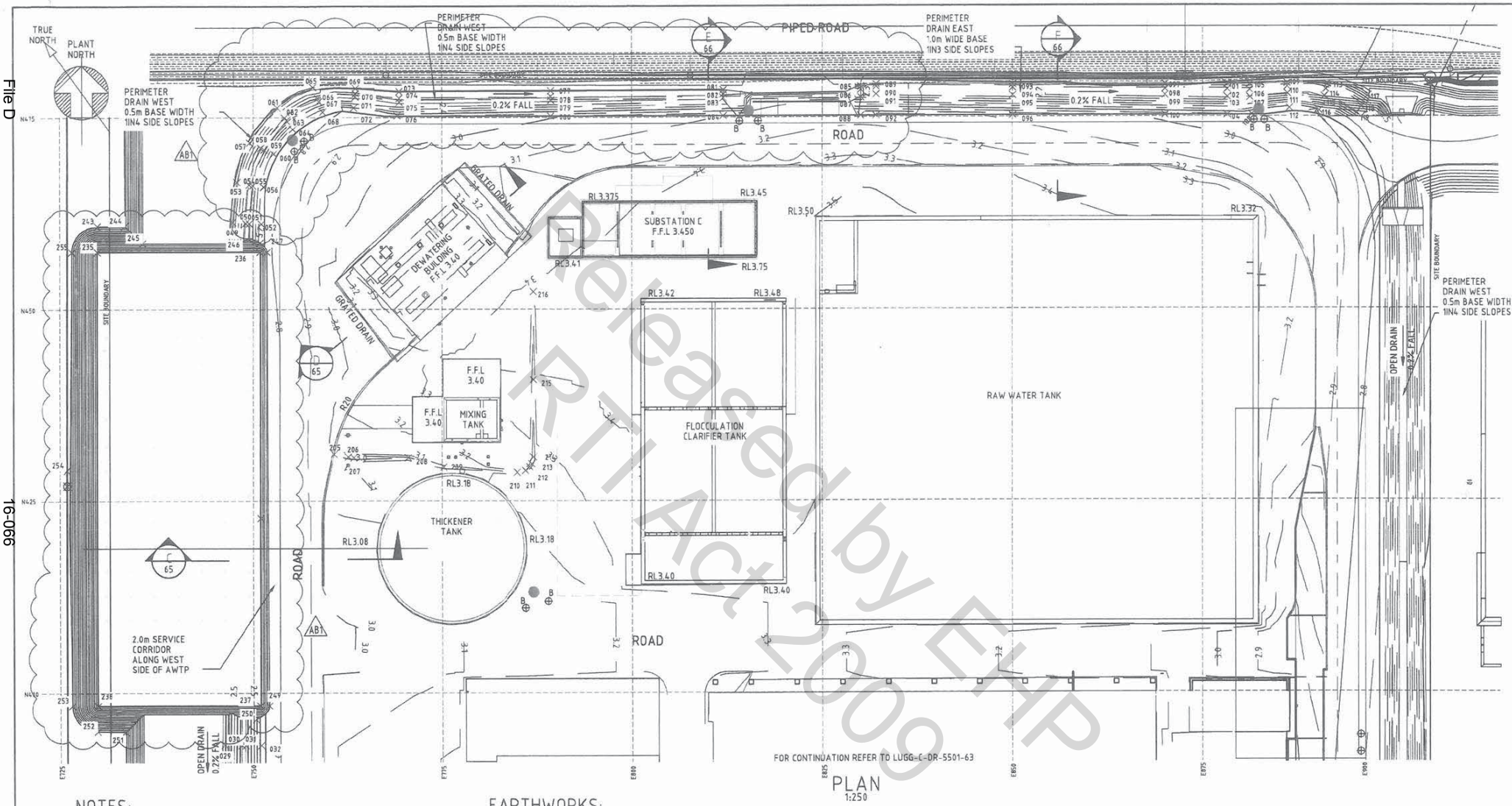

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NOTES:

1. REFER TO LUGG-C-DR-5501-60 FOR LOCALITY PLAN AND LEGEND.
2. REFER TO LUGG-C-5501-61 FOR GENERAL NOTES.
3. CONSTRUCTOR TO MAKE THEMSELVES AWARE OF ALL EXISTING AND PROPOSED UNDERGROUND SERVICES. FOR FURTHER INFORMATION REFER TO THE FOLLOWING DWGS:
   -LUGG-C-DR-5501-20, 21 AND 23 FOR UNDERGROUND SERVICES LAYOUTS
   -LUGG-C-DR-5501-70,71 AND 73 FOR STORM WATER SERVICES LAYOUTS
   -LUGG-C-DR-5501-01 TO 15 FOR SANITARY DRAINAGE AND RISING MAIN
   -LUGG-C-DR-5501-50 FOR ROC PIPELINE
   -LUGG-C-DR-5500-63 FOR RAW WATER PIPELINE

EARTHWORKS:

4. ROAD TO BE GRADED IN ACCORDANCE WITH CONTOURS, RLs AND SET-OUT POINTS SHOWN.
5. REFER TO LUGG-C-DR-5501-69 FOR EARTHWORKS SET-OUT POINTS.
6. REFER TO LUGG-C-DR-5501-81, 82, 83 AND 84 FOR PAVEMENT LAYOUT AND POINTS.
7. REFER TO LUGG-C-DR-5501-87 FOR DETAILS.
8. REFER TO LUGG-C-DR-5501-01, 02 FOR SET-OUT POINTS FOR FIRE HYDRANTS.

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FOR CONSTRUCTION

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CAD FILE	.
REF. FILES	.
PLOT SCALE	.
SCALE USED	1:250
CONSULTANT	.

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REV	DATE	DESCRIPTION	DRN	CHKD	ENG	APP
AB1	01-04-09	REISSUED FOR CONSTRUCTION	CW			
AB0	11-12-08	AS BUILT	CD	DT	DT	MD
2	14-05-08	RFI 667	MLP	DT	DT	MD
1	14-12-07	AS SHOWN	MLP	DT	DT	MB
0	14-11-07	ISSUED FOR CONSTRUCTION	MLP	DB	SC	MRD

REVISIONS

	NAME	DATE
DESIGNED BY	A.Tadman	20-11-07
DRAWN BY	M.Palin	20-11-07
CHECKED BY	D.Berry	20-11-07
LEAD DISC. ENGR.	S.Clarke	20-11-07
APPROVED	M.Duvendack	21-11-07
OWNER APPROVED		

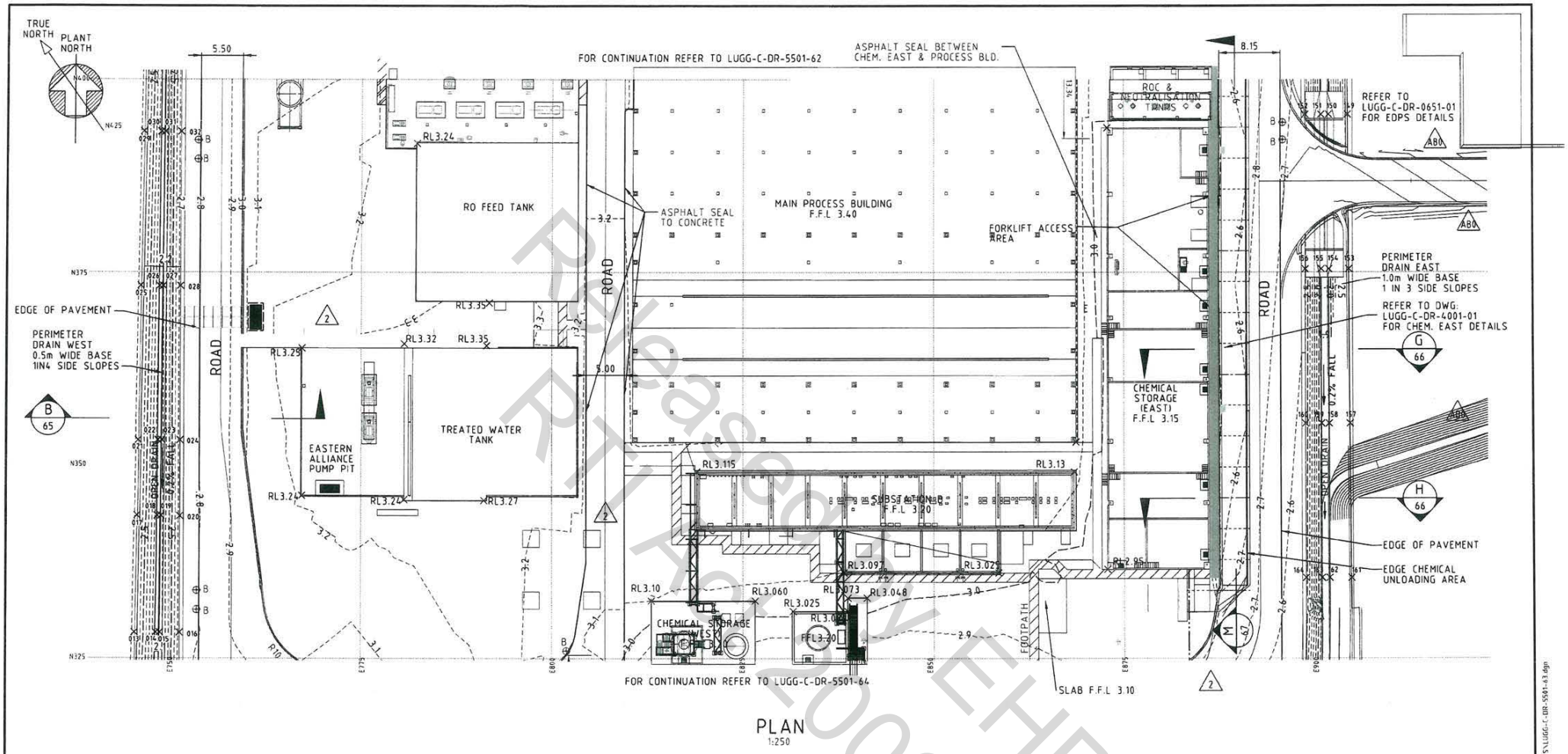
WESTERN CORRIDOR RECYCLED WATER PROJECT

LUGGAGE POINT AWTP

TITLE:
EARTHWORKS, ROADWORKS AND DRAINAGE LAYOUT AND LEVEL PLAN SHEET 1 OF 3

DRAWING NO. LUGG-C-DR-5501-62
REV. AB1

File D
16-066
38 of 52



PLAN
1:250

Released for EHP RFI Approval 2009

NOTES:

1. REFER TO LUGG-C-DR-550-60 FOR LOCALITY PLAN AND LEGEND.
2. REFER TO LUGG-C-5501-61 FOR GENERAL NOTES.
3. CONSTRUCTOR TO MAKE THEMSELVES AWARE OF ALL EXISTING AND PROPOSED UNDERGROUND SERVICES. FOR FURTHER INFORMATION REFER TO THE FOLLOWING DWGS:
   -LUGG-C-DR-5501-20, 21 AND 23 FOR UNDERGROUND SERVICES LAYOUTS
   -LUGG-C-DR-5501-70,71 AND 73 FOR STORM WATER SERVICES LAYOUTS
   -LUGG-C-DR-5501-01 TO 15 FOR SANITARY DRAINAGE AND RISING MAIN
   -LUGG-C-DR-5501-50 FOR ROC PIPELINE
   -LUGG-C-DR-5500-63 FOR RAW WATER PIPELINE

EARTHWORKS:

4. ROAD TO BE GRADED IN ACCORDANCE WITH CONTOURS, RLs AND SET-OUT POINTS SHOWN.
5. REFER TO LUGG-C-DR-5501-69 FOR EARTHWORKS SET-OUT POINTS.
6. REFER TO LUGG-C-DR-5501-81, 82, 83 AND 84 FOR PAVEMENT LAYOUT AND POINTS.
7. REFER TO LUGG-C-DR-5501-87 FOR DETAILS.
8. REFER TO LUGG-C-DR-5501-01, 02 FOR SET-OUT POINTS FOR FIRE HYDRANTS.

0 5 10 15 20 25
SCALE IN METERS
1:250

AS BUILT

A1	
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REF. FILES	.
PLOT SCALE	.
SCALE USED	1:250
CONSULTANT	.

DRAWING NO. | TITLE
REFERENCE DRAWINGS

LUGGAGE POINT ALLIANCE

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REV	DATE	DESCRIPTION	DRN	CHKD	ENG	APP
AB0	11.12.08	AS BUILT	BF			
1	13-12-07	AS SHOWN	MLP	DGT	DGT	MRD
0	16-11-07	ISSUED FOR CONSTRUCTION	MLP	DB	SC	MRD

REVISIONS

	NAME	DATE
DESIGNED BY	A.Tadman	20-11-07
DRAWN BY	M.Palin	20-11-07
CHECKED BY	D.Berry	20-11-07
LEAD DISC. ENGR.	S.Clarke	20-11-07
APPROVED	M.Duvendack	21-11-07
OWNER APPROVED	.	.
	.	.
	.	.

WESTERN CORRIDOR RECYCLED WATER PROJECT
LUGGAGE POINT

LUGGAGE POINT AWTP

TITLE:
EARTHWORKS, ROADWORKS AND DRAINAGE LAYOUT AND LEVEL PLAN SHEET 2 OF 3

DRAWING NO. LUGG-C-DR-5501-63 | REV. AB0

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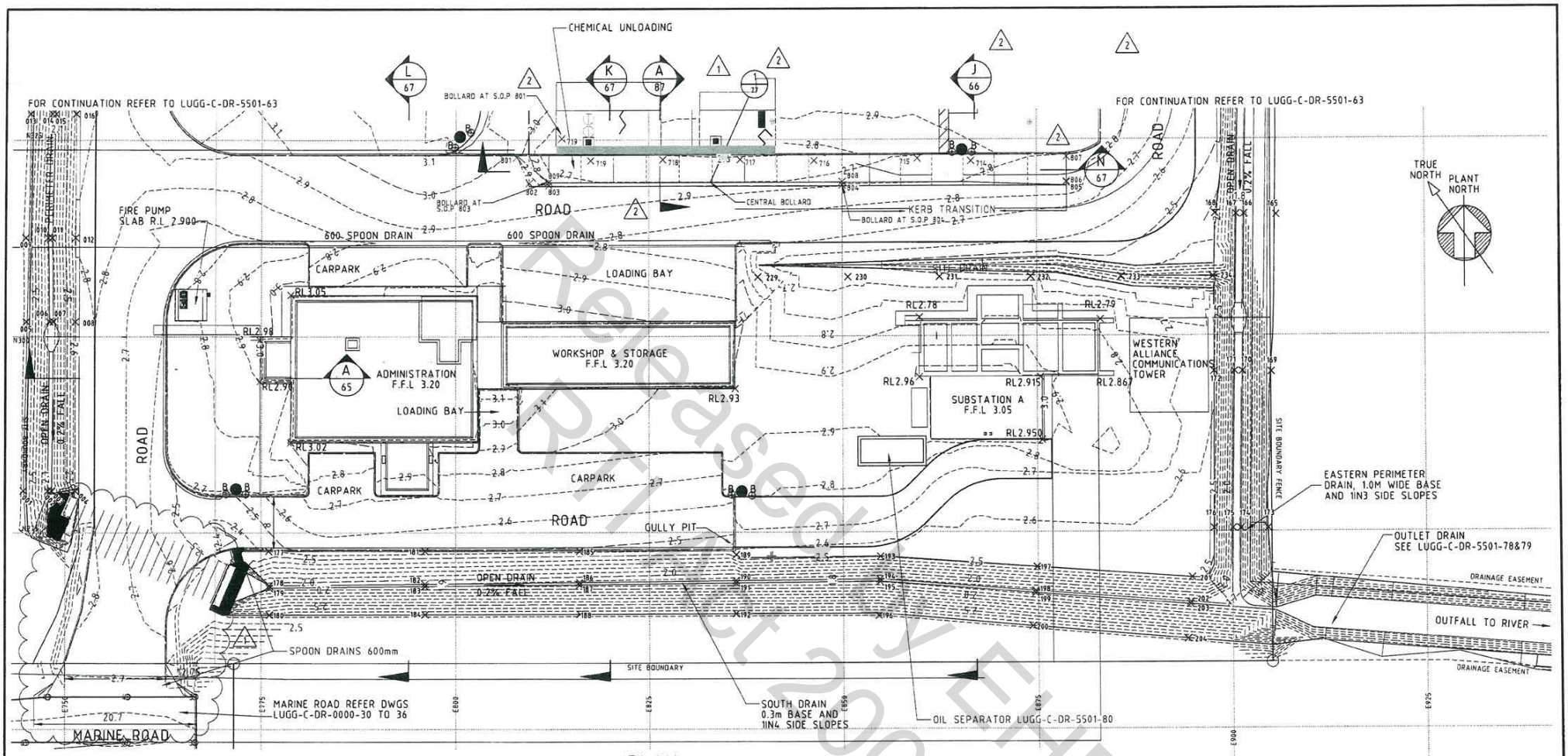

PLAN
1:250

Released for EHP RPI Act 2009

NOTES:

1. REFER TO LUGG-C-DR-5501-60 FOR LOCALITY PLAN AND LEGEND.
2. REFER TO LUGG-C-5501-61 FOR GENERAL NOTES.
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   -LUGG-C-DR-5501-70,71 AND 73 FOR STORM WATER SERVICES LAYOUTS
   -LUGG-C-DR-5501-01 TO 15 FOR SANITARY DRAINAGE AND RISING MAIN
   -LUGG-C-DR-5501-50 FOR ROC PIPELINE
   -LUGG-C-DR-5500-63 FOR RAW WATER PIPELINE

EARTHWORKS:

4. ROAD TO BE GRADED IN ACCORDANCE WITH CONTOURS, RLs AND SET-OUT POINTS SHOWN.
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7. REFER TO LUGG-C-DR-5501-87 FOR DETAILS.
8. REFER TO LUGG-C-DR-5901-01, 02 FOR SET-OUT POINTS FOR FIRE HYDRANTS.

= EXPANSION JOINT
..... = CONTRACTION JOINTS AT 4m CEVTERS

0 5 10 15 20 25
SCALE IN METERS 1:250

AS BUILT

A1	
CAD FILE	-
REF. FILES	-
PLOT SCALE	-
SCALE USED	1:250
CONSULTANT	-

DRAWING NO. | TITLE
REFERENCE DRAWINGS

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REV	DATE	DESCRIPTION	DRN	CHKD	ENG	APP
AB0	10.12.08	AS BUILT	BF	-	-	-
2	14-05-08	AS SHOWN	MLP	DB	DGT	MRD
1	13-12-07	AS SHOWN	MLP	DGT	DGT	MRD
0	16-11-07	ISSUED FOR CONSTRUCTION	MLP	DB	SC	MRD

REVISIONS

DESIGNED BY	A.Tadman	20-11-07
DRAWN BY	M.Palin	20-11-07
CHECKED BY	D.Berry	20-11-07
LEAD DISC. ENGR.	S.Clarke	20-11-07
APPROVED	M.Duvendack	21-11-07
OWNER APPROVED	-	-
	-	-
	-	-
	NAME	DATE

WESTERN CORRIDOR RECYCLED WATER PROJECT LUGGAGE POINT

LUGGAGE POINT AWTP

TITLE:
EARTHWORK, ROADWORKS AND DRAINAGE LAYOUT AND LEVEL PLAN SHEET 3 OF 3

DRAWING NO. LUGG-C-DR-5501-64 | REV. AB0

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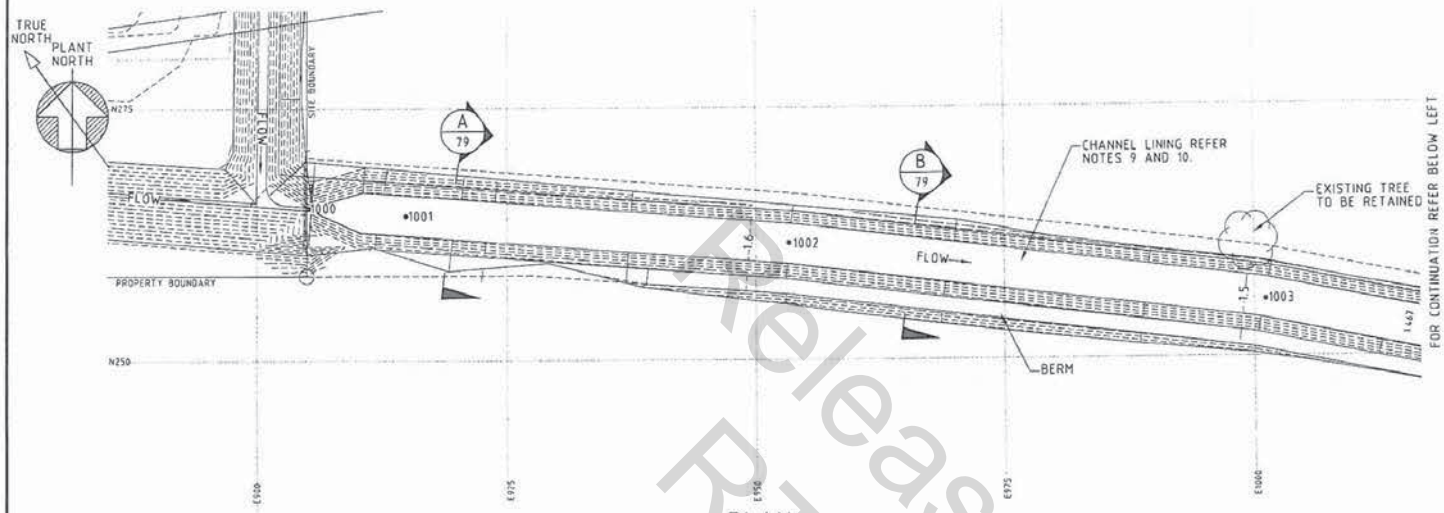
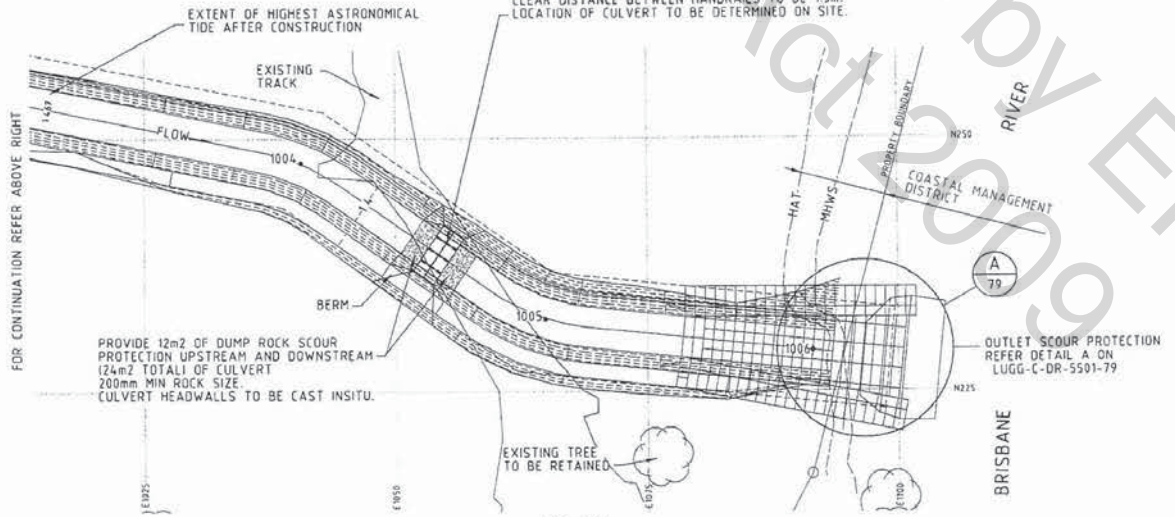
40 of 52



PLAN
1:250

CONSTRUCT 4OFF 1200x450 R.C.B.C (SALT WATER COVER) ON PRECAST BASE SLABS.
CAST A 2.0m WIDE 100mm THICK SLAB ON TOP OF CELLS
ERECT HANDRAIL TO BCC STD DRG UMS241 WITH BASEPLATE FIXING.
CLEAR DISTANCE BETWEEN HANDRAILS TO BE 1.5m.
LOCATION OF CULVERT TO BE DETERMINED ON SITE.



PLAN
1:250

NOTES:

1. ALL LEVELS TO A.H.D UNLESS NOTED OTHERWISE.
2. REFER TO LUGG-C-DR-5501-60 FOR GENERAL CIVIL NOTES.
3. MATTRESSES SHALL BE MACCAFERRI 300 THICK CASTORO RENO MATTRESSES WITH GALMAC COATING AND PVC SLEEVE (OR APPROVED EQUIVALENT).
4. GABIONS SHALL BE MACCAFERRI 2.0x1.0x1.0 AND 2.0x1.0x0.5 WITH GALMAC COATING AND PVC SLEEVE (OR APPROVED EQUIVALENT).
5. GABIONS AND MATTRESSES SHALL BE CONSTRUCTED FOLLOWING PUBLISHED MACCAFERRI (OR APPROVED EQUIVALENT) SITE INSTRUCTIONS FOR ASSEMBLY AND ERECTION OF GABIONS AND MATTRESSES"
6. MATTRESSES AND GABIONS SHALL BE FILLED WITH DURABLE STONE, RESISTANT TO WEATHERING WITH A SPECIFIC GRAVITY NOT LESS THAN 2400kg/m3
7. ROCK SIZE SHALL BE 70-120mm WITHIN MATTRESSES (d50=95mm).
8. ROCK SIZE SHALL BE 100-200mm WITHIN GABIONS (d50=150mm).
9. CHANNEL SHALL BE LINED WITH 150mm DIAMETER ROCK IN TWO LAYERS WITH BID 424 ED TEXTILE AT ROCK AND SOIL INTERFACE
10. CHANNEL SHALL BE TOPSOILED AND VEGETATED WITH SALT TOLERANT GRASS AFTER THE COMMISSIONING PERIOD HAS BEEN COMPLETED.
11. GEOTEXTILE SHALL BE INSTALLED AT ALL MATTRESS/GABION MESH AND SOIL INTERFACES.
12. GEOTEXTILE SHALL BE MACCAFERRI (NON WOVEN) GEOMAC 270 (OR APPROVED EQUIVALENT).
13. TIDAL LEVELS OBTAINED FROM SEMIDIURNAL TIDAL PLANES 2007 FOR BRISBANE BAR STATION.
14. REFER TO LUGG-C-TS-0005-01 FOR DRAINAGE INFRASTRUCTURE SPECIFICATION

DESIGN CRITERIA:

Commissioning and proving period flow from AWTP (822l/s - 120 day duration) plus coincidental Q2 ARI event from site & surrounding catchment (6391l/s) contained in channel.

10yr ARI runoff from site and surrounding catchment following commissioning period (1064 l/s) contained in channel.

Design velocity in channel = 0.69 m/s

Outlet structure to be fenced off during commissioning period for public safety.

Adopted mannings 'n' for channel = 0.031 (from Maccaferri design software, EnkaGreen V2.01).

POINT NUMBER	EASTING	NORTHING	R.L
1000	905.600	265.06	1.688
1001	910.515	264.680	1.678
1002	953.625	261.500	1.592
1003	1000.300	255.900	1.498
1004	1040.600	247.500	1.415
1005	1064.300	232.500	1.360
1006	1093.463	228.782	1.300

OUTLET DRAIN SETOUT SERVICE

AS BUILT

0 5 10 15 20 25
SCALE IN METERS 1:250

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A1	
CAD FILE	
REF FILES	
PLOT SCALE	1
SCALE USED	1:250
CONSULTANT	

DRAWING NO. | TITLE
REFERENCE DRAWINGS

LUGGAGE POINT ALLIANCE

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REV	DATE	DESCRIPTION	DRN	CHKD	ENG	APP
AB0	11-12-08	AS BUILT	KD			
2	06-03-08	EXTENSION TO OUTLET - RFI 478	ALG	DGT	DGT	MRD
1	13-12-07	AS SHOWN	ALG	DGT	DGT	MRD
0	2-11-07	ISSUED FOR CONSTRUCTION	MLP	DB	SC	MRD

REVISIONS

DESIGNED BY	A.McCreadth	2-11-07
DRAWN BY	M.Palin	2-11-07
CHECKED BY	D.Berry	2-11-07
LEAD DISC. ENGR.	S.Clarke	2-11-07
APPROVED	M.Duvendack	5-11-07
OWNER APPROVED		

NAME | DATE

WESTERN CORRIDOR RECYCLED WATER PROJECT
LUGGAGE POINT

LUGGAGE POINT AWTP

TITLE
INTERNAL ROADWORKS and DRAINAGE STORMWATER OUTLET LAYOUT PLAN

DRAWING NO LUGG-C-DR-5501-78 | REV. AB0

19/01/2009 10:12:24 AM \\BRIDATA1\Projects\VEHLOBRA\324299\CADVC\Drawings\AS-Built\S\LUGG-C-DR-5501-78.dgn
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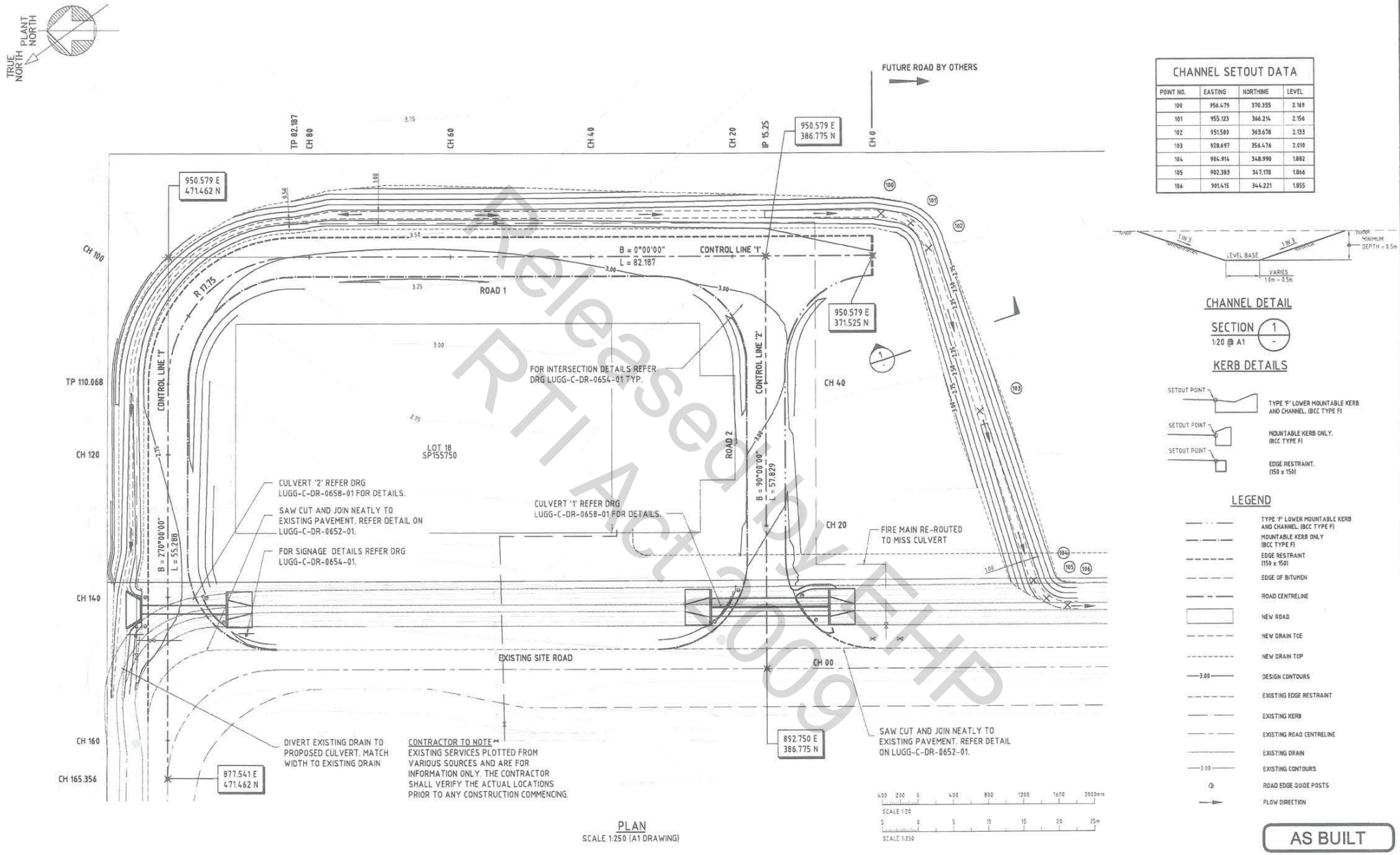
16-066
41 of 52



PLAN
SCALE 1:250 (A1 DRAWING)

SCALE 1:20
SCALE 1:250

CHANNEL SETOUT DATA			
POINT NO.	EASTING	NORTHING	LEVEL
100	956.479	370.355	2.169
101	955.123	366.214	2.156
102	951.580	363.678	2.133
103	928.697	356.476	2.010
104	906.914	348.990	1.882
105	902.383	347.178	1.866
106	901.415	344.221	1.855

CHANNEL DETAIL
SECTION 1
1:20 @ A1

KERB DETAILS

TYPE 'F' LOWER MOUNTABLE KERB AND CHANNEL. (BCC TYPE F)
MOUNTABLE KERB ONLY. (BCC TYPE F)
EDGE RESTRAINT. (150 x 150)

LEGEND

- TYPE 'F' LOWER MOUNTABLE KERB AND CHANNEL. (BCC TYPE F)
- MOUNTABLE KERB ONLY (BCC TYPE F)
- EDGE RESTRAINT (150 x 150)
- EDGE OF BITUMEN
- ROAD CENTRELINE
- NEW ROAD
- NEW DRAIN TOE
- NEW DRAIN TOP
- DESIGN CONTOURS
- EXISTING EDGE RESTRAINT
- EXISTING KERB
- EXISTING ROAD CENTRELINE
- EXISTING DRAIN
- EXISTING CONTOURS
- ROAD EDGE QUIDE POSTS
- FLOW DIRECTION

AS BUILT

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A1	
CAD FILE	
REF. FILES	
PLOT SCALE	
SCALE USED	
CONSULTANT	

DRAWING NO. | TITLE
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REV	DATE	DESCRIPTION	DRN	CHKD	ENG	APP
AB0	07.04.09	AS BUILT	SMW	-	DGT	RP
0	17.07.08	FOR CONSTRUCTION	SR	AT		

REVISIONS

DESIGNED BY	S.ROGERS	17.07.08
DRAWN BY	S.ROGERS	17.07.08
CHECKED BY	A.TADMAN	17.07.08
LEAD DISC. ENGR.	D.THOMAS	23.07.08
APPROVED	R.PALMER	23.07.08
OWNER APPROVED		
	NAME	DATE

WESTERN CORRIDOR
RECYCLED WATER PROJECT
LUGGAGE POINT

LUGGAGE POINT AWTP

TITLE:
EARTHWORKS, ROADWORKS AND DRAINAGE
ROADWORKS AND DRAINAGE PLAN

DRAWING NO. LUGG-C-DR-0653-01
REV. AB0

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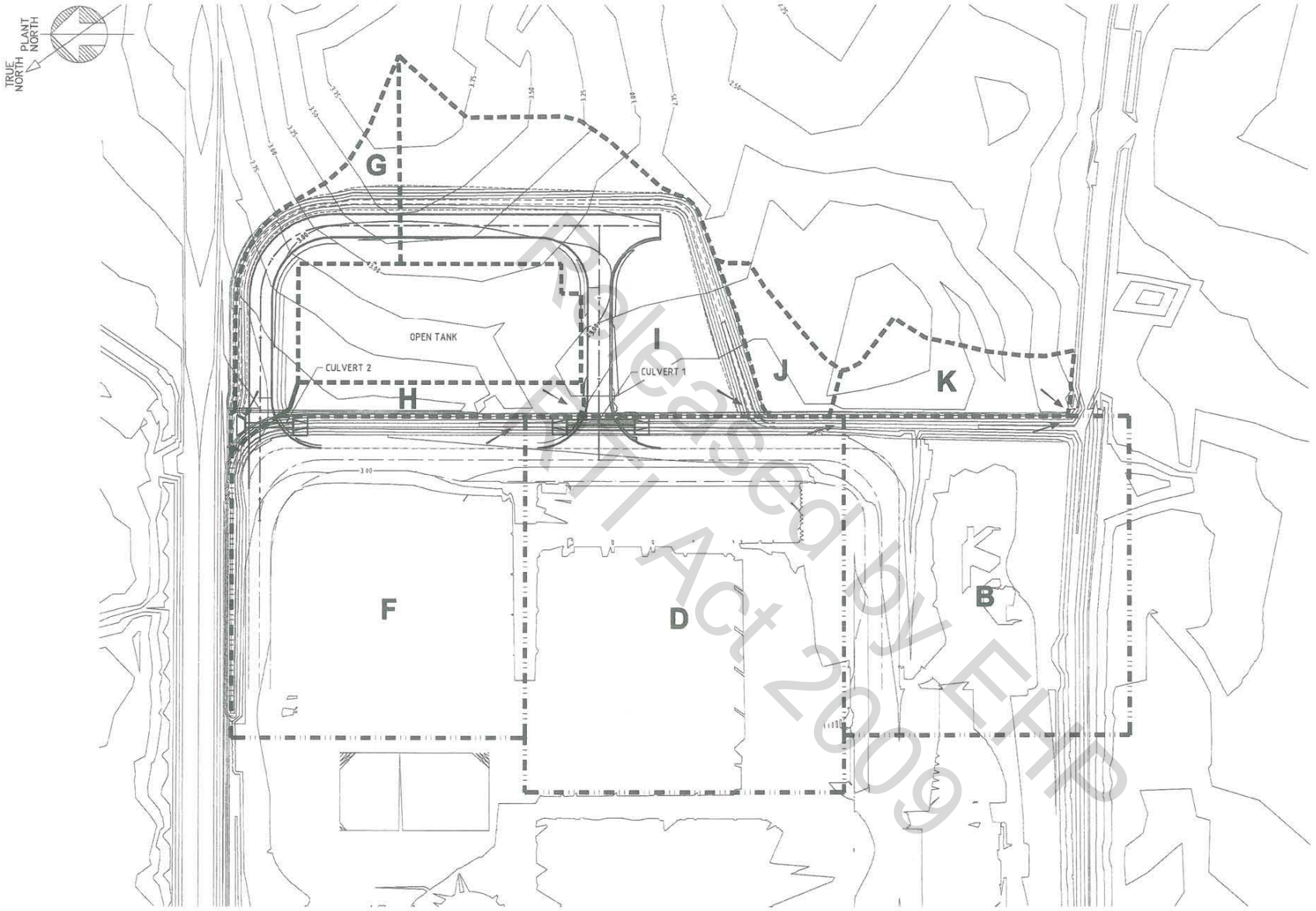
RTI Act 2009

Appendix B
EDPS Catchment Plan

File D
16-066
43 of 52



CATCHMENT NO.	AREA (m²)
B	5622
D	7391
F	5183
G	1497
H	607
I	4056
J	580
K	1000

LEGEND

EXISTING CATCHMENT

PROPOSED CATCHMENT

PROPOSED CATCHMENT

SCALE
SCALE 1:500 @ A1

AS BUILT

10 0 10 20 30 40 50m
SCALE 1:500

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RTI Act 2009

A1	
LEAD FILE	
REF. FILES	
PLOT SCALE	
SCALE USED	
CONSULTANT	

DRAWING NO. | TITLE
REFERENCE DRAWINGS

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REV	DATE	DESCRIPTION	DRN	CHKD	ENG	APP
AB0	07.04.09	AS BUILT	SHW	-	DGT	RP
0	17.07.08	FOR CONSTRUCTION	SR	AT		

REVISIONS

	NAME	DATE
DESIGNED BY	B.BREEN	17.07.08
DRAWN BY	S.ROGERS	17.07.08
CHECKED BY	A.TADMAN	17.07.08
LEAD DISC. ENGR.	D.THOMAS	22.07.08
APPROVED	R.PALMER	23.07.08
OWNER APPROVED		

WESTERN CORRIDOR
RECYCLED WATER PROJECT
LUGGAGE POINT

LUGGAGE POINT AWTP

TITLE:
EARTHWORKS, ROADWORKS AND DRAINAGE
STORMWATER DRAINAGE - CATCHMENT PLAN

DRAWING NO. LUGG-C-DR-0657-01

REV. AB0

I:\EA\ZB0\jb0\5.0 P:\SMP\Work\128755-Western Corridor Luggage Point\1688-13 Raw Water Capacity Increase\CAD\DRAWINGS\NEW ROAD\LUGG-C-DR-0657-01.dwg PAGE: A-1 TITLE: PM_ATHEW A-1 P ROADS LOGIN NAME: : address:

14 October 2010

Kerynne Birch
Department of Environment and Resource Management
Level 4, Landcentre
Cnr Main and Vulture Streets
Woolloongabba QLD 4102

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RTI Act 2009

Dear Ms Birch,

Subject: Luggage Point Stormwater Infrastructure Compliance

Please find the enclosed memo which contains information on the existing Stormwater Infrastructure at Luggage Point Advanced Water Treatment Plant (LPAWTP) from expertise in stormwater management and drainage issues. It follows from an independent review of the stormwater infrastructure for compliance against commitments made to the Department of Environment and Resource Management (DERM) in the Stormwater Management Plan (SMP) submitted as part of the erstwhile Environmentally Relevant Activity 16 (presently Environmentally Relevant Activity 64(4)(b).

Please provide a response on review of the as-built stormwater infrastructure differences between the Stormwater Management Plan and the as-built infrastructure, to meet the relevant guidelines and policies.

Should you have any further queries regarding the responses to the report, please contact Tom Talbot on 07 3358 9603.

Yours sincerely

udice the protection of an individuals

Tom Talbot
Alliance Manager
Western Corridor Recycled Water Project - Luggage Point Alliance
Phone: 3358 9603

Encls: LUGG-C-ME-5592-01- Stormwater Infrastructure Compliance Review

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MEMORANDUM

TO	Department of Environment and Resource Management		
COMPANY	Luggage Point AWTP Alliance	FAX NUMBER	
DATE	13 October 2010	NO. OF PAGES	7
FROM	David Thomas	JOB NUMBER	
SUBJECT	Stormwater Infrastructure Compliance Review		

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1 Introduction

This memorandum presents a review of the as-built stormwater infrastructure at the Luggage Point Advanced Water Treatment Plant. It follows from an independent review of the stormwater infrastructure for compliance against commitments made to the Department of Environment and Resource Management (DERM) in the Stormwater Management Plan (SMP) submitted as part of the erstwhile Environmentally Relevant Activity 16 (presently Environmentally Relevant Activity 64(4)(b)) Application for the project, and other relevant guidelines and policies.

The items identified in the independent review, and a description of the affect of the deviation from the original SMP are included in Table 1.

2 Stormwater infrastructure capacity

A review of the As-Built stormwater infrastructure capacity has been undertaken, and the design capacity in accordance with the SMP, Queensland Urban Design Guidelines and project Scope of Work and Technical Criteria has been achieved.

3 Review of differences between the As-Built Luggage Point AWTP stormwater infrastructure and the Stormwater Management Plan Revision B.

The independent review of the as-built stormwater infrastructure identified several differences between the Stormwater Management Plan and the as-built infrastructure. These differences are presented in Table 1. It is the opinion of the Luggage Point Alliance that items 1, 2, and 4 identified in the independent review, are minor items where the as-built infrastructure deviates from the original design intent at the time of submitting the SMP, but the intent of the original design has been retained, and the level of environmental protection has been retained or exceeded.

Items 3 and 5, however, need more detailed discussion. These two items are discussed and presented herein for the consideration of the DERM.

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Table 1 – Identified Deviations form the original Stormwater Management Plan.

Sr. No.	Commitment in SMP	Identified 'As-Built' Deviation	Affect of Deviation
1	Provision of speed humps on the entrance and exit from the chemical unloading areas.	There are no speed humps on the entrance and exit from the chemical unloading areas. Spoon drains (dips in the road) are in place to slow trucks down and allow drainage of surface water to truck bund.	The SMP makes a commitment to isolate the chemical delivery area drainage system from the site drainage and provide storage in this area for environmental protection in the event of a chemical spill. The SMP notes that speed humps will be provided to achieve the isolated storage volume. During the detailed design, it was found that the required isolated storage volume could be provided without installing speed humps and they were therefore not installed. It is considered that the level of environmental protection is unchanged and the intent of the commitment in the SMP is retained.
2	Three trash racks proposed in the perimeter swale and the surrounding buffer strip will remove gross pollutants.	Two trash racks are installed - one at the Eastern Drain and one at the box culvert of stormwater channel (main PRW discharge point).	Three trash racks were noted in Revision B of the Stormwater Management Plan to provide coverage of the entire site catchment: One rack to cover the western portion of the site, one to cover the eastern portion of the site, and one for the southern portion of the site. During detailed design, however, the CDS unit which treats run-off from the Southern part of the site was specified with a built in trash basket. This CDS unit acts as a trash rack as well as a hydrocarbon trap. The purchase and installation of this CDS

File D

Sr. No.	Commitment in SMP	Identified 'As-Built' Deviation	Affect of Deviation
			unit made the trash rack for the southern portion of the site redundant. It was therefore removed from the detailed design with no reduction in the level of environmental protection.
3	The Stormwater Channel beyond the LPAWTP boundary will be vegetated with salt tolerant grasses or plants such as salt water couch once the commissioning and proving periods are completed.	The Stormwater Channel beyond the LPAWTP boundary is not vegetated with salt tolerant grasses or plants such as salt water couch.	Refer to detailed assessment in Section 4 below
4	The current alignment of Marine Road will be moved to allow construction of the LPAWTP. When relocation of this road is complete, a new swale will run parallel to the north of the road and discharge into the open stormwater channel that also collects stormwater from the internal drainage network.	The drain is on the south side of Marine Rd and does not discharge to the open stormwater channel. An Energex easement for 33kV powerline prevented drain to be installed on north side.	During construction the invert level of the mian site perimeter drain was raised by approximately 150mm due to a 66kVA underground power main installed higher than nominated in the design. The raising of this drain meant that the Marine road drainage channel could not connect to the outfall channel without reducing upstream flood protection along Marine Road. The Marine Road drainage was therefore maintained in it's original alignment running along the southern side of the road and discharging directly to the Brisbane River as per the pre-development case. The retention of the pre-existing hydrological regime is considered to have no adverse environmental impact.
5	Establishment of Vegetated swales and Bio-retention as per the SMP.	The following are identified deviations: - The layout of the	1 - As a result of the construction of an additional storage tank (EDPS tank) on the eastern edge of the site, the proposed vegetated swale at the north-east corner of the site could not be

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Sr. No.	Commitment in SMP	Identified 'As-Built' Deviation	Affect of Deviation
		vegetated swales have been modified. - Bioretention has not been established in any part of the Stormwater infrastructure.	installed. The vegetated swales throughout the site were revised as part of the EDPS design to maintain the same level of nutrient and particle removal. The DERM was notified of this change with the resubmittal of the SMP for the EDPS project expansion. 2. Bioretention trenches were not installed at the site as intended in the original design, and detailed in the SMP. The primary reason they were not installed, was because the 66kVA main power feeder to the plant was installed at a higher level than intended. As a consequence of this higher cable installation the drainage channel upstream was widened to retain the channel flow capacity leading to the loss of space for bioretention trenches. The impact of this change is discussed in Section 5 below.

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4 External Drainage Channel.

The original design for the Luggage Point AWTP drainage system included a grassed swale to convey rainfall runoff from the site boundary to the Brisbane River. This grassed swale was also intended to provide a degree of stormwater treatment system (WSUD) providing nutrient and suspended solids removal during rainfall events. It is important to note, however, that the stormwater quality treatment requirements of Brisbane City Council were incorporated into the internal drainage system, and the additional 'polishing' provided by the external drainage channel was over and above that required to meet the BCC stormwater quality objectives for the site.

During the AWTP commissioning and proving periods this swale was used to convey treated water to the Brisbane River. It was identified during design, that the external drainage channel should not be vegetated until the commissioning and proving periods were complete as any vegetation would be unlikely to survive three months of continuous inundation with commissioning and proving flows. In lieu of vegetation, the outfall channel was rock lined to prevent erosion and subsequent sediment loading into the Brisbane River. This rock lining served its purpose very well, and low turbidity water was discharged to the Brisbane river throughout the commissioning and proving periods.

At completion of the proving period the design intention was to remove the rock lining and vegetate the channel. However, Watersecure, has advised that they would like to retain the ability to use the external outfall channel for future re-commissioning and proving of the AWTP should the need arise in future. To accommodate this request, the design intent of the external stormwater channel has been amended as follows:

- It is proposed to leave the rock lining in place. The rock lining has proven to protect the outfall channel from erosion during the proving period. It is feared that if the rock lining is removed, and the channel vegetated, there is a risk of vegetation death and subsequent soil erosion during prolonged use of the channel for commissioning flows in future.

- Despite not turfing or seeding the outfall channel, a significant amount of self vegetation has occurred during the proving period, and the outfall channel now contains wetland grasses which have proven to be suitable for continuous inundation. It is proposed to leave the self seeded grasses in place, and not to seed the outfall channel with introduced grasses which may die off during future inundation.

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In summary the outfall channel has proven to be effective in preventing erosion and it has self vegetated with wetland type grasses. It is proposed to leave the channel in this state and be confident that it will operate effectively as both a grassed swale for stormwater discharge from the site, and also operate as a treated water outfall channel in future if required. The Alliance believe that this approach retains the design intent and level of environmental protection provided by the outfall channel.

5 Internal vegetated swales and bio-retention trenches.

During the design phase, the site stormwater infrastructure was designed in accordance with Water Sensitive Urban Design (WSUD) principals to minimise hard piping and utilise WSUD drainage components wherever practical. The design was modelled using MUSIC, and nutrient and suspended solids reduction modelled for compliance with the BCC stormwater quality objectives.

While the majority of the stormwater quality treatment systems were implemented, several amendments to the drainage infrastructure were necessary during construction as detailed below:

- Bioretention trenches - Several bioretention trenches could not be constructed due to additional in-ground piping added to the project after the original stormwater design was completed.

- Vegetated swale - A section of the main stormwater vegetated swale from the treated water tank to the site boundary was lined with polyethylene sheeting during the construction phase to enable the channel to be used to convey treated water during the commissioning and proving periods. To accommodate Watersecure's requirement to use this channel for future re-commissioning and proving of the plant, it is proposed to retain this polyethylene lining.

The net effect of the above two changes is a reduction in the level of nutrient removal from rainfall runoff within the site, such that the nutrient removal levels at the site boundary are to slightly below the BCC WSUD nutrient reduction objectives.

If the additional nutrient removal provided by the external drainage channel discussed above is considered, then the nutrient reduction targets are achieved prior to the Brisbane River discharge. This wholistic view of the drainage infrastructure, including the external drainage channel is considered to be appropriate for the Luggage Point AWTP, as the land downstream of the site is within the Brisbane River floodplain, and not available for future development.

6 Summary

In summary, six deviations from the original design intent detailed in the ERA 16 application have been identified. It is the Alliances opinion that five of these deviations are minor deviations which have not reduced the level of environmental protection provided and no physical modifications should be undertaken.

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Review of the sixth identified deviation suggests that the amount of nutrient removal provided within the site boundary has been reduced during construction, however if both the internal and external drainage infrastructure are considered, it is the Alliance's opinion that the level of nutrient removal and environmental protection provided to the Brisbane River and Moreton Bay can be retained with the following changes to the original SMP:

1. The external drainage channel should be retained in its as-constructed form complete with rock lining and naturally seeded native vegetation.
2. The internal drainage swale between the treated water tank and the site boundary should be retained with polyethylene lining to enable future use of the channel for treated water conveyance.
3. Both the internal and external drainage infrastructure should be assessed as a complete system providing nutrient and suspended solids removal prior to the discharge to the Brisbane River.

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