APPENDIX B4

Soil and Water Management Sub Plan

The Northern Road Upgrade - Stage 3 North Project

MARCH 2017

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Glossary / Abbreviations

AWS	Automatic Weather Station
BOM	Bureau of Meteorology
CEMP	Construction Environmental Management Plan
DPI	Department of Primary Industries (Fishing and Aquaculture)
EEC	Endangered Ecological Community
EPA	Environment Protection Authority
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPL	Environmental Protection Licence
EWMS	Environmental Work Method Statements
FM Act	*Fisheries Management Act 1994*
NOW	NSW Office of Water
OEH	Office of Environment and Heritage
PESCP	Progressive Erosion and Sediment Control Plan
REF	Review of Environmental Factors
RMS	Roads and Maritime Services
RUSLE	Revised Universal Soil Loss Equitation
SWMP	Soil and Water Management Plan

1 Introduction

1.1 Context

This Soil and Water Management Sub Plan (SWMP or Plan) forms part of the Construction Environmental Management Plan (CEMP) for The Northern Road Upgrade - Stage 3 North Project (the Project).

This SWMP has been prepared to address the requirements of the Review of Environmental Factors (REF), and all applicable legislation.

1.2 Background

The REF assessed the impacts of construction and operation of the Project on soils and water, within Section 6.7 and Appendix H.

As part of REF development, a detailed flooding and water quality assessment was prepared. The flooding and water quality assessment was included in the REF as Appendix G.

The REF identified the potential for direct and indirect impacts on water quality but also provided environmental safeguards to manage those impacts.

1.3 Environmental management systems overview

The overall Environmental Management System for the Project is described in the Construction Environmental Management Plan (CEMP).

The SWMP is part of the Lendlease environmental management framework for the Project, as described in *Section 4.1 of the CEMP*.

Management measures identified in this Plan will be incorporated into site or activity specific Environmental Work Method Statements (EWMS) and Progressive Erosion and Sediment Control Plans (PESCP).

EWMS will be developed and signed off by environment and management representatives prior to associated works and construction personnel will be required to undertake works in accordance with the identified safeguards. For high risk activities, EWMS will be provided to Environmental Review Group (ERG) representatives for input prior to sign off (*refer to Section 4.1.3 of the CEMP*).

PESCPs are designed for use as a practical guide and may be produced in conjunction with EWMS to provide more detailed site-specific environmental mitigation measures. PESCP's will be developed by the Lendlease environment team in consultation with construction personnel and the Project Soil Conservationist, and modified as required when:

- Site conditions evolve
- Flow paths change
- Construction activities that affected the characteristics of ground conditions change.

Used together, the CEMP, strategies, procedures, EWMS and PESCP form management guides that clearly identify required environmental management actions for reference by Lendlease personnel and contractors.

The review and document control processes for this Plan are described in *Section 9 and 10 of the CEMP*.

2 Purpose and objectives

2.1 Purpose

The purpose of this Plan is to describe how Lendlease proposes to manage and protect water quality during construction of the Project.

2.2 Objectives

The key objective of the SWMP is to ensure that impacts on water quality are minimised and within the scope permitted by the REF. To achieve this objective, Lendlease will undertake the following:

- Ensure best management practice controls and procedures are implemented during construction activities to avoid or minimise erosion/sedimentation impacts and potential impacts to water quality in rivers, creeks and groundwater along the Project corridor;
- Ensure appropriate measures are implemented to address the relevant REF Environmental Safeguards outlined in *Table 3.1; and*
- Ensure appropriate measures are implemented to comply with all relevant legislation and other requirements as described in *Section 3.1 of this Plan*.

2.3 Targets

The following targets have been established for the management of soil and water impacts during the Project:

- Ensure full compliance with the REF and relevant legislative requirements;
- Meet EPL water quality discharge parameters for all planned basin discharges (ie those within design capacity);
- Manage downstream water quality impacts attributable to the project (ie maintain waterway health by avoiding the introduction of nutrients, sediment and chemicals outside of that permitted by the EPL and/or ANZECC guidelines); and
- Ensure training on best practice soil and water management is provided to all construction personnel through site inductions.

3 Environmental requirements

3.1 Relevant legislation and guidelines

3.1.1 Legislation

Legislation relevant to soil and water management includes:

- *Environmental Planning and Assessment Act 1979* (EP&A Act);
- Environmental Planning and Assessment Regulation 2000;
- *Protection of the Environment Operations Act 1997;*
- *Water Management Act 2000;*
- *Fisheries Management Act 1994;*
- *Commonwealth Environment Protection and Biodiversity Conservation Act 1999; and*
- *Water Act 1912*.

Relevant provisions of the above legislation are explained in the register of legal and other requirements included in *Appendix A1 of the CEMP*.

3.1.2 Guidelines and standards

The main guidelines, specifications and policy documents relevant to this Plan include:

- Acid Sulfate Soil Manual (ASSMAC 1998);
- Acid Sulfate Soil and Rock – Victorian EPA Publication 655.1 – July 2009;
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ 2000);
- Department of Environment and Conservation (DEC): Bunding & Spill Management. Insert to the Environment Protection Manual for Authorised Officers - Technical section "Bu" November 1997;
- Managing Urban Stormwater: Soils and Construction. Landcom, (4th Edition) March 2004 (reprinted 2006) (the “Blue Book”). Volume 1 and Volume 2;
- Volume 2A Installation of Services (DECCW 2008);
- Volume 2C Unsealed Roads (DECCW 2008);
- Volume 2D Main Roads Construction (DECCW 2008);
- DIPNR Roads and Salinity Guideline, 2003;
- DLWC, 1998. Constructed Wetlands Manual;
- Fairfull, S. and Witheridge, G. (2003) Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings. NSW Fisheries, Cronulla, 16 pp;
- *NSW Fisheries, November 2003. Fishnote – Policy and Guidelines for Fish Friendly* Waterway Crossings (Ref: NSWF – 1181);
- RMS Dewatering Guideline;
- RMS Pacific Highway Practice Note for Dewatering;
- RTA’s Code of Practice for Water Management – Road Development and Management (1999);

- Approved Methods for the Sampling and Analysis of Water Pollutants in NSW – March 2004;
- Guidelines for the Management of Acid Sulphate materials: Acid Sulphate Soils, Acid Sulphate Rock and Monosulphidic Black Ooze (RTA 2005);
- RMS Environment Direction Management of Tannins from Vegetation Mulch;
- Stockpile Site Management Guideline, RMS 2011;
- Environmental Best Management Practice Guideline for Concreting Contractors, DEC, 2004; and
- Waste Classification Guidelines (NSW EPA, 2014).

3.2 REF Environmental Safeguards

The Environmental Safeguards (ES) relevant to this Plan are listed Table 3-1 below. A cross reference is also included to indicate where the condition is addressed in this Plan or other Project management documents.

Table 3-1 Environmental Safeguards relevant to the SWMP

ES No.	Requirements	Document Reference
SW1	*A Soil and Water Management Plan (SWMP) will be prepared and implemented as part of the CEMP. The SWMP will identify all reasonably foreseeable risks relating to soil erosion and water pollution and describe how these risks will be addressed during construction.*	*This Document*
SW2	*A site specific Erosion and Sediment Control Plan/s will be prepared and implemented as part of the Soil and Water Management Plan. The Plan will include arrangements for managing wet weather events, including monitoring of potential high risk events (such as storms) and specific controls and follow-up measures to be applied in the event of wet weather.*	*Appendix F*
SW3	*Soil salinity testing will be carried out prior to construction to further assess these risks and implement appropriate controls.*	*Section 6*
SW4	*A comprehensive field aquatic assessment will be carried out to confirm the findings of the preliminary assessment.*	*Section 6*

ES No.	Requirements	Document Reference
SW5	*Control measures to manage erosion and sedimentation risks will be implemented including:* • *Erosion and sediment controls will be implemented before any construction starts* • *Sediment basins will be regularly serviced and maintained to comply with water quality and capacity requirements* • *Vegetation clearing and site stabilisation of disturbed areas will be undertaken progressively to limit the time that disturbed areas are exposed to erosive forces* • *High risk soil and erosion activities such as earthworks will not be undertaken immediately before or during high rainfall or wind events* • *Topsoil will be stockpiled separately for potential reuse in landscaping and rehabilitation works* • *Permanent catch drains will be installed behind cut faces to act as diversion drains during construction* • *Erosion and sediment control measures will be maintained until the proposal is completely constructed and areas are stabilised by revegetation.*	*Section 6 / appendix F*
SW6	*Control measures to minimise the risk of water pollution will be implemented including:* • *All fuels, chemicals, and liquids will be stored at least 50 metres away from the existing stormwater drainage system and stored in an impervious bunded area* • *within the compound site* • *Plant and maintenance machinery will be refuelled in impervious bunded areas in the designated compound area* • *Vehicle washdowns and/or concrete truck washouts would be undertaken within a designated bunded area of an impervious surface or undertaken off-site.*	*Section 6 / appendix F*

4 Existing environment

The following sections summarise what is known about factors influencing soils and water within and adjacent to the Project corridor.

4.1 Soil

Table 4.1 below identifies the soil units that underlay the works area and the relative soil limitations including the soil erodibility factor (K-factor). The project will also import soil from various quarry sources or other construction projects, specific K-factors for this material will be sought on a case by case basis for use in soil loss equations.

Unit	Limitations	K-factor
Luddenham (lu)	High soil erosion hazard, localised impermeable highly plastics subsoil, moderately reactive.	0.04
Blacktown (bt)	Moderately reactive, high plastic subsoil, low fertility and poor drainage.	0.04
South Creek (sc)	Erosion hazard and frequent flooding	0.04

4.1.1 Salinity

An assessment of the *Salinity Potential for Western Sydney* mapping revealed the project area to be at moderate risk of soil salinity.

4.2 Catchment

The proposal lies within the Lower Nepean River Management Zone of the Hawkesbury and Lower Nepean Rivers Water Source. The catchment is relatively flat with gently undulating hills. The Project crosses an eastern tributary of Surveyors Creek, which ultimately drains to the Nepean River at Penrith. The Project also traverses a number of other unmapped, unnamed minor tributaries, drainage lines and/or gullies. The predominant catchment land uses are residential, rural residential and agricultural.

4.3 Water quality and key fish habitat

One waterway, a tributary of Surveyors Creek at Glenmore Parkway has been identified as Type 1 – Key Fish Habitat (DPI, 2013) due to a combination of native aquatic plants and/or woody snags. This tributary is an impacted, intermittent watercourse that is also identified as Class 2 – Moderate Fish Habitat (Fairfull & Witheridge, 2003) due to the presence of limited in-stream aquatic vegetation. Another tributary of Surveyors Creek within the proposal area is located at the Northern Road at Penrith Golf and Recreation Club. Several other minor, ephemeral gullies are present within the proposal area, but they are poorly defined, with no water and no aquatic habitat present.

There is currently no water quality data available for Surveyors Creek or its tributaries. However, these waterways within the Project area drain into Peach Tree Creek for which there is some water quality data. The water quality within Peach Tree Creek reflects a highly degraded system and is identified as having poor water quality (Penrith City Council, State of Environment report, 2008– 2009), largely due to the stormwater it receives from its immediate catchment and nearby urban creeks, including Surveyors Creek and its tributaries.

Thus, the water quality of Surveyors Creek and its tributaries can be inferred from that of Peach Tree Creek as being likely to have elevated turbidity and nutrients and elevated

concentrations of indicators typically found in stormwater, such as polycyclic aromatic hydrocarbons (PAHs) and metals (TfNSW, 2014). This inference is based on Surveyors Creek having similar land uses and other influencing factors in its catchment, and the fact that nutrients and stormwater pollutants in Peach Tree Creek are likely to originate in upstream catchments.

4.4 Groundwater

It is expected that a shallow and a deep groundwater system exists along the proposal alignment. The shallow groundwater system is likely comprised of regolith (weathered Wianamatta Shale) through to unweathered shale. The depth of the shale layer is about 35 metres below ground level as indicated by work summaries obtained from DPI Water. The shallow water table, if present, is expected to range from two to 30 metres below ground level.

The Wianamatta Shale is a low permeability formation and therefore the contribution of this to base flow in surface water courses is expected to be minor to negligible. The deep groundwater system comprises Hawkesbury Sandstone. Recharge to the Hawkesbury Sandstone is expected to occur from rainfall and surface water interaction along the Lapstone Monocline along the far eastern edge of the Blue Mountains (west of the proposal area) and, to a minor extent, vertical percolation from the overlying Wianamatta Shale. Groundwater is expected to flow in a north-easterly within the Hawkesbury Sandstone. There are some faults in the area that could indicate enhanced connectivity between the shallow and deeper groundwater systems.

The Orchard Hills dyke is located east of The Northern Road alignment and is intersected by the M4 Motorway. This is expected to be weathered in the surface zone and unlikely to influence shallow groundwater. The dyke may have some influence in the deeper groundwater system in terms of preferential pathways and/or barriers for groundwater flow.

However, the geological map indicates that the dyke is less extensive than other dykes in the region and therefore may not have a significant influence on deep groundwater.

There is limited groundwater use near the proposal due to the geological environment comprising low permeability shale, siltstone and sandstone. Six registered groundwater boreholes were identified within a 500 metre buffer of the proposal area during a review of the DPI Water's Groundwater PINNEENA online database (accessed March 2016). These registered boreholes (excluding monitoring bores) were assessed as potential groundwater receptors from the proposal. One borehole (GW108906) was identified in the proposal area (see Table 6-40); it is drilled into unweathered shale and sandstone. Other groundwater boreholes in the study area are monitoring piezometers installed into the Wianamatta Shale. It is presumed these monitoring piezometers refer to local, site-specific investigation for geotechnical or due diligence purposes. The PINNEENA database indicates that the groundwater borehole (GW108906) is currently inactive.

4.5 Rainfall

The nearest weather station with long-term historical records operated by the Bureau of Meteorology (BOM) is the Penrith Lakes Automatic Weather Station (AWS) (station number 67113). Data from this station was assessed to characterise prevailing weather conditions within the Project area (refer to Table 4-2). Long-term temperature and rainfall averages recorded at this station indicate that the area around the Project experiences warm and wet summers with mean daily maximum temperature of about 29 degrees Celsius. Winter and

the beginning of spring are the coldest and driest months with average monthly rainfall from July to September of about 30 millimetres. A summary of the rainfall records from the Bureau of Meteorology is provided in Table 4- below.

Table 4-2 Summary of rainfall records

Month	Mean rainfall	Mean number of rain days
January	100.8	7.6
February	121.4	7.8
March	69.2	7.5
April	53.1	5.8
May	40.4	4.7
June	52.4	5.7
July	29.8	4.2
August	30.6	3.6
September	31.2	4.7
October	53.4	5.3
November	85.7	8
December	62.4	7
Average	**728.1**	**71.9**

Rainfall is typically higher during summer and autumn. Winter and spring are typically drier periods during the year.

4.6 Rainfall erosivity factor

The Rainfall Erosivity Factor is a measure of the ability of rainfall to cause erosion (referred as “R” in the Revised Universal Soil Loss Equitation RUSLE). The rainfall erosivity factor is used to determine the soil loss in tonnes per hectare over one year, and is used in calculations when sizing construction sediment basins.

The Project has a Rainfall Erosivity Factor of *2500* SI as the project sits between two bands of 2500SI.

Sydney is the closest location with detailed R-factor data and is detailed below in Table 4- below.

Table 4-3 Monthly % and annual rainfall erosivity (R-factor) values for Sydney

Monthly % and annual rainfall erosivity (R-factor) values													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
%	*10.9*	*13.2*	*13.1*	*11.1*	*9.2*	*8.1*	*5.7*	*5.1*	*4.1*	*5.7*	*7.1*	*6.8*	*100*
R-Value	*405*	*491*	*487*	*413*	*342*	*301*	*212*	*190*	*152*	*212*	*264*	*253*	*3721*

4.7 Flooding

Construction phase flooding impacts have not been modelled as part of the Project assessment. However, it is expected that a number of construction activities have the potential to impact flooding as follows:

- The inclusion of any temporary fill within the floodplain (e.g. stockpiles) would reduce floodplain storage, which could potentially result in increased flood elevations;

- Loose material stored within the floodplain has the potential to be mobilised during a flood, which can become a hazard, and may also contribute to blockage of hydraulic structures;
- Temporary crossings of watercourses may be required during the construction and have the potential to impact on flooding by blocking waterways as well as erosion and sediment impacts; and
- Activities at temporary compound sites including stockpiling of material and assets.

If stockpiles are to be located within the floodplain, the obstruction of flow paths and loss of floodplain storage has the potential to cause flooding impacts. Loose material stored within the floodplain has the potential to be mobilised during a flood, which can become a hazard during a flood, and may also contribute to blockage of hydraulic structures.

Temporary watercourse crossings may be required for some of the watercourses traversed by the project to facilitate construction activities. Temporary watercourse crossings may result in the following potential impacts:

- Disturbance of the watercourse bed and banks, resulting in erosion and sedimentation;
- Partial obstruction of low flows, resulting in minor modification of downstream flow; and
- Scour of the bed near the culvert inlets and outlets.

The compound site boundaries have been compared to modelling results, the findings of which indicate that the majority of the compound sites are not at risk of flooding for the 100 year ARI event. There is a risk of flooding affecting two compound sites:

- The southeast corner of the compound site at the intersection of The Northern Road and Wentworth Road; and
- A drainage line runs through the proposed compound adjacent to culvert C6730 which poses a flood risk. Ponding of flood water upstream of culvert C6730 also results in flooding at the site.

To avoid flooding impact, compound sites at these locations would be laid out to avoid placement of material in flood affected areas. Additionally, mitigation measures for the interim and operational phase are recommended to be implemented during early stages of the construction phase to help mitigate for this phase as well as during operation.

5 Environmental aspects and impacts

5.1 Construction activities

Key aspects of the Project that could result in adverse impacts to soils and water include:

- Vegetation clearing and topsoil stripping;
- Bulk earthworks;
- Site access including temporary waterway crossings;
- Culvert and drainage works;
- Bridge construction;
- Material stockpiles including the treatment of acid sulphate soil and other contaminated materials;
- Paving/ asphalt placement activities;
- Water use / extraction;
- Compounds operation including fuel and chemical storage, refuelling and chemical handling;
- Noxious weed treatment including herbicide spraying; and
- Inappropriate management of contaminated material e.g. Asbestos Containing Material (ACM).

Refer also to the Aspects and Impacts Register included in *Appendix A2 of the CEMP*.

5.2 Impacts

The potential for impacts on soil and water will depend on a number of factors. Primarily impacts will be dependent on the nature, extent and magnitude of construction activities and their interaction with the natural environment. Potential impacts attributable to construction might include:

- Exposure of soils during vegetation clearing and earthworks, creating the potential for off-site transport of eroded sediments and pollutants;
- Production of tannins from mulch during clearing;
- Disturbance of acid sulphate soils, creating the potential for oxidation of these soils and subsequent generation of acidic run-off;
- Alteration of surface and subsurface flows that could cause disturbances to hydrology and hydraulics;
- Contamination of soils, and surface and groundwater from accidental spills or oil leaks. This might include grease or fuel from machinery and vehicles, construction sites or compounds, or spills of other chemicals that may be used during the course of construction;
- Increase in the volume of contaminated material through inappropriate management of impacted soil e.g. ACM; and
- Disturbance of unidentified contaminated land eg Areas of Environmental Interest (AEI's) from the REF or other pesticide/chemical concentrations in soil from historical land use practices, and subsequent generation of contaminated runoff.

Some impacts on soil and water attributable to the Project are anticipated. Relevant aspects and the potential for related impacts have been considered in a risk assessment at *Section 3.4/Appendix A2 of the CEMP*. Section 6 provides a suite of mitigation measures that will be implemented to avoid or minimise those impacts.

6 Environmental control measures

A range of environmental requirements and control measures are identified in the various environmental documents, including the REF and RMS documents, and from recent experience on similar road projects. Specific measures and requirements to address impacts on soil and water are outlined in Table 6-1.

Table 6-1 Soil and water management and mitigation measures

ID	Measure / Requirement	When to implement	Responsibility	Reference
SW1	*A Soil and Water Management Plan (SWMP) will be prepared and implemented as part of the CEMP. The SWMP will identify all reasonably foreseeable risks relating to soil erosion and water pollution and describe how these risks will be addressed during construction.*	*Pre-construction/ Construction*	*Environment Manager*	*This Document*
SW2	*A site specific Erosion and Sediment Control Plan/s will be prepared and implemented as part of the Soil and Water Management Plan. The Plan will include arrangements for managing wet weather events, including monitoring of potential high risk events (such as storms) and specific controls and follow-up measures to be applied in the event of wet weather.*	*Pre-construction/construction*	*Environment Manager*	*This document* *PESCPS*
SW3	*Soil salinity testing will be carried out prior to construction to further assess these risks and implement appropriate controls.*	*Pre-construction*	*Environment Manager*	*This document*
SW4	*A comprehensive field aquatic assessment will be carried out to confirm the findings of the preliminary assessment.*	*Pre-construction*	*Environment Manager*	*This document*
SW5	*Control measures to manage erosion and sedimentation risks will be implemented including:* • *Erosion and sediment controls will be implemented before major construction starts, understanding that a small amount of works are generally required to prepare the site for the erosion and sediment controls;* • *Where catchment predicted annual soil loss exceeds 150m3/Ha*	*Construction*	*Environment manager/Foreman/Environmental Officer*	*EWMS* *PESCPS* *Inspection Checklists*

ID	Measure / Requirement	When to implement	Responsibility	Reference
	construction sediment basins will be utilized, other catchments with lower soil loss characteristics will be managed through other adequate erosion and sediment controls; • *Sediment basins would be designed to accommodate the 5 day 80th%ile rainfall event;* • *Sediment basins will be regularly serviced and maintained to comply with water quality and capacity requirements;* • *Vegetation clearing and site stabilisation of disturbed areas will be undertaken progressively to limit the time that disturbed areas are exposed to erosive forces;* • *High risk soil and erosion activities such as earthworks will not be undertaken immediately before or during high rainfall or wind events;* • *Topsoil will be stockpiled separately for potential reuse in landscaping and rehabilitation works; and* • *Permanent catch drains will be installed behind cut faces to act as diversion drains during construction.* *Erosion and sediment control measures will be maintained until the proposal is completely constructed and areas are stabilised by revegetation.*			
SW6	*Control measures to minimise the risk of water pollution will be implemented including:* • *All fuels, chemicals, and liquids will be stored at least 50 metres away from the existing stormwater drainage system and stored in an impervious bunded area within the compound site; and*	*Construction*	*Foreman*	*REF, Good practice*

ID	Measure / Requirement	When to implement	Responsibility	Reference
	• *Plant and maintenance machinery will be refuelled in impervious bunded areas in the designated compound area.* *Vehicle washdowns and/or concrete truck washouts would be undertaken within a designated bunded area of an impervious surface or undertaken off-site.*			
SW7	*Training will be provided to all project personnel, including relevant sub-contractors on sound erosion and sediment control practices and the requirements from this plan through inductions, toolboxes and targeted training.*	*Pre-construction* *Construction*	*Construction Manager / Environment Manager*	*G38/G36, Good practice, Induction*
SW8	*A Project Soil Conservationist will be engaged and regularly consulted throughout construction to provide advice on erosion and sediment control design, installation and maintenance*	*Pre-construction / Construction*	*Environment Manager*	*G38, Good practice*
SW9	*An environmental protection scheduled activity licence will be obtained for the Project. All relevant conditions relating to soil and water management will be implemented as required by the licence.*	*Construction / Post construction*	*Construction Manager*	*POEO Act 1997*
SW10	*Ancillary facilities and stockpiles will be located in accordance with the criteria outlined in Appendix A4 of the CEMP.*	*Pre-construction / Construction*	*Construction Manager / Environment Manager*	*REF/CEMP Appendix A4*
SW11	*Progressive erosion and sediment control plans (ESCPs) will be prepared and implemented in advance of construction, including earthworks and stockpiling. ESCPs and will be updated as required.* *These PESCPs will provide the level of detail required by RMS G38 as applicable.*	*Pre-construction / Construction*	*Environment Officer / Foreman*	*Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom 2006).* *Managing Urban Stormwater: Soils and Construction, Volume 2D, Main Road Construction*

ID	Measure / Requirement	When to implement	Responsibility	Reference
				(DECC 2008). *G38*
SW12	*The following EWMS will be prepared and implemented to manage soil and water impacts. EWMS for activities identified as having high environmental risk will undergo a period of consultation with the ERG Group:* • *Working platforms in or adjacent to waterways;* • *Sediment basin construction and maintenance;* • *Dewatering; and* • *Clearing, grubbing and mulching.*	*Construction*	*Superintendent / Environment Manager*	*G38/G36* *EWMS* *CEMP*
SW13	*All ASS or PASS disturbed during the construction process will be managed in accordance with RMS Acid Sulfate Soil Management Procedure.*	*Pre-construction / Construction*	*Superintendent / Environment Manager*	*G36/G38*
SW15	*Works will be programmed to minimise the extent and duration of disturbance to vegetation. This will include leaving clearing and initial earthworks within 15 meters of watercourses until subsequent works are about to commence.*	*Pre-construction* *Construction*	*Superintendent / Foreman*	*G38/G40* *PESCPS*
SW16	*Wastewater or "dirty" water generated during the construction process will, wherever possible, be collected, treated and disposed of by appropriate means, including the installation of sediment barriers downslope of all disturbed areas. In areas where it is not possible to direct dirty water to sediment basins, other sediment controls will be implemented in accordance with "Blue book" best practice.*	*Construction*	*Superintendent / Foreman*	*G38*
SW17	*Clean and dirty water runoff will be adequately separated to avoid mixing where possible through the use of diversions, clean water*	*Construction*	*Superintendent / Foreman*	*G38* *PESCPS*

ID	Measure / Requirement	When to implement	Responsibility	Reference
	drains, and the early installation of permanent drainage infrastructure.			
SW18	*Exposed batter slopes, and other areas exposed for extended periods but not worked, will be protected from erosion during construction through temporary seeding, or the early implementation of permanent stabilisation measures eg topsoiling, seeding, revegetation.*	*Construction*	*Superintendent / Foreman*	*G38*
SW19	*Active work areas will be secured at the end of each day's work and/or just prior to inclement weather, by means such as grading or smooth drum rolling to create a smooth surface and by installing of temporary "catch" drains to prevent / minimise transport of sediment.*	*Construction*	*Superintendent / Foreman*	*G38* *PESCPS*
SW20	*Where required, catch drains, contour and diversion drains across exposed areas will be installed immediately following clearing, and re-established and maintained during topsoil removal and earthwork operations.*	*Construction*	*Superintendent / Foreman*	*G38* *PESCPS*
SW21	*Erosion and sediment control structures will remain installed and maintained until sufficient vegetative cover is achieved.*	*Construction*	*Superintendent / Foreman*	*Blue Book*
SW22	*Site compounds, access tracks, stockpile sites and temporary work areas will be located to minimise erosion.*	*Pre-construction / Construction*	*Superintendent / Foreman*	*G38*
SW23	*Hardstand material, rumble grids or similar will be provided at exit points from construction areas onto public roads to minimise the tracking of soil and particulates onto public roads.*	*Pre-construction / Construction*	*Superintendent / Foreman*	*G38*
SW24	*Vehicle movements from site will be minimised during wet weather if the tracking of mud may become an issue.*	*Pre-construction / Construction*	*Superintendent / Foreman*	*Good practice*

ID	Measure / Requirement	When to implement	Responsibility	Reference
SW25	*Loose rock, soil, debris etc will be removed from road surfaces (including sweeping of the road) at the end of each work shift.*	*Pre-construction / Construction*	*Superintendent / Foreman*	*G38*
SW26	*Where temporary crossings are required, these will be designed, constructed and maintained in accordance with Managing Urban Stormwater Soils and Construction Volumes 2A and 2D Main Road Construction (DECC 2008) and section 5.3.4 of the guideline Managing Urban Stormwater 4th edition March 2004, Volume 1 Soils and Construction and subject to the preparation of an EWMS identified in SW12. Temporary crossings will:* • *Be 'fish friendly' with a lower section of the temporary crossing provided to act as an emergency spillway.* • *Be used for the shortest time required to complete their designed operational function.* • *Use material that will not result in fine sediment material entering the waterway.* • *Where rock crossings are used, the rock will be of suitable size to prevent / reduce the likelihood of the material being washed away in a storm or flood event, with large sized rock on the lower side of crossings where water velocity increases.*	*Construction*	*Environment Manager / Superintendent / Engineers*	*G38*
SW27	*Scour protection will be installed at the base of permanent and temporary drainage outlets, and will be integrated where feasible into current banks to minimise impacts.*	*Construction*	*Engineers*	*G36, G38*
SW28	*Drainage works will be stabilised against erosion by appropriate selection of channel dimensions, slope and lining, and the inclusion, if necessary, of drop structures and energy dissipaters.*	*Construction*	*Engineers*	*Best Practice*

ID	Measure / Requirement	When to implement	Responsibility	Reference
SW29	*Culverts and permanent stream protection measures will be installed as early as possible in the construction program to facilitate transverse drainage during the early stages of construction.*	*Construction*	*Superintendent / Foreman*	*Best Practice*
SW30	*Water captured in sediment basins and other areas will be reused for dust suppression, compaction, or other construction activities in preference to potable water.*	*Construction*	*Superintendent / Foreman*	*Best Practice*
SW31	*All sediment basin discharge points will be clearly identified and access made available at all times for inspections or management.*	*Construction*	*Foreman*	*Best Practice*
SW32	*Concrete pumping or concreting activities will be undertaken in accordance with Environmental Best Management Practice Guideline for Concreting Contractors 2002 to prevent and/or minimise spillages.*	*Construction*	*Superintendent / Foreman*	*G38*
SW33	*Designated impervious bunded facilities will be provided for washout of concrete trucks and cleaning and/or maintenance of other vehicles, plant or equipment. These facilities will be located at least 50 metres away from natural and built drainage lines.*	*Construction*	*Superintendent / Foreman*	*G38*
SW34	*An EWMS for Clearing, Grubbing and Mulching including the management of tannin leachate will be prepared in accordance with the RMS Environmental Direction for the Management of Tannins from Vegetation Mulch attached at Appendix C. The requirements include detail on:* • *Planning and staging vegetation processing activities;* • *Stockpile location and management to minimise the production and release of tannins;* • *Monitoring the stockpiles for the*	*Construction*	*Environment Manager / Foreman*	*RMS Environmental Direction for the Management of Tannins from Vegetation Mulch*

ID	Measure / Requirement	When to implement	Responsibility	Reference
	production of tannins; and • *Response to tannin production.*			
SW35	*Unexpected Discovery of Contaminated Land Procedure contained in Appendix D will be followed if potentially contaminated land, spoil or fill is encountered. Works in the vicinity will be stopped or modified and will not recommence until the material has been analysed and management measures developed. The procedure incorporates relevant requirements of the Contaminated Land Management Guideline (RTA 2005e) and Contaminated Lands Management Act (year).*	*Construction*	*Foreman / Superintendent / Environment Manager*	*Good practice*
SW36	*Disturbed areas will be progressively stabilised during the construction phase eg with a cover crop, hydromulch, hydroseeding, topsoil and/or mulch. Wherever possible, permanent landscaping and revegetation works will take place progressively in accordance with the Urban Design Plan.*	*Construction*	*Superintendent / Foreman*	*G38* *Urban Design Plan*
SW37	*Rainfall forecasts will be monitored daily and the site managed to avoid erosion and sedimentation, and to minimise the impact of heavy rainfall and flood events.*	*Construction*	*Superintendent / Foreman / Environment Manager / Environment Officer*	*G38*
SW38	*Erosion and sediment controls will be inspected (informally) at least daily (with maintenance and/or modifications made as necessary). Inspections and/or maintenance during wet-weather maybe increased where necessary.*	*Construction*	*Foreman*	*Good practice*
SW39	*Records of dewatering activities will be maintained. Details will be recorded on a form consistent with Lendlease LLE705A/705B (Appendix G)include:*	*Construction*	*Environment Manager*	*G36* *Good practice* *LLE705A* *LLE705B*

ID	Measure / Requirement	When to implement	Responsibility	Reference
	i. A copy of the work method statement(s); *ii. Date, time and estimated volume released at each discharge location;* *iii. Water quality test results for each discharge;* *iv. The personnel approving the dewatering activities; and* *v. Evidence of discharge monitoring, or risk assessment and mitigation measures used to eliminate the risks of pollution.*			
SW40	*The levels of site septic systems (where installed) will be monitored during weekly inspections to identify spillages that may need clean up and any pump out requirements.*	*Construction*	*Foreman/Environment Manager*	*Good Practice* *Inspection checklist*

7 Compliance management

7.1 Roles and responsibilities

The Lendlease Project Team's organisational structure and overall roles and responsibilities are outlined in *Section 4.2 of the CEMP*. Specific responsibilities for the implementation of environmental controls are detailed in Section 6 of this Plan.

7.2 Training

All employees, contractors and utility staff working on site will undergo site induction training relating to soil and water management issues. The induction training will address elements related to soil and water management including:

- Existence and requirements of this sub-plan;
- Relevant legislation;
- Roles and responsibilities for soil and water management;
- Water quality management and protection measures; and
- Procedure to be implemented in the event of an unexpected discovery of contaminated land.

Targeted training in the form of toolbox talks and specific training will also be provided to personnel with a key role in soil and water management. Examples of training topics may include:

- ERSED control installation methodology;
- Sediment basin construction;
- Sediment basin operation;
- Sediment basin maintenance;
- Working near or in drainage lines and creeks;
- Emergency response measures in high rainfall events;
- Preparedness for high rainfall events;
- Lessons learnt from incidents and other event e.g. high rainfall/flooding;
- Mulch and tannin management;
- Spill response;
- Stockpile location criteria; and
- Identification of potentially contaminated spoil and fill material.

Further details regarding staff induction and training are outlined in Section 5 of the CEMP.

7.3 Monitoring and inspection

Regular monitoring and inspections will be undertaken in the lead up to, during and following construction. Monitoring and inspections will include, but not be limited to:

- Up and downstream of the Project alignment water quality monitoring at nominated locations (as detailed within the Water Quality Monitoring Program);
- Construction sediment basin water quality prior to discharge; and

- Weekly and post rainfall inspections to evaluate the effectiveness of erosion and sediment controls measures in accordance with Section 8.1.1 of the CEMP.

The type, timing, frequency, assessment criteria and associated reporting requirements are detailed in the Water Quality Monitoring Program attached at Appendix A.

7.4 Licenses and permits

An EPL will be obtained for the scheduled activity “road construction”. The EPL typically prescribes water quality parameters to be measured and associated discharge criteria. They also detail the monitoring and analytical requirements by reference to authority publications eg Approved Methods for Sampling and Analysis of Water Pollutants in NSW, 2004. The water quality discharge criteria for the Project are listed in Table 7-1.

Table 7-1 Discharge water quality criteria

Parameter	Criteria	Sampling method	Analytical method
pH*	6.5 –8.5	Probe or Grab Sample	Field analysis and confirmed as required with laboratory assessment
Turbidity	TBA following correlation with TSS results	Grab Sample	Field analysis and confirmed as required with laboratory assessment, regularly updating correlations and having a factor of conservatism.
Total Suspended Solids*	50 mg/L	Grab Sample	Laboratory analysis
Oil and Grease*	No visible	Grab Sample	Field analysis and confirmed as required with laboratory assessment

Any other relevant licenses or permits will be obtained in the lead up to and during construction as required.

7.5 Weather monitoring

Rainfall at the premises will be measured and recorded in millimetres per 24-hour period at the same time each day from the time that the site office associated with the activities is established. An automatic rainfall intensity/ weather device will be installed at the main compound.

7.6 Auditing

Audits (both internal and external) will be undertaken to assess the effectiveness of environmental controls, compliance with this sub plan, and other relevant approvals, licenses and guidelines.

Audit requirements are detailed in *Section 8.3 of the CEMP*.

7.7 Reporting

Reporting requirements and responsibilities are documented in the Water Quality Monitoring Program, and *Section 8.5 of the CEMP*.

8 Review and improvement

8.1 Continuous improvement

Continuous improvement of this Plan will be achieved by the ongoing evaluation of environmental management performance against environmental policies, objectives and targets for the purpose of identifying opportunities for improvement.

The continuous improvement process will be designed to:

- Identify areas of opportunity for improvement of environmental management and performance;
- Determine the cause or causes of non-conformances and deficiencies;
- Develop and implement a plan of corrective and preventative action to address any non-conformances and deficiencies;
- Verify the effectiveness of the corrective and preventative actions;
- Document any changes in procedures resulting from process improvement; and
- Make comparisons with objectives and targets.

8.2 SWMP update and amendment

The processes described in Section 8 and Section 9 of the CEMP may result in the need to update or revise this Plan. This will occur as needed.

Only the Environment Manager, or delegate, has the authority to change any of the environmental management documentation.

A copy of the updated plan and changes will be distributed to all relevant stakeholders in accordance with the approved document control procedure – refer to *Section 10.2 of the CEMP*.

Appendix A
Water Quality Monitoring Program

Appendix B Spoil and Fill Management Procedure

Appendix C
Management of Tannins from Vegetation Mulch

Appendix D
Unexpected Discovery of Contaminated Land Procedure

Appendix E – Stockpile Management Protocol

APPENDIX F - Concept Erosion and Sediment Control Plan

APPENDIX G: LLE705A AND LLE705B

Water quality Monitoring Program

February 2017

Document control

File name	SWMPAppendix A _Rev 2 27/02/2017.doc
Report name	Water quality Monitoring Program
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Revision history

Revision	Date	Description	Approval
2	27/07/2017	Address RMS comments	HC
1	03/02/2017	RMS Initial Review	HC
0	291116	Initial Draft	HC

Contents

1 Introduction

There are no restrictions on the distribution/circulation of this Water Quality Monitoring Program (WQMP) within the TNR3N project.

2 Purpose

This WQMP has been prepared to meet the requirements of G38 2.3 and is to be implemented as a supplement to the Erosion and Sediment Control Plan. The program has been prepared in accordance with the *RMS Guideline for Construction Water Quality Monitoring* and the EPA Publication '*Approved Methods for the Sampling and Analysis of Water'.*

3 Training

All staff that undertake monitoring required under the WQMP will be trained in the technical and administrative requirements in accordance with this WQMP, including equipment calibration, sample collection, sample labelling and sample cross contamination processes. Records of staff certified to undertake water quality monitoring will be held by the Environmental Manager.

4 Scope

This WQMP applies to the sampling, analysis and reporting of water quality from both within existing waterways that the project traverses and discharges from sediment basins licensed under the project EPL.

5 Monitoring Equipment

5.1 Equipment to be used

Water quality monitoring will be undertaken using a multi-parameter water meter.

Where required, samples would be collected in a manner that complies with *Australian Standard AS/NZS 5667.1 1998* and the EPA Publication '*Approved Methods for the Sampling and Analysis of Water'.*

5.2 Calibration

All monitoring equipment is to be calibrated in accordance with the manufacturer's specifications, records of calibration to be kept on a register which is maintained by the Environmental Manager.

6 Pre-construction Water Quality Sampling

In order to ascertain existing water quality in the Project area, the TNR3N environment team will undertake three (3) pre-construction sampling events at the water quality monitoring locations nominated in section 8 below.

The pre-construction monitoring will assess the water quality through the following field parameters:

- NTU;
- pH;
- Electrical Conductivity (EC);
- Dissolved Oxygen (DO);
- Temperature; and
- Visual Oil and Grease.

7 Construction Water Quality Objectives

The following sections identify the relevant water quality objectives (WQO's) for both in stream waters and those discharged from sediment basins during construction.

7.1 Surface Water

In accordance with the REF, the water quality objective of the Project is to minimise the impact on downstream environment during construction and delivery.

In order to assess this, the water quality objective for the TNR3N project has set a target of no increase in the following physical parameters by more than 20% between the upstream and downstream sampling location and maximum values not 20% above those recorded in background water quality monitoring (or below minimum for DO):

- NTU;
- pH;
- EC;
- DO;
- Temperature; and
- Visual Oil and Grease

7.2 Sediment Basin Discharge

The Project Environment Protection Licence will contain specific details in regards to sediment basin discharge criteria. This is anticipated to include the following:

- pH: 6.5-8.5;
- TSS: 50mg/L; and
- Oil and grease: no visible trace

The project may seek to undertake an NTU/TSS correlation, which would allow the use of NTU instead of TSS measurements for discharge of water from sediment basins. This Water Quality Monitoring Program will be updated in the event that an NTU/TSS correlation is approved by NSW EPA.

8 Monitoring Locations

8.1 Surface Water

Based on the assessment of environmental sensitivity undertaken within the REF, the surface water monitoring locations for the project are as follows:

- **SC1a**: Immediately upstream of the project boundary within the Unnamed Tributary of Surveyors Creek where it passes under Glenmore Parkway

- **SC1b**: Immediately downstream of the project boundary within the Unnamed Tributary of Surveyors Creek where it passes under Glenmore Parkway

The monitoring locations are shown in Figure 6.1 below.

Figure 6.1: Water quality monitoring locations

Should pre-clearing assessments of aquatic ecology identify other waterways that would require construction phase monitoring due to environmental sensitivity, this WQMP will be updated by the Environment Manager.

8.1.1 Instream Monitoring Limitations

Sampling will not be undertaken where there is a risk to the safety of the staff undertaking sampling.

8.2 Sediment Basins

Sediment basins will be sampled at the spillway of the basin, using an extendable pole that allows sampling at mid water.

Following retrieval, field pH will be tested and recorded along with the presence or absence of oil or grease (visual assessment).

Sampled water will then be transferred into a sample bottle provided by a NATA accredited laboratory and labelled. The labelling convention will consist of the following:

- Sediment Basin ID Number;
- Sampling Date and Time;
- Sampler;
- Project Name : TNR3N; and
- Analytes Required : TSS/NTU.

9 Monitoring Frequency

9.1 Surface Water

Surface water will be sampled at the locations specified within Section 8 above following the cessation of a rainfall event that exceeds 10mm (recorded at the Project Weather station).

9.2 Sediment Basins

Sediment basin water quality will be sampled prior to each discharge in accordance with the requirements of the Project EPL.

10 Sampling Protocol

10.1 Surface Water

Sample will be retrieved from the waterway with an extendable pole prior to testing for physical parameters or sampled in situ where waterway depth allows. The order of sampling will be downstream followed by upstream.

Results will be recorded along with any observations made by the sampler on the Surface Water Quality Monitoring Event Record (Appendix 1 to this WQMP).

10.2 Sediment Basins

Following retrieval, field pH will be tested and recorded on a Sediment Basin Checklist (Appendix 2 to this WQMP) along with the presence or absence of oil or grease (visual assessment).

Sampled water will then be transferred into a sample bottle provided by a NATA accredited laboratory and labelled. The labelling discussed In section 8.2.

Bottled samples will then be stored in an eski or refrigerator and transported to a NATA accredited laboratory for analysis. All batches of sampled water will be accompanied by a Chain of Custody document detailing the number of samples, the sender and the details of each individual sample.

11 Non-conformance

11.1 Surface Water

In the event that surface water results exceed the objectives established within Section 7.1, an investigation into the local catchment will be undertaken. The purpose of the investigation is to identify if the exceedance is due to construction activities, or other sources. The investigation will be recorded on the Surface Water Quality Monitoring Checklist (Appendix 1 to this WQMP) and the findings reported to the Environment Manager immediately.

In the event that the exceedance in WQO's is linked directly to construction activities a Notifiable Event Report will be prepared and submitted to RMS in accordance with the *RMS Incident Classification and Reporting Guidelines* (Appendix A6 to the CEMP).

Should the exceedance in water quality be severe enough to trigger a notifiable incident under the *POEO Act 1997*, the EPA would be notified in accordance with the EPL. The triggers for this notification are:

- If the actual or potential harm to the health or safety of human beings or ecosystems is not trivial; and
- If actual or potential loss or property damage (including clean-up costs) associated with an environmental incident exceeds $10,000.

11.2 Sediment Basin

Where sediment basin sampling identifies a non-conformance with the WQO's the water will not be discharged.

And the following treatment methods may be implemented where required and documented on the Sediment Basin Checklist:

- Flocculation to reduce TSS;
- Oil and grease removal; and
- pH adjustment.

Sediment basin water will be re-tested following treatment prior to discharge.

The process is repeated until water meets the WQO's.

In the event that water is discharged from a sediment basin that does not comply with the EPL discharge criteria (refer to section 7.2), the EPA will be notifiedand any other reporting completed as requested by the EPA..

12 Monitoring Records

12.1 Surface Water

Surface water monitoring events will be recorded on the Surface Water Quality Monitoring Event Record form in the field, and the results maintained within the Project's Surface Water Quality Monitoring Register.

12.2 Sediment Basin

All sediment basin sampling events will be recorded on the Sediment Basin Checklist in the field.
Sediment basin discharge records will be maintained within the Project Sediment Basin Discharge Register, along with soft copies of the NATA accredited laboratory analysis.

13 Reporting

The results of water quality monitoring will be provided to RMS through the Monthly Environmental Performance Reports.

EPA will be provided with water quality monitoring data in accordance with the requirements of the Project EPL.

Non-conformances with the WQO's will be managed as detailed within Section 11.

In addition to the above, water quality monitoring results, non-compliances and follow up actions will be discussed during the Environmental Review Group (ERG) meetings.

APPENDIX 1 – SURFACE WATER QUALITY MONITORING EVENT FORM

Surface Water Quality Monitoring Event Record				
Project: TNR3N		**Date:**		
Record rainfall for previous 24 hours:		**Rainfall**	**mm**	
Upstream Monitoring Location: SC1a		**Time sample taken:**		
#	**Field Analysis**	**Result**	**Max^{B} ***	**Min^{B}***
1.	pH			
2.	NTU			
3.	Electrical Conductivity (EC) mS			
4.	Dissolved Oxygen			
5.	Is oil and/or grease visible on the surface of the water?			
Downstream Monitoring Location: SC1b		**Time sample taken:**		
#	**Field Analysis**	**Result**	**Max^{B} ***	**Min^{B}***
6.	pH			
7.	NTU			
8.	Electrical Conductivity (EC) mS			
9.	Dissolved Oxygen			
10.	Is oil and/or grease visible on the surface of the water?			
Interpretation				
11.	What is the % difference between upstream and downstream? If greater than 20% assess against Max^{B} and Min^{B}			
12.	If NTU, EC or pH are 20% higher than Max^{B}, undertake investigation. If DO or pH are 20% lower than Min^{B}, undertake investigation.			
Investigation				
13.	Undertake detailed site investigation to identify and record potential sources for non-conformances with Water Quality Objectives. Report directly to Environmental Manager.			
Additional comments:				
Conducted by:				

*Max^{B} = Maximum concentration recorded during background water quality monitoring.

*Min^{B}= Minimum concentration recorded during background water quality monitoring.

APPENDIX 2 – SAMPLE SEDIMENT BASIN CHECKLIST

Sediment Basin Checklist				
Project:		**Date Inspected:**		
Basin No.:		**Location/Chainage:**		
Is inspection following a rainfall event? **Yes** **No** **If yes record rainfall for previous 24 hours:** **Rainfall** **mm**				
What is the approximate volume of water in the basin (as a % of the total capacity)?				
#	**Control Measure**	**Yes**	**No**	**Comments**
1.	Is maintenance to the basin required? (e.g. spillway, wall etc.)			
2.	Does the basin need emptying? (i.e. basin more than 30% full – refer to marker)			
3.	Does the basin need de-silting? (i.e. >30% capacity reduced by silt – refer to marker)			
4.	Is oil and/or grease visible on the surface of the water? (If visible, remove using a suitable absorbent material).			
5.	What is the turbidity tube reading of the basin? Flocculate basin before discharge if it does not meet required turbidity standards.			
6.	How much flocculant was added?			
7.	What was the reading of the *basin* after flocculating?			
8.	What was the lab TSS reading at the discharge point after flocculating? (Needs to be <50mg/L)			
9.	What is the pH of water in the basin? pH must be between 6.5 and 8.5. If pH is below 6.5, add lime.			
10.	Measure and record pH again before discharge.			
11.	How long was the basin left to flocculate before being discharged?	Hours		
12.	**Date and time of discharge.**	Date:		Time:
13.	Duration and volume of discharge.	Duration:		Volume:
ALL PARTS OF THE CHECKLIST MUST BE COMPLETED				
Additional comments:				
Approved by:		**Discharged by:**		

Spoil and fill management procedure

February 2017

Document control

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Report name	Spoil and fill management procedure
Revision number	2

Revision history

Revision	Date	Description	Approval
2	27022017	Address RMS Comments	HC
1	03022017	RMS Review	HC
0	291116	Initial Draft	HC

Contents

1 Introduction

There are no restrictions on the distribution/circulation of this Procedure within the TNR3N project.

2 Purpose

This Procedure details the requirements for the planning, locations, types and handling of spoil and fill on the Project. The objectives of this procedure are to:

- Identify spoil and fill issues potentially arising from the Project;
- Present processes for spoil and fill material handling, transportation and movement, stockpiling, reuse and disposal to protect the environment and maximise the reuse of earthen materials generated on site; and
- Identify and describe measures to be implemented relating to spoil and fill activities that may impact on air quality, sedimentation, contamination, noise and local amenity.

3 Induction / Training

Personnel involved in spoil and fill management will be trained in the requirements of this Procedure. Training will include inductions, toolbox talks, pre-starts and targeted training as required.

4 Scope

This Procedure is applicable to all activities relating to spoil and fill management on the TNR3N Project.

5 Aspects and impacts

5.1 Aspects

Key aspects of the project associated with the management of spoil and fill are:

- clearing of vegetation;
- stripping of topsoil;
- excavation of earthen material;
- import and transport of earthen material;
- storage/stockpiling of spoil, topsoil and mulch; and
- reuse of spoil, topsoil and mulch.

5.2 Impacts

The potential spoil and fill impacts that may occur during construction include:

- water pollution due to sediment runoff from spoil excavation and excess spoil storage;
- weed infestation from dispersion of seeds;
- air pollution due to dust generated from stockpiles;
- flora and fauna impacts due to sediment runoff from spoil excavation;
- water, soil and air pollution from inappropriate storage, handling and disposal of spoil;
- contamination to site through the import of potentially contaminated material from external suppliers;

- increase in the volume of contaminated material through inappropriate management of impacted soil e.g. Asbestos Containing Material (ACM);
- mud-tracking during haulage operations; and
- impact on soil microbiological activity.

It is un-likely that acid sulfate soils will be encountered during the construction work.

6 Spoil and fill information

6.1 Material types

For the purpose of this procedure the following definitions can be applied:

Spoil can be defined as any earthen material that is surplus to requirements or unsuitable for reuse in within the Project works, or material that is contaminated.

Fill can be defined as earthen material excavated from either along the corridor and relocated elsewhere as compacted fill or imported from off site for utilisation in earthworks.

Select Material Zone (SMZ) is earthen material of comparatively higher quality than general fill material and necessary for engineered backfilling.

Unsuitable (non-contaminated) spoil comprises soil of comparatively lower engineering quality than SMZ and may be utilised for general fill or landscaping works. Unsuitable material may be won during earthworks from areas including:

- creek beds;
- water courses;
- pile spoils;
- low lying fill foundation areas; and
- shallow cuttings.

Topsoil occurs between approximately 50-200mm of natural ground surface. Topsoil reuse will be maximised on site to minimise the import of external topsoil for revegetation and landscaping purposes.

6.2 Expected volumes and sources of spoil

This TNR3N Project consists of 4 km of road widening and bridge construction. Due to lack of suitable material available on site a cut/fill deficit exists, hence requiring the importation of ~210,000 m³ from off-site sources for use in general fill, SMZ and drainage works.

It is expected that all spoil generated by the project (with the exception of contaminated material) will be utilised as fill, or placed for landscaping works.

6.3 Spoil classification

Where applicable, spoil generated during the construction of the Project will firstly (preferably before excavation) be assessed against the requirements for Virgin Excavated Natural Material (VENM) detailed within the *Protection of the Environment Operations (POEO) Act 1997.*

If the material is not deemed to be VENM an assessment of the suitability of any current general resource recovery exemptions issued under the *Protection of the Environment Operations (Waste) Regulation 2005* will be undertaken. Current general resource recovery exemptions that may apply to the Project are:

- The excavated natural material order/exemption 2014;

- The excavated public road material order/exemption 2014;
- The recovered aggregate order/exemption 2014;
- The reclaimed asphalt pavement order/exemption 2014; and
- The raw mulch order/exemption 2016.

Spoil that cannot be re-used under any of the exemptions stated above, or classified as VENM will require waste classification in accordance with the Waste Classification Guidelines (NSW EPA, 2014) prior to offsite disposal at an appropriately licensed facility.

7 Spoil and fill management

7.1 Spoil and fill storage

Temporary stockpile areas for the Project will be located as shown in, but not limited to, those detailed in the SWMP Appendix E Stockpile Management Protocol, and RMS approval obtained when locations do not satisfy the locational criteria in the Stockpile Management Protocol.

Stockpiles not identified within the SWMP will be located in accordance with the locational criteria stipulated within Appendix E of the SWMP. Fill material required for engineering purposes in road construction will be managed to maximise direct placement and minimise double handling and stockpiling requirements. Dust and erosion and sediment control measures will be implemented as required to minimise air and water quality impacts as per the Air Quality Management Plan and the Soil and Water Management Plan.

7.2 Spoil and fill transportation

Spoil and fill will be required to be transported both within and outside the project boundary during construction, however, wherever possible haulage will be along the Project corridor.

In instances where haulage of cut material is required by road, exit from and entry to the project will be via specific Project access points, using designated haul routes, as detailed in the Project Traffic Management Plan.

Standard dust and mud tracking controls will be implemented and additional requirements will be detailed in other project traffic and safety plans.

7.3 Record keeping

Records of the mass haul of material within the site, as well as imported or exported material, will be kept as per the processes described in the Earthworks Management Plan.

This will include an overall mass haulage calculation, daily cut to fill records, tips sheets, purchasing or other imported fill records and any documentation required to dispose material off site as detailed in the WRMP.

Records will be kept up to date by Engineers and Foremen in accordance with the Earthworks Management Plan. Section 143 certificates will be completed and retained for any material to be disposed of or stored temporarily outside the Project boundary. All offsite disposal of spoil at an appropriately licensed facility will be recorded in the project Waste Register.

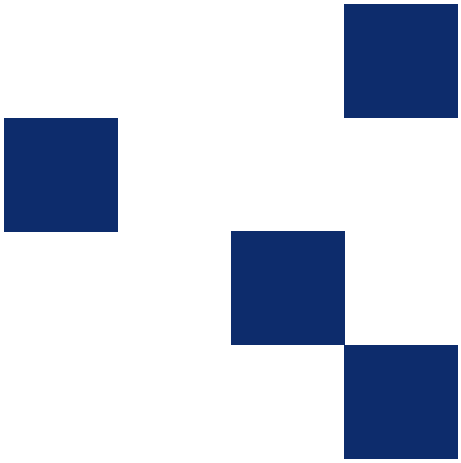
Transport Roads & Maritime Services

NSW GOVERNMENT

ENVIRONMENTAL DIRECTION

Management of Tannins from Vegetation Mulch

JANUARY 2012



ABOUT THIS RELEASE

Environmental Direction number	25
	Management of Tannins from Vegetation Mulch
	Environment Branch (Environmental Policy)

1	December 2011	Final draft
2	January 2012	Final

CONTENTS

1 PURPOSE

The purpose of this environmental direction is to set RMS's minimum management measures to minimise the generation and discharge of tannins from vegetation mulch on Roads and Maritime Services (RMS) construction projects. Additional background information on tannins and the use of mulch on construction sites is included in section 3 of this direction.

2 MANAGEMENT MEASURES

The primary focus must be to minimise tannin generation on construction sites.

2.1 General mulch management measures

These general mulch management measures are to be followed for all RMS construction projects.

2.1.1 Planning and works staging

The first step in planning and works staging is to identify the amount of mulch to be generated. With this information, a strategy can be prepared to manage mulch on site. Staging of chipping, tub grinding and/or mulching activities should be planned to reduce the volume of mulch to be managed at any one time. The volume of excess mulch can then be assessed and plans made to dispose of this off site.

Other general considerations at the planning and works staging phase are as follows:

- Mulch stockpile sites should be established with appropriate controls in place before the main site clearing activities commence. Limited clearing may be required earlier for establishment of stockpile areas and access.
- Stage the mulching of cleared vegetation to ensure that mulch can be progressively moved to elevated, or otherwise suitable, stockpile locations. It is preferred that mulch should be transferred to a stockpile or reused on the day of mulching.
- Plan to efficiently reuse mulch in progressive works to reduce the time that mulch is concentrated in stockpile locations.
- Excess mulch can be managed by community giveaway. This takes considerable time and mulch needs to be suitably located and managed as this occurs. The conditions for community giveaway of mulch are included as Appendix 3.
- Any other form of bulk offsite mulch disposal (eg to Council parkland or a development site) must be assessed to ensure waste management provisions are adhered to for off site disposal.

2.1.2 Stockpile location and management

- Mulch stockpile sites should be established on elevated ground where possible.
- Stockpile sites with a duration of not more than 1 month should be constructed not less than 20 metres from a watercourse, including floodplains.
- Stockpile sites with a duration of more than 1 month should be constructed not less than 50 metres from a watercourse, including floodplains.
- Mulch stockpiles should be designed and constructed to divert upgradient water to prevent it from entering the stockpile site.

2.1.3 Management measures for the use of mulch on site

- Do not use mulch for surface cover or sedimentation controls in any low lying areas of the site that remain consistently wet. Alternative controls such as geofabric (for surface protection) or sediment fence will be required in these areas.
- Do not spread surface mulch in thicker than 100mm layers. Mixing mulch with topsoil is encouraged for batters to prevent loss of topsoil during initial stabilisation. It should be noted that mulch will generally cause nitrogen draw down which may inhibit plant growth, unless mulch has been composted first.
- Care is to be taken to ensure that excessive mulch is not applied for sedimentation controls such as perimeter bunds or catch dams.

2.1.4 Monitoring and response

- Monitor the site for generation of tannins. Tannin impacts can be readily identified visually as dark coloured ponded water. Site staff should be trained to identify and report potential impacts to the site project management or environment staff.
- Review management practices where required to prevent the generation of tannins in identified problem areas.

2.2 Mulch management methods for high risk sites

2.2.1 High risk sites

High risk sites, where additional management measures may be required, include:

- where large quantities of mulch will be generated and stockpiled.
- where high tannin generating vegetation types are to be mulched (see 3.1).
- where the receiving environment is identified as sensitive (eg Marine Park, threatened aquatic species habitat).
- where tannins have been observed to be generated or discharged from an operating site with standard management controls.

2.2.2 Stockpile management measures for high risk sites

- Mulch stockpiles for high tannin generating vegetation types should incorporate an impermeable bund to capture stockpile leachate or tannin impacted water. Impervious bunds must be a minimum of 300 mm high, preferably higher to capture tannin impacted water. All bunded stockpiles that are in place for a period longer than one month must include a lined discharge point for overflow in extreme rainfall events.
- Stockpiles established on sloping sites must be designed to provide temporary stormwater containment equivalent to a 300 mm minimum height bund on a flat site.
- Tannin impacted water should be pumped out of bunded stockpiles within 5 days of the end of a rainfall event to maintain the storage capacity. This water should be used for on site purposes including dust suppression and landscape watering. These activities must be managed to prevent any pooling or runoff of tannin impacted water.
- Bunded stockpiles must be inspected within 24 hours of cessation of any rainfall event greater than 10mm to ensure tannin impacted water does not overflow.

2.3 Site management procedures

Site management procedures must be prepared for all sites where tannins are identified as a potential issue. Site management procedures should be based on the management measures provided in this Environmental Direction.

3 BACKGROUND

3.1 Tannin generation from vegetation mulch

See Plates 1 – 3 in Appendix 1.

Tannins are naturally occurring plant compounds. Tannin generation from vegetation mulch is likely to be highest from low-lying coastal floodplain areas. The species of vegetation (eg *Melaleuca*) will have a major impact on the likelihood of tannin generation.

Tannin generation is generally highest from mulched vegetation that is stockpiled in areas that are subject to inundation. Placement in wet areas will result in accelerated leaching of tannins into water, concentration of tannins in pooled water, and greater impacts on water quality.

3.2 Tannin impacts on water quality

See Plates 4 – 5 in Appendix 1.

The main concern with the discharge of water that is high in tannins is that it may increase the biological oxygen demand (BOD) of the receiving environment. Increases in BOD may result in a decrease in available dissolved oxygen. A lack of dissolved oxygen is identified as the main cause of about 80 percent of fish kills in NSW rivers and estuaries.

Tannin impacts may result in dark coloured water discharge from construction sites. This impact can be obvious and may raise the concern of the community and other stakeholders including regulatory authorities. Once discharged to the environment, tannins may reduce visibility and light penetration and change the pH of receiving waters. These impacts may affect aquatic ecosystems in receiving environments.

Tannins cannot be readily treated with standard construction site water quality controls. Once water on site is impacted with tannins it is not possible to treat effectively with currently approved flocculants. Minimisation of tannin generation in the first place is the management strategy that must be applied.

3.3 Use of mulch on construction sites

See Plates 10 – 16 in Appendix 2.

The RMS Biodiversity Guidelines provide guidance on the benefits of reusing various sizes of vegetation for different purposes. Mulch is a readily available and cheap source of material for temporary site stabilisation and sedimentation control. The re-use of mulch reduces the need to transport this material off-site and reduces handling and disposal costs for construction contracts.

Unprotected mulch sedimentation controls should not be placed in concentrated flow lines where mulch may be washed away. Mulch may be protected by wrapping it with geofabric or other materials to provide a stable control. All temporary catch dams constructed from mulch must have a stable outlet to minimise the washing away of mulch in high rainfall events, and the possible failure of the control.

4 ADDITIONAL RESOURCES

- RTA Biodiversity Guidelines- Protecting and Managing Biodiversity on RTA Projects, 2011
- Pacific Highway Mulch Protocol 2011

5 APPENDICES

Appendix 1: Plates showing tannin generation & water quality impacts

Plate 1: Melaleuca vegetation community – mulch from this vegetation type will generally produce high amounts of tannins.

Plate 2: Vegetation mulching activity – mulch should be progressively moved into prepared stockpile areas.

Plate 3: Tannin generation from recently felled and partially mulched vegetation in an area subject to localised inundation. Mulched vegetation should be progressively moved to prepared stockpiles to manage tannin impacted water.

Plate 4: Tannin impact in stormwater at the discharge point from a road construction site. The discharge of impacted water may be obvious to community and other stakeholders.

Plate 5: Tannins in a drainage line generated from very thickly applied mulch on the batter above. Note that the sedimentation fence is not effective in treating the tannins.

Appendix 2: Plates showing the use of mulch for erosion & sedimentation controls

Plate 6: Mulched vegetation stockpiled in a low-lying area subject to inundation. This is not an appropriate stockpile location and may increase the generation of tannins from stockpiled mulch.

Plate 7: Mulch being placed as batter erosion control. Mulch should not be applied in layers more than 100 mm thick for surface stabilisation.

Plate 8: Site showing recent application of a mulch/topsoil mix on batters (40% mulch to 60% topsoil). Mulch mixes are used to provide temporary stabilisation to prevent the loss of topsoil from batters in heavy rainfall events. Mulch use is also shown as a mounded sedimentation control to prevent sediment entering the median drain.

Plate 9: A mulch/topsoil mix used to provide temporary batter stabilisation and to assist cover crop establishment.

Plate 10: Successful establishment of cover crops on batters where mulch has been used with topsoil to assist temporary stabilisation.

Plate 11: Geofabric wrapped mulch bunds used for sedimentation control

Plate 12: Mulch used as a bund for a temporary sedimentation catch dam. Mulch is effective as it can provide both containment and filtering of site water. Mulch should not be used as a control in areas of concentrated flow where it may be washed away. Any mulch containment control should have a defined and lined outlet that allows discharge from the control without washing mulch away. Note that this control does not have a defined discharge outlet which should be installed to prevent failure of the control in heavy rainfall events.

Appendix 3: Minimum requirements for community mulch giveaways

The purpose of community mulch giveaways is to provide mulch for residential landscaping purposes.

The activities of a community mulch giveaway are permissible under the *Protection of the Environment Operations (Waste) Regulation 2005 – General Exemption Under Part 6, Clause 51 and 51A* (the Raw Mulch Exemption 2008). However, the activities remain subject to other relevant environmental regulations within the Act and Regulations. The Raw Mulch Exemption 2008 is subject to the following conditions:

- The raw mulch can only be applied to land for the purposes of filtration or as a soil amendment material or used either singularly or in any combination as input material(s) to a composting process.
- The consumer must land apply the raw mulch within a reasonable period of time.

Further information can be found at: www.environment.nsw.gov.au/resources/waste/ex08mulch.pdf

It is the mulch generators responsibility to ensure that the mulch is reused in an environmentally responsible manner.

A safe work method statement (SWMS) must be prepared that identifies potential OHS risks and all prevention and mitigation measures. The SWMS must apply to both the community and site workers involved in the mulch giveaway.

Each member of the community who participates in the mulch giveaway must read and understand a site specific information sheet. A template information sheet is attached as Appendix 4.

The site occupier must maintain written records for each load of mulch that is taken away and to ensure that each community participant understands the conditions of the community mulch giveaway information sheet. A suggested template to record this information is attached as Appendix 5.

Appendix 4: Community mulch giveaway information sheet

The following community mulch giveaway information sheet must be populated with site specific information.

Community Mulch Giveaway
Information Sheet

Details of Mulch Supply	
Site Occupier	<insert name of contractor / alliance etc>
Project Name	<insert project name>
Location	<insert location of mulch stockpile>
Mulch stockpile access directions	<insert adequate directions for community members to find the stockpile location>

Background

- This information sheet supports the non-commercial giveaway of mulch for local residents.
- The product is raw vegetation mulch from <insert project location / name>.

Conditions

- Any one individual may only take a maximum of 5 trailer loads from this project.
- The mulch may only be used for residential landscaping purposes.
- Mulch must not be placed in or immediately adjacent to waterways.
- The raw mulch can only be applied to land for the purposes of filtration or as a soil amendment material or used either singularly or in any combination as input material(s) to a composting process.
- The consumer must apply the raw mulch to land within a reasonable period of time.

Community Safety Requirements

-

Appendix 5: Records template for community mulch giveaway

The records in the following suggested template must be kept as a minimum.

Community Mulch Giveaway Record Sheet				
Date	**Car Registration**	**I have read and understand the 'Community Mulch Giveaway Information Sheet'**	**Name**	**Signature**
		❑ Yes		
		❑ Yes		
		❑ Yes		
		❑ Yes		
		❑ Yes		
		❑ Yes		
		❑ Yes		
		❑ Yes		
		❑ Yes		
		❑ Yes		
		❑ Yes		

Unexpected Discovery of Contaminated Land Procedure

Distribution

There are no restrictions on the distribution/circulation of this Procedure within the TNR3N Project (the Project).

Purpose

This Procedure details the actions to be taken when potential contaminated soil/material is encountered during excavation/construction activities.

Induction/Training

Where required, personnel will be trained in the identification of potential contaminated soil/material including the requirements of this Procedure during the Project induction and/or regular toolbox talks.

Scope

This Procedure is applicable to all activities conducted by personnel on the TNR3N Project that have the potential to uncover/encounter contaminated soil/material.

Procedure

1. Potential Contaminated Soil/Material Encountered during Construction Activities

If potential contaminated soil/material is encountered during excavation/construction activities:

- STOP ALL WORK in the immediate/affected area.
- Immediately notify the Environment Manager (EM).
- Environment Manager immediately notify RMS Project Manager.
- Recommence works in an alternate area where practicable.

2. Personal Protective Equipment (PPE)

Prior to any contamination investigation/management, appropriate personal protective equipment (PPE) is to be worn as per the relevant Material Safety Data Sheet(s) (MSDS).

This may include, but not be limited to:

- Eye goggles.
- Face mask.
- Rubber boots.
- Rubber gloves.
- Work clothes (ie long sleeve shirt/pants and steel capped boots).

3. Undertake a Site/Area Contamination Investigation

The EM or Environment Officer is to assess the situation and if considered necessary, commission a suitably qualified contamination specialist to undertake a contamination investigation in the area of the find.

The material is to be classified in accordance with the Waste Classification Guidelines (NSW EPA, 2014).

If necessary, the EM will liaise with the relevant authorities to determine the appropriate management options.

The EM (in consultation with specialists) will determine the appropriate management measures to be implemented. This may include treatment or offsite disposal. If the material is to be disposed of offsite, ensure the waste facility is appropriately licensed.

If the material is determined to be acid sulfate soil or potential acid sulfate soil, the Acid Sulfate Soil Management Procedure is to be followed.

4. Remedial Action

Remedial actions are to be incorporated into specific Remediation Action Plan.

Implement G36 hold point 4.2.4 - Remediation Action Plan.

5. Recommence Works

Recommence works once remedial works have been implemented. The EM grants approval once hold point is released.

Transport
Roads & Maritime
Services

NSW GOVERNMENT

Stockpile management protocol

February 2017

Document control

File name	SWMP Appendix E_Rev2_ 27022017.doc
Report name	Stockpile management protocol
Revision number	2

Revision history

Revision	Date	Description	Approval
2	27/02/2017	Address RMS Comments	HC
1	03/02/2017	RMS Review	HC
0	29/11/2016	Initial Draft	HC

1 Introduction

There are no restrictions on the distribution/circulation of this Protocol within the TNR3N Project.

2 Purpose

This protocol outlines the locational criteria used to guide the placement of temporary stockpiles and provides both standard and site-specific mitigation measures to be implemented to minimise impacts on the environment. Stockpile sites may typically be required to store material including, but not limited to temporary storage of:

- Excavated materials to be used in fill embankments and other design features;
- Contaminated material prior to sampling and subsequent offsite disposal;
- Excavated material unsuitable for reuse in the formation;
- Excess concrete, pavement, rock, steel and other material stored for either future use in the Project or prior to removal from site; and
- Topsoil, mulch, excess timber for landscaping and revegetation works.

Temporary stockpiles would be removed for re-use within the project or disposed of off-site.

Potentially contaminated materials will be managed in accordance with the *Unexpected Discovery of Contaminated Land Procedure (Appendix D to the SWMP).*

The process for monitoring and managing spoil and fill including details of how excavated material would be handled, stockpiled, reused and disposed is detailed in Appendix B of the Soil and Water Management Plan and the Waste and Resource Management Plan.

This includes ensuring the offsite disposal of materials to an appropriately licensed facility or in accordance with the waste exemptions; and records including section 143 certificates to be completed and retained for any material to be disposed of outside of the project boundary.

Appropriate approvals will be obtained under the POEO Act 1997 where the material is not taken to a licensed landfill facility.

3 Induction / Training

Personnel involved in planning or managing stockpiles will be trained in the requirements of this Procedure. Training will also include inductions, toolbox talks, pre-starts and targeted training as required.

4 Scope

This protocol is relevant to the planning, placement and management of all stockpiles, with the exception of small stockpiles that are utilised within a short period of time and do not pose a risk to erosion and or dust generation (i.e. aggregate material for use in drainage within a shift) on or related to the TNR3N Project.

5 Stockpile location criteria

Stockpiles sites on the Project shall be assessed against the following criteria:

- Outside the Tree protection zone of trees or native vegetation to be retained;

- At least 5m from concentrated water flows;
- At least 10m from waterways classified as Class 1 or Class 2 Waterways;
- On relatively level ground;
- Away from areas of Heritage Conservation Value;
- Within the REF assessment area;
- No greater than 2m in height, with slopes no steeper than 2:1; and
- In a location that allows the installation of appropriate erosion and sediment control measures.

Stockpile sites that do not comply with the criteria above will be the subject of a Consistency Review or REF Addendum to be approved by RMS.

An assessment of proposed stockpile sites will be completed by assessing the site against the criteria outlined above using the '*Stockpile Location Assessment*' form (Appendix A to this protocol). This is to be completed by the Environmental Officer and approved by the Environment Manager.

Stockpile locations that either comply with the locational criteria above or are approved through the RMS will be recorded in the project stockpile register (example located in Appendix B).

6 Protocol

Prior to the establishment of any stockpile on site as part of the project, ensure that:

1. The location of the stockpile is considered against the site selection criteria contained in Section 5 and that detail of how the stockpile site meets each of the criteria is provided within the '*Stockpile Location Assessment'*.
2. Site-specific mitigation measures, where they are necessary to further reduce impacts, are identified and detailed in the '*Stockpile Location Assessment'*.
3. Mitigation measures for each stockpile site include as a minimum:
    - The perimeter of the stockpile (excluding vehicle access points) will be delineated with a bund (made out of earth or mulch) or other type of fencing or barrier such as sediment fence;
    - Materials will not be stockpiled under the drip lines trees or native vegetation to be retained, and never pushed up around the base of trees. Trees are not to be flooded or soils caused to be waterlogged as a result of stockpile development;
    - Erosion and sedimentation controls will be erected between the site and any drainage lines or down-slope areas;
    - A diversion bund will be installed on the uphill side of the stockpile to divert water around the site, unless run on water is 'dirty' construction water. Where this occurs 'dirty' run on water shall be diverted to erosion and sediment controls;
    - Short-term stockpiles will be kept damp to control dust where required. Long-term stockpiles not in use for longer than 20 days will be stabilised with cover crop or similar within 10 days;
    - Where a proposed stockpile is located on private land, an approved notice under *s143 of the POEO Act 1997* must be obtained prior to commencement of stockpiling;

- Mulch stockpile management, including leachate containment, will be in accordance with the SWMP and the respective management strategies;
- Dust management measures (including for vehicle movements associated with stockpiling activities) will be implemented in accordance with the requirements of the Air Quality Management Plan;
- Stockpiled material must be appropriately segregated into manageable portions, adequately separated to prevent mixing and clearly sign posted as to material type e.g. topsoil, general fill, unsuitable, mulch, reclaimed asphalt, recycled concrete etc; and
- Approval from RMS is to be sought prior to the stockpiling of any contaminated material generated on site.

4. In accordance with Roads and Maritime Specification R44, topsoil stockpiles must:
   - be free from subsoil, other excavated materials, contaminated materials, refuse, clay lumps and stones, timber or other rubbish;
   - be trimmed to a regular shape to facilitate measuring and batter slopes not steeper than 2H:1V;
   - have their batters track rolled or stabilised by other means; and
   - be seeded with sterile cover crop in accordance with Specification Roads and Maritime D&C R178, to encourage vegetation cover.

7 Compliance

Compliance with this *Stockpile management protocol* will be tracked through the weekly environmental inspection regime, as per the Construction Environmental Management Plan. Identified non-compliances will be reported to the Environment Manager and the appropriate management measures will be put in place to ensure ongoing compliance.

Stockpiles created from construction works will be managed in accordance with the Earthworks Plan.

Appendix A

Stockpile Location Assessment

Stockpile Location Assessment				
Project: TNR3N				
Date:		**Location/Chainage:**		
#	**Location Based Criteria**	**Yes**	**No**	**Comments**
1	Is the site located 5 metres away from areas of concentrated water flow?			
2	Is the site located at least 10 metres from a Class 1 or Class 2 waterway? And 50m from a water way for mulch stockpiles?			
3	Is the site located so that the appropriate erosion and sediment control measures can be installed and will operate effectively?			
4	Is the site Outside the Tree protection zone of trees or native vegetation to be retained?			
5	Is the site away from areas of Heritage Conservation Value?			
6	Is the site on relatively level ground?			
7	Is the site located within the REF Assessment Area?			
Non-compliant stockpile Locations: If the answer to any of the above questions is **NO**, further environmental assessment is required as specified in the project *Stockpile Management Protocol, Appendix E to the SWMP*.				
Compliant Stockpile Locations: If the proposed stockpile site is deemed compliant with the location based criteria the completed form and a copy of the project Sensitive Area Plan's with the stockpile location marked must be submitted to the Environmental Manager for approval **prior** to establishment of the stockpile site.				
Once approved, the stockpile location must be recorded in the project stockpile register.				
Prepared by: **Date:**		**Environmental Manager Approval:** **Date:**		

Appendix B

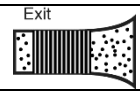
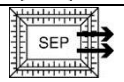
Example Stockpile Site Register

TNR3N- STOCKPILE REGISTER					
Stockpile Number					
Chainage					
Carriageway (NB/SB)					
Material to be Stockpiled (i.e. VENM, Topsoil, Mulch, Waste Concrete etc)					
Is the site located 5m away from areas of concentrated water flow?					
Is the site located at least 10 metres from a Class 1 or Class 2 waterway?					
Is the site located so that the appropriate erosion and sediment control measures can be installed and will operate effectively?					
Is the site Outside the Tree protection zone of trees or native vegetation to be retained?					
Is the site away from areas of Heritage Conservation Value?					
Is the site on relatively level ground?					
Is the site located within the REF Assessment Area?					
Is the stockpile site compliant with the locational criteria and approved by the Environmental Manager? If yes, insert hyperlink to the approved Stockpile Location Assessment.					
If the site is non-compliant with the locational criteria, was the stockpile site approved by RMS a consistency review or REF Addendum? If yes insert hyperlink to the approved document.					
Date Stockpile Approved					
Comment: additional mitigation measures etc.					

PROGRESSIVE EROSION AND SEDIMENT CONTROL PLAN
The Northern Road Upgrade Stage 3 North – Early works
Concept PESCP's

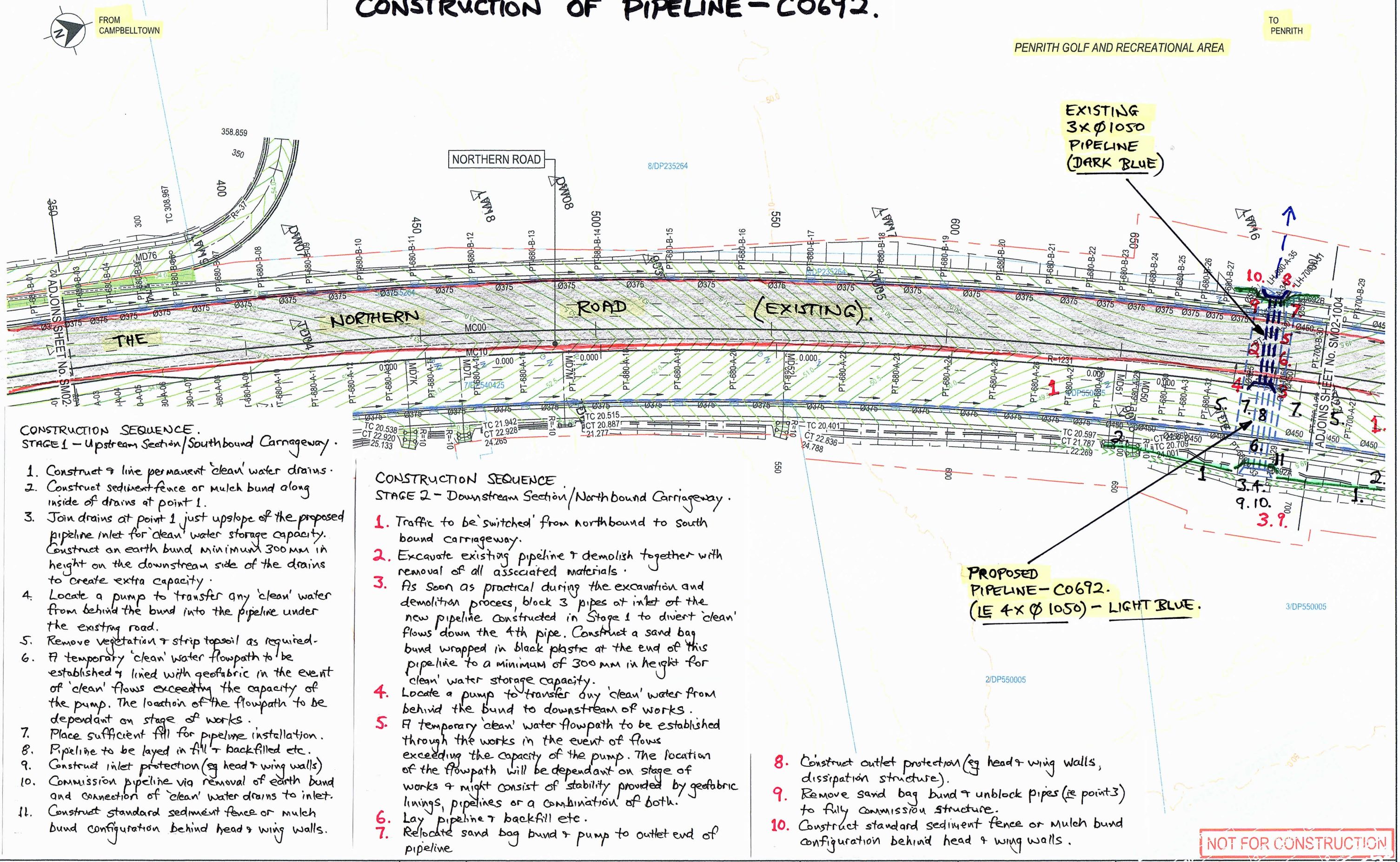
CONSTRUCTION NOTES:

1. THIS PLAN WILL BE READ TOGETHER WITH RELEVANT ENVIRONMENTAL DOCUMENTATION (E.G. SWMP, EWMS)
2. WEATHER FORECASTS TO BE REGULARLY MONITORED
3. NUMBERING INDICATES 'ORDER' OF WORKS WHERE RELEVANT (E.G. 1, 2, 3)
4. THE PRINCIPLE OF MINIMUM DISTURBANCE TO EXISTING VEGETATION TO BE IMPLEMENTED WITH 'NO-GO' ZONES ISOLATED WITH FLAGGING ETC.
5. PRIORITY TO BE PLACED ON THE CONSTRUCTION OF PERMANENT DRAINAGE WORKS FOR 'CLEAN' WATER MANAGEMENT
6. 'CLEAN' AND 'DIRTY' OR CONSTRUCTION RUNOFF TO BE SEPARATED
7. SEDIMENT BASINS AND 'CLEAN' AND 'DIRTY' WATER DRAINS TO BE CONSTRUCTION IMMEDIATELY AS PERMITTED
8. TEMPORARY EROSION AND SEDIMENT CONTROLS TO BE INSTALLED PRIOR TO SITE DISTURBANCE WHERE REASONABLE AND FEASIBLE
9. CROSSINGS TO BE CONSTRUCTED AS PER 'BLUE BOOK' GUIDELINES AND PRIOR TO ANY PLANT/VEHICLE MOVEMENT OVER WATERCOURSES
10. STOCKPILE LOCATIONS ARE INDICATED ON THE PLAN WHERE RELEVANT WITH TEMPORARY CONTROLS AS NECESSARY (E.G. SEDIMENT FENCE)
11. THE DIVERSION OF 'DIRTY' RUNOFF TO SEDIMENT BASINS IS TO BE MAXIMISED
12. RUNOFF CONTROL FROM FORMATIONS/TOPS OF FILLS TO SEDIMENT BASINS TO BE VIA ONE OR A COMBINATION OF FILL SHAPING, DIVERSION DRAINS/BANKS, EARTH BUNDS ALONG TOP EDGES OF FILL BATTERS DISCHARGING TO BATTER DRAINS AND STORM WATER PITS ETC.
13. SEDIMENT BASINS TO BE MANAGED IN ACCORDANCE WITH THE SWMP (E.G. FLOCCULATION, TESTING & DISCHARGE OR REUSE)
14. CULVERT INLET AND OUTLET PROTECTION TO BE CONSTRUCTED IMMEDIATELY AFTER PIPE OR BOX UNIT INSTALLATION (E.G. HEAD & WING WALLS, DISSIPATERS)
15. THE LOCATIONS OF TEMPORARY CONTROLS ON THIS PLAN ARE INDICIDIVE ONLY WITH ACTUAL SITES TO BE DETERMINED DURING WORKS
16. TEMPORARY CONTROLS IN ADDITION TO THOSE SHOWN ON THE DRAWINGS TO BE CONSTRUCTED AT 'KEY' LOCATIONS AS REQUIRED AND CONSIST OF:
    - EROSION CONTROLS (E.G. WINDROWS ON CONTOURS TO REDUCE SLOPE LENGTH AND SURFACE FLOW VELOCITIES); and
    - SEDIMENT CONTROLS (E.G. SEDIMENT FENCES, MULCH SEDIMENT TRAPS, MULCH BUND SEDIMENT TRAPS)
17. THE ONSITE TEAM ARE TO ENSURE PROPOSED SLOPE LENGTHS ARE ADHERED TO
18. DISTURBED AREAS ARE TO BE PROGRESSIVELY STABILISED (E.G. FINAL DESIGN TREATMENTS SUCH AS CONCRETE OR REVEGETATION)
19. CONTROLS REMOVED OR DISTURBED DURING WORKS TO BE REINSTATED PRIOR TO WEEKENDS AND FORECAST RAIN
20. AREAS TO BE FULLY 'SECURED' WITH CONTROLS PRIOR TO ANY TEMPORARY SUSPENSION OF WORKS
21. ADEQUATE TIME TO BE PERMITTED TO 'SECURE' THE PROJECT PRIOR TO FORECAST RAIN
22. MULCH TO BE STORED AND MANAGED IN ACCORDANCE WITH THE DOCUMENT – 'ENVIRONMENTAL DIRECTION MANAGEMENT OF TANNINS FROM VEGETATION MULCH' (ROADS & MARITIME SERVICES, 2012 B)
23. DEWATERING OF EXCAVATIONS ETC TO BE CONDUCTED AS PER THE REQUIRMENTS OF THE SWMP
24. THE TRACKING OF MUD/SOIL MATERIAL ONTO LOCAL ROADS TO BE MONITORED AND CONTROLLED (E.G. SHAKER RAMPS)
25. DUST TO BE CONTROLLED ON SITE AND ALONG UNSEALED ROADS WITH CONTROLS SUCH AS WATER CARTS AND OR LIMITING VEHICLE SPEEDS
26. TEMPORARY CONTROLS TO BE INSPECTED REGULARLY WITH MAINTENANCE/REPAIRS UNDERTAKEN AS REQUIRED
27. THIS PLAN HAS BEEN PREPARED AS PER 'BLUE BOOK' GUIDELINES AND STANDARD DRAWINGS – VOLUMES 1 & 2D
28. THIS PLAN IS TO BE REVISED WHEN REQUIRED (E.G. CHANGE IN CONSTRUCTION METHODS AND/OR SITE CONDITIONS)

LEGEND	
Sediment Fence/Geofabric Fence	
Mulch Berm	
Earth Bund / Diversion Bank	
Catch Drain/ Geofabric Lined	
Rock Check Dam	
Sandbag Check Dam	
Protective Fencing (Sensitive Area)	
Construction Exit with Shaker Grid	
Clean water flow path	
Temporary Culvert / Pipe Crossing	
Settling Pond / Temporary Basin	
Revegetation Area	
Stockpile	
Construction Water Flow Direction	
Construction Water Catchment Divide	
Geofabric Lined Batter Chute	
15m Exclusion around drainage lines	
Vegetation Windrow	

REVISION	PREPARED BY	DATE	COMMENTS	REVIEWED BY	DATE
Rev0	John Wright	20/03/2017	Concept PESCP's	Hari Corliss	20/03/2017

CONSTRUCTION OF PIPELINE – C0692.



CONSTRUCTION SEQUENCE.
STAGE 1 – Upstream Section/Southbound Carriageway.

1. Construct & line permanent 'clean' water drains.
2. Construct sediment fence or mulch bund along inside of drains at point 1.
3. Join drains at point 1 just upslope of the proposed pipeline inlet for 'clean' water storage capacity. Construct an earth bund minimum 300 mm in height on the downstream side of the drains to create extra capacity.
4. Locate a pump to transfer any 'clean' water from behind the bund into the pipeline under the existing road.
5. Remove vegetation & strip topsoil as required.
6. A temporary 'clean' water flowpath to be established & lined with geofabric in the event of 'clean' flows exceeding the capacity of the pump. The location of the flowpath to be dependant on stage of works.
7. Place sufficient fill for pipeline installation.
8. Pipeline to be layed in fill & backfilled etc.
9. Construct inlet protection (eg head & wing walls)
10. Commission pipeline via removal of earth bund and connection of 'clean' water drains to inlet.
11. Construct standard sediment fence or mulch bund configuration behind head & wing walls.

CONSTRUCTION SEQUENCE
STAGE 2 – Downstream Section/Northbound Carriageway.

1. Traffic to be 'switched' from northbound to south bound carriageway.
2. Excavate existing pipeline & demolish together with removal of all associated materials.
3. As soon as practical during the excavation and demolition process, block 3 pipes at inlet of the new pipeline constructed in Stage 1 to divert 'clean' flows down the 4th pipe. Construct a sand bag bund wrapped in black plastic at the end of this pipeline to a minimum of 300 mm in height for 'clean' water storage capacity.
4. Locate a pump to transfer any 'clean' water from behind the bund to downstream of works.
5. A temporary 'clean' water flowpath to be established through the works in the event of flows exceeding the capacity of the pump. The location of the flowpath will be dependant on stage of works & might consist of stability provided by geofabric linings, pipelines or a combination of both.
6. Lay pipeline & backfill etc.
7. Relocate sand bag bund & pump to outlet end of pipeline
8. Construct outlet protection (eg head & wing walls, dissipation structure).
9. Remove sand bag bund & unblock pipes (ie point 3) to fully commission structure.
10. Construct standard sediment fence or mulch bund configuration behind head & wing walls.

NOT FOR CONSTRUCTION

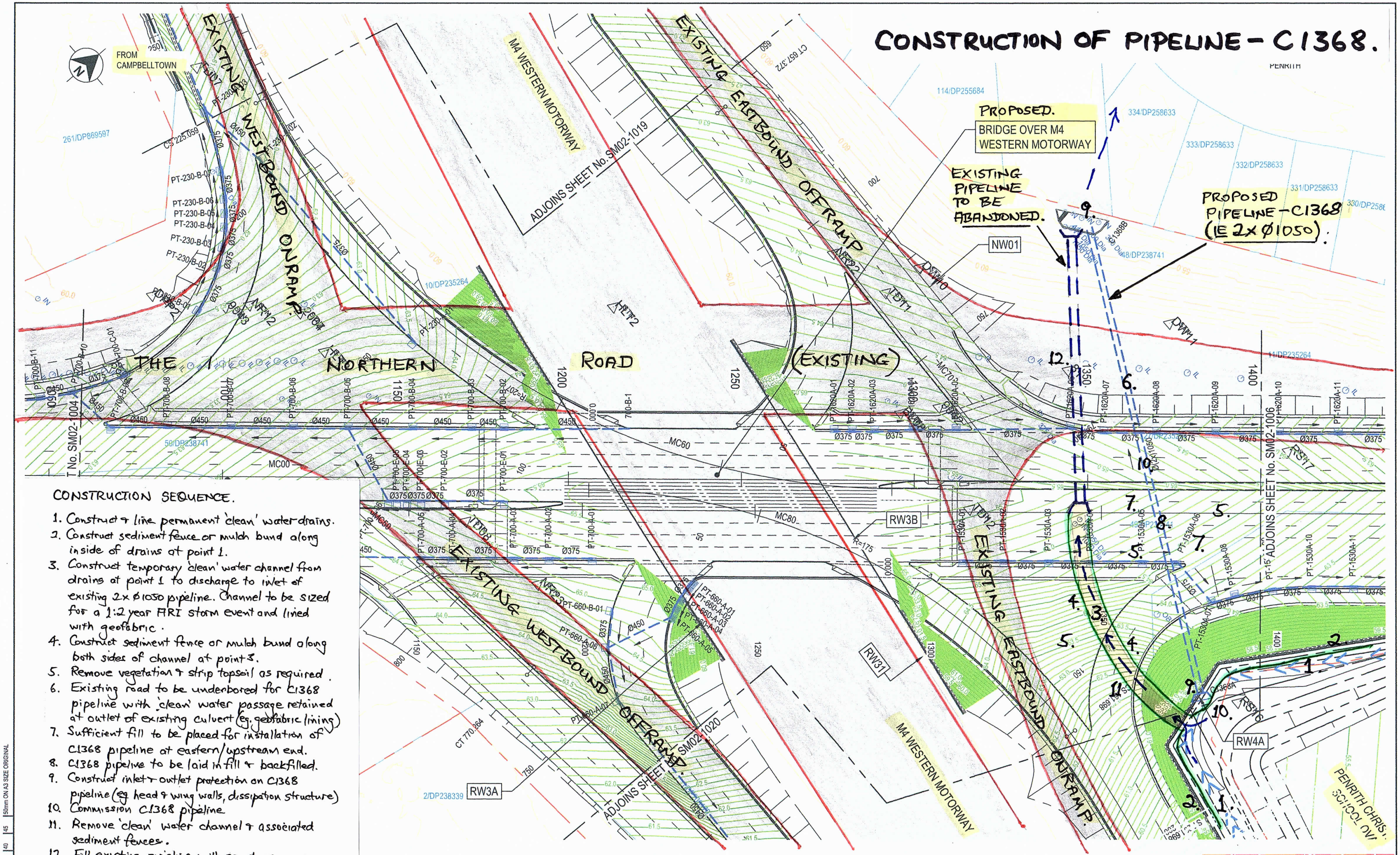
THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED
0 5 10 15 20 25 30 35 40 45 50mm ON A3 SIZE ORIGINAL

DRAWING FILE LOCATION / NAME: C:\projectwise\syd_projects\r.fletcher\d0184257\TNR3N-DG-SM02-1003.dwg				DESIGN LOT CODE	DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING	PLOT DATE / TIME: 16 February 2017 - 3:13:02 PM	PLOT BY: Fletcher, Rebecca
EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No. / APPROVAL	SCALES ON A3 SIZE DRAWING: 0 10 20 30 40 SCALE 1:1000m	DRAWINGS / DESIGN PREPARED BY: APB JV lendlease	TITLE / NAME / DATE: DRAWN R. FLETCHER 16.02.2017; DRG CHECK C. YATES 16.02.2017; DESIGN E. DEAN 16.02.2017; DESIGN CHECK A. ROTSEY 16.02.2017; DESIGN MNGR P. REES 16.02.2017; PROJECT MNGR M. ADAMS 16.02.2017
					CO-ORDINATE SYSTEM: MGA ZONE 56; HEIGHT DATUM: AHD	DRG No. TNR3N-DG-SM02-1003	

CLIENT: NSW GOVERNMENT Transport Roads & Maritime Services
PREPARED FOR: WESTERN SYDNEY PROGRAM OFFICE

PENRITH CITY COUNCIL AREA — A3
MR154 THE NORTHERN ROAD UPGRADE - STAGE 3 NORTH
FROM GLENMORE PARKWAY TO JAMISON ROAD
DRAINAGE
GENERAL ARRANGEMENT
PLAN — SHEET 3 OF 28
RMS REGISTRATION No. DS2017/000012 — PART
ISSUE STATUS: DEVELOPED CONCEPT DESIGN — EDMS No. — SHEET No. SM02-1003 — ISSUE A1

CONSTRUCTION OF PIPELINE - C1368.



CONSTRUCTION SEQUENCE.

1. Construct & line permanent 'clean' water drains.
2. Construct sediment fence or mulch bund along inside of drains at point 1.
3. Construct temporary 'clean' water channel from drains at point 1 to discharge to inlet of existing 2x Ø1050 pipeline. Channel to be sized for a 1:2 year ARI storm event and lined with geofabric.
4. Construct sediment fence or mulch bund along both sides of channel at point 3.
5. Remove vegetation & strip topsoil as required.
6. Existing road to be underbored for C1368 pipeline with 'clean' water passage retained at outlet of existing culvert (eg. geofabric lining)
7. Sufficient fill to be placed for installation of C1368 pipeline at eastern/upstream end.
8. C1368 pipeline to be laid in fill & backfilled.
9. Construct inlet & outlet protection on C1368 pipeline (eg. head & wing walls, dissipation structure)
10. Commission C1368 pipeline
11. Remove 'clean' water channel & associated sediment fences.
12. Fill existing pipeline with grout as now offline.

NOT FOR CONSTRUCTION

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50mm ON A3 SIZE ORIGINAL

DRAWING FILE LOCATION / NAME: C:\projectwise\syd_projects\r.fletcher\d0184257\TNR3N-DG-SM02-1005.dwg	DESIGN LOT CODE	DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING	PLOT DATE / TIME: 16 February 2017 - 3:13:41 PM; PLOT BY: Fletcher, Rebecca
EXTERNAL REFERENCE FILES	REV / DATE / AMENDMENT / REVISION DESCRIPTION	WVR No. / APPROVAL	SCALES ON A3 SIZE DRAWING: 0 10 20 30 40 SCALE 1:1000m; CO-ORDINATE SYSTEM: MGA ZONE 56; HEIGHT DATUM: AHD
		DRAWINGS / DESIGN PREPARED BY: APB JV, lendlease	DRG No. TNR3N-DG-SM02-1005

TITLE	NAME	DATE
DRAWN	R. FLETCHER	16.02.2017
DRG CHECK	C. YATES	16.02.2017
DESIGN	E. DEAN	16.02.2017
DESIGN CHECK	A. ROTSEY	16.02.2017
DESIGN MNGR	P. REES	16.02.2017
PROJECT MNGR	M. ADAMS	16.02.2017

CLIENT: NSW Government — Transport Roads & Maritime Services

PREPARED FOR: WESTERN SYDNEY PROGRAM OFFICE

PENRITH CITY COUNCIL AREA
MR154 THE NORTHERN ROAD UPGRADE - STAGE 3 NORTH
FROM GLENMORE PARKWAY TO JAMISON ROAD
DRAINAGE
GENERAL ARRANGEMENT PLAN — SHEET 5 OF 28

A3

RMS REGISTRATION No.: DS2017/000012 — PART

ISSUE STATUS: DEVELOPED CONCEPT DESIGN — EDMS No. — SHEET No.: SM02-1005 — ISSUE: A1

WIDENING - SOUTHBOUND CARRIAGEWAY.
CH 2800 TO 3150

FROM CAMPBELLTOWN

TO PENRITH

NOTE:-
STORMWATER SYSTEM WITHIN THIS CATCHMENT FLOWS TO A DISCHARGE POINT ON ADJOINING SHEET.

NOTE:-
STORMWATER SYSTEM WITHIN THIS CATCHMENT FLOWS TO THE EXISTING MARKED SYSTEM ON THIS PLAN.

APPROXIMATE CATCHMENT BOUNDARY

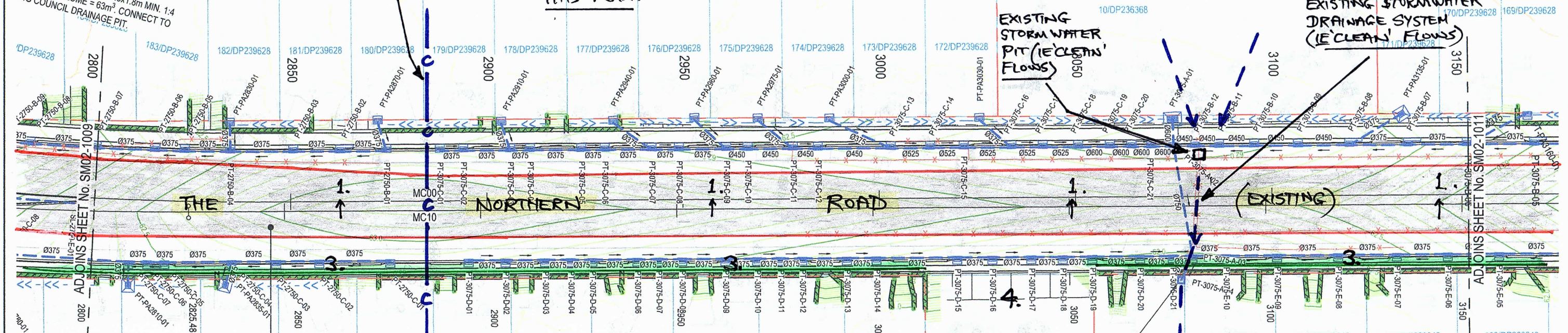
'ENUATION BASIN. 10.5x10.5x1.8m MIN. 1:4 SLOPES. VOLUME = 63m³. CONNECT TO ING COUNCIL DRAINAGE PIT.

CHILDREN'S PLAYGROUND

PARK (OPEN SPACE)

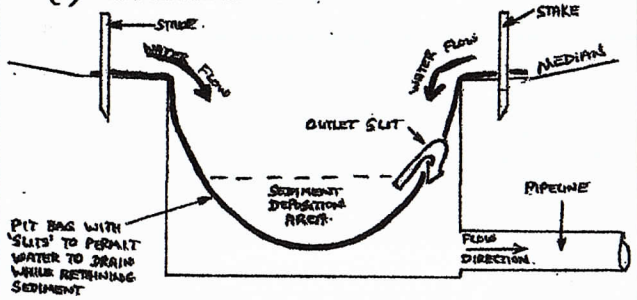
EXISTING STORMWATER PIT (IE'CLEAN' FLOWS)

EXISTING STORMWATER DRAINAGE SYSTEM (IE'CLEAN' FLOWS)

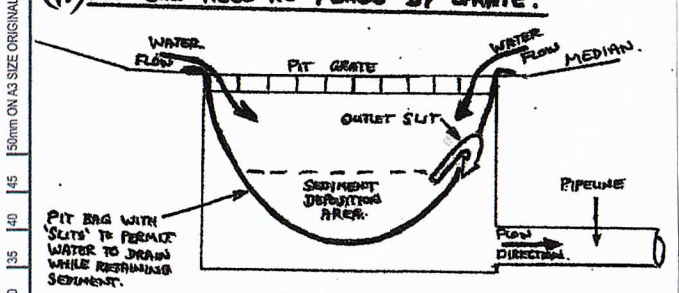


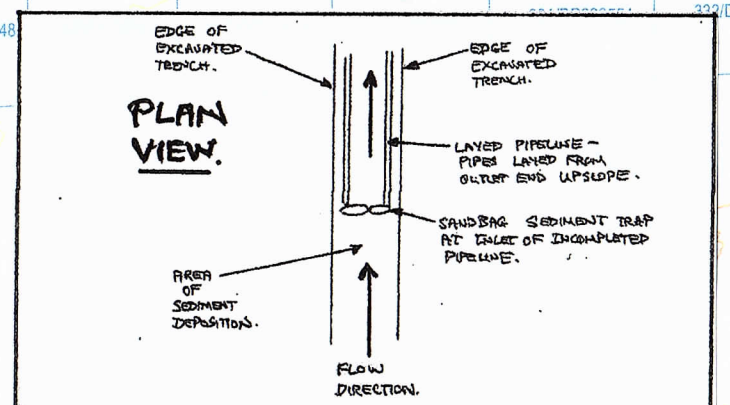
SKETCH PLAN - USE OF PIT BAGS.

(i) PIT BAG HELD IN PLACE WITH STAKES.



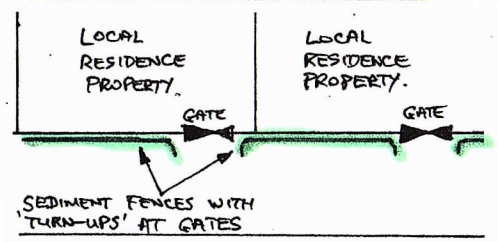
(ii) PIT BAG HELD IN PLACE BY GRATE.





SKETCH PLAN — SANDBAG SEDIMENT TRAP AT INLET OF INCOMPLETE PIPELINE.

SKETCH PLAN - SEDIMENT FENCE CONFIGURATION ALONG BOUNDARY.



CONSTRUCTION SEQUENCE.

1. Relocate traffic towards northbound carriageway with concrete barriers isolating the works area.
2. Provide access for local residences through the works area.
3. Construct sediment fences along the boundary with provision for access for local residences — refer to Sketch Plan for general configuration.
4. Construct sediment trap/basin to a capacity permitted by available area re tree removal.
5. Commence road works.
6. Construct sediment controls at pit inlets as adjacent areas are disturbed — refer to Sketch Plan detailing use of pit bags.
7. Adapt controls to 'match' progress re construction of the new stormwater system - refer to Sketch Plan detailing use of sand bag sediment traps at inlets of incomplete pipelines.
8. Mud/soil tracking, dust generation & maintenance of temporary controls to be constantly monitored and addressed/controlled as required.
9. Continue works to completion with road sealing & revegetation.

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DRAWING FILE LOCATION / NAME: C:\projectwise\Export\SM\TNR3N-DG-SM02-1010.dwg				DESIGN LOT CODE: SM02	DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING: TNR3N-RD-0001-MOD-04, TNR3N-SM-0003-MOD-03	PLOT DATE / TIME: 17 March 2017 - 5:11:59 PM; PLOT BY: Chris Yates
EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL	SCALES ON A3 SIZE DRAWING: 0 10 20 30 40 SCALE 1:1000m
	A1	06.03.2017	DEVELOPED CONCEPT DESIGN - CDR ISSUE			CO-ORDINATE SYSTEM: MGA ZONE 56; HEIGHT DATUM: AHD
	A2	17.03.2017	DEVELOPED CONCEPT DESIGN - LLE REVIEW			DRAWINGS / DESIGN PREPARED BY: APB JV / lendlease; DRG No. TNR3N-DG-SM02-1010

TITLE	NAME	DATE
DRAWN	R. FLETCHER	16.02.2017
DRG CHECK	C. YATES	16.02.2017
DESIGN	D. CARRIGAN	16.02.2017
DESIGN CHECK	A. ROTSEY	16.02.2017
DESIGN MNGR	P. REES	16.02.2017
PROJECT MNGR	M. ADAMS	16.02.2017

CLIENT: NSW GOVERNMENT Transport Roads & Maritime Services

PREPARED FOR: WESTERN SYDNEY PROGRAM OFFICE

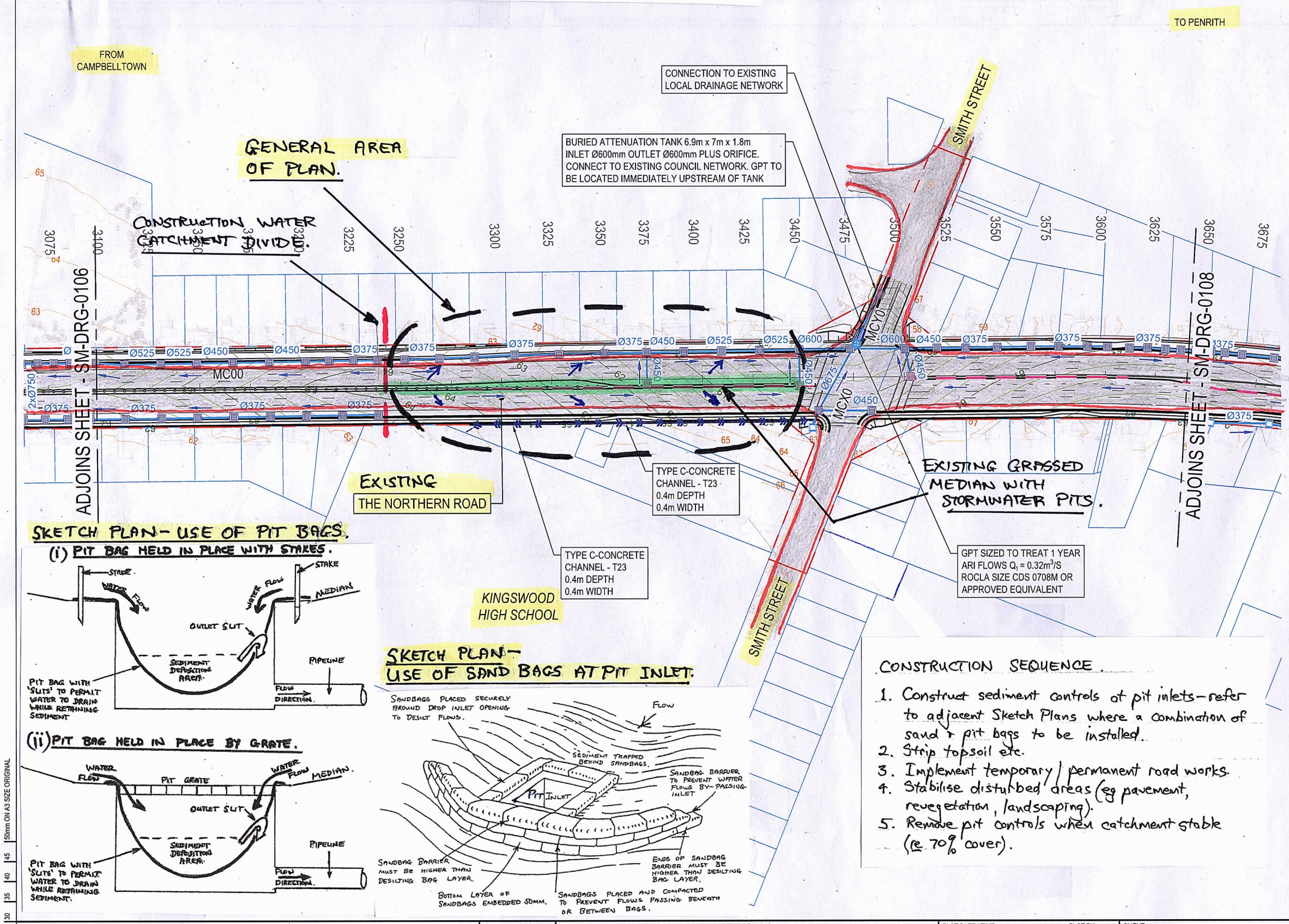
PENRITH CITY COUNCIL
MR154 THE NORTHERN ROAD UPGRADE - STAGE 3 NORTH
FROM GLENMORE PARKWAY TO JAMISON ROAD
DRAINAGE - LONGITUDINAL & WATER QUALITY
GENERAL ARRANGEMENT
PLAN — SHEET 10 OF 28

A3

RMS REGISTRATION No. DS2017/000012 — PART

ISSUE STATUS: DEVELOPED CONCEPT DESIGN — EDMS No. — SHEET No. SM02-1010 — ISSUE A2

WIDENING INTO MEDIAN – CH. 3240 TO SMITH STREET.



SKETCH PLAN – USE OF PIT BAGS.

(i) PIT BAG HELD IN PLACE WITH STAKES.

(ii) PIT BAG HELD IN PLACE BY GRATE.

SKETCH PLAN – USE OF SAND BAGS AT PIT INLET.

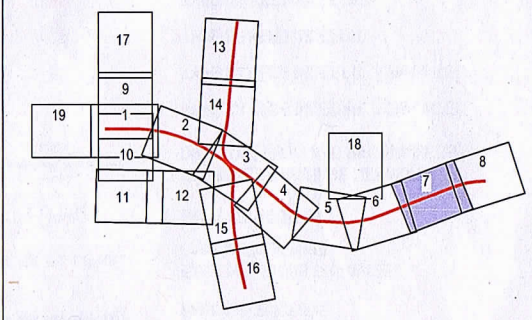
LEGEND

- PROPOSED PROJECT BOUNDARY
- EXISTING CADASTRAL BOUNDARY
- EXISTING PAVEMENT AREAS
- ACO DRAIN H100SK
- PROPOSED CROSS DRAINAGE / FAUNA STRUCTURE
- EXISTING CROSS DRAINAGE / FAUNA STRUCTURE
- DRIVEWAY CULVERT
- PROPOSED DRAINAGE NETWORK, DRAINAGE FLOW AND PIPE DIAMETER (Ø450)
- TYPE SA KERB INLET PIT, 1.2m LINTEL
- TYPE SA KERB INLET PIT, 3.2m LINTEL
- TYPE SF KERB INLET PIT
- TYPE SO KERB INLET PIT
- TYPE F BARRIER PIT
- FIELD INLET/ MEDIAN GULLY
- JUNCTION PIT
- GROSS POLLUTANT TRAP (GPT)
- SCUPPER
- CONCRETE HEADWALL
- SLOT DRAIN
- BATTER CHUTE
- TYPE SO KERB CHANNEL
- GRASS LINED CHANNEL
- CONCRETE CHANNEL
- ROCK LINED CHANNEL
- SCOUR PROTECTION
- DETENTION BASIN
- DESIGN CONTOURS (55)
- EXISTING CONTOURS (55)
- RETAINING WALLS

CONSTRUCTION SEQUENCE.

1. Construct sediment controls at pit inlets – refer to adjacent Sketch Plans where a combination of sand & pit bags to be installed.
2. Strip topsoil etc.
3. Implement temporary / permanent road works.
4. Stabilise disturbed areas (eg pavement, revegetation, landscaping).
5. Remove pit controls when catchment stable (ie 70% cover).

KEY PLAN



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DRAWING FILE LOCATION / NAME: C:\projectwise\Export\TNR3N\SM\TNR3N-TD-SM-DRG-0107.dwg	DESIGN LOT CODE	DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING	PLOT DATE / TIME: 14/5/2015 11:31:23 AM; PLOT BY: Kurt.Harris

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
	A	10.06.16	TENDER SUBMISSION		
	B	23.09.16	CONCEPT DESIGN		

SCALES ON A3 SIZE DRAWING: 0 20 40 60 80 — SCALE 1:2000m

CO-ORDINATE SYSTEM: MGA ZONE 56 | HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY

CONTRACTOR: lendlease

DESIGN PARTNERS: ARUP, WSP PARSONS BRINCKERHOFF

DRG No. TNR3N-TD-SM-DRG-0107

TITLE	NAME	DATE
DRAWN	K. HARRIS	26.04.16
DRG CHECK	C. YATES	26.04.16
DESIGN	E. DEAN	26.04.16
DESIGN CHECK	A. ROTSEY	26.04.16
DESIGN MNGR	S. PALMER	26.04.16
PROJECT MNGR	M. ADAMS	26.04.16

CLIENT: NSW GOVERNMENT Transport Roads & Maritime Services

PREPARED FOR

PENRITH CITY COUNCIL AREA
THE NORTHERN ROAD UPGRADE - STAGE 3 NORTH
MR154 THE NORTHERN ROAD
STAGE 3 NORTH (TNR3N)
STORMWATER MANAGEMENT
PLAN — SHEET 7 OF 19

A3

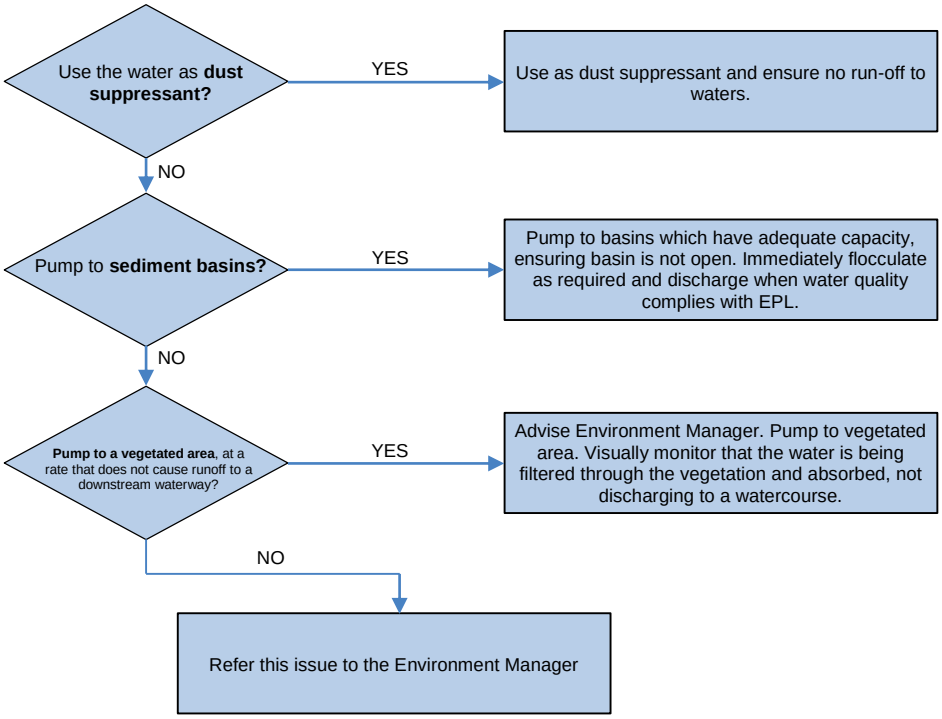
RMS REGISTRATION No. | PART

ISSUE STATUS: CONCEPT DESIGN | EDMS No. | SHEET No.: SM-0107 | ISSUE: B

TNR3N

Dewatering Permit

Dewatering Flowchart



Implement water management options in the following order:

a. pump into a **water cart** and use as dust suppression;
b. pump into **a sediment basin** where there is capacity, ensuring the basin is not open. Immediately flocculate and test as required, record results and discharge when water quality complies with relevant legislative requirements;
c. following discussion with the Environment Manager or Environment Officer, spray over a **grassed or vegetated area**, ensuring that the water is being filtered through the vegetation and absorbed, and not discharging into a watercourse. Complete the de-watering layout plan below;
d. for other options refer to the Environment Manager.

Foreman: _____

Date:_____

Dewatering Layout Plan:

Any Issues/ Risks?:

How will these be managed?

Date of monitoring: _____ **Time:** _____

Monitored by: _____ **Signed:** _____

Reviewed by (Engineer): _____ Date: _____

Return this completed permit to the Environmental Manager for filing

TNR3N

Sediment Basin Discharge Permit

Project: The Northern Road Upgrade Stage 3	**Date Inspected:**
Basin No.:	**Location/Chainage:**
Is inspection following a rainfall event? **Yes** **No**	
If yes record rainfall for previous 24 hours: **Rainfall** **mm**	
What is the approximate volume of water in the basin (as a % of the total capacity)?	

#	Control Measure	Yes	No	Comments
1.	Is maintenance to the basin required? (e.g. spillway, wall etc.)	☐	☐	
2.	Does the basin need emptying? (i.e. basin more than 30% full – refer to marker)	☐	☐	
3.	Does the basin need de-silting? (i.e. >30% capacity reduced by silt – refer to marker)	☐	☐	
4.	Is oil and/or grease visible on the surface of the water? (If visible, remove using a suitable absorbent material).	☐	☐	
5.	What is the turbidity tube reading of the basin? Flocculate basin before discharge if it does not meet required turbidity standards (<50mg/L).			
6.	How much flocculant was added? (guide: 32 kg/100 cubic metres)			
7.	What was the reading of the *basin* after flocculating?			
8.	What was the reading at the discharge point after flocculating? NOTE: the reading at the basin and the discharge point may be different – ensure that the water at BOTH monitoring points complies with the relevant legislative criteria.			
9.	What is the pH of water in the basin? pH must be between 6.5 and 8.5. If pH is below 6.5, add lime.			
10.	Measure and record pH again before discharge.			
11.	How long was the basin left to flocculate before being discharged?	Hours		

12.	Has there been intercepted groundwater captured in the sediment basin?		
13.	If groundwater has been captured are the salinity levels high? (measure background and compare)		
14.	Date and time of discharge.	Date:	Time:
15.	Duration and volume of discharge.	Duration:	Volume:
ALL PARTS OF THE CHECKLIST MUST BE COMPLETED			
Additional comments:			
Approved by:		**Discharged by:**	