Construction Water Management Plan

~~July~~ September 2018

Mt Messenger Alliance

MMA-DES-ESC-E1-RPT-1213

NZ TRANSPORT AGENCY WAKA KOTAHI | Mt Messenger Bypass

New Zealand Government

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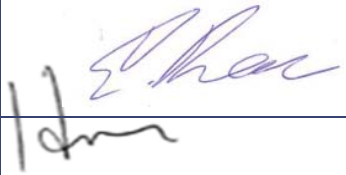
Reviewed by:		Ed Breese	Environmental Manager
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Revision schedule		
Rev. Number	**Date**	**Description**
0.	15 December 2017	Draft for consent lodgement
1.	25 May 2018	Update for Council
2.	17 July 2018	Updated for Council Hearing
3.	28 September 2018	Updated for Council Hearing

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Contents

Glossary of Terms and Abbreviations

Acronym /Term	Definition
AEE	Assessment of Environmental Effects
BPO	Best Practicable Option
CEMP	Construction Environmental Management Plan
CIS	Container Impoundment System
CWAR	Construction Water Assessment Report
CWD	Clean Water Drain
CWMP	Construction Water Management Plan
DEB	Decanting Earth Bund
DMP	Dust Management Plan
DWD	Dirty Water Diversion
E&SC	Erosion and Sediment Control
ELMP	Ecology and Landscape Management Plan
NPDC	New Plymouth District Council
PAC	Poly aluminium chloride
RMA	Resource Management Act 1991
SCWMP	Specific Construction Water Management Plan
SH3	State Highway 3
SRP	Sediment Retention Pond
SSF	Super Silt Fence
TRC	Taranaki Regional Council

1 Introduction

The Construction Water Management Plan (CWMP) has been developed to provide the overall approach and guidance for construction water management during construction of the NZ Transport Agency's Mt Messenger Bypass (the Project), and support the assessment detailed in the Construction Water Assessment Report (CWAR). The objectives of the CWMP are summarised in Figure 1.1.

Construction Water Management Plan (CWMP)

- Developed pre-works and Project wide.
- Supports the CWAR and the resource consent application.
- Confirms the overall approach and guidance for construction water management during construction of the Project with a specific focus on principles, practices and a comprehensive management approach.
- Forms the guidance for all Specific Construction Water Management Plans prepared for the Project.
- Is a 'live document' that will be reviewed annually and updated as necessary, during the course of the Project to reflect significant changes associated with construction techniques, communication, mitigation or the natural environment.

Specific Construction Water Management Plans (SCWMPs)

- In accordance with the conditions of consent, SCWMPs will be prepared and finalised prior to construction works to which they apply.
- Confirms practices and principles that will apply to specific Project areas or activities in accordance with the guidance provided in the CWMP.
- Sets out design detail and documents monitoring outcomes and learnings (where relevant).

Figure 1.1 - CWMP framework

1.1 Purpose and scope of the CWMP

The CWMP primarily sets out the approach to erosion and sediment control site management practices during construction of the Project, so that works are undertaken in a manner that potential or actual discharges of sediment from the site are minimised to the greatest extent possible. The CWMP also addresses the management of other contaminants, such as concrete and fuel use which may also directly or indirectly discharge into receiving environments from construction works.

The main construction activities, along with key considerations to manage construction water effects, are summarised in Sections 5 and 6 of the CWMP. Construction methods and specific design details shall be set out in the relevant SCWMPs.

The CWMP sets out:

- The procedures for determining staging and sequencing of earthworks (Section 4);
- Identification of a suite of appropriate structural and non-structural erosion and sediment control measures to be installed prior to and during works (Section 5 – 6);
- Design specifications for erosion and sediment controls to be implemented (Section 5);
- Procedures for decommissioning the erosion and sediment control measures (Section 5.5);
- A procedure to establish and define minor on the ground changes to erosion and sediment control, in accordance with the intent of the CWMP (Section 11); and
- Methods for amending and updating the CWMP as required (Section 1.4 and 11).

While the erosion and sediment control measures and practices discussed within this CWMP are conceptual in nature, they are based on widely used practices that are well understood and known to effectively mitigate environmental effects.

The CWMP references the key construction stages developed for the Project (refer to the Construction Environmental Management Plan (CEMP) and the Assessment of Environmental Effects (AEE) prepared for the Project), which are based on a four year construction period.

1.2 Approach

The approach for construction water management during construction of the Project is to:

- Develop an overall framework to assist with medium to long term construction decision making (the CWMP);
- Develop detailed plans for area and activity based planning and short term decision making (the SCWMPs);
- Implement a monitoring programme to assess site performance and assist with all construction decision making (Construction Water Discharges Monitoring Programme (CWDMP)); and
- Have an experienced and involved team to ensure that all relevant aspects of the Project are taken into consideration as part of planning and decision making.

This approach will ensure that adequate Project team resources, commitment and expertise are available for construction water management. It will also ensure that all key stakeholders, such as Taranaki Regional Council (TRC) as the consent authority responsible for ensuring compliance with the consent conditions, are involved and communicated with as necessary during the construction phase.

This approach applies to the implementation of erosion and sediment control measures from start to finish of the Project i.e. design and construction planning through to disestablishment of controls and reinstatement of the site.

1.3 Associated management plans and reports

Related management plans and technical reports prepared for the Project and referenced in the CWMP include:

- Construction Environmental Management Plan (CEMP);
- Ecology and Landscape Management Plan (ELMP);
- Construction Dust Management Plan (CDMP);
- Construction Water Assessment Report (CWAR, Technical Report 13); and
- Assessment of Ecological Effects – Freshwater Ecology (Technical Report 7b).

1.4 Updates to the CWMP

The CWMP will be updated to reflect conditions of resource consent prior to construction.

The CWMP will be supported by a suite of detailed SCWMPs prepared for the management of construction water effects at specific work locations or for construction activities.

SCWMPs will be prepared, reviewed or finalised at the construction stage prior to commencement of works in the location or for a specific activity. SCWMPs will confirm the construction method(s), risk profile, management measures and water control devices to be implemented. Further detail on preparing the SCWMPs is provided in Section 4 of this CWMP.

During the course of the Project, and in accordance with the conditions of consent, this CWMP will be reviewed and updated to reflect significant changes associated with construction techniques, communication, mitigation or the natural environments. The review process ~~is set out in Section 12.~~

~~A~~and amendments to the CWMP and SCWMPs will be made subject to the requirements set out in Section ~~12~~8 of the CEMP.

1.5 Relevant RMA conditions

The full suite of designation and resource consent conditions, along are provided at Appendix B to this CEMP.

Error! Reference source not found. identifies the resource consent conditions relevant to this CWMP and where they are addressed in the document.

Table 1-1: Consent Conditions relevant to this CWMP

Reference	Condition	Section of CWMP
SED.2	The Consent Holder shall implement the Construction Water Management Plan (CWMP) dated September 2018, which identifies how all Works shall be undertaken and addresses: (a) The procedures for determining staging and sequencing of earthworks. (b) Identification of a suite of appropriate structural and non-structural erosion and sediment control measures to be installed prior to and during all Works. (c) The design specifications for all erosion and sediment controls to be implemented. (d) A procedure to establish and define minor on the ground changes to erosion and sediment control, in accordance with the intent of the CWMP. (e) The procedures for decommissioning the erosion and sediment control measures (f) Methods for amending and updating the CWMP as required. (g) Methods for revegetation and / or stabilisation.	**Section 1.4**: Updates to the CWMP **Section 2.3**: Overview of earthworks **Section 4**: Process for confirming and documenting staging and sequencing of earthworks. **Section 5**: Approach and implementation, including: - **Section 5.1**: Structural controls set out in Table 5-1 - **Section 5.4**: Construction staging and progressive stabilisation - **Section 5.6**: Decommissioning of structural controls **Sections 8,9 & 10**: Non-structural controls **Appendix A**: Typical design details shown on MMA-DES-ESC-C0-DRG-4001-4008

Reference	Condition	Section of CWMP
SED. 3	The CWMP includes, but need not be limited to: (a) construction activities to be undertaken; (b) area and volume of the earthworks and / or streamworks proposed; (c) location of the earthworks and / or streamworks with particular consideration of the downstream receiving environment; (i) methods for managing construction water effects; (ii) duration of the earthworks and / or streamworks; (iii) time of the year that the streamworks are to be undertaken, and where applicable, the measures to be implemented to respond to any heightened risks at that time; (iv) stabilisation and timing to reduce the open area of high risk locations to assist with a reduction in sediment generation; (d) framework for the chemical treatment (flocculation) of sediment retention ponds and decanting earth bunds receiving catchments larger than 500m^2 ; and (e) construction water related monitoring programme in accordance with condition SED.11, including the procedures for adapting the controls to appropriately respond to the monitoring findings.	**Section 4:** Process for confirming and documenting area and volume of earthworks and/or stream works **Section 5:** Approach and implementation – **Section 5.5:** Chemical treatment **Section 6:** Specific project activities – **Section 6.6: Steam works** **Appendix A:** Drawings showing Indicative locations and extents of works **Appendix C:** Construction Water Discharges Monitoring Programme

Reference	Condition	Section of CWMP
SED. 4	Specific Construction Water Management Plans (SCWMP) shall be prepared for all earthworks in accordance with the CWMP and shall otherwise be consistent with the CWMP The SCWMPs shall be provided to the Chief Executive, TRC for certification in accordance with Condition GEN.12. *Advice Note: These SCWMPs will be developed within the context of the principles and practices of the CWMP and the Construction Water Assessment Report and will allow for innovation, flexibility and practicality of approach to effects of construction on water (including, erosion and sediment control). The SCWMPs will also enable ongoing adaption to changing conditions throughout the Project lifetime.*	**Section 4:** SCWMP process
SED. 7	The Consent Holder shall design, construct and maintain all erosion and sediment control measures in general accordance with the Transport Agency's Erosion and Sediment Control Guidelines for State Highway Infrastructure – Construction Stormwater Management 2014, including: (a) Directing, including pumping, of all sediment laden runoff and groundwater during Construction Works shall be to Sediment Retention Ponds (SRPs), Decanting Earth Bunds (DEBs), or temporary sediment retention devices such as container impoundment systems; (b) All DEBs and SRPs that serve a catchment area greater than 500 m2 shall be treated using a liquid flocculant and a rainfall activated dosing system. Flocculation shall be undertaken and managed in accordance with the certified SCWMP.	**Section 5**: Approach and implementation, including: – **Section 5.1**: Structural controls set out in Table 5-1 – **Section 5.4**: Construction staging and progressive stabilisation – **Section 5.5**: Chemical treatment – **Section 5.6**: Decommissioning of structural controls **Appendix B:** SCWMP template includes guidance on managing works within the 20 year flood level.

Reference	Condition	Section of CWMP
	(c) All SRPs and DEBs shall be fitted with floating decants that are designed to discharge at a rate of 3 litres per second per ha of contributing catchment; (d) All SRPs shall contain measures to cease discharge (e.g. decant pulley systems) and a forebay with a minimum volume of 10% of the pond volume. (e) All erosion and sediment control devices shall be located outside of the 20 year Annual Return Interval (ARI) flood level, unless no other viable location exists. In the event where it is not possible to locate a device outside the 20 year ARI, the SCWMP prepared for that area of work shall set out how flooding risks will be managed. (f) All DEBs shall have a volume no less than 3 m3 for every 100 m2 of contributing catchment, unless the physical characteristics of the location of the DEB constrain the sizing of the device. In the event that the characteristics of the location of the DEB constrain the sizing of the device the SCWMP prepared for that area of work shall set out the sizing of the DEB. (g) All SRPs shall have a volume no less than 3 m3 for every 100 m2 of contributing catchment and shall contain decant pulley systems and a forebay with a minimum volume of 10% of the pond volume, unless the characteristics of the location of the SRP constrain the sizing of the device. In the event that the characteristics of the location of the SRP constrain the sizing of the device the SCWMP prepared for that area of work shall set out the sizing of the SRP. (h) All dirty water diversion channels shall be constructed with sediment sumps with a minimum volume of 2m3 per sump. The details of the sediment sumps shall be set	

Reference	Condition	Section of CWMP
	out in the SCWMP prepared for that area of work and shall be spaced at intervals generally no more than 50m. *Advice note: Any modifications to the above shall be subject to certification in accordance with Condition GEN.12.*	
SED.8A	Re-vegetation and / or stabilisation of all disturbed areas is to be completed in general accordance with the measures set out in the 'Erosion and Sediment Control Guidelines for State Highway Infrastructure - Construction Stormwater Management', NZ Transport Agency 2014.	**Section 5**: Approach and implementation, including: - **Section 5.1**: Stabilisation set out in Table 5-1 - **Section 5.4**: Construction staging and progressive stabilisation
SED.9	An 'as-built' audit of the erosion and sediment devices shall be undertaken by an appropriately qualified and experienced erosion and sediment control practitioner. The audit shall be provided to the Chief Executive, TRC as confirmation that the erosion and sediment control measures for that location / activity to which the SCWMP applies have been constructed in accordance with the SCWMP. Bulk earthworks within each location to which a SCWMP applies shall not commence until the 'as-built' audit confirming compliance with the SCWMP has been provided to the Chief Executive, TRC.	**Section 4**: SCWMP - **Section 4.1**: Documentation

Reference	Condition	Section of CWMP
SED. 11	The Consent Holder shall undertake monitoring of construction water related discharges in accordance with the Construction Water Discharges Monitoring Programme (set out as an Appendix C to the CWMP). The Construction Water Discharges Monitoring Programme shall include: (a) Baseline monitoring – monitoring of at least 12 months of baseline water quality monitoring to be undertaken prior to the commencement of Works. This shall include at least 3 months of continuous turbidity monitoring at the locations described in (c) (i) below. (b) Monitoring undertaken during the construction period including both qualitative and quantitative monitoring. This monitoring shall include (i) to (iv) following rainfall trigger: (i) Visual inspections of all receiving waterways, SRPs and DEB's; (ii) Manual inlet and outlet sampling from SRPs; (iii) Stream grab sampling at WQ1 to WQ5; and (iv) Sediment deposition sampling at Mimi wetland. (c) Continuous monitoring – real-time continuous turbidity (NTU) monitoring shall be undertaken in both the Mimi River and the Mangapepeke Stream as follows:	**Appendix C:** Construction Water Discharges Monitoring Programme – **Section 4:** Monitoring overview – **Section 5:** Baseline monitoring – **Section 6:** Management triggers and response process – **Section 6.4:** Flocculent management – **Section 7:** Incident response – **Section 8:** Reporting

Reference	Condition	Section of CWMP
	(i) at a point downstream of the works following reasonable mixing (CM1 and CM2) to be confirmed with TRC; and (ii) at a point upstream of the works (EM4 and EM1). Data shall be made available to the Chief Executive, TRC on request. (d) If upstream monitoring in SED.11(c)(ii) above doesn't reflect the extent or stage of works, or is demonstrated to be unsuitable, the consent holder may seek written approval from the TRC to use an alternative upstream location, or to use baseline or control data as the comparison. Only once this approval has been obtained shall the monitoring programme be altered. (e) The establishment of a publicly accessible Project website on which monitoring data gathered under this Condition shall be reported with a comparison of upstream versus downstream data made available. (f) All monitoring data gathered in accordance with Conditions (b) shall be reported on the Project website within one week of the results becoming available to the Consent Holder. (g) All monitoring data gathered in accordance with Condition (c) shall be audited by the Consent Holder for its accuracy and shall be reported on the Project website on a weekly basis. (h) Establishing the monitoring response triggers and the associated actions which shall be undertaken in the event that triggers are exceeded. This	

Reference	Condition	Section of CWMP
	shall include a process for establishing trigger level(s) and actions for continuous monitoring locations, and provision of a method to immediately alert the Consent Holder of an exceedance of a trigger at continuous monitoring locations and detail how this alert system will be effective 24 hours per day, 7 days per week. The trigger level(s) and actions for the continuous monitoring locations determined pursuant to this Condition shall include a trigger on downstream NTU against the upstream NTU data for the sites in each of the Mangapeke and Mimi Catchments, a process to verify exceedances as real. This shall be submitted to the Chief Executive, TRC for certification in accordance with Condition GEN. 14. (i) Any exceedance on the continuous downstream NTU Trigger levels shall be reported to the Chief Executive within two hours of the exceedance. The consent holder shall verify the exceedance, and notify the Chief Executive, TRC of the result of that verification exercise, within 24 hours of the exceedance. Any other exceedance of a trigger level shall be reported to the Chief Executive, TRC within two working days, including reporting on the actions undertaken.	

Reference	Condition	Section of CWMP
	Advice note: the condition provides for the possibility that NTU Trigger level exceedances may not be 'real'. The condition provides for immediate reporting of the NTU trigger exceedance, and for the consent holder to then verify and confirm whether the exceedance is 'real', or caused by non-Project related issues, such as equipment issues. (j) Details on chemical treatment monitoring requirements; (k) Procedures for responds to the spillage or accidental discharge of sediment or contaminants to an aquatic environment; and (l) Reporting requirements.	
DIV. 6	The Consent Holder shall undertake works in general accordance with the CWMP and relevant SCWMP(s) to minimise sedimentation and increased turbidity of the stream during the construction, implementation and maintenance of the works. The CWMP and SCWMP(s) address how: (a) All works shall be completed in the minimum time practicable; (b) The placement of excavated material in the flowing channel shall be avoided; (c) All machinery shall be kept out of the actively flowing channel, as far as practicable; and	**Section 6:** Specific project activities - **Section 6.6: Steam works** **Appendix B:** SCWMP template includes guidance on confirming timing and reinstatement.

Reference	Condition	Section of CWMP
	(d) All disturbed areas shall be reinstated.	
TCV.7	The Consent Holder shall undertake works in accordance with the CWMP and relevant SCWMP to minimise stream bed disturbance, sedimentation and increased turbidity during installation of the culvert The CWMP and SCWMP address how: (a) All works shall be completed in the minimum time practicable; (b) The placement of excavated material in the flowing channel shall be avoided; (c) All machinery shall be kept out of the actively flowing channel, as far as practicable; and (d) All disturbed areas shall be reinstated.	**Section 6:** Specific project activities – **Section 6.6: Steam works** **Appendix B:** SCWMP template includes guidance on confirming timing and reinstatement.
PCV.5	The Consent Holder shall undertake works in accordance with the CWMP and relevant SCWMP to minimise stream bed disturbance, sedimentation and increased turbidity during installation of the culvert The CWMP and SCWMP shall address how: (a) All works shall be completed in the minimum time practicable; (b) The placement of excavated material in the flowing channel shall be avoided; (c) All machinery shall be kept out of the actively flowing channel, as far as practicable; and (d) All disturbed areas shall be reinstated as far as practicable.	**Section 6:** Specific project activities – **Section 6.6: Steam works** **Appendix B:** SCWMP template includes guidance on confirming timing and reinstatement.

2 Project Background and Description

2.1 Existing environment

As described in the CWAR, the Project is located within the Mount Messenger Parininihi area, situated in the North Taranaki Ecological District.

The Project site experiences a mean annual rainfall of about 2000 mm[1].

The Project includes works within both the Mangapepeke and Mimi catchments. The topography comprises steep slopes (typically greater than 20%) over most of the Project area. The Project alignment within the lower slopes of the valley has slopes typically less than 10%.

The Project area includes both degraded habitats from farming activities, and high quality habitat for indigenous terrestrial and aquatic flora and fauna. The geology is dominated by papa mudstone (primarily silt based), and has a considerable influence on stream substrate where the gravels are soft and a relatively high amount of fine sediment is present at the stream bed.

Sediment laden discharges and deposits are observed to be naturally occurring in these catchments, in particular following heavy rainfall. This is reflected in the baseline monitoring carried out to date (refer Appendix C).

2.1.1 Mangapepeke catchment overview

The northern Project area comprises the alignment between Chainage 0 – 3635, located within the Tongaporutu catchment (Construction Zones 1-5). The Tongaporutu catchment within the northern Project area discharges to the Mangapepeke Stream and tributaries of the Mangapepeke Stream. The stream continues past the Project site via an existing culvert under SH3. The existing environment within the northern construction zones comprises vegetated steep slopes, gullies and incised streams leading down to an indigenous forest valley floor. The forest valley becomes pasture and grazed wetland to the north, where the ground is poorly drained.

2.1.2 Mimi catchment overview

The southern Project area comprises the alignment between Chainage 3635 – 5955, located within the Mimi catchment (Construction Zones 6-10). The Mimi catchment discharges to tributaries of Mimi Stream, which becomes Mimi River further south of the Project. The Mimi River flows south-west to enter the coast between Waiiti and Urenui. The catchment is predominantly covered in indigenous forest, however the valley through which the main stream meanders is predominated by pasture and grazed wetland. A kahikatea, pukatea swamp forest is present downstream of the Project, which has high ecological value. A raupo

[1] Measured at a private rainfall gauge monitored by a local landowner.

/sedgeland wetland is located directly upstream of the swamp forest and observed to provide some natural sediment retention.

2.2 Construction water assessment

The CWAR that supports the application identifies that potential construction water related effects from the Project will arise from the exposure of bare land from earthworks to rainfall (particularly within steep topography), and works within or adjacent to watercourses. The assessment indicates that both erosion and sediment controls are required to capture and minimise sediment laden runoff that may enter the receiving environments as a result of the Project.

The assessment also recognises the ecological values associated with areas of the immediate receiving environment, and that some increase of naturally occurring sediment laden discharges to these environments are likely during construction of the Project, which will need to be appropriately managed (refer Section 5.3 of the CWAR).

The CWMP provides the framework and approach to manage the potential increase of sediment discharges from the Project area, to avoid or minimise adverse effects from the Project.

An important consideration to this approach is that construction water management methods and measures may need to vary across the Project site to reflect the nature of work in specific localities and environmental sensitivities. This shall be documented through the SCWMP process, set out in Section 4 of the CWMP.

2.3 Construction method overview

An overview of the construction method for the Project, along with construction staging and sequencing, is outlined in the CEMP and AEE. In summary:

- The Project is anticipated to take four years to construct, commencing in late 2018 with completion proposed by the end of 2022.
- Project works will be carried out in two construction regions; North Region (including the proposed Mt Messenger Tunnel) and South Region. These regions are further split into ten construction zones.
- Construction of the Project will be undertaken on a number of fronts or work faces, such that different construction operations will, at times, be simultaneously progressed across all construction zones. Construction regions and zone are shown on Drawings MMA-DES-CON-E1-DRG-1051-1054 appended to the CEMP.

The key construction stages comprise:

- ~~**Preparatory works within each region** (referred to as Preparatory works). This will comprise initial works to enable Establishment Works and Construction Works such as:~~
    - ~~site surveys~~
    - ~~investigations (including geotechnical investigations)~~

- ~~monitoring~~
- ~~land disturbance activities to establish site access, access tracks, construction yards, laydown areas and spoil disposal sites and associated erosion and sediment control~~

- **Establishment works within each region and zone** (referred to as Establishment works). This will comprise earthworks to progressively open up and establish the construction site. This will initially include constructing and/or widening roads/tracks to access construction areas and install sediment control measures (e.g. sediment control ponds), followed by:
  - Wider vegetation clearance;
  - Forming the construction yards;
  - Establishing full width access tracks/haul roads;
  - Installing remaining erosion and sediment controls; and
  - Establishing stream diversions at key locations (e.g. embankment fills at the north and south tunnel portals).
- **Main construction works within each zone** (referred to as Construction works). This will comprise all construction works, including:
  - Wick drains and ground improvement works;
  - Temporary and permanent drainage installation;
  - Bulk earthworks (cut and fill activities);
  - Bridge and tunnel construction;
  - Pavements and surfacing; and
  - Reinstatement of site following the completion of construction including; landscaping, installation of permanent road furniture and ancillary works.

3 Overview of Construction Water Management

3.1 Objectives and principles

Key objectives and principles for construction water management during construction of the Project are defined in the CWAR. The CWMP is prepared to meet the overall objective of the CWAR by applying these key principles. These principles are not repeated below and can be referenced within Section 7.3 of the CWAR.

3.2 Erosion and sediment control

Erosion control is based on the practical prevention of sediment generation in the first instance. Sediment control refers to management of the sediment after it has been generated. It is inevitable that some sediment will be generated through land disturbance activities even with best practice erosion control measures in place. Sediment control measures are designed to capture this sediment to minimise any resultant sediment-laden discharges to waterways.

If erosion control measures and practices are effective, then sediment generation will be minimised and the reliance on sediment control measures shall be reduced.

Erosion and sediment control for the Project recognises the need to minimise the potential for erosion, rather than primarily relying on sediment control measures. In addition to erosion and sediment control structural practices, which include physical measures such as sediment retention ponds, the Project will use a series of non-structural practices that will focus on various site management practices.

Examples of structural and non-structural measures include:

Structural

- Erosion and sediment control specific device installation;
- Baffles within SRPs and higher risk DEBs;
- SRP decant pulleys; and
- Chemical treatment devices.

Non-Structural

- Training and staff education;
- Construction methodologies and sequencing;
- Monitoring including pre, during and post rain inspections;
- Implementing a monitoring programme which allows continuous improvement in response to monitoring outcomes when required; and
- Selection of all discharge locations (and the timing) to the receiving environment to minimise potential effects on sensitive environments (where practical).

4 Specific Construction Water Management Plans

SCWMPs are detailed erosion and sediment control plans that will be prepared for specific work areas or activities within the site. Any SCWMP that was not provided at the hearing shall be submitted to TRC for certification. The SWCMP will provide the detailed design, specific erosion and sediment control measure location, staging and sequencing of works for that location / activity.

The SCWMPs are considered field documents, and will need to be developed in consultation with construction supervisors and engineers. They shall be suitable to guide works at the construction stage.

The SCWMPs shall take into account environmental and ecological values and risks to determine the most effective and appropriate form of erosion and sediment control practices to manage construction water on a location and/or activity basis.

4.1 Documentation

The SCWMPs shall confirm on a location or project wide activity basis the:

- Soil types to be encountered;
- Area and volume of earthworks and stream works at specific locations, and identification of the downstream receiving environment;
- Locations of all earthworks and stream works;
- Duration of the earthworks and stream works;
- Time of the year that the stream works are to be undertaken, and where applicable, the measures to be implemented to respond to any heightened weather risks at that time;
- Methods for managing construction water effects;
- Stabilisation methods and timing to reduce the open area at key locations and assist with a reduction in sediment generation;
- Chemical treatment (flocculation) for all SRPs, and DEBs with greater than 500m^2 of contributing catchment area;
- Process for decommissioning of structural erosion and sediment control measures;
- Any specific monitoring details that relate to the SCWMP and the overarching CWDMP including any procedures for adapting the controls to appropriately respond to the monitoring findings; and
- Associated exposure risk for the activity. Exposure risk is determined by assessing nature of works, timing of works and rainfall probabilities or weather forecast (where available). This is discussed further in Section 7 of this CWMP.

A SCWMP template has been developed which address the above requirements and is attached in Appendix B. This template may be updated over time based on feedback from

TRC compliance staff and/or in response to lessons learned as works proceed and/or as part of the CWMP review process.

SCWMPs will be prepared as follows:

<u>On a location basis (defined by a chainage extent):</u>

- Establishing the construction site, in particular construction yards, access roads and temporary stream diversions for access;
- Bulk earthworks within the construction zones, including associated ground improvement works (e.g. wick drains) and establishing temporary stockpile/lay down areas where required;
- Staged works for fill embankment 12 at the northern tunnel portal, including establishing access and stream diversions;
- Staged works for fill embankment 13 at the southern tunnel portal, including establishing access and stream diversions; and
- Bulk earthworks for site improvement works at the southern extent.

<u>On a Project wide activity basis:</u>

- Bulk earthworks at tie-in locations of the new alignment to the existing SH3;
- Works to install grout anchors in the upper few meters of cut embankments where required;
- Works to construct the tunnel, including establishing access and yard areas;
- Works to construct the bridge, including establishing access and yard areas;
- Spoil disposal sites, where required; and
- Establishing water takes, where required.

Prior to the commencement of earthworks to which a SWCMP applies, as-built audits of the erosion and sediment control measures shall be prepared and reviewed by the Project team to confirm that the control measures for that location / activity have been constructed in accordance with the SCWMP. These "as-built" audits will be provided to TRC prior to earthworks commencing.

4.2 Project specific design

The Transport Agency Erosion and Sediment Control Guidelines for State Highway Infrastructure – Construction Stormwater Management (2014) are specific to State highway projects, and as set out in the CWAR, are adopted as the principal guidance document for the CWMP.

In some circumstances, there will be specific practical reasons for not implementing controls in direct accordance with the Transport Agency Guideline. In particular, with the higher slope categories on the Project, there are some practical constraints with respect to installing devices to guideline design standards and volume criteria. As such, Project specific design will be proposed in some circumstances and outlined within the SCWMPs, This will be based on determining the best practicable option for that location.

5 Construction Water Management Approach and Implementation

5.1 Erosion and sediment control tool box

A tool-box approach to erosion and sediment control will support the SCWMP process described above. Table 5-1 sets out erosion and sediment control measures considered suitable for the Project, in accordance with the principles of the CWAR.

For design and construction planning purposes, site appropriate measures and typical details are indicatively shown on drawings MMA-DES-ESC-C0-DRG-1001-1010 in Appendix A of this CWMP.

Key considerations for specific stages of work are summarised in Sections 5.2 - 5.5 below. Further considerations for specific Project activities are detailed in Section 6 below.

The methods implemented for any given part of the works may be modified and improved in response to detailed design and site conditions as works proceed, and will be reflected in updates to SCWMPs prepared for locations and specific activities.

Further guidance on erosion and sediment controls measures are set out in Sections 6 and 7 of the CWAR.

Maintenance requirements for erosion and sediment control measures are summarised in Section 7 of the CWMP.

Table 5-15.1: Erosion & sediment structural control tool-box

Measure	Purpose	Typical Project application Note: Design details to be confirmed in relevant SCWMPs
Water treatment		
Sediment retention ponds (SRPs)	Detain runoff flows so that deposition of transported sediment can occur through settlement within the SRP	Primary device to treat run-off from areas of bulk earthworks where the catchment is between 0.3- 5 ha. Unless otherwise approved in a SCWMP, SRPs will have a volume no less than 3 m^3 for every 100 m^2 of contributing catchment and will contain decant pulley systems and a forebay with a minimum volume of 10% of the pond volume. A typical detail is shown in Drawing MMA-DES-ESC-C0-DRG-4001 and 4007.
Silt fence/ Super silt fence	Detain runoff flows so that deposition of	Used to treat un-concentrated run-off (or "sheet-flows") from batter slopes or roads,

Measure	Purpose	Typical Project application Note: Design details to be confirmed in relevant SCWMPs
	transported sediment can occur through settlement	where it is not practical to direct the flow to an SRP or DEB. May also be used on the downslope side of work near waterbodies. Installation details are set out in the Transport Agency Guidelines. A typical detail is shown in Drawing MMA-DES-ESC-C0-DRG-4002.
Decanting earth bunds (DEBs)	Detain runoff flows so that deposition of transported sediment can occur through settlement	Primary device to treat run-off from areas of earthwork, where the maximum catchment is 0.3 ha Unless otherwise approved in a SCWMP, all DEBs shall have a volume no less than 3 m^3 for every 100 m^2 of contributing catchment. ~~DEB volumes will be based on the design criteria within the Transport Agency Guidelines.~~ A typical detail is shown in Drawing MMA-DES-ESC-C0-DRG-4003.
Container impoundment systems (CIS)	Detain runoff flows so that deposition of transported sediment can occur through settlement. Will be utilised where there is limited ability develop SRPs or DEBs. Can also be used to aid in treating runoff for pH.	In locations where SRPs or DEBs cannot be located due to slope, space constraints or stability issues and for activities where pH treatment is required. A typical detail is shown in Drawing MMA-DES-ESC-C0-DRG-4008.
Sump/ sediment pit	Intercept runoff flows from earthwork surfaces within dirtywater diversion channels to allow heavier sediment particles to drop out and retain the maximum sediment onsite. Note these are not a primary sediment control device.	Sumps/sediment pits (2m^3) will be positioned along the dirty water channels at 50m intervals~~.~~, unless otherwise approved in a SCWMP.
Chemical treatment	Flocculation will be used to improve the sediment	Preliminary testing has been carried out on surficial soil samples collected from the Project site. Results indicate a noted improvement of water clarity achieved with the addition of

Measure	Purpose	Typical Project application Note: Design details to be confirmed in relevant SCWMPs
	removal efficiency of SRPs, DEBs and CIS's.	chemical flocculant. A framework for chemical treatment is provided in Section 5.5. A typical detail for a rainfall activated flocculation unit is shown in Drawing MMA-DES-ESC-C0-DRG-4001.
Water diversion		
Dirty water diversions(DWDs)	Temporary drains which intercept and convey run-off from earthwork surfaces to sediment treatment measures.	A typical cross section for a dirty water drain is shown in Drawing MMA-DES-ESC-C0-DRG-4006. This detail will typically apply to dirty water drains outside or on the perimeter of the earthworks footprint and are likely to have a duration of more than 1 month. These drains may be stabilised dependent upon soil type and slope for the specific area of works.
Clean water diversions (CWDs)	Intercept and convey runoff from upslope (non earth worked) catchments to stabilised ground	All clean water diversions to discharge to stabilised ground or a constructed stabilised outlet. These drains may be stabilised dependent upon soil type and slope for the specific area of works. Three concepts for clean water diversions have been developed and are shown in Drawing MMA-DES-ESC-C0-DRG-4006.
Contour drains/bunds	To intercept and slow down runoff over bare soil or erodible ground with a primary purpose to reduce overall slope lengths.	Contour diversion will be used to intercept and slow down flows from disturbed slopes. Contour diversions shall discharge to DWD (if dirty). Contour diversions used for directing clean water shall be constructed of non-erodible material (e.g. pinned filter socks) and may discharge to stabilised ground (if clean). Contour Drains will be based on the design criteria within the Transport Agency Guidelines where practicable.
Permanent or temporary Pipe drop/ flume	Convey a concentrated flow of clean or dirty surface runoff down a	May be used to convey run-off down incomplete cut and fill batter slopes, either to keep separate clean and dirty water, or to convey flows to

Measure	Purpose	Typical Project application Note: Design details to be confirmed in relevant SCWMPs
structures (clean or dirty water)	slope without causing erosion	treatment devices without scouring of the batter face. Where practical, permanent flume structures will be used to convey clean water down the cut embankments, and discharge to a clean water channel or vegetated ground.
Rock check dams	To reduce the velocity of flow within the channel and prevent scour of the channel surface. Check dams also allow for some settlement of suspended solids within the channel	Rock Check Dams will be based on the design criteria within the Transport Agency Guidelines where practicable.
Temporary stream diversions	Temporary practices used to convey stream water from above a construction activity to downstream of that activity	Refer Section 6.6 of this CWMP
Other controls (as required)		
Stabilisation	The application of a "cover" over the exposed soil surface to achieve a stabilised surface and as a result minimise erosion from that surface.	Stabilisation is defined as resistant to erosion such as rock, or rendered resistant by the application of aggregate, geotextile, vegetation or mulch. Stabilisation can be in many forms including geotextiles, mulching and the placement of clean aggregate. Where vegetation is to be used on a surface that is not otherwise resistant to erosion, the surface is considered stabilised once an 80% vegetation cover has been established. The design criteria for the various techniques will be as within the Transport Agency Guidelines where practicable.
Slash/mulch bunds	Provide a bund of mulch or slash during vegetation removal activities to assist with reduction of water runoff velocities (sheet flow) and to assist with	Mulch and slash bunds may be used to temporarily reduce water velocities and to filter runoff from disturbed areas where sheet flows are expected.

Measure	Purpose	Typical Project application Note: Design details to be confirmed in relevant SCWMPs
	the capture of any sediment. Note these are not a primary sediment control device.	
Filter sock/ polymer filled socks	To temporarily impound sediment-laden runoff, slowing down the flow rate and allowing sediment to settle out of the water.	May be used on short batter slopes (pinned to ground) and around watercourses and vegetated or protected areas. Can provide secondary containment and treatment where it is not possible to direct flows to a sediment treatment pond. Filter Socks will be based on the design criteria within the Transport Agency Guidelines where practicable.
Stabilised entrance ways	Stabilised pads at site entry and exit points to minimise sediment generation from these areas and also help to reduce dust generation and tracking of sediment to public roads.	For construction yards, and where site access points are identified. A typical detail is shown in Drawing MMA-DES-ESC-C0-DRG-4004.

5.2 Establishment works

Establishment works comprise the early stages of construction works to establish construction yards, clear and access the earthwork areas and establish areas to store/stockpile equipment to the site for construction. Establishment works will include:

- Constructing access tracks;
- Temporary stream works to provide access across streams;
- Temporary stream works to access through the base of steeply sided gullies; and
- Localised earthworks to create a base or pad for long-term sediment retention ponds.

Establishment works will be set out in the relevant SCWMPs. Key considerations for this stage include:

- Weather forecast monitoring for planning works;
- Working (to the extent possible) only in a dry weather period;

- Maintaining a buffer between the area of works and watercourses (where practicable);
- Avoid, where practicable, plant tracking through watercourses, unless a stream diversion is in place. Where this is not possible, the SCWMP for the works shall confirm:
  - How access will be minimised as far as practicable with respect to crossing extent, duration and frequency; and
  - Timing of works to coincide with stream flow conditions.
- Minimising works areas (i.e. minimising access widths);
- Installing "interim" erosion and sediment controls (e.g. sediment "traps", silt fence and super silt fences, treatment by CIS); and
- Utilising a "construct and cover" methodology when practical to establish access roads.

The indicative sequences of establishment works for Fills 12 and 13 (the two largest fill embankments for the Project) are shown on Drawings MMA-DES-CON-C0-DRG-1201, MMA-DES-CON-C0-DRG-1205 and MMA-DES-CON-C0-DRG-1301, in Appendix A and will be confirmed (in stages) prior to construction through the SCWMP process.

5.3 Construction works

5.3.1 Northern Construction Zone

The Project works will include removal of vegetation from steep slopes within the Mangapepeke catchment and localised areas of the valley floor to allow access roads to be established and cut and fill earthworks to be carried out. Other activities within the northern construction zones include:

- Permanent diversion of the Mangapepeke Stream headwaters;
- Permanent culverting of tributaries to the Mangapepeke Stream; and
- Constructing permanent stormwater treatment wetlands.

The proposed measures for the northern construction zones will be confirmed in relevant SCWMPs and shall consider:

- DEBs and silt fences for all access tracks as the specific erosion and sediment control. Progressive cover methodologies will also be utilised for access tracks with the final control measures specified within the SCWMPs,
- Silt fence and super silt fence for linear fill earthworks between CH 0 – 350. Cut and cover methodologies shall be utilised for these works.
- Where practical, clean water diversion channels, bunds and checks to separate clean water from sediment laden water, progressively installed as works proceed. Clean water diversions shall discharge into Mangapepeke Stream via permanent or temporary culverts or flumes.
- Chemically treated SRPs utilised for treatment of cut and fill earthworks between CH 350 – 3400. SRPs will treat discrete Project catchments varying from 2-5 ha, and will

be progressively installed as works proceed. Where possible, discharge of the SRP directly into Mangapepeke stream will be avoided and a vegetation "polishing" buffer of at least 5m shall be maintained between the stream and pond's discharge point. SRP discharge point to land shall be stabilised with rock and/or geotextile to prevent subsequent erosion and scour.

Some SRPs are located within the 20 year flood extents and will require additional consideration for resilience against flooding for this event.

5.3.2 Southern Construction Zone

The Project works will include removal of vegetation from steep slopes within the catchment to allow access tracks to be established and cut and fill earthworks to be carried out. Other activities include:

- Bridge construction between CH 4150-4270;
- Permanent diversion of headwaters, which discharge into the kahikatea swamp forest;
- Permanent culverting of tributaries to the Mimi River; and
- Construction of a permanent stormwater treatment wetland.

The proposed measures for earthwork activities in the southern construction zones will be confirmed in relevant SCWMPs and shall consider:

- DEBs and silt fences for all access tracks as the specific erosion and sediment control. Progressive cover methodologies will also be utilised for access tracks with the final control measures specified within the SCWMPs., .
- Silt fence and super silt fence for linear fill earthworks between CH 4800 – 5955. Cut and cover methodologies shall be utilised for majority of these works.
- A DEB utilised for cut earthworks between CH 5450 – 5700, which discharges to the Mimi River via permanent or temporary culverts.
- Where practical, clean water diversion channels, bunds and checks to separate clean water from sediment laden water, progressively installed as works proceed. Clean water diversions shall discharge to either tributaries of the kahikatea swamp forest or Mimi River via permanent or temporary culverts.
- Chemically treated SRPs utilised for treatment of cut and fill earthworks between CH 3635 – 4800. SRPs will treat discrete project catchments which vary from 0.5- 3ha, and shall be installed progressively as works proceed. Where possible, discharge of the SRP directly into a tributary stream will be avoided and a vegetation "polishing" buffer of at least 5m shall be maintained between the stream and pond's discharge point. SRP discharge point to land shall be stabilised with rock and/or geotextile to prevent subsequent erosion and scour.

5.4 Construction staging and progressive stabilisation

The extent of exposed soil and length of time that an area is exposed has a direct influence on the sediment discharged from the area. Earthworks and construction activities will be

staged and sequenced as part of the normal construction programme. These earthworks areas shall be progressively stabilised to reduce the potential for erosion to occur.

Where Project areas are not actively worked for more than 14 days (or a period otherwise agreed in relevant SCWMPs) the area will be stabilised. This will encourage and enforce the need to ensure that potentially erodible areas are not left exposed for long periods of time and reduce the potential for sediment generation (and subsequent discharges). The 14 day stabilisation period is further defined as below:

- Stabilised Area (as per Section 5.5 below) is defined as an area inherently resistant to erosion such as rock, or rendered resistant by the application of aggregate, geotextile, vegetation or mulch, or as identified in the Construction Water Management Plan. Where vegetation is to be used on a surface that is not otherwise resistant to erosion, the surface is considered stabilised once an 80% vegetation cover has been established.
- The method of stabilisation is dependent upon site conditions and may include use of mulch and/or other woody organic matter, geotextile, the use of hard fill material and exposing rock.
- Actively worked means actively subject to earthworks production with cut and fill, stockpiling or topsoil removal.
- Areas of earthworks will be monitored on a weekly basis with ongoing field checks and understanding of production locations. The Environmental Manager will have a responsibility for ensuring identification of areas not worked and ensuring these are stabilised within the 14 day period (or otherwise agreed). A register of areas subject to earthworks, including timing, will assist in this process.
- The 14 day period (or otherwise agreed) will apply to all earthworks and will include parts of larger earthwork footprint locations. The overall intent is that if the Project is not working an area (or part of an area) then the stabilisation period provision applies.

Where mulch is used, it may include hay/straw and wood bark (generated where possible onsite through the removal and mulching of existing vegetation) as appropriate. Stabilisation will also apply at stockpile areas and batter establishment to reduce both erosion and dust generation.

Mulch will typically be applied to slopes of less than 15 degrees where erodible soils are exposed. However, greater slope angles can be subject to mulching if combined with an approved tackifier. Hydromulch can also be utilised in some circumstances. At these higher slope angles, alternatives may need to be considered and could include the use of pinned geotextile, coir matting and/or spray polymer products. Spray polymer products shall only be specified where the product is demonstrated to achieve a stabilised surface based on site trials.

The development of SCWMPs will outline the specific stabilisation requirements and timing.

Stabilisation will be undertaken to achieve the following:

- To achieve progressive stabilisation in accordance with the consent conditions for the Project;
- To reduce the open area to assist with a reduction in sediment generation; and
- To address any potential effects from sediment discharges in response to the monitoring programme.

5.5 Chemical treatment

5.5.1 Overview

Flocculation (the chemical treatment of a SRP or DEB) will be used to improve the efficiency of sediment retention devices unless bench testing proves otherwise. .

In each SCWMP that specifies chemical treatment (flocculation) of SRPs and DEBs, the SCWMP shall include:

- Specific design details of the chemical treatment system;
- Monitoring maintenance (including post-storm) and contingency programme;
- Details of optimum dosage (including catchment specific soil analysis and assumptions, and consideration of any environmental effects);
- Procedures for undertaking bench testing; and
- Details of the person or bodies that will hold responsibility for the maintenance of the chemical treatment system and the organisational structure which will support the system.

Preliminary testing has been undertaken on soils from the Project area and has demonstrated that chemical flocculation is likely to be required (refer to section 7.3.6 of the CWAR for further discussion in this regard). Based on these results, there are chemical flocculants and methodologies that will be suitable for the Project. An overview of these flocculation methods are outlined below, and specific details shall be provided in the relevant SCWMPs.

5.5.2 Flocculation methods

Flocculants typically come in three forms, liquid, solid and powder:

- Liquid flocculant can be added to construction runoff flowing into a SRP or DEB via rainfall activated systems or via manual batch dosing to contained water in the treatment device. Suitable for variable flows.
- Flocculant supplied as a solid brick or block, secured in a wire cage, can be placed at a point of turbulence that will have the greatest contact with concentrated construction runoff. Suitable for concentrated low to moderate flows.
- Powder flocculant is placed into geotextile socks. These socks can be pinned to the ground and dispersed construction runoff can be directed through the sock or they can be placed within diversion channels.

Liquid flocculant shall be applied at all SRPs and DEBs (pending further bench testing). All SRPs and DEBs (with greater than 500m^2 of contributing catchment area) will be treated with rainfall activated systems (e.g. sheds or similar approved).

Preliminary testing of liquid flocculant has been carried out on three soil samples collected at the Project site. Testing results are attached in the CWAR. Results indicate that the following products are likely suitable for Project soils:

- Poly aluminium chloride (PAC). Optimal dosage range of 5-15ppm. Results note a minor reduction of water pH, and close monitoring of water pH is recommended for this product.
- PolyDADMAC 40% solution. Optimal dosage range of 2-4ppm. Results noted no change in water pH.
- Blend of PolyDADMAC and 33% PAC solution. Optimal dosage range of 2-6ppm. Results note some reduction of water pH, and close monitoring of water pH is recommended for this product.

The above products are considered suitable for use in a rain activated treatment system or a placed as powder form into a geotextile sock. PAC may also be used for manual application to contained water (batch dosing).

Bulk storage of flocculant will be appropriately stored at the construction yard, to ensure it is available when required.

5.5.3 Flocculation management (for PAC)

5.5.3.1 Monitoring and maintenance requirements

Instructions for routine management and maintenance of the chemical treatment system include as follow. This is based on the use of PAC in a rainfall activated shed system, however similar principles will apply if other flocculants are utilised within the Project:

REDUCING THE HEADER TANK WATER VOLUME.

The header tank is used to avoid dosing during the initial stages of rainfall when site conditions are dry and no runoff is expected.

The volume in the header tank is lowered using the lowest of the three outlet tubes.

After 3 days without rain - reduce volume to 50%.

After 6 days without rain - reduce volume to empty (level at lowest outlet).

REFILLING THE PAC RESERVOIR.

The PAC reservoir tank should be refilled when the displacement tank is half full, or sooner if heavy rain is predicted. This is done by first emptying the displacement tank (baling with a bucket is efficient), and then refilling the reservoir tank until the PAC level is at the lower edge of the outlet.

OBSERVATION OF WATER QUALITY IN POND.

The SRP or DEB water quality and clarity will be observed on a daily basis and recorded on a monitoring sheet. On a weekly basis, pH shall be measured from water detained by the SRP or DEB.

PERIODIC SYSTEM CHECKS.

- Check that the rainfall catchment tray is not leaking – especially along the lower edge of the tray. This should be done after rainfall has ceased.
- Check the lower hose with the small tube outlet, from the header tank to the displacement tank, is not blocked.
- Check the chemical discharge hose is not blocked and flows easily when displacement tank lowered.

PRIOR TO FORECAST RAIN AND DURING RAIN

- Check the full operating system to ensure appropriate operational effectiveness.
- Check the colour/clarity of water within the treatment pond. Visual indicators of poor performance of the treatment system, or effects of other influences on stormwater quality include:
    - If the treated water in the SRP or DEB is consistently very clear it could indicate overdosing, with the possibility of lowered pH. Low pH (i.e. less than 5.5) presents a potential risk to receiving waters as a result of elevated free aluminium concentration in the discharge. If the treated water is consistently clear the pH of the water in the pond will be tested, and the dosage rate adjusted if required.
    - If the treated water in the SRP or DEB is consistently discoloured, it could indicate underdosing. If the treated water is consistently discoloured, the catchment area and soil characteristics will be reviewed, and the design amended if required.

5.5.3.2 Record keeping and reporting

All monitoring records and maintenance checks and actions should be recorded on site checklists and this shall include the clarity of the water in the SRP or DEB.A copy of the maintenance record for the chemical treatment system will be kept in the treatment system shed.

The integrity of the treatment system should be checked weekly during both dry and wet weather. This check should include a quick check of the plumbing, a check that the header tank hoses are clear, and a check of the dosing point to ensure that the chemical would drop into the stormwater flow from the site.

After rain, draining of the header tank is required at least on the 3rd day and 6th day following rain, and possibly more frequently if the treated water in the pond is consistently clear.

After moderate or heavy rain the dosing point should be checked to ensure that the chemical is being delivered into the storm flows during low flow conditions.

The integrity of the catchment tray, particularly the seal between the tray and the upstand should be checked monthly.

5.5.3.3 Storage of flocculant on site

Any flocculant should be kept in secure storage, either in a locked shed or container, or in the chemical treatment system shed. This will be secured on the site.

Empty flocculant drums will be washed out with water, and the washwater poured onto dry soil well away from any watercourse. Drums can be disposed of to a drum recycling company.

5.5.3.4 Chemical spill contingency plan

If there is a spill of flocculant onto the ground it should be immediately contained using earth bunds to prevent it entering water. The spilt flocculant should be recovered if possible and placed in polyethylene containers. If the spilt flocculant cannot be recovered, it should be mixed with a volume of soil equal to at least ten times the volume of spilt flocculant, and buried in dry soil.

If there is a spill of PAC into ponded water, discharge from the pond to natural water should be prevented.

If there is a spill of PAC into flowing water:

1. The TRC should be advised immediately.
2. The volume of the spill should be recorded.
3. If possible the water and spilt PAC should be pumped into a bund or pond until all the spilt PAC has been removed from the watercourse.
4. If the PAC cannot be removed from the watercourse any downstream users should be identified and advised. In association with TRC an action plan will be developed.

5.5.3.5 Chain of Responsibility for Monitoring and Maintaining the Chemical Treatment Systems

The Environmental Manager will have primary responsibility for maintenance and monitoring the effectiveness of the chemical treatment system. Specialist resource will be utilised as necessary throughout the Project implementation.

5.5.3.6 Training of Person Responsible for Monitoring and Maintenance of Chemical Treatment System

Training of the site environmental staff will occur as necessary to ensure that routine monitoring and maintenance of the system is undertaken and appropriate records kept.

5.6 Decommissioning of structural controls

The removal of any erosion or sediment control measure shall only occur after the area serviced by the measures has been stabilised as determined by the Environmental Manager, unless ~~or certification to remove has been granted by~~ the Chief Executive ~~Manager~~, TRC

Environmental Regulation has been notified. The process for decommissioning structural erosion and sediment control measures shall be set out in the relevant SCWMPs.

'Stabilised' is defined as inherently resistant to erosion or rendered resistant, such as by using indurated rock or by the application of aggregate, geotextile, vegetation, mulch or other approved measures set out in the CWMP. Where vegetation (e.g. hydro seeding or establishing grass strike) is used on a surface that is not otherwise resistant to erosion, the surface is considered stabilised once 80% vegetative cover has been established.

5.7 Non-sediment contaminants

Non-sediment contaminants generally consist of site and materials management measures that may directly or indirectly discharge into the receiving environment from site activity.

Potential non-sediment contaminants used in construction activity on the Project are listed in the CWAR and are repeated in Table 5-2 below. Table 5-3 provides a management approach for these contaminants.

Table 5-25.2 - Potential non-sediment contaminants

Product / work activity	Potential contaminants	Indicator	Non-visible potential contaminants
Adhesives	• Adhesives • Glues • Resins • Epoxy • PVC Cement	Oily sheen or discoloration from some products	• Phenols • Formaldehydes • Asbestos • Benzene and • Naphthalene
Asphalt Paving	Hot and Cold Mix Asphalt	Oil Sheen	Oil, petroleum distillates, Poly aromatic hydrocarbons
Cleaning Products	Cleaners, ammonia, lye, caustic sodas, bleaching agents, chromate salts	Discolouration	Acidity / alkalinity
Concrete	Cement	Discolouration	Alkalinity (High pH)
Flocculants	Specific to Flocculant used but can include pH and aluminium	Clarity	• Aluminium toxicity • pH
Sanitary Waste	Portable Toilets, disturbance of sewer lines	Discolouration, sanitary waste	Bacteria, Biological Oxygen Demand, Pathogens
Vehicle and Equipment Use	Equipment operation, maintenance, washing, refuelling	Oil sheen, sediment	Total Petroleum, hydrocarbons, coolants, benzene and derivatives

Table 5-35.3 - Potential non-sediment contaminants - management approach

Product / work activity	Potential contaminant management
Adhesives	• Store materials in an area that is not subject to rainfall contact • Use adhesives carefully and clean up any spilled material • Properly dispose of containers in designated disposal areas once empty
Asphalt paving	• Water runoff should discharge to a treatment system designed to capture hydrocarbons
Cleaning products	• Store materials in an area that is not subject to rainfall contact • Use adhesives carefully and clean up any spilled material • Properly dispose of containers in designated disposal areas once empty
Concrete	• Concrete truck chutes, pumps and internals should only be washed out into the areas built for this task. • Hand tools should only be washed out into the formed areas awaiting installation of concrete
Flocculants	Refer to Section 7.3.6 of the CWAR • Ensure the use of flocculants follows an approved flocculant management plan and industry best practice • Regularly measure pH of the discharge from sediment retention devices
Sanitary waste	• Avoid knocking over portable toilets • Place portable toilets away from site vehicle movement areas • Service portable toilets regularly • Empty portable toilets before they are moved • Avoid breaking sanitary sewer lines that may exist onsite by pre-construction determination of location of such infrastructure.
Vehicle and equipment use	• Fuel storage tanks shall be bunded to store a minimum of 100% of the tank's capacity. No bulk fuel storage is expected for the Project and mobile refuelling will occur. • Procedures and practices shall be put in place to minimise or eliminate the discharge of lubricants, coolants or hydraulic fluids to the receiving environment • Have spill prevention and control measures and procedures in place

6 Specific Project Activities

This section summarises construction water management measures and practices to manage construction-related runoff from specific Project activities.

The practises discussed below are those accepted by the industry as best practice. However construction methods and practises for these activities below will be further developed and detailed within the relevant SCWMPs. Indicative locations of the activities are shown in Drawing MMA-DES-ESC-C0-DRG-1001-1010 in Appendix A of this CWMP.

6.1 Vegetation removal

Vegetation removal will form part of the land disturbance activity required to facilitate construction, and it is typically the initial activity to occur. While the vegetation removal itself does not include earthworks activity, it is often associated with a number of earthworks activities, such as access road construction.

Vegetation removal that creates an erodible surface is not anticipated to be required as a standalone activity, and instead will be undertaken as part of wider earthworking activities. If vegetation removal is required as a standalone activity, a separate SCWMP shall be prepared to set out any supplementary controls that are required.

Prior to undertaking any vegetation removal that creates an erodible surface, erosion and sediment control measures that apply to wider earthworks shall be installed. Where removal of vegetation creates an erodible surface, progressive stabilisation is required within 14 days (or a period otherwise agreed in relevant SCWMPs). Stabilisation will occur (as per Section 5.3 above) prior to diversion channels and treatment devices being established.

To reduce effects on terrestrial habitat, vegetation clearance will be undertaken in accordance with the CEMP and the ELMP, including the Bat, Avifauna and Vegetation Clearance Management Plan chapters of the ELMP. As part of the vegetation removal activity, care will be taken to ensure any stockpiles of mulched vegetation are not placed in locations where leachate from the mulch will discharge directly into watercourses.

6.2 Access track and haul road establishment

Access tracks and haul roads will be required along the length of the alignment to transport, plant, machinery, personnel, and materials through the Project area and between construction zones.

Temporary access tracks will typically be established by placing a layer of geotextile fabric on the existing ground and overlaying structural fill. Access tracks which cross waterways will have appropriately sized temporary culverts (with fish passage provisions included where fish migration is required) installed beneath the track. A stabilised overflow path will be maintained for all crossings located within the flood plain on the northern side.

In areas of very weak ground, a bridging layer (e.g. logs) may be used with underlying geotextile fabric. This construction method will generally be applied in locations where the

unsuitable soil material is of a depth or extent that removal of this unsuitable material is not practical (e.g. depth greater than 500mm).

Where all-weather access is required, the road surface will be constructed using clean hardfill. During construction, in addition to sediment control measures such as DEBs and silt fences, sufficient hardfill material shall be on hand to allow progressive covering as the road is formed. This allows a construct and cover operation with a stabilised road surface completed on a daily basis and prior to forecasted rain.

Where roads are subject to high or heavy traffic use (e.g. hauling roads), the construct and cover methodology may not be suitable and the track itself likely will become a source of sediment. In this circumstance, dirty water diversions (DWDs) will be constructed on the downslope side of road to receive and direct runoff to the closest treatment device (DEB or SRP).

Where access roads and/or haul roads form a component of the larger earthworks footprint, these road surfaces will be treated by erosion and sediment control measures for the wider area and shall be set out in location based SCWMPs.

6.3 Stockpile establishment and management (temporary sites)

Materials to be stockpiled onsite will include topsoil, subsoil, unsuitable material gained from the bulk earthworks operations, and imported hardfill material, such as crushed rock and/or road aggregate. Stockpiles of organic material for re-use during establishment of the permanent landscaping for the Project are also likely to be required.

Temporary soil stockpiles will be established over the course of the Project. As these areas have the potential to generate sediment laden discharges, establishment of stockpiles and disposal sites are subject to the SCWMP process (likely to be incorporated into location based SCWMPs). Where required, the SCWMP shall confirm:

- Locations of proposed stockpiles sites. For temporary stockpile sites located within the low lying valley in the northern extent of the Project, the potential flood risk will be assessed and additional measures implemented as required (e.g. perimeter bunding);
- Set back distance from permanent watercourses or proposed details for diversion of the watercourse if required;
- Location of clean water drains (CWD) to direct upslope runoff away from the stockpile area where required. CWDs will prevent erosion of the base of the stockpile, which could affect the stability of the stockpile and induce a slip within the stockpiled material;
- Proposed treatment device(s) (e.g. SRP) and associated DWDs to direct sediment-laden runoff from the surface of the stockpile for treatment. Where temporary stockpile sites are within a larger earthworks footprint, the control measures will likely be incorporated into the erosion and sediment control measures for the wider area.

- Expected stockpile period. Stockpiles which are expected to remain untouched for longer than one month (or otherwise agreed in the SCWMP) shall be progressively stabilised e.g. covered with geotextile (or similar approved) or hydroseeded or topsoiled and grassed; and
- Measures to control dust in accordance with the DMP to minimise the discharge of dust from stockpile operations in proximity to sensitive receivers and the transport of material to/from stockpiles.

Stockpiles comprising of sawdust, chip and/or mulch can produce leachate, which can have an adverse effect on aquatic life. Procedures for locating wood residue piles away from any waterways, collection and treatment of any leachate from wood residue piles shall be carried out in accordance with the Vegetation Management Plan chapter of the ELMP.

6.4 Spoil disposal site establishment and management (permanent disposal sites)

Construction of the Project will generate surplus clean fill material, estimated at approximately 145,000m^3. Multiple surplus disposal sites have been provisionally identified and are shown in Drawings MMA-DES-ESC-C0-DRG-1001 to 1010 in Appendix A of this CWMP.

The nature and footprint of these sites vary across the Project extent, as summarised below:

- Raising of the lower valley in the North region over an area of up to 1.5 ha;
- Filling of existing gullies in the North region over an area of up to 0.8ha; and
- Filling of existing gullies in the South region over an area of up to 1.5ha.

Project wide activity specific SCWMPs shall be prepared for all disposal sites to be established for the Project. Key considerations for the SCWMP shall include:

- DEB or SRP sized to include spoil disposal catchment area;
- Bunding to contain all saturated soils or other wet materials (where required). Silt fences may be installed if required downslope of bunds to allow drainage while minimising sediment discharge from the material;
- Permanent diversion of streams located within gully spoil disposal sites; and
- Temporary clean water cut-offs to separate run-off from the undisturbed catchment from the area of fill. These temporary cut-offs may be installed prior to commencement of works or progressively extended as the fill progresses.

An indicative cross section of a disposal site demonstrating these concepts is provided in Figure 6.1. The establishment and management of spoil disposal sites shall be confirmed by activity specific SCWMPs.

Some sites identified for permanent spoil disposal may be used for the temporary storage of topsoil, or surplus until on-alignment fill sites become available. If this is the case, erosion and sediment control measures shall be installed prior to such temporary stockpiling.

Following completion of construction, the disposal sites will be recontoured so water drains to the edge of the fill area to a permanent drain or stream diversion. The finished surface will be topsoiled, grassed and planted in accordance with the Project Landscape and Environment Design Framework and the Vegetation Management Plan chapter of the ELMP.

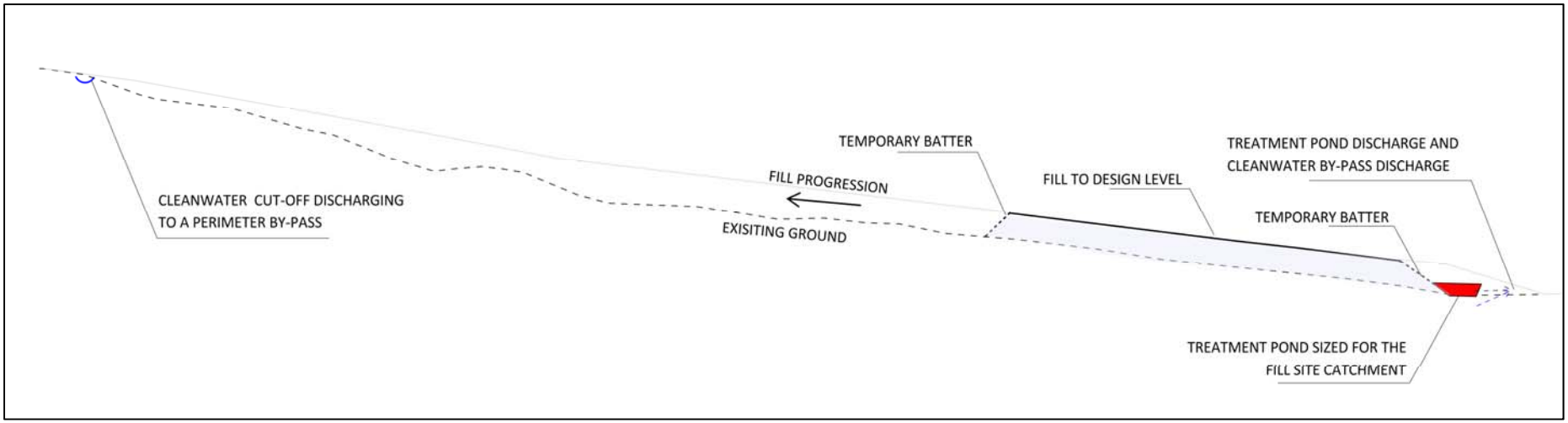

Figure 6.1 – Erosion and sediment control for an indicative disposal site

6.5 Construction yards

Construction yards and laydown areas will be required for repairs, maintenance, re-fuelling of earthmoving equipment, lay down and storage areas for materials delivery, workshops, project offices, messing, and ablution facilities during the construction phase. The yards will operate throughout the construction period.

The establishment of all construction yards will be highlighted within the relevant SCWMPs.

The main construction yard is proposed at the northern end of the alignment and will provide:

- Main site offices and carpark;
- Main plant/equipment storage and workshop and servicing;
- Fuel storage and refuelling facilities
- Main access to northern end of alignment;
- Main delivery point and laydown area for materials (including stockpiles); and
- Transfer and segregation point for site and Project office waste (for off-site disposal)

Smaller construction yards will be established at the bridge and tunnel construction work areas as well as remote locations where crews are based. These yards will primarily comprise a small office and also provide for:

- Local plant/equipment storage;
- Local access to alignment;
- Delivery point for construction materials;
- Ablution facilities; and
- Collection of site waste.

Construction yard establishment is recognised as a quick process, and the yard surface generally will be progressively stabilised with 100 to 150 mm thick layer of clean hardfill material on reaching the required level. This shall stabilise the surface and ensure traffic movement to and from the site do not generate sediment.

Erosion and sediment control required for establishment and operation of construction yards shall include:

- Silt fences around the perimeter of the yard during the yard establishment phase of works as necessary.
- Stabilised construction tracks established at entry and exit points to reduce the transfer of sediment onto the external SH3 network;
- SRPs, DEBs or CIS installation as necessary to treat any exposed earthworks areas during construction;
- Stabilisation with hardfill, dependent upon final yard usage, to minimise sediment generation; and
- If necessary, CWDs will be established at the perimeter of the yard to intercept and divert clean overland flow from catchments uphill of the construction yards.

Construction water management practices to be implemented during operation of the main construction yard include:

- Vehicle movements and parking within designated areas of hardstand;
- Non-sediment contaminants (chemicals, petroleum and solvent based) products to be stored within appropriately designed bunded areas;
- Measures at site access points to minimise vehicles tracking soil from the Project onto public roads (e.g. wheel brush); and
- If sediment laden runoff are observed from yard surfaces, the runoff will be collected and/or directed to the closed sediment treatment device (e.g. SRP or DEB or CIS).

6.6 Stream works

Stream works for the Project comprise the construction of stream diversions and the installation and/or extension of culverts.

SCWMPs will be prepared for all stream works to confirm:

- Design specifications;
- The method of construction; and
- Timing and duration of stream works.

Further description on proposed stream works are set out in Section 6.6.1 and 6.6.2 below. In additional, SCWMPs shall consider the following:

Design specification

The Transport Agency Guideline set out the following design events for sizing of temporary diversions:

- The 2 year peak catchment discharge for a diversion duration of less than 30 days;
- The 10 year peak catchment discharge for the diversion duration between 30 and 60 days; and
- The 20 year peak catchment discharge for a diversion duration of greater than 60 days.

If site constraints (e.g. space) limit the size of temporary diversions to less than recommended guidelines, the specific design of the diversion shall be confirmed in the SCWMP and shall be supported by a contingency plan for conveying overtopping flows in wet weather. Such overtopping of flows will be based on provision of an overland flow path that has the capacity to allow the passage of the 100 year ARI rain event.

Timing

The timing of stream diversion works shall consider peak fish migration and spawning seasons as practicable, as described in the Assessment of Ecological Effects – Freshwater Ecology (Technical Report 7b) including all fish recovery protocols. All stream works shall be timed for a suitable fine weather window forecast.

The works will be staged such that if heavy rain or flood conditions are forecasted, the area may be stabilised prior to the event. Placement of geotextile fabric and/or rock are considered feasible techniques to promptly stabilise any exposed areas. This material shall be on hand in sufficient quantity prior to all heavy rain forecasts.

Fish management

The Freshwater Management Plan chapter of the ELMP and the Fish Recovery and Rescue Protocols for the Project provide for fish management measures during stream works.

Measures to enable fish passage will be required at temporary access track culverts where fish migration and recruitment is identified. The specific design to enable temporary fish passage (where required) will be confirmed in the SCWMP, and shall be in accordance with the ELMP and the Fish Recovery and Rescue Protocols.

At all locations, any fish observed in any of the pools within the work area will be removed by hand netting and released downstream of the work area. Any fish or eels discovered during excavation will also be captured and released downstream in accordance with the ELMP.

Reinstatement of disturbed areas

Where necessary, adjacent stream beds and banks disturbed during stream works shall be stabilised temporarily by lining with geotextile, rock or other approved methods.

Permanent stabilisation shall be carried out in accordance with the objectives and requirements of the ELMP and/or LEDF.

The relevant SCWMPs will outline the specific stabilisation requirements and timing.

6.6.1 Temporary or permanent stream diversions

Permanent stream diversions are proposed to realign a natural stream channel (or section of stream channel) for the Project (refer to the CEMP and the AEE). Stream diversions will also be required during construction to temporarily divert flows around working areas in order to allow works to progress or provide access to construction areas.

For both permanent and temporary stream diversions, works shall endeavour to establish an 'off-line' environment to allow majority of works to be completed outside of the active stream channel. However, there are locations where this approach is not practical (i.e. steep gullies where large fill embankments are proposed) so an online approach has also been developed.

The following sequences are indicative only, and alternative methods may be proposed (e.g. sheet piling, installing coffer dam). Stream diversion sequences shall be confirmed in the relevant SCWMPs. Refer also the Freshwater Management Plan chapter of the ELMP.

Indicative off-line diversion

The off-line approach is the preferred approach where practical and recognises that works within the water body are limited in extent to the "tie-in" locations between the diversion and the existing stream. A work sequence to achieve this could comprise:

- Establish set back distance from existing stream (if any). Where a setback of at least 10 m between the working area and the stream cannot be maintained, a silt fence (or similar approved) shall be installed on the stream side of the working area prior to excavating the channel.
- Excavate the base for a channel or pipe diversion, working from the lowest to the highest point without excavating the tie-in to the existing stream. Permanent channels/pipes shall be sized in accordance with permanent stormwater design details and the conditions of consent.
- Stabilise all erodible surfaces created by the diversion:
    - For channels, stabilise the channel to ensure it does not become a source of sediment. Permanent channels shall be stabilised in accordance with permanent stormwater design details. Temporary channels may be stabilised using pinned geotextile fabrics, rock armour, logs (where available). If scouring velocities are observed rock or log checks may be installed within the channel.
    - For pipes, install the pipe, and backfill the trench. Where headwater depth is anticipate at the pipe inlet point, any erodible material at inlet will be protected against scour (e.g. pinned geotextile or concrete or a headwall structure or similar approved).
- Just prior to completing the tie-in to the existing stream, construct a non-permeable bund at each end of the tie-in extent to minimise flows through the tie-in area. Pump stream flow around the works area if required.
- Remove the downstream bund and allow stream flows to enter the diversion. Once flows have entered the diversion, the upstream bund can then be removed. Removing the downstream bund first will allow some water to enter the diversion channel, and reduce the scouring velocities when the upstream bund is removed;
- Where required, retain the non-erodible bund within the original stream channel immediately downstream of the entrance to the newly constructed diversion in order to divert flows into it.
- If required, place a non-erodible bund immediately downstream end of the original stream channel but upstream of the new diversion channel outlet to prevent backflow into newly drained area of works. Once the flows have been diverted and the bunds placed, fish removal from the original channel can be completed in accordance with the ELMP.

Indicative online stream diversion

Where an off-line approach is not practical, an online approach may be proposed for locations where permanent stream diversions are required e.g. beneath fill embankments in

existing gullies. The online approach recognises that diversion of stream flows must occur first, with all subsequent works (e.g. plant access or earthworks) occurring in a "dewatered" stream environment. A work sequence to achieve this could comprise:

- Construct a non-permeable bund across the stream channel ahead of the work front. The purpose of the bund is to create sufficient water depth to impound water to enter the inlet of a pump or gravity pipe. Where natural barriers or pools are present a bund may not be required.
- Pump or pipe the stream flow around the works area, discharging back into an existing watercourse downstream of the works area. The inlet of the pump will be supported above the base of the stream and will contain a fish grill, to prevent fish from entering the pump intake structure. The pump flow rate will be selected to equal the stream flow at the time of works, so that the existing channel is dewatered. The point of discharge to the existing watercourse shall be stabilised (e.g. rock or geotextile) to prevent scour.
- Once the flows have been diverted and the stream dewatered, fish removal from the original stream channel will be completed in accordance with the ELMP and associated Fish Recovery and Rescue Protocols.
- Install and extend appropriately sized clean water diversion pipes to the non-permeable bund.
- Extend access and earthworks to the non-permeable bund.
- Construct a second non-permeable bund approximately100-200m ahead of the work front and over pump or pipe the stream flow around and extending past the works area. Once flows are diverted past the works area, the initial bund can then be removed.
- Repeat the above process as often as required.

Key considerations for SCWMPs with stream diversion works shall include:

- Non-erodible bunds shall comprise a sand bag barrier with an impermeable lining to minimise seepage through the sand-bags. Low permeable soil (e.g. clay) shall be placed immediately behind the sand-bags to prevent water flowing through the sand-bag barrier and into the construction area.
- Any water remaining within the original stream channel and works area may be pumped to the closest treatment pond or through a series of turkey nest structures (or similar approved) if sediment laden. Where pumping to a treatment pond is required, decant systems within the treatment ponds shall be raised during the pumping process to allow for settlement of sediment and chemical flocculant applied as necessary.
- Material excavated from the diversion channel will be placed in stockpiles away from the stream diversion, where it cannot slump back in.
- Construction works, including the removal of weak and unsuitable material, filling, culvert construction, can commence within the original channel as required.
- While it is considered unlikely to be required, if necessary, CWDs (or similar approved) may be installed above the area of work to exclude clean stormwater

runoff from upslope undisturbed catchments outside of the works from the works area.

6.6.2 Culvert construction

Temporary and permanent culvert construction will be required in a number of locations throughout the Project area. A summary of the permanent culverts is provided in Section 4 of the AEE. Where possible, permanent culverts will be installed early on in the work to convey stream flows during construction.

In some locations (e.g. lower valley floors where soft compressible soils are present), the construction method may not allow a one-off installation of the permanent culvert. In such cases, a temporary culvert will be required prior to earthworks commencing if stream flows are present. The drawings included in Appendix A provisionally indicate where temporary culverts are required. The need for temporary culverts will be confirmed in the relevant SCWMPs.

Additional temporary culverts will be required for the duration of the Project at the proposed access road along the western side of Pascoes' valley and at all crossing of the main stem of the Mangapepeke Stream.

A stabilised overflow path shall be established at all main crossings for flood events to flow over the road in a controlled manner and return to the stream channel/flood plain.

All temporary access road culverts outside of the permanent alignment shall be removed when not required, or on completion of works. The stream channel and riparian margin disturbed outside the permanent alignment shall be restored to existing conditions on the removal of temporary culverts.

The culvert construction method will generally replicate the offline stream diversion method, where construction mostly isolated from the existing stream flows with the exception of the tie-in locations. If culvert construction works are required within a stream channel, either:

- A temporary stream diversion will be established to divert flows; or
- If it is not possible to divert the stream, the culvert will be installed by pumping the flows around the culvert works areas. This will only be carried out in situations where a temporary stream diversion is not considered practical. The decision to pump as opposed to installing a diversion channel will be made by the Project team, and will be set out in the relevant SCWMP.

All other construction activity following the culvert construction, such as the placement of fill, will only be carried out once erosion and sediment control measures are in place.

When the works have been completed, any disturbed and erodible areas will be stabilised through mulching or vegetation establishment.

Key considerations for SCWMPs with culvert works shall include:

- Timing of stream works to avoid peak fish migration and spawning seasons where practicable;

- Incorporating fish passage within culverts where migration and recruitment are identified;
- Prior to any works commencing on the construction of a particular culvert, a period of forecast dry weather, sufficient to construct the portions of the culvert within a waterbody, shall be confirmed through appropriate weather monitoring system;
- Any sediment laden water present within the work area and/or dewatered stream channels shall be pumped to the closest treatment pond or through a series of turkey nest structures (or similar approved).
- Culverts are expected to be installed in sections such that the immediate area may be stabilised at the end of each working day, and prior to forecasted rain.
- On completion of the culvert, all plant, materials and labour will be demobilised from the stream channel and any disturbed banks shall be stabilised in accordance with the Freshwater Management Plan chapter of the ELMP and relevant SCWMPs;
- In the event of high rainfall during the course of construction of the culvert, or prior to leaving the site for more than a 24 hour period where culvert works are incomplete, the following will occur:
  - All loose material that could enter a watercourse is to be removed from the flood plain of the stream;
  - Erosion and sediment control measures are checked;
  - Any downstream sand bag barriers are checked and, if required, removed; and
  - The streambed in the location of the culvert is stabilised to ensure flows overtopping upstream bunds (if any) will not create scour issues. It is expected that this may be achieved through geotextile fabric being appropriately pinned and trenched in at the head and toe of the work area
- As soon as the culvert is commissioned and stream flows are directed through the culvert, operational considerations shall apply which includes verifying that short term or long term fish passage remains and that the hydrological design aspects of the Project are fully addressed.

6.7 Bridge construction

The Project will require the construction of a bridge over a tributary of the Mimi River between CH 4150 – 4270, upstream of the kahikatea swamp. Bridge construction works will include:

- Establishing a dedicated bridge construction yard adjacent to either the northern or southern bridge abutment or both (to be confirmed). Cut earthworks are likely required to form this yard.
- Stage 1: Bridge Abutment and Pier Foundations. Access to both bridge abutments will be established for plant and equipment and construction access across the tributary will not be not required. Plant and equipment (drill rig and excavator) will be craned into place from the abutments to minimise the need for access tracks to the valley floor. Concrete and grout is likely to be required for constructing the bridge foundations.

- Stages 2-3: Bridge Piers and Deck. Erect braced piers at both ends and place steel superstructure to both ends. Erect central steel superstructure span.

The Project also requires the construction of a second bridge over a tributary of the Mangapepeke Stream.

Erosion and sediment control for bridge works shall primarily comprise the placement of controls around and below the bridge abutment and pier locations but above the stream bank profile. This shall include:

- Installing one or more rows of super silt fences downslope of the working area; and
- Pumping all sediment laden or cement laden water within the abutment and pier excavations to the nearest treatment device for pH and sediment treatment (e.g. CIS).

An activity specific SCWMP shall be prepared for bridge construction works. Sediment laden water generated from localised earthworks for the yard construction shall be collected and treated by one or more CIS (or similar approved). Specific management protocols for concrete and grout use shall be included in the SCWMP, and shall set out procedures for immediately containing all cement and other contaminant spills.

6.8 Tunnel construction

The proposed Mount Messenger tunnel is located between Chainage 3400 – 3635 through the ridge line east of Mount Messenger. Works in this tunnel zone will include earthworks at the northern and southern tunnel portals, and excavation through the ridge line to connect the northern and southern construction zones.

Works also include:

- Establishing a dedicated tunnel construction yard adjacent to either the northern or southern portal. Cut and fill earthworks are likely required to form this yard.
- Establishing a concrete and materials delivery area.
- Excavating the tunnel in stages. Excavated spoil will be taken directly into the closest fill site, and temporary stockpiling is not envisaged to be necessary. The anchor bolts and shotcrete lining will be installed as the excavation proceeds. This will provide temporary protection as well and serve as the final tunnel lining.
- Pavement, drainage, utilities and concrete barriers construction will be done after completion of the two-stage excavation process.
- The tunnel portals may be completed to final profile after all excavation and pavement works are completed if not required before for structure support.

An activity specific SCWMP shall be prepared for tunnel construction works. Sediment laden water generated from localised earthworks for the yard construction and portal entrance (if any) shall treated by the nearest SRP or a dedicated CIS. If grout/cement laden water is generated, a dedicated CIS (or similar approved) shall provide treatment for pH prior to its discharge or reuse. Removal of this water offsite also remains an option if required.

Low volumes of groundwater may be encountered during these works. If groundwater becomes sediment and/or cement laden during works, it shall be collected and treated by a

CIS to an acceptable standard for sediment and/or pH, prior to discharge or reuse for construction purposes. A target pH of between 6.5 and 8.0 shall be achieved prior to discharge or reuse of any water being treated for pH.

6.9 Soil nails and rock anchors

Soil exposed by the cut embankments and within the slopes between the bridge abutments and piers are likely to require soil geotechnical stabilisation with soil nails (or similar). Rock anchors may be required where weak and unfavourable rock is exposed in the cuttings (e.g. cut embankments, tunnel portals).

Soil nails and rocks anchors are proposed to be installed by drilling a hole, placing a steel bar and filling the hole with high strength grout. A steel plate is then bolted on to the face of the cutting.

Localised grout overspills will occur during installation of the soil nails and rock anchors in the immediate vicinity of works, and may result in grout laden water. A Project wide activity specific SCWMP shall be prepared to manage this. Key considerations for this SCWMP shall include:

- Containing all grout overspills at the location of the overspill to minimise grout laden water being generated;
- Measures to minimise grout entering any drain or pipe downstream of the works (e.g. bunding the area of works);
- Keeping grout laden water separate from sediment laden water to minimise the volume of water requiring pH treatment.; and
- Collecting all grout laden water for pH treatment (via CIS or similar approved) prior to discharge or reuse. A target pH of between 6.5 and 8.0 shall be achieved prior to discharge or reuse of any water being treated for pH. Untreated grout laden water shall not be discharged to clean or dirty water drains, or streams.

7 Winter works

Winter works refer to all earthworks occurring in the winter period (1 May to 30 September inclusive). The CWMP recognises that works in this period are more likely to present a higher risk of sediment discharges to the receiving environment due to the wetter soil conditions, colder climate and potential for higher rainfall. The Project shall manage this risk through the risk assessment process outlined within the relevant SCWMP as per Section 1.7 of the SCWMP template (Appendix B).

For the winter period this risk assessment, which shall be undertaken within the SCWMP process, shall specifically consider:

- The scope/nature of the proposed works;
- Structural controls proposed, or existing, that will be/are installed;
- Additional non-structural controls to be implemented (e.g. increased on site monitoring and staging); and
- Maintenance consideration of structural controls to ensure effective access can be achieved to undertake the maintenance and controls continue to work efficiency.

The CWDMP shall continue to apply to any winter works being carried out as a way to identify improvements or the need to reduce scope where required.

A summary of the winter works assessment and documentation procedure is shown in Figure 7.1 below.

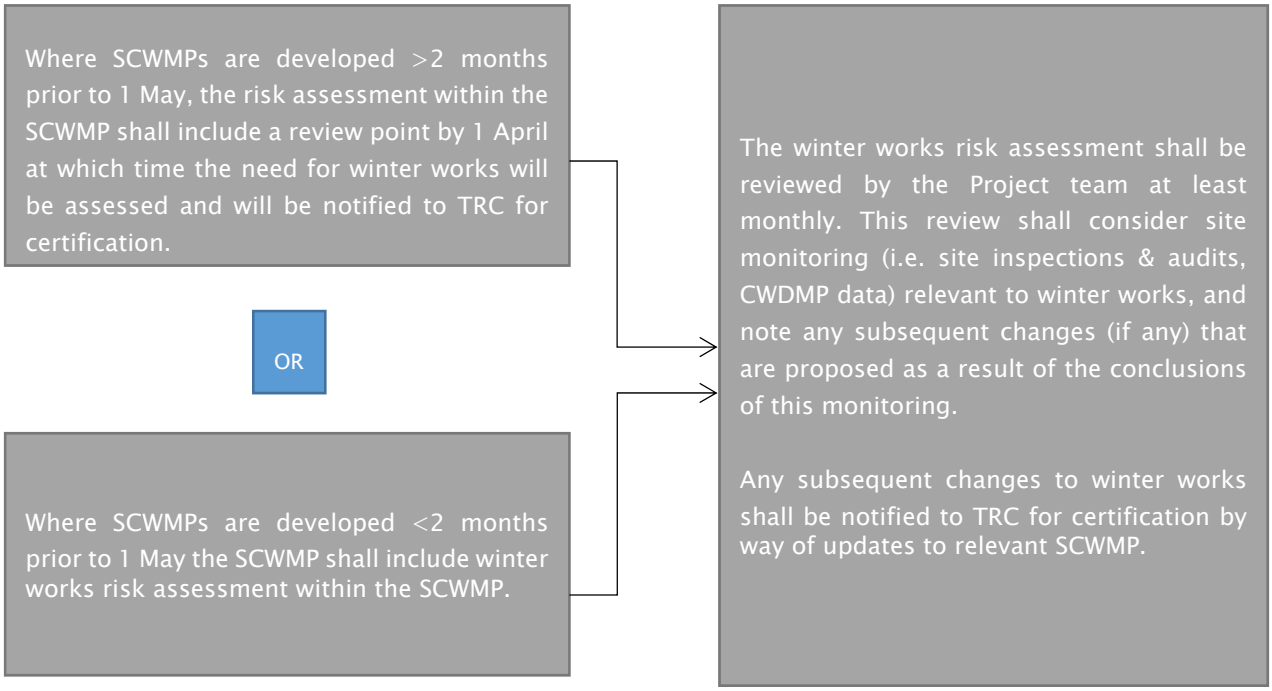

Figure 7.1 - Winter works assessment and documentation

The risk assessment process that forms part of the SCWMP process is based on Table 7.1 as outlined below:

Table 7.1 - Risk assessment Process – Winter Works

Date prepared	
Is Winter Works required	Yes or No
Risk assessment	Scope/nature of the proposed works and associated risk (eg area of works, vicinity of receiving environment, slope of works area, duration of works):
	Structural controls required to minimise risk:
	Non-structural controls required to minimise risk:
	Maintenance considerations to ensure risk continues to be minimised:
Next review date	

This above process allows for winter works to be assessed on a SCWMP basis, within a risk assessment framework and ensures TRC are kept informed throughout. All winter works will be subject to TRC certification and works over that period will only occur with this certification in place.

8 Maintenance

8.1 Overview

Table 8-1 identifies the maintenance actions for specific erosion and sediment control (E&SC) devices.

Table 8-2 identifies requirements on an activity basis to ensure appropriate maintenance can be carried out. Maintenance is based on routine inspections, or will occur in response to predicted rainfall events, or as a result of inspection following rainfall events.

A trigger rainfall event (refer Section 10.1.1) will require an inspection to check the condition and continued effectiveness of sediment control measures.

Table 8-18.1 - Maintenance actions for specific erosion and sediment control devices

E&SC devices	Maintenance trigger	Action
Diversion drain	Debris in channel forcing water out of channel	Remove debris
	Scour along edges of cut off or break out	Widen cut off channel and extend armour
	Scour in channel	Place armour rock in cut off channel
	Scour at outlet	Place armour rock at outlet
	Sumps within DWDs are full after rain event	Clean sumps to original capacity
Pipes	Any build-up of debris in flume or pipe inlet	Remove debris
	Scour at inlet	Protect inlet with geotextile overlain with armour
	Scour around outlet	Place armour to dissipate energy
SRP	Forebay more than 20% full with sediment	Empty forebay and remove sediment
	Main pond more than 20% full with sediment	Empty pond and remove sediment
	Floating decant blocked or sunk	Empty pond and repair decant
	Scouring at discharge point from pond	Place material (e.g. geotextile) to dissipate energy from discharge

E&SC devices	Maintenance trigger	Action
	Erosion of bund	Armour bund by either placement of geotextile or rock
Silt fence/Super silt fence	Fence flapping in wind	Reattach fabric to guide wire and increase number of fabric locks. If required install additional waratahs
	Build-up of sediment greater than 150mm in depth resulting in straining structure	Remove sediment
	Large rocks distorting fence alignment	Remove rocks
	Bottom of silt fence not properly anchored	Dig fence into ground and backfill.
	Undermining of fence by concentrated flow	Identify options to minimise concentrated flow
	Silt fence broken off top wire	Install additional clips on top wire. In very windy locations a netting fence may be required to keep the silt fence in place
DEBs	More than 20% full with sediment	Remove sediment. Consider baffle installation.
	Scour at exit point	Install concreted pipe exit or sand bag over flow point to provide erosion resistant surface
	Insufficient capacity filling quickly	Enlarge trap or provide additional DEBs
CISs	More than 20% full with sediment	Remove sediment
	Outlet blocked	Empty CIS and clear blockage
	Scouring at discharge point from CIS	Place material (e.g. geotextile) to dissipate energy from discharge
Road DEBs /sumps/sediment pits	More than 50% full with sediment	Remove sediment
	Scouring at discharge point from DEB	Place material (e.g. geotextile) to dissipate energy from discharge
	Flocculant rainfall activated shed not operating as required. Plumbing blocked, flocculant levels low, header tank blocked or roof of	General maintenance of full flocculant shed. Following every rain event checking

E&SC devices	Maintenance trigger	Action
	shed has debris on it. Water quality in SRP or DEB not achieving outcomes. Refer section 5.5.3.	full operation of flocculant shed and undertaking maintenance as required.

Table 8–2~~8.2~~ – Summary of maintenance requirements on an activity basis

Activity	Maintenance requirements
Roads (access and haul)	• Shape surface to minimise riling and scour and regrade road surfaces following heavy rainfall • Identification of sites to dewater (if required) and dispose sediment removed from dedicated DEBs • Inspection and sediment removal at any dedicated E&SC measures (e.g. CWDs, DEBs)
Spoil disposal sites	• Identification of sites to dewater (if required) and dispose sediment removed from dedicated SRPs • Access to dedicated E&SC measures (e.g. silt fences, CWDs, SRPs) and discharge points to allow inspections and sediment removal.
Stream works	• Access to entrance and exit points of all temporary diversions (pipe or channel) to check for and repair scour. Access to allow inspection and repair of channel scour. • If pumps are required, refuelling of pump generators away from water course.
Bridge construction	• Access to dedicated E&SC measures (e.g. CIS) and discharge points to allow inspections and sediment removal. Identification of sites to dewater (if required) and dispose sediment removed from dedicated CIS, • If pumps are required, refuelling of pump generators away from water course.

Activity	Maintenance requirements
Tunnel construction	• Identification of sites to dewater (if required) and dispose sediment removed from dedicated treatment measures. • Access to dedicated E&SC measures (e.g. CIS) and discharge points to allow inspections and sediment removal. • If pumps are required, refuelling of pump generators away from water course
Bulk earthworks	• Identification of sites to dewater (if required) and dispose sediment removed from erosion and sediment control devices
	• Temporary stockpiling sites: Access to dedicated E&SC control measures (e.g. silt fences, CWDs and DWDs) to allow inspection, sediment removal and repair
	• Treatment ponds: Access around full perimeter to all SRPs and DEBs to allow: • Safe inspection and monitoring of inlet and outlet water quality; • Sediment removal at both fore bay and main pond; and • Repair of side bunds, outlet structure, scouring at discharge point and/or spillways as required. • Longitudinal controls (e.g. silt fences, diversion drains): Access to allow inspection and repair of undermining and scour.
	• Chemical treatment devices: Vehicle access to flocculant reservoirs for topping up of chemicals. Rainfall activated devices will be inspected following every rainfall event and during heavy rainfall to record level of flocculant in the reservoir. Additionally: • Water within header tanks may need to be adjusted to prevent over or under-dosing of the device; and • Devices will need to be regularly checked for blockages (e.g. leaves) at the catchment tray, and also low and high rate hoses to ensure that rainwater enters the header tank and flocculant exits the device at the correct dosage rate.

8.2 Improvements

Section 8.1 identifies inspections of the sediment control devices that will be undertaken to ensure they are operating correctly and achieving the erosion and sediment control objectives. However, if the devices are found not to be operating correctly, the appropriate response identified in Table 8-3 will be assessed and implemented as necessary.

Table 8-3~~8.3~~ - E&SC Device Potential Improvements

E&SC Device	Improvement trigger	Improvement
Diversion drains	Source of sediment laden water	Line base of channel with geotextile or rock
		Regrade the channel to have a flatter slope

E&SC Device	Improvement trigger	Improvement
Pipes	Water undermining the pipe.	Reinforce pipe inlet and/or outlet
		Construct a formal inlet/outlet structure (if appropriate)
		Increase number of pipes
Sediment Retention Pond	Poor operating performance	Assess if the chemical remains appropriate for the soil type, assess if dosing rate can be increased and/or dosing system can be adjusted.
		Reduce catchment area
		Improve catchment condition e.g. progressive stabilisation
		Clean out fore-bay
		Reconsider baffle design in the SRP
DEB	Poor operating performance	Increase capacity of the DEB
		Reduce catchment area by installing another DEB
		Assess if the chemical remains appropriate for the soil type, assess if dosing rate can be increased and/or dosing system can be adjusted.
		Improve catchment condition e.g. progressive stabilisation
Silt fence/super silt fence	Poor performance	Repair/replace fence fabric
		Replace with super silt fence
		Avoid concentrated flow paths into silt fence or super silt fence

9 Roles and Responsibilities and Training

9.1 Roles and responsibilities

This section outlines the responsibilities expected for all aspects of construction water management. Within the Mt Messenger Alliance an Erosion and Sediment Control Team will be established and will form a key part of the overall organisational structure. The Erosion and Sediment Control Team have a direct link to both the Environmental and Construction Managers and will be a key role in developing construction methodologies for the Project that align with the intent of the approved CWMP.

It is noted that any local sub-contractors utilised within the Project will operate within this same structure and will comply (under supervision) with the Mt Messenger Alliance management systems and expectations.

Table 9-19.1 - Construction Water Management Responsibilities

Organisation	Responsibilities
Transport Agency	• Overall responsibility for compliance with the Resource Management Act 1991 (RMA) and any conditions of the designations and resource consents • Ensuring SCWMPs are included in contract documentation as necessary to ensure sub-contractor buy in • Reviews of CWMP and SCWMPs as required during construction • Audits of E&SC devices and methodologies • Record keeping as necessary
Mt Messenger Alliance	• Overall responsibility for environmental management during construction • Preparation of the CWMP and SCWMPs • Implementation and review of the CWMP and SCWMPs • Installation of construction water measures and erosion and sediment devices • Inspection and maintenance of erosion and sediment control devices • Stabilisation activities • Training in relation to the CWMP and SCWMPs • Monitoring and reporting in accordance with the CWMP and SCWMPs
Taranaki Regional Council (Consent Authority)	• Review and comment on the CWMP and any SCWMPs provided with the application • Certification of the SCWMPs not provided with the application • Auditing to ensure compliance with the CWMP and SCWMPs

9.2 Project inductions and training

9.2.1 Inductions

All people working on-site, or with site responsibilities, will be required to undertake a formal site induction process as outlined in the CEMP. No person will be permitted to work on the site until they have completed the induction process.

Part of this induction process will be based on environmental management, including erosion and sediment control and the requirements under this CWMP.

The induction will include information on the ecological and, cultural values of the area, sensitive areas and, key environmental risks, including areas defined within the SCWMPs as having a higher risk. Information will also be provided on environmental controls such as erosion and sediment control devices.

9.2.2 Training

The Alliance Management Team, Construction Manager, Site Managers, superintendents environmental and ecology team members (responsible for implementation of this CWMP) will undergo a general environmental awareness training to make all aware of their responsibilities relating to this CWMP. Training requirements are described in full detail within the CEMP with specific training requirements relating to this Plan outlined in Table 9-2.

Table 9-2~~9.2~~ - Construction Water Management Training

Environmental Aspect	Specific Training
Erosion and Sediment Control / Construction Water Management	• Relevant TRC regional plans and earthwork guidelines • Transport Agency erosion and sediment control guidelines for state highway infrastructure • Design details for the erosion and sediment control and construction water management measures and associated methodologies during construction • The performance standard as defined in this CWMP to be achieved by all erosion and sediment controls on site • The sensitivity of the receiving environment to sediment discharges • Understanding risk for specific activities and/or locations • SCWMP requirements
Stream works	• Briefing on the values of waterbodies within and downstream of the Project area and the sensitivity of the receiving environment to sediment discharges. • The objectives of the stream design including fish passage requirements. • Briefing on the Project Fish Recovery and Rescue Protocol, which contains the methodology to minimise direct effects of

Environmental Aspect	Specific Training
	construction on fish, kōura and kākahi (freshwater mussels) prior to draining, diverting or excavating streams. • Construction method requirements for stream works (stream diversions, culverting or other in-stream work).
Vegetation Clearance	• A briefing on the values of any significant areas of vegetation that are to be retained. • Briefing of the Project Vegetation Clearance Protocol and related terrestrial ecology protocols included in the ELMP – Bat Management, Lizard Management, Avifauna Management. • The methods that shall be used to identify and protect retained vegetation during construction.

A record shall be kept of all training, including the information presented and a list of attendees (refer to the CEMP for further detail).

9.2.3 Toolbox talks

Environmental issues, including construction water management and erosion and sediment control, will form a regular part of toolbox meetings to ensure all workers are aware of the key issues.

10 Site Monitoring

Site monitoring and management will be implemented through regular site visits by a suitably qualified and experienced person in construction water management, to identify changing site conditions and continuous improvement opportunities in response to monitoring outcomes. Internal construction team planning meetings shall be held while earthworks are occurring (frequency yet to be determined), where changes that may potentially affect the construction water management will be discussed.

10.1 Monitoring programme

The CWDMP provided at Appendix C to this CWMP will be implemented during the Project in accordance with the CWAR. The focus of this monitoring programme is to quantify potential sediment discharges from the Project and enable appropriate site management responses to be identified. Monitoring will include:

- Weather forecast monitoring for daily and weekly planning;
- Visual assessments of the receiving environment;
- Flocculation monitoring;
- Devices monitoring, which includes monitoring of outflow turbidity and/or total suspended solids associated with a selection of SRPs;
- Monitoring of the receiving environment through manual water quality sampling both upstream and downstream of discharges where required;
- Continuous downstream (immediately downstream from the project earthworks) turbidity sampling in the Mimi and Mangapekeke Streams pre and during earthworks activities; and
- Water quality and habitat surveys (fish and invertebrates) pre and during earthworks in accordance with the Freshwater Management Plan chapter of the ELMP.

10.1.1 Rainfall triggered monitoring

Rainfall has a direct effect on the performance of erosion and sediment control measures. Experience suggests that high intensity rainfall of short duration can have the same, if not worse effect as continuous rainfall over a 24 hour period. To maximise the success of erosion and sediment control measures, site management and construction planning must take into account measured rainfall.

Rainfall events shall instigate monitoring and inspection to check the condition and continued effectiveness of the sediment control measures (referred as Trigger Event in the CWDMP).

As an initial trigger, a Trigger Event of greater than 25mm in a 24 hour period or 15mm in a 1 hour period will instigate this process, however this may be revised once rainfall on site is better understood.

Other triggers to instigate monitoring will include:

- Spillage/accident reports that cause a discharge of sediment or contaminants to the aquatic environment; and/or
- Obvious degradation of the receiving environment immediately downstream of the SRPs such as accumulation of sediment, conspicuous oil/grease, scums/foams, floatable matter, fish kills, discolouration of water or significantly increased growth of nuisance algae.

Monitoring to identify potential effects from construction related discharges will be carried out in accordance with the CWDMP, Freshwater Management Plan chapter of the ELMP and conditions of consent. The response and reporting of incidences relating to construction water management shall be carried out in accordance with Section 7 & 8 of the CWDMP.

10.1.2 Monitoring response to indicators of effects

The CWDMP identifies thresholds to instigate a further site investigation of potential effects on the receiving environments (after reasonable mixing) as a result of construction water discharge.

The CWDMP also identifies "management" thresholds, which allow early detection of potential on site issues. Management threshold levels do not indicate potential effects.

If monitoring results indicate potential effects thresholds are exceeded, procedures set out in the Freshwater Management Plan chapter of the ELMP shall be carried out. As a minimum, the following steps shall be undertaken:

- In the first instance, investigate a possible (cause-effect) association with the Project;
- Should this investigation establish linkages between the adverse effect and on-site practices, then investigate alterations to the operational methods (including modifications to environmental control measures and methodologies) as a first order response;
- Assess the effectiveness of the alterations in operational methods by conducting further monitoring to alleviate/avoid adverse effects on the environment; and
- Assess the need for, and nature of, any remedial action.

The most likely causes for effects are:

- Incorrect installation of devices;
- Sub-optimal performance of the measures and methodologies implemented; and/or
- Damage from heavy rainfall/storm events.

The monitoring programme shall provide a process for a 'check and balance' approach, which enables the opportunity for improvement as necessary throughout the construction period.

10.1.3 Chemical treatment monitoring

While the careful use of flocculants at SRP's and DEBs at the correct dose rate has the positive effect of improving treatment efficiencies, overdosing can have negative impacts if residual compounds leave with the pond discharge and enter receiving waters. Overdosing

shall, as far as practicable, be avoided or addressed by identifying appropriate indicators (e.g. pH) and management thresholds in the CWDMP.

Chemical use shall be reassessed if data shows that the current chemical flocculation methods are exceeding the above triggers. It is noted that some of the flocculants available have no effect on pH levels and if such chemicals are used on this Project then there will be no requirement to monitor discharge pH levels. Where other chemical flocculants are used, specific monitoring parameters (if any) shall be set out in the relevant SCWMPs.

10.2 Wet weather response and contingences

A plan and check list of measures to be undertaken in advance of forecasted wet weather will be prepared and updated by project team. These measures may include:

- Sealing off of fill surface;
- Stabilisation of higher risk locations;
- Construction of cut off channels to divert water to treatment devices;
- Construction of cut off channels to reduce overland flow path lengths;
- Construction of bunds to reduce discharges to the front faces of fills; and
- Checking of all erosion and sediment controls to ensure they are operational, including all temporary diversion channels and spillways.

A rainfall actions list (or similar approved), detailing site specific measures shall be prepared, and shall be discussed and documented at regular project meetings.

The weather forecast shall be monitored and in advance of predicted rainfall, ensure that all erosion and sediment controls measures are in place and the rainfall actions are completed.

11 Incident Response

Incident response shall be undertaken in accordance with the process outlined in Section 5.15 of the Project CEMP.

In relation to construction water management, an incident is defined as:

- Discharges from non-stabilised areas that are not treated by erosion and sediment control measures as required by the CWMP / SCWMPs;
- Failure of any erosion and sediment control measures;
- Discharge of a hazardous substances, including cement, to a water body;
- Failure of any temporary stream diversion; and
- Any other incident, which either directly or indirectly causes, or is likely to cause, adverse ecological effects in any waterbodies, that is not authorised by a resource consent.

Incidents will primarily be identified by site observations by Project staff and as a result of specific environmental and erosion and sediment control inspections undertaken by the Environmental team. An incident may also be identified as a result of the monitoring undertaken for the Project (as detailed in Section 10) or through complaints or stakeholder feedback.

11.1 Corrective Actions

As soon as practicable after an incident, the Environmental Manager and the Construction Manager shall:

- Determine the immediate actions to be taken to re-establish control measures where these have failed or have not been implemented in accordance with the relevant management plan as soon as possible.
- The corrective actions shall be implemented as soon as practicable, taking into account health and safety issues.
- Liaise with TRC to establish what remediation or rehabilitation is required and whether this is practicable to implement.

In addition to the above requirements the incident report will include the following details:

- Description and location of incident;
- Description of the weather conditions before the incident;
- Description of work being carried out at the time of the incident and how the incident occurred;
- Corrective actions taken to rectify the situation and mitigation measures to be taken to minimise the adverse effects on the environment;
- Causes of the incident; and
- Environmental controls in place at the time of the incident.

Additional monitoring may be required as a result of the incident and changes may be required to the CWMP or approved and future SCWMPs. Any such changes will be made in accordance with the revision provisions of this CWMP and the conditions of consent.

12 Review

12.1 Review process

A review of the CWMP will be undertaken at least annually by the Alliance. The management review will be organised by the Environmental Manager and the Project team will be informed of any changes to this CWMP through the regular Project communications processes. The review will take into consideration:

- Compliance with the Project consent / designation conditions, the CEMP and management plans.
- Any significant changes to construction activities or methods that require the description of construction activities to be updates and/or any unanticipated more than minor adverse effects resulting from the Project.
- Key changes to roles and responsibilities within the Project team.
- Results of inspections, monitoring and reporting procedures associated with the management of adverse effects during construction.
- Relevant comments or recommendations from TRC or NPDC regarding the CEMP or management plans.
- Unresolved complaints and any response to complaints and remedial action taken to address the complaint.

The outcomes of any review will be provided to TRC and NPDC.

Where the CWMP is updated as part of a review, the on-site version shall be updated promptly and prior to any works associated with the amendment being implemented.

12.2 Minor amendment

In accordance with the consent conditions, minor amendments may be made to this final CWMP at any time. Minor amendment is any amendment where the adverse environmental effect arising from the amendment is the same or less than the effect that would result in the absence of the amendment.

Any minor amendment to the CWMP shall remain consistent with the overall original version of the final CWMP.

The Alliance shall provide TRC with a copy of any amendment as soon as practicable and before any construction works associated with that amendment are implemented.

12.3 Material amendment

Material amendments to this CWMP may be made at any time subject to certification by TRC. Material amendments are any amendments that are consistent with the overall intent of the original version of the final CWMP, but that are not minor amendments in accordance with Section 12.2.

~~In the event of material amendment, the amendment shall be submitted to TRC for certification 20 working days before the commencement of works to which the amendment applies. Works unaffected by the material amendment may continue during the certification process.~~

Appendices

Appendix A: Conceptual Erosion and Sediment Control Plans and Typical Details

- Conceptual Erosion and Sediment Control Plans – MMA-DES-ESC-C0-DRG-1000-1010
- Erosion and Sediment Control Typical Details – MMA-DES-ESC-C0-DRG-4001-4008
- Fill 12 Establishment works indicative sequence – MMA-DES-CON-C0-DRG-1201 and MMA-DES-CON-C0-DRG-120
- Fill 13 Establishment works indicative sequence – MMA-DES-CON-C0-DRG-1301

Appendix B: Specific Construction Water Management Plan Template

Appendix C: Construction Water Discharges Monitoring Programme