

**WAIKATO EXPRESSWAY-CAMBRIDGE  
SECTION**

*Erosion & Sediment Control Plan*



# Waikato Expressway-Cambridge Section

## *Erosion and Sediment Control Plan*

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## 1 Introduction

This Erosion and Sedimentation Control Plan (ESCP) outlines measures to minimise the discharge of sediment offsite during earthworks and temporary stockpiling of soil for the construction of the proposed Cambridge Section of the Waikato Expressway (The Project).

This ESCP is based on the scheme assessment design of the road that was prepared to confirm the feasibility of the Project to gain resource consent.

The majority of issues relating to the construction of the Project, and thus the final ESCP, will be dealt with during the yet to be commissioned design and construction phase of the Project, through adoption of the NZTA's SH Construction Contract Pro-forma Manual (SM031) and the Contract Procedures Manual (SM021).

Drawings of the proposed erosion and sediment control measures are included in Appendix 1. USLE calculations are included in Appendix 2. The Project overview map area included in Appendix 3.

## 2 Methodology

The methodology for the proposed erosion and sediment control plan (ESCP) will be consistent with the Environment Waikato *Erosion and Sediment Control Guidelines for Soil Disturbing Activities 2009*, and in summary, is as follows:

1. Contractor's Environmental Management Plan (CEMP) to be prepared and submitted to EW for approval;
2. Pre-construction meeting with contracting staff and Environment Waikato (EW) representative to discuss erosion and sediment control measures;
3. Install erosion and sediment controls as per ESCP in accordance with EW guidelines,
4. EW to inspect and approve controls;
5. Commencement of bulk earthworks;
6. Progressively stabilise the site with topsoil, grass seed, mulch and hardfill as finished levels are achieved;
7. Maintain erosion and sedimentation controls until the site is fully stabilised.

The CEMP referred to in point 1 above will be prepared by the successful Contractor and submitted to the relevant EW officer for approval prior to the commencement of works. NZTA accepts that it would be appropriate for this requirement to be recorded in conditions of consent. The purpose of the CEMP is to set out in writing all environmental measures that will be put in place for the duration of the project.

The CEMP provides additional hold points and checks during construction phase of the project where there is the greatest potential for adverse effects.

The Contractor's CEMP requirements are as follows:

1. The CEMP is to include Erosion and Sediment Control Plans (ESCP) for each specific stage of construction. The ESCP (as a minimum) shall include:
  - Contour information at a suitable interval;
  - Details (including sizing calculations) of erosion and sediment control;
  - Catchment boundaries for the sediment controls;
  - Location of works, and cut and fill operations;
  - Drawings to be at an appropriate scale;
  - Details of all maintenance and inspections requirements;
  - Location of all devices plus contributing areas, volumes (where applicable) and location relative to the road stations;
  - The ESCP, (as staged in accordance with works) shall be submitted to EW for approval at least two weeks prior to works in that area commencing;
  - Any amendments to the ESCP are to be approved by EW.
2. As-builts to be submitted prior to end of defects liability period.
3. During construction, the ESCP shall be amended to incorporate as-built information for any temporary sediment control ponds.
4. The CEMP shall include a maintenance programme for haul and access roads.
5. The CEMP shall include a site specific 'Dust Management Plan'.
6. The ESCP is to include a construction methodology and timetable, which shall include:
  - A brief discussion of how the proposed techniques will minimise erosion and sediment discharge; and
  - Key stages and phases of the Project.
  - As-builts of various control devices will be submitted for written approval by EW prior to bulk earthworks commencing.
7. The CEMP is to include details of how the subcontractors onsite will be required to comply with erosion and sediment controls, consent conditions and the requirements of the CEMP.
8. The CEMP shall set out mitigation and contingency measures for (but not limited to) the following:
  - Extreme weather events
  - Failure of protections works or earthworks;
  - Oil spills;
  - Dust nuisance;

- Tracking of dirt onto public roads; and
- Water collection management.

9. The CEMP shall include environmental emergency response procedures, which shall include details of appropriate actions to be taken, all response personnel and means of notifying emergency response agencies. The emergency response procedure shall incorporate the following requirements:

In the event of non-compliance with resource consent conditions, or an incident occurs that results in a significant adverse environmental effect, the following shall occur:

- a. The Contractor shall take immediate action to stabilise the situation. All spills shall be contained, recovered and disposed of appropriately;
  - b. The Contractor shall contact the Engineer and EW within 24 hours or sooner if appropriate to the situation;
  - c. The Contractor shall contact affected parties if the incident has the potential to have effects beyond the site that would affect a given party;
  - d. The Contractor (and EW if possible) shall determine if any further response is required. The Contractor shall take steps necessary to mitigate the incident;
  - e. Should remedial action and/or monitoring be required, an appropriate course of action shall be determined by EW in association with the Contractor, and if necessary external specialists; and
  - f. The Contractor shall prepare an incident report to be forwarded to the Engineer and EW within one week of the incident.
10. Any non-compliances with the consent conditions and CEMP must be recorded. Information will include the reason for the non-compliance, the expected duration, the action taken, what will be done to prevent a re-occurrence and remedial works required.
11. The CEMP shall identify:
- An appropriately qualified and experienced environmental quality systems manager, who shall be responsible for ensuring compliance with the CEMP and resource consent conditions;
  - A chain of responsibility for managing environmental issues and details of responsible personnel; and
  - The person(s) responsible for implementing and maintaining appropriate erosion and sediment controls for the works during construction.
12. The CEMP shall detail a programme for the education and control (with respect to the environment) of employees and subcontractors to ensure that all personnel are briefed on environmental issues prior to commencing work.

### 3 Site Description

The majority of the Project is constructed through a greenfields route from State Highway 1 near Discombe Road to south of the Cambridge Golf Course approximately 11km in length. It will require closure of four local roads, construction of 4 defined drain crossing points (including the Karapiro Stream Bridge crossing), construction of 7 bridges and several hundred metres of retaining walls. The project also includes the construction of approximately 60 cross-highway culverts to provide conveyance of overland flows across the Project designation.

The road is constructed in fill from Station 0 to 8000m approximately. From Station 8000m onwards the road is generally constructed in cut, falling towards the Karapiro Stream gully from both directions.

The road is generally divided into sub-catchments in line with locations of culverts and high points. A location plan is included in Appendix 3.

### 4 Proposed Works

A significant amount of earthworks will be required during the construction of the Project. In order to construct a four lane bypass as per the long section shown in the attached plans, earthwork volumes are likely to be as follows:

- 200,000 m<sup>3</sup> of topsoil stripping to stockpile for re-spreading onto batters
- 230,000 m<sup>3</sup> of cut material to be used as structural fill (without treatment)
- 350,000 m<sup>3</sup> of cuts material to be used as structural fill (with treatment)
- 200,000 m<sup>3</sup> of cut to waste. (these may be spread over the structural fill batters to flatten the slopes and used as general landscaping/bunding)
- 230,000 m<sup>3</sup> of imported structural fill.

Surface vegetation will be limited but where present it is to be felled and disposed of offsite. Topsoil will be stripped off and stockpiled. Erosion and sediment control measures are to be installed before work starts.

Erosion and sediment control measures for these activities are detailed in Section 6 & 7 of this ESCP.

Earthworks are normally not allowed during the period 1 May to 30 September inclusive during any year, apart from necessary maintenance works, unless approved in writing by the EW.

### 5 Construction Sequence

Depending on the type of procurement method adopted by NZTA it is most likely that the contractor will determine the optimum construction sequence construction of Project. However, we expect that the work is likely to proceed generally in accordance with the following sequence:

- Pre-construction Works – Given the relatively short timeframes before the scheduled start date for construction it is unlikely that this project will involve any pre-

construction works. The exception to this may be in the form of relocation of specific services (such as telephone, power, water, and stormwater)

- Set up traffic management at SH1 approaches and each of the local roads that are to remain open (Peake Road, Swayne Road, and Thornton Road). Formalise road closures at Discombe Road, Forrest Road, Hannon Road, and Watkins Road
- Site establishment - including establishment of sediment ponds, drainage, clearing and stripping and further adjustment to existing services
- Culvert construction – 3 drain locations require culverts to be constructed within the first 6 months of construction to enable full length access along the site. No permanent stream diversions are necessary but they will require works within the existing watercourse. These works are subject to separate Resource Consent processes.
- Structural embankment construction (concurrently at multiple separate locations).
- Construct bridge structures (could occur during the embankment consolidation period, but not before embankment construction).
- Construction of pavement and surfacing (inclusive of kerb & channel)
- Completion of remaining traffic services (signage, lighting, traffic signals, pavement marking). Includes installation of any outstanding noise mitigation measures (such as noise walls)
- Landscaping (topsoil on batters, grassing and planting)
- Construction of tie-in onto SH1 at either end

## **6 Erosion Control**

### **6.1 Vegetation clearance**

Trees and weeds will be cleared, mulched and laid down on runoff diversion bunds as a temporary surface cover. Otherwise the mulched material will be carted offsite for disposal.

### **6.2 Diversion of overland flow (clean water)**

Along most sections of the new road, the surrounding areas are flat and overland runoff flowing towards the site will be minimal. Offsite runoff affecting the works can be prevented by creating a small bund adjacent any dirty water channels. Separate clean water channels are therefore generally not required.

There are some exceptions, where separation of clean and dirty water is required, see ESCP included in Appendix 1. Where such channels are constructed the grades will generally be flat. Scour protection (geotextile etc.) will therefore generally not be required.

Clean water drains are required alongside subcatchments 2b, 18, 19, 21, 38 and 53. These diversions drains all have small catchments and are mainly required to divert existing drains and prevent any runoff from entering the site. These diversion drains are to be installed and seeded early on. The size will vary but will generally be designed similarly to local drain, approx 1m deep, with a 1m base with and with 1:1 batters or steeper. From site observations it appears local soil can support relatively steep batters (when seeded and stabilised).

### 6.3 Control of onsite runoff (dirty water)

The area of earthworks is divided by topography into 66 subcatchments. Control measures for each subcatchment depend on the catchment slope and size.

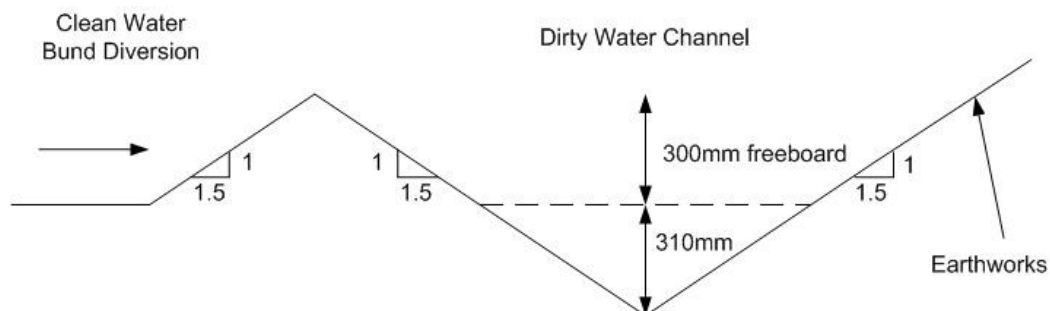
The road cross sections show that:

- The road has a crown with crossfall towards both verges on straight sections
- The road is superelevated in corners

In general, the area is very flat, but the road is built in cut of fill along its entire length and a combination of DEBs, SRPs and silt fences are required to manage dirty water flows. Silt fences are generally used in areas that are small, flat and with short batter slopes. Where ponds are used SRPs are generally required due to the large areas involved.

Table 2 in Section 6 includes a summary of the site characteristics for each subcatchment.

Environment Waikato requires diversion channels to be designed to carry the flow from the critical 20 percent AEP rainfall event (plus 300 mm freeboard after settling). The largest area discharging through a single dirty water diversion channel has an area of 3.6ha (subcatchments 22b & 23b each). With a runoff coefficient of 1 and a time of concentration of 30 min, the 20% AEP design flow is approximately 56l/s. On average a grade of 0.2% appears to be available. Dirty water “V” shape channels are to be constructed to a total depth of 610mm with 1.5H: 1V side slopes for conveyance of the 20% AEP event (56l/s) with 300mm freeboard requirement as shown below.



Other subcatchments are larger by are serviced by two dirty water channels.

### 6.4 Stabilisation

Bare areas subject to erosion will be progressively stabilised as they are completed. Stabilisation can be achieved through applying mulch from felled vegetation or from periodic hydroseeding /

hydromulching. The centre of the roading corridor will mostly be use as a haul route during construction. Therefore embankment, cut slopes and any area not required for the haul road within the corridor should be stabilised as constructed.

## 6.5 Stockpile Areas

Top soil stockpiles will generally be located along the road corridor. Construction methodology will be finalised by the Contractor closer to the construction date. Erosion and sediment control requirements of the stockpile areas will be in compliance with the EW's *Erosion and Sediment Control Guidelines*. The stockpiles will be stabilised using grass or hydro seeding as appropriate and contained using either silt fence or, where available, dirty water diversion channels.

## 6.6 Construction Entrances

A standard detail of a construction entrance to be use for this Project is shown in Figure 13 of EW's *Erosion and Sediment Control Guidelines*. Stabilised construction entrances are to be located at all construction entrances, which could be at any of the roads that the Project crosses. The locations of construction entrances and wheel wash facilities will be determined as the construction staging and entrance points are not confirmed at this time. It is likely that the wheel washes will be semi-permanent facilities due to the likely length of construction and will include a metalled bypass track for light/clean vehicles. The construction entrances all have drainage to an SRP or appropriate sediment retention device. Any additional construction entrances added at a later date once construction staging is required, should also have this facility.

Local road crossings within the site will be incorporated into the erosion and sediment control area by installing temporary culverts in the water table drain to form a temporary crossing. Dirty water diversion bunds would also be installed to divert run-off from the road crossing to adjacent sediment retention devices. This will ensure that heavy vehicles working along the new alignment, assumed to have the dirtiest tracks, will be kept within the erosion and sediment control area.

## 7 Sediment Control

EW's *Erosion and Sediment Control Guidelines for Soil Disturbing Activities* indicate that:

- Silt Fences (SF) can be used on low gradient sites where the contributing catchment is small (less than 0.25 ha).
- Super Silt Fences (SSF) can be used on low and higher gradient sites where the contributing catchment is small (less than 0.5 ha).
- The maximum contributing catchment for a DEB (Decanting Earth Bund) should not exceed 0.3 ha.
- Catchment areas are to be restricted to less than 5.0 ha per SRP (Sediment Retention Pond).

### 7.1 Summary of Control Devices

Locations of the proposed silt/super silt fences, SRPs and DEBs are shown on the attached ESCP drawing (Appendix 1). General subcatchment as well as device sizes and comments details are summarised in Table 2 below.

**Table 2: Characteristics of worksite subcatchments**

| Subcatchment | Area (ha) | Length (m) | Sediment Control Device | Device Size and /or Comments          |
|--------------|-----------|------------|-------------------------|---------------------------------------|
| 1            | 1.1       | 420        | SSF                     | Minimum earthworks & flat             |
| 2a           | 5.7       |            | SRP                     | 1140m <sup>3</sup> : 1.1m x 16m x 65m |
| 2b           | 4.7       |            | SRP                     | 940m <sup>3</sup> : 1.1m x 15m x 57m  |
| 2c           | 0.3       | 300        | SSF                     |                                       |
| 3            | 0.4       | 320        | SSF                     |                                       |
| 4            | 0.8       | 320        | SSF                     | Minimum earthworks & flat             |
| 5a           | 0.4       | 140        | SSF                     |                                       |
| 5b           | 0.25      | 140        | SSF                     |                                       |
| 6            | 0.25      | 100        | SSF                     |                                       |
| 7            | 0.3       | 100        | SSF                     |                                       |
| 8            | 0.5       | 200        | SSF                     |                                       |
| 9            | 0.5       | 200        | SSF                     |                                       |
| 10           | 0.45      | 180        | SSF                     |                                       |
| 11           | 0.45      | 180        | SSF                     |                                       |
| 12           | 0.35      | 140        | SSF                     |                                       |
| 13           | 0.35      | 140        | SSF                     |                                       |
| 14           | 1.05      |            | SRP                     | 420m <sup>3</sup> : 1.1m x 10m x 38m  |
| 15           | 1.05      |            |                         |                                       |
| 16           | 0.75      |            | SRP                     | 300m <sup>3</sup> : 1.1m x 8m x 34m   |
| 17           | 0.75      |            |                         |                                       |
| 18           | 0.8       |            | SRP                     | 540m <sup>3</sup> : 1.1m x 11m x 45m  |
| 19           | 0.38      |            |                         |                                       |
| 20a          | 1.5       |            |                         |                                       |
| 20b          | 1.5       |            | SRP                     | 650m <sup>3</sup> : 1.1m x 12m x 49m  |
| 21           | 1.75      |            |                         |                                       |
| 22a          | 0.6       |            | SRP                     | 840m <sup>3</sup> : 1.1m x 14m x 55m  |
| 22b          | 3.6       |            |                         |                                       |
| 23a          | 0.6       |            | SRP                     | 720m <sup>3</sup> : 1.1m x 14m x 55m  |
| 23b          | 3.6       |            |                         |                                       |
| 23c          | 3.5       |            |                         |                                       |
| 24           | 0.75      |            | SRP                     | 840m <sup>3</sup> : 1.1m x 14m x 55m  |
| 25           | 0.75      |            |                         |                                       |
| 26           | 1.35      |            |                         |                                       |
| 27           | 1.35      |            |                         |                                       |
| 28           | 0.4       |            | DEB                     | 150m <sup>3</sup>                     |
| 29           | 0.4       | 150        | SSF                     |                                       |
| 30           | 0.4       |            | DEB                     | 150m <sup>3</sup>                     |
| 31           | 0.15      | 60         | SSF                     |                                       |
| 32           | 0.15      | 60         | SSF                     |                                       |
| 33           | 0.9       |            | SRP                     | 360m <sup>3</sup> : 1.1m x 9m x 36m   |
| 34           | 0.9       |            |                         |                                       |
| 35a          | 0.26      | 130        | SSF                     |                                       |
| 35b          | 0.11      | 90         | SSF                     |                                       |

|                           |      |     |      |                                                                                                      |
|---------------------------|------|-----|------|------------------------------------------------------------------------------------------------------|
| 36a                       | 0.26 | 130 | SSF  |                                                                                                      |
| 36b                       | 0.11 | 90  | SSF  |                                                                                                      |
| 37                        | 0.75 |     | SRP  | 300m3: 1.1m x 8m x 34m                                                                               |
| 38                        | 0.75 |     |      |                                                                                                      |
| 39                        | 0.15 | 60  | SF   |                                                                                                      |
| 40                        | 0.13 | 50  | SF   |                                                                                                      |
| 41                        | 0.15 | 60  | SF   |                                                                                                      |
| 42                        | 0.15 | 60  | SF   |                                                                                                      |
| 43                        | 0.3  | 120 | SSF  |                                                                                                      |
| 44                        | 0.25 | 100 | SSF  |                                                                                                      |
| 45                        | 0.3  | 120 | SSF  |                                                                                                      |
| 46                        | 0.3  | 120 | SSF  |                                                                                                      |
| 47                        | 0.3  | 120 | SSF  |                                                                                                      |
| 48                        | 0.3  | 120 | SSF  |                                                                                                      |
| 49                        | 0.8  |     | SRP  | 320m3: 1.1m x 8m x 36m                                                                               |
| 50                        | 0.8  |     |      |                                                                                                      |
| 51                        | 0.7  | 280 | SSF  | Road level at ground level                                                                           |
| 52                        | 0.7  | 280 | SSF  | Road level at ground level                                                                           |
| 53                        | 5.6  |     | SRP  | SRPs to be installed in stages as stated on plan. May require to be lined. (1120m3: 1.1m x16m x 64m) |
| 54                        | 3.9  |     | SRP  |                                                                                                      |
| 55                        | 1.1  |     | SRP  |                                                                                                      |
| 56                        | 2.6  |     |      | 740m3: 1.1m x 13m x 52m<br>May require to be lined.                                                  |
| 57                        | 0.15 | 80  | SF   |                                                                                                      |
| 58                        | 0.15 | 80  | SF   |                                                                                                      |
| 59                        | 0.15 | 80  | SF   |                                                                                                      |
| 60                        | 0.12 | 60  | SF   |                                                                                                      |
| 61                        | 5.6  |     | SRP  | 1120m3: 1.1m x 16m x 64m                                                                             |
| 62                        | 4.0  |     | SRP  | 800m3: 1.1m x 13m x 56m                                                                              |
| Gully access road         | 0.7  | 600 | DEBs | DEB X 2 each 150m3                                                                                   |
| Access road off Swayne Rd | 0.45 | 450 | SF   | Minimum earthworks, flat small area                                                                  |
| St Kilda Road realignment | 0.5  | 350 | SF   | Minimum earthworks, flat small area                                                                  |
| Thornton Road works       | 0.3  | 200 | SF   | Minimum earthworks, flat small area                                                                  |

## 7.2 Flocculation

Prior to bulk earthworks commencing, flocculation bench testing to determine if flocculation will provide a benefit to the sediment discharge shall be undertaken. If the tests indicate a benefit to sediment discharge from SRP's, a draft Flocculation Management Plan will be prepared for the written approval of the EW.

### 7.3 Exceptions

This paragraph discusses locations where unusual or specific practices are proposed, due to deviation from standard practice or difficulties for erosion and sedimentation control that the works pose in those locations.

- Station 3000 to 4000m: An existing drain is present directly next to the proposed construction area. Due to designation boundaries it is required to reconstruct this drain on the opposite (north) side of the new road. The relocated drain will run from Forest to Peake Road to act as a clean water diversion and a discharge point for the SRPs proposed at Station 3900m.
- Station 5200 to 6100m: The fill required at Victoria Road overpass and intersection will be preloaded for approximately 6 months prior to construction of the road. The area will therefore be bare for a relatively longer period. SRPs capturing all runoff from this area are proposed to be installed and maintained during this period.
- Station 8200 to 9800m: This section directly adjacent the gully is built in cut with positive drainage towards the gully. Stage one of the proposed erosion and sedimentation controls will be to construct a SRP and temporary discharge pipeline to the gully floor with excavation going upslope. Depending of site conditions this SRP may require lining to avoid seepage towards the gully. Once excavation has reached a depth to install the permanent wetland discharge pipeline, a second SRP will be constructed near the wetland site using its installed discharge pipeline. The balance of the road construct can now proceed.
- Station 10000 to 10700m: This section is similar to Station 8200 to 9800m. An SRP will be construct and temporary discharge pipeline to the gully floor with excavation going upslope. Depending of site conditions this SRP may require lining to avoid seepage towards the gully. Once excavation has reached a depth to install the permanent wetland discharge pipeline, it will be used for SRP discharges.

No pumping is expected to be necessary from these works. If required, pumped water will be directed to the proposed SRPs for treatment prior to discharge.

Other sediment control measures may be used as appropriate. This may include the use of rock, geo-textile fabric, filter socks, etc. However, due to the flat nature of the site, the requirement for these will likely be minimal.

New clean water drains are to be hydroseeded or hydromulched and significant is to be strike achieved prior to use. The proposed clean water drains at subcatchments 2b/2c, 18/19/21, 38, and 53 are to be built and stabilised early on in the programme.

## **8 Stream Crossings**

This project includes a number of culverts that cross the road embankment as well as a major Expressway Bridge crossing the Karapiro Stream. To construct this bridge a temporary stream crossing is required.

### **8.1 Road Culverts**

Road culverts will be installed at existing farm drain and two residential development runoff channels that cross the Expressway alignment.

It is anticipated that the construction of these three culverts will be in their existing channels which are normally dry. Diversion channels will be installed so if there is a rainfall event any stormwater flow will safely bypass each culvert. During culvert construction clear water bunds and silt fences will be installed to control potential erosion and sedimentation.

### **8.2 Overland Flows**

To accommodate overland flows approximately 60 culverts will be installed across the Expressway alignment between Stations 0 to 7200m. It is likely that the overland flow culverts will be installed by excavating across the road once the base of the embankment has been established. No diversion will be required and the work lies within the embankment boundaries and control devices as set out in the Erosion and Sedimentation Control Plan.

### **8.3 Expressway Bridge**

To construct the Expressway bridge, access to the base of the gully will be provided by a purpose built track located on the south side of the gully. The specific location of the access track is detailed on the sheets 7 of 8 and 8 of 8 the attached drawings showing erosion and sedimentation control devices.

The proposed Expressway bridge crossing the Karapiro Stream gully is at least 220m long and 38m above stream bed level. Four sets of bridge piers will be located in the gully but not within the normal stream channel. Normal flows will not be affected by the bridge piers. Due to the height of the bridge flood flows will not be affected either. Some flood flows will surround the two middle sets bridge piers but this will not be detrimental to flood levels as there are no major assets immediately upstream of the bridge. Materials from pier excavations will be carefully managed to managed to minimise potential sediment run-off with all excess cut material being transported our of the gully footprint. During pier construction clear water diversion bunds and silt fences will be installed around the piers along with stabilisation of all disturbed materials to control potential erosion and sedimentation. DEB devices will be used to control pier access tracks.

### **8.4 Temporary Stream Crossing**

Access from the northern side of the gully cannot be provided because of the potential effects on the adjacent pa site and potential urupa. Thus to construct the bridge access to the northern sides of Karapiro Stream will need to be established by a temporary stream crossing.

A temporary bridge crossing is proposed. However the Construction Contractor may consider alternative temporary crossing methods. The main stream channel is near the northern bank. It is proposed to construct the stream crossing at this location providing enough waterway area to pass the annual flood flow estimated at 5m<sup>3</sup>/sec. Discharges greater would flow around the temporary crossing. During times of flood flows the temporary crossing would not be used. Temporary access tracks will be surfaced to prevent sediment runoff.

## 9 Monitoring & Maintenance

The Contractor will be required to nominate in his contract a person to maintain and manage the erosion and sediment control measures for this site. The Contractor should carry out regular self-audits to monitor the performance of the erosion control plan. Review of self audit reports and discussion of related issues will be included in the regular site meetings.

Site monitoring should also be undertaken before, during and immediately after heavy rainfall events.

Amendments can be made to this ESCP based on the successful Contractor's CEMP. EW should be consulted for advice as and when required during the construction stage.

## 10 Universal Soil Loss Estimate

### 10.1 General

A USLE assessment has been undertaken for the proposed works. The USLE model has not been calibrated for New Zealand conditions and any absolute values obtained from it should be viewed with caution. Nevertheless, it is useful in identifying "hot spots" on a site and where particular erosion and sediment control efforts should be directed.

### 10.2 Assumptions

The sub-catchments as listed above each include a combination of batters and road areas. Sediment yield calculations for individual subcatchments are subject to variation along the works as fill and depths vary significantly (between 0 and 8m). Representative slopes have been assigned for each subcatchment based on the following information:

- All batter slopes (cut or fill) will be constructed at 2:1 slopes.
- The average slope of the road is very flat (generally 0.3%), with an exception at the Victoria Road overbridge where the grade is 1.7%.
- Where the road is flush with ground level an average crossfall of 3.0% is applied.
- Where the road is in cut or fill, an average slope between 5.7% and 22.4% is used, depending on batter slope length.

### 10.3 Construction period

The earthworks are estimated to take up to 2.5 years. However, as works progress batter slopes will be stabilised with the central road area used as a haul road during the earthworks construction. Individual subcatchments will therefore only be bare for a portion of this time with batter slopes and areas not required for the haul road stabilised, with the centre of the corridor used as a haul road. For the purpose of the USLE calculations a nominal time period has been set for each catchment,

relative to its size. A minimum construction period of 2 weeks (0.04yrs) is applied to small catchments. To account for the haul road, which will be used during the Project, a second set of USLE calculations were made assuming that a 6m wide along the haul road will be open for the entire construction period.

Post construction calculations have been undertaken for the cut and fill batters only, as most of the road area will be sealed. A re-establishment period of 2 months (0.17yrs) has been assumed for all areas.

#### **10.4 Results**

The USLE calculations (refer to Appendix 2) indicate that a total of 2690 tonnes of sediment could be mobilised during the works and re-establishment period. However, the majority of this sediment will be trapped by the erosion and sediment control measures, resulting in a minimal amount of sediment being transported off-site. The USLE calculations indicate that up to 673 tonnes of sediment could be discharged from the site.

The “hot spots” identified mainly relate to largest areas subject to bulk earthworks. These areas use SRPs for sediment control devices. Depending on bench testing chemical flocculation may be adopted. Alternative methods such as contouring and progressive stabilisation may be used as well.

Between Stations 0 to 7200m there are no perennial water ways thus nil to minor impact on the environment is expected. Treated discharge from erosion and sedimentation devices over the last 3.8km of road will find its way to the Karapiro Stream and the Waikato River.

## **11 Dust Control**

Earthworks should be completed during the summer earthworking season to minimise the generation of sediment, but at this time in the year risk of generating dust is higher than during winter. Measures to avoid or minimise dust generation during Project construction will be incorporated into a Construction Dust Management Plan, which will form part of the Project’s Construction Management Plan. To minimise the generation of dust the following techniques should be considered;

- **Minimise Exposed Surfaces**

Only expose surfaces to be actively earthworked and stabilise completed areas. Rapidly stabilise highly trafficked areas such as entrance and exit points. Use compactor and roller to seal surfaces. Ensure access tracks are stabilised and reduce the speed of earthmoving plant as appropriate.

- **Water Sprinkling**

Water should be applied as a dust suppressant at a rate of 5-10 mm/day by a sprinkler truck before the soil moisture level drops. During spring and summer, water should be applied more liberally, especially during dry periods of more than 7 days duration. Water should be primarily sourced from sediment retention ponds, but can be augmented as necessary by river abstraction and pumping. An application to “take” and “use” water from the Waikato River for dust control is being sought from EW.

- **Dust Suppressants**

Where water is unavailable or not sufficiently effective, dust suppressants may be used. Dust suppressants provide a protective surface that reduces dust emissions.

- **Contact Phone Numbers**

Signage should be erected at the entrance to the site to provide the public with the contact details of the contractor. This will allow the public to provide feedback to the contractor on the effectiveness of their dust suppression measures and to alert them in the event that their measures are ineffective.

Dust generation during Project construction is assessed further in Cambridge Bypass: Assessment of Effects on Air Quality, which is included at Appendix 9 of the AEE. Section 8.2 of that report includes an extensive list of potential dust mitigation measures.

**Appendix 1**

ESCP Drawings

Note that the ESCP Drawings will be included in the *Waikato Expressway-Cambridge Section: Drawings* document

**Appendix 2**

USLE Calculations

**Appendix 3**

Project Overview Map