

INDICATIVE SITE SPECIFIC ENVIRONMENTAL MANAGEMENT PLAN (SSEMP)

Duck Creek Focus Area
(from Chainage 20800 - 23000)

This Document, that is in the form of an SSEMP, is one of a number that have been developed for key focus areas along the Transmission Gully Project Alignment. The focus areas were chosen to be representative of the range of sites along the route and to have between them the full range of environmental management issues likely to be encountered during construction of the route.

The aims in producing these documents are to:

- Provide confidence in design;
- Provide an indication as to how works can be staged and programmed;
- Assist in assessing effects;
- Assist in developing mitigation strategies; and,
- Assist in consultation with stakeholders regarding construction management issues.

The SSEMP for Duck Creek specifically explores the following issues:

- Culvert installation and fish passage;
- Bridge Construction
- Erosion and sediment control;
- Mitigation planting and stream works; and,
- General management of environmental issues in a listed stream.

The SSEMPs have been prepared using the best information available and are not intended to be final. They will be refined further during the specimen and detailed design stages and will be to relevant local authority as required by conditions.

July 2011
Version 5 Final

1 INTRODUCTION

This SSEMP relates to those construction matters that have potential or actual effects on aspects of the local natural and human environment.

It covers the upgrading of the existing farm access road, establishment of erosion and sediment control structures, installation of culverts, construction of four bridges, formation of a four lane highway including cut slopes and batter fills which sidles across steep faces, installation of a variety of stormwater treatment devices, and post construction landscape and mitigation planting. This SSEMP covers a length of alignment of approximately 2.2 kilometres in Duck Creek.

Note that the CEMP contains generic details common to the route standard details and methodologies for a range of activities such as diversions, culvert installation, sediment and erosion control, monitoring and mitigation which are not repeated in this SSEMP.

This site specific management plan relates to those matters that are unique to this section of the alignment.

1.1 Consents

The following consents are relevant to this SSEMP

Consent	Condition
Greater Wellington Regional Council	
Porirua City Council	

The following activities relevant to this SSEMP are permitted.

Activity	Rule
Greater Wellington Regional Council	
Porirua City Council	

2 PREPARATION OF DOCUMENT

The draft SSEMP has been prepared by the following people:

Name	Organisation	Role
Peter Ward	NZTA	Project Manager
Mark Edwards	OPUS	Civil & Roading
Stephen Fuller	BML	Ecology
Craig Martell	SKM	Hydrology and Water Quality
Wade Robertson	Isthmus	Landscape

3 CONTACT DETAILS

NZTA

Position	Name	Organisation	Contact Details
Project Engineer			
Project Manager			
Site Supervision			
Environmental Management Auditor			
Project Ecologist			

CONTRACTOR

Position	Name	Organisation	Contact Details
Contractors Representative			
Site Supervisor			
Site Safety Supervisor			

4 PLANS

Drawings relevant to this SSEMP are attached and show the location of the proposed works and sediment control structures, as outlined below:

- E1 General Arrangement Plan
- E2 Construction Access Plan
- E3 Landscape Plan
- E4 Bridge 19 – Plan and Elevation
- E5 Bridge 19 – Details
- E6 Long and Cross Sections.

5 ENVIRONMENTAL CONSIDERATIONS

5.1 Erosion & Sediment Control and Stormwater

The area covered by this SSEMP falls within the wider watershed of Pauatahanui Inlet, the northern arm of Porirua Harbour. This harbour is recognised as nationally significant. It is the ultimate receiving environment for any discharges from site. Therefore, considerable care is essential in the management of sediment and contaminants.

5.2 Stream Works

Duck Creek and tributaries are listed in the Regional Freshwater Plan, and their regional significance is recognised in the operative Regional Policy Statement. It is considered to be a significant habitat for indigenous fish and has a high level of natural character.

This section of the alignment will cross Duck Creek and its tributary with three bridges. Care will be needed during its construction to protect the stream from contaminants and in particular the use of cement (e.g. for bridge construction), as this is toxic to freshwater fauna.

- Bridge 17 at chainage 21600
- Bridge 18 at chainage 21950
- Bridge 19 at chainage 22650

There will be five permanent culverts installed in tributaries of Duck Creek. Three of these require provision of fish passage:

- Culvert D8 at chainage 21000
- Culvert D9 at chainage 21225
- Culvert D14 at chainage 226700

Care is also required in the management of sediment discharge to this stream.

Within the SSEMP eight existing perched culverts will be upgraded or replaced to reinstate fish passage (culvert annotated 'DM' on the Drainage Plan Set in Volume 3). This is being undertaken as part of offset mitigation for stream habitat loss elsewhere on the alignment and is discussed in section 7.6.

5.3 Indigenous Fish

Duck Creek has a number of fish species, several of which are Threatened or At Risk (banded kokopu, giant kokopu, long finned eel, red finned bully). During construction special attentions needs to be paid to the protection of native fish within any section of stream being culverted.

5.4 Habitats / Flora / At Risk - Threatened plant species

The alignment passes through three early retirement sites, planted in accordance with conditions attached to the original designation. Best endeavours are required to avoid as much of this retirement planting as possible.

- Early Retirement Area 1 at chainage 22600 to 22800
- Early Retirement Area 2 at chainage 21900 to 22100
- Early Retirement Area 3 at chainage 21500 to 21750

5.5 Terrestrial Fauna / at risk-threatened fauna species

No rare or threatened terrestrial fauna have been identified within this SSEMP site.

5.6 Landscape

There are no significant landscape issues for this SEMP although the final form and landscape treatment of large cut batters and stabilised earth walls will require specific consideration. The primary mechanisms used include the design of batter slopes and benches; contouring of fill areas; and revegetation of all earth-worked areas. There is significant cross over between landscape, ecological and hydrological mitigation measures in addressing the over effects within this SEMP area.

5.7 Visual

There are no visual issues for this SEMP

5.8 Social & Amenity

There are no communities that will be directly affected within this SEMP

5.9 Historical & Cultural Sites

There are no known sites of historical interest or cultural significance within the area covered by this SEMP. Unexpected Discovery protocols are contained within the CEMP.

5.10 Dust

Dust control is necessary as part of sediment management and stream protection.

5.11 Noise & Vibration

There are no particular noise issues for this SEMP

5.12 Traffic

There are no particular traffic issues for this SEMP

5.13 Utilities

The 220kv line approaches the SEMP section from the east with wires overhanging the SEMP south of 22800 and sidling above. There are no towers within the SEMP.

The GWRC Water Main passes under the alignment at 20800, follows the existing farm track that sidles below the alignment to 233000, then passes beneath the alignment again.

The North Island Gas Main crosses the alignment at 21800.

5.14 Restricted 'NO GO' Areas

There are no restricted areas within this SEMP.

5.15 Forestry

There is no exotic forestry within this SEMP.

5.16 Water Abstraction

No water abstraction from streams is currently proposed within this SEMP. Harvesting of treated water from sediment ponds for dust management may occur.

6 WORK PROGRAMME

6.1 Staging

The exact timing and construction staging is still to be confirmed however generally the construction process includes:

- Access track widening and installation of temporary culverts.
- Establishment of Erosion and Sediment Control measures.
- Culvert installation.
- Earthworks, and bridge construction
- Re-vegetation of exposed earthworks areas (to be undertaken as work areas are completed).
- Pavement Works.
- Removal of Erosion and Sediment Control measures after agreement with GWRC.

6.2 Programme

The works will be undertaken in a sequential manner. All stream works will be completed prior to commencement of bulk earth works to form access track. The track works will be divided into four 1 kilometre sections. Two construction teams will be used to construct the access road.

A detailed work programme will be prepared in due course by the constructor but may be undertaken in the following sequence.

No.	Activity	Duration	Preceding Activity
	ENABLING WORKS		
1	Retire pasture and fence	3 weeks	-
2	Install temporary culverts along existing access road (if needed)	2 weeks	-
3	Upgrade existing access track (widening)	1 week	1
	CONSTRUCTION WORKS		
4	Install culverts within proposed alignment.	3 weeks	2 & 3
5	Initial erosion and sediment control structures		4
6	Bulk earthworks chainage	6 weeks	5
7	Construct MSE embankments	10 weeks	5 & 6
8	Remove temporary culverts along track (if possible and practicable)*	1 week	7
9	Earthworks Stabilisation	1 week	6 & 7
10	Pavement works chainage	4 weeks	9
11	Remove temporary sediment ponds	1 week	9
12	Form stormwater treatment pond	1 week	10
13	Carry out revegetation planting	2 weeks	9, 10 & 11
	POST CONSTRUCTION WORKS		
14	Monitor and maintain revegetation.	Ongoing	All

* culvert work will entail removal of existing perched culverts and topography may mean that these existing culverts need to be retained in order to retain existing access.

7 ENABLING WORKS

The following works will be carried out prior to bulk earthworks commencing.

7.1 Site Access

The Duck Creek focus area falls within front 1 of the three simultaneous construction fronts in the proposed staging of construction of Transmission Gully Project. The main site compound for the front falls outside of the study area as it is adjacent to SH58. To gain access to the section in the study area a temporary access track will be constructed from Bradley Road to link with the existing Duck Creek / Waitangirua Stream access track around CH 20800. This is shown in drawing AC16. The temporary access track will incorporate the existing track within the Silverwood pine forest.

As there are substantial structures within the Duck Creek study area the existing track will be only be used for initial establishment, foundation works and the commencement of earthworks. This is due to the steepness of the track between James Cook interchange and bridge 16 over Duck Creek.

Access for construction of the bridge superstructures will not be possible until the road formation for the top section of the Waitangirua Link Road is in place. This section would then become the main haul road and access to the Duck Creek area.

The temporary construction access tracks are shown in SEMP/E-2.

7.2 Traffic

There are no traffic issues within this SEMP

7.3 Noise

There are no particular noise issues within this SEMP

7.4 Site Clearance / Forestry

No vegetation clearance is required within this SEMP.

7.5 Laydown Areas

A laydown area is proposed where the temporary access track links with the Duck Creek / Waitangirua track. This will be formed in advance of bulk earthworks.

The location of the laydown area is shown in SEMP/E-1

7.6 Stockpile Areas

None proposed within this SEMP.

7.7 Utilities

The GWRC Water Main passes under the alignment at 20800, follows the existing farm track that sidles below the alignment to 233000, then passes beneath the alignment again. Care will be needed during upgrading of the construction access road.

The North Island Gas Main crosses the alignment at 21800. A number of enabling works activities will be needed to prepare and protect this pipeline prior to commencement of bulk earthworks.

The utility locations are shown in SEMP/E1

7.8 Fencing

Fencing will be required to limit stock access to the site of works. Fencing of the three early retirement sties will also need to be reviewed based on the detailed design and may need to be modified.

7.9 Species Translocations

Immediately prior to any stream reclamation or diversion process, the section of stream to be reclaimed will be isolated by coffer dams or bunds, and any fish present will be safely captured for translocation by accepted methods as provided in the Ecological Mitigation and Monitoring Plan .

All fish that are captured will be transferred upstream to the nearest equivalent habitat to limit their exposure to any increased turbidity that is caused during the diversion or culvert installation process.

7.10 Stream Works

Work will be required within a number of small existing streams, involving temporary diversion, the construction of eight new culverts and the redirection of the stream through the new culverts.

7.10.1 Culverts

All culverts will be constructed in the dry either by installing a diversion around the work area or constructing the culverts adjacent to the stream and then diverting water into the culvert on completion.

In steeper catchments the diversion may be done using a pipe. Prior to using a pipe the project ecologist will confirm the use of this method will not adversely affect fish passage.

The locations of all culverts are shown in SSEMP/E1-02. Design calculations are provided in Technical Report 14. Culvert locations requiring fish passage are:

Chainage	Culvert Number	Type Of Fish Passage Treatment
21000	D8	Fish passage design required
21225	D9	Fish passage design required
22700	D14	Standard

7.10.2 Diversions

Permanent diversions will primarily be due to the replacement of natural stream bed with linear culverts. However, these will not be of significant size or length.

7.10.3 Fish Passage

As part of enabling works eight existing culverts that lie beneath the farm track that will be upgraded for construction access, will be modified to provide for fish passage. A range of methods will be used depending on the culvert length, location and water velocity. The culverts are located, as follows:

Site	E	N	Comments
Culvert_DC-01	1758049.5394	5442709.7649	Duck Main Channel - Upper – True right branch
Culvert_DC-02	1758118.7653	5442874.4719	Duck Tributary
Culvert_DC-03	1758240.9691	5443130.5532	Duck Main Channel – Mid
Culvert_DC-04	1758539.68	5443550.0734	Duck Tributary

Site	E	N	Comments
Culvert_DC-05	1758560.5918	5443554.5207	Duck Tributary
Culvert_DC-06	1758716.2164	5443727.35	Duck Tributary
Culvert_DC-07	1758864.4025	5443884.4487	Duck Tributary
Culvert_DC-08	1758971.5504	5444002.7304	Duck Tributary

8 CONSTRUCTION WORKS

8.1 Earthworks

Construction will occur progressively over the length of the alignment in the study area. Construction will not commence within the study area until 2019. Roadworks will be completed over a two year period with work progressing from the north.

The earthworks in the study area primarily involve the formation of cut benches on both sides of the alignment. The cut material will be used where fill material is required or will be transported to fill site 1.

Earthworks will be staged in sections as construction of each bridge allows access to the sections of alignment. With the completion of bridges 17, 18 and 19 earthworks transfer from around CH 23,000 to fill site 1 can begin.

Earthworks will be completed from CH 20800 – CH 21620 (north abutment of bridge 17) first. Bridges 17, 18 and 19 will be constructed following this, allowing access for earthworks to be completed from CH 21845 – CH 23000 within a two year period (anticipated).

Closure of earthworks is defined when stream diversions, or permanent culverts have been installed, slopes have been stabilised with geotextiles where necessary and sufficient re vegetation has occurred that temporary erosion and sediment control measures are no longer required.

8.2 Cut & Fill Treatments

The final form and treatment of cut and fill batters has a significant bearing on both landscape and visual effects. In order to reduce the degree of these effects the following actions will be undertaken (see Technical Report 5):

Both cut and fill batters to receive final revegetation treatment (see Revegetation section 8.7 below) at earliest possible time following completion of construction *provided* this timing is conducive to vegetation growth. If the Site Environmental Management Auditor finds that conditions are not acceptable an interim treatment (hydroseeded grass) will be applied prior and the final landscape treatment carried out at an appropriate time within the following year.

- Benches where practical will be spaced evenly *except* for the first bench which will be a minimum of 15m above finished road level.
- Faces will be left with a rough surface to facilitate vegetation growth.
- Tops of cuts rounded off to reduce hard edges.
- Soil material will be left on benches to aid revegetation.
- Benches shaped to retain water and facilitate vegetation growth.

8.3 Bridges

Three bridges are proposed for this SSEMP. Construction will require earthworks on the slopes above the streams being bridged, to allow for construction of piers.

Access roading which sidles across steep slopes will need to be managed to prevent erosion or mass wasting into the stream beds.

Use of concrete for pier construction will need to be managed to prevent cement discharge to the streams.

Bridge locations are shown in SSEMP/E4-5.

8.4 Erosion Control Measures

The primary construction methodology for mitigation against sediment release to the environment is targeted erosion control. In the Horokiri area this will involve the development of stepped slopes during earthworks, roughing up the soil, importing and laying topsoil, mulch or compost blankets, use of sprayed and bound straw mulch or hydro seeding. On steeper slopes rolled erosion control blankets or netting may be used, and if any particularly steep vulnerable slopes are worked wire blankets or cellular confinement will be used to provide sufficient control.

The initial state of earthworks primarily focuses on prevention of erosion during stream diversions. The following describes erosion control works in the stream at the Whitby interchange:-

In the first phase of works a new culvert will be constructed off-line through the centre of the site. A clean water diversion bund will be installed around the works to prevent clean runoff from flowing through the earthworks site. Once the culvert is complete a temporary dam will be constructed and the stream diverted through the new culvert. The disused watercourse will then be cleaned out and backfilled.

Further clean water diversion bunds will be utilized in the southern region of the site to direct water away from the earthworks areas and into existing streams.

CHAINAGE	MATERIAL	ACTION
19600	Stream diversion and offline culvert construction	One culvert constructed offline. Once complete the stream will be channelled through the culvert and away from the work site.
19500 - 19600	Clean water diversion bunds	Constructed on the upgradient side of work sites to channel clean water around the work site. These will discharge to existing watercourse.s
19600	Temporary dam	Constructed to divert water away from the existing watercourse into the new culvert. Constructed of an appropriate material so as to prevent water entering this area and eroding backfill.

8.5 Sediment Control Measures

During the second phase of earthworks, the first sediment diversion bunds / contour drains will be constructed to convey sediment-laden water to treatment devices. These are located in appropriate places down-gradient of small sections of earthworks. The chemically treated sediment retention ponds have been sized on the basis of 3% of the contributing catchment (see sediment calculations in the Technical Report 15 for further details).

In the third phase further chemically treated sediment ponds will be installed as bulk earthworks commence. Smaller areas will be treated with container sediment tanks (either one or two at each location), or earth decanting bunds, with the addition of flocculent.

During the final phase the sediment ponds and tanks will be repositioned to suit the new contours and changing construction catchments. The sediment controls will remain in place until all earthworks are complete and all areas are stabilised.

8.5.1 Chemically Treated Sediment Retention Ponds

The following ponds will be installed during works at the Whitby Interchange:-

CHAINAGE	CATCHMENT AREA (ha)	POND SIZE m ³	POND NUMBER	COMMENTS
19400	1	TBA	-	
19500	2.5	TBA	-	
19550	2.5	TBA	-	
19550	1	TBA	-	
19575	1	TBA	-	
19600	0.21	TBA	-	

The chemically treated sediment retention pond sizes have been calculated on the basis of 3% of the contributing catchment.

8.6 Stormwater Treatment Devices

There are proposed to be two proprietary stormwater treatment devices for the capture and treatment of road runoff within the Upper Duck SSEMP area. Details of these devices are as follows:

CHAINAGE	DEVICE NUMBER	CATCHMENT AREA (ha)	TYPE OF TREATMENT	COMMENTS
20100	P15	1.75	Proprietary device	-
20600	P16	2.05	Proprietary device	-

Proprietary devices have been chosen for stormwater treatment where space within the alignment is constrained.

8.7 Revegetation

Following completion of bulk earthworks restoration planting will be carried out as per plan SSEMP/E3. The treatments will be:

Site	Name	Chainage	Treatment
1	Early Retirement Area 1	22600 to 22800	Replacement of damaged or lost plants and extension of planting as shown in SSEMP/E3
2	Early Retirement Area 2	21900 to 22100	Replacement of damaged or lost plants and extension of planting as shown in SSEMP/E3
3	Early Retirement Area 3	21500 to 21750	Replacement of damaged or lost plants and extension of planting as shown in SSEMP/E3

8.8 Water Abstraction

No water abstraction from streams will occur within this SSEMP. Harvesting from Sediment Ponds for dust management may occur.

8.9 Quarrying

No aggregate sourcing will occur outside the road footprint within this SSEMP.

8.10 Dust Control

Where dust control is identified as a specific issue, an investigation by the Construction Supervisor into the cause will be required. When the cause has been identified the specific

controls can be applied to the problem area(s). The following controls are to be deployed on the construction sites as required.

- Water (water cart irrigation), provides good short term solution. Caution is required to avoid a discharge from the over application of water. All areas identified as dust sources including roads are to be kept dampened during dry weather periods to minimise public nuisance from windborne dust.
- Chemical Adhesive Sprays, provide longer term solutions to small areas which aren't able to be treated by water such as hill slopes or long term stock piles. Need to check use is permitted activity and over spray risks are managed.
- Wind fences, are good for small areas and may be appropriate to be used in this location.
- Mechanical treatment, such as slopes rolled with mulch or aggregate provide effective control for wind erosion. However these can't be used in active work areas, so require careful planning for installation.
- Cover Blankets for stock piles.

8.11 Transporting of Materials

There are also risks from the delivery and removal of materials from the sites. All materials transported to and from the sites will need to be assessed for the risk of dust release during transit. Where the load is identified as being a dust source such as crushed concrete or topsoil, etc... Then the load will need to be covered or dampened down prior to transporting. The Construction Supervisor will be responsible for keeping a record of:

- Date and time of movement;
- Transport provider;
- Material moved on and off site;
- Potential for dust release; and,
- Actions taken to control the material.

9 TRAINING

Within this SSEMP site, all contractors will receive a full briefing on the Environmental Considerations including avoidance of NO-GO sites, recognition of habitats of significant species, timing of ecological and water quality monitoring.

10 MONITORING

The monitoring will be undertaken in accordance with the procedures outlined in the CEMP. Some of the aspects that will be monitored in this SSEMP site will be erosion and sediment control devices, freshwater quality, aquatic habitat, macro-invertebrate, fish passage, revegetation success, weeds, translocation success.

10.1 Erosion & Sediment Control Devices

Performance monitoring of the proposed ESC devices is intended to ensure that they operate as designed and that their performance is maintained over the lifespan of their use on the project. The discharges from the site works and the proposed treatment devices will enter watercourses throughout the catchments. The following monitoring of the receiving environment is proposed to check whether the effects of the discharges are as anticipated.

Monitoring of erosion and sediment control measures sediment will be as follows:

Control Measure	Routine Inspection	Wet Weather And Incident Inspections		Performance Measures	Management Action	Reporting
			Inspect For			
Control and retention of disturbed soil at earthwork sites (Improve Soil Health)	Weekly	During heavy rain (Q10 event) and after all rain	Soil loss Rill erosion Surface water flow pathways	Retention of soil	Rectify any erosion or channel formation Re-grade surface as required	Inspection, outcomes and management action in site log
Provide Short Term Soil Cover	Weekly	When rainfall predicted through weather monitoring. After all rain	Surface water pathways / erosion	Design specifications	Undertake straw mulching Hydro seeding	Inspection, outcomes and management action in site log
Provide Long Term Soil Cover	Weekly	During heavy rain (Q10 event) and after heavy rain (Q10 event)	Damage / erosion Growth of plantings (including gaps)	90% cover or stabilised	Rectify and repair damage to blankets/netting Replant gaps/dieback	Inspection, outcomes and management action in site log
Steep Slope Techniques	Weekly till 90% stabilised (i.e. 90% gassed or equivalent)	During heavy rain (Q10 event) and after heavy rain (Q10 event)	Damage / erosion Growth of plantings (including gaps)	Design specifications	Rectify and repair damage to blankets/netting Replant gaps/dieback	Inspection, outcomes and management action in site log
Clean water diversion bund	Weekly	During heavy rain (Q10 event) and after all rain	Damage / erosion Blockages Sediment build-up	Design specifications	Rectify any damage / erosion or blockages Remove accumulated sediment in diversion channel.	Inspection, outcomes and management action in site log
Rock check dam	Weekly	After all rain	Damage / erosion Blockages Sediment build-up	Design specifications	Rectify any damage / erosion or blockages Remove accumulated sediment behind dams when 50% full	Inspection, outcomes and management action in site log
Pipe drop structure/ flume	Weekly	After all rain	Damage / erosion Blockages	Design specifications	Rectify any damage / erosion or blockages	Inspection, outcomes and management action in site log
'Pinned' Silt socks or gravel check dams	Weekly	During heavy rain (Q10 event) and after heavy rain (Q10)	Damage / erosion Sediment build-up	Design specifications	Rectify and damage / erosion or blockages Replace/	Inspection, outcomes and management action in site log

Control Measure	Routine Inspection	Wet Weather And Incident Inspections		Performance Measures	Management Action	Reporting
		event)	Inspect For			
Sediment Retention Pond	Daily	After all rain. During heavy rain (Q10)	Sediment build up	Measure depth of sediment versus pond volume	repair gaps Remove sediment when 20% full	Inspection, outcomes and management action in site log
			Damage/ Function of the decants/ Level Spreaders / Fore bay	Design Specifications	Rectify any damage / blockages to fore bay	Inspection, outcomes and management action in site log Advise GWRC within 24hrs of significant damage and management actions
Chemical treatment System	Weekly	After all rain. During heavy rain (Q10)	Damage, low dosing supply	Design Specifications	Rectify any damage or blockages. Replace flocculent	Inspection, outcomes and management action in site log
Sediment Fence / Silt Socks	Weekly	After all storm events (Q2-Q10)	Sediment build-up	Measure depth of sediment versus fence height	Remove sediment when 20% of height occupied	Inspection, outcomes and management action in site log
			Damage/ erosion/ water bypass	Design Specifications	Rectify any damage / erosion. Relocate devices to deal with bypass	Inspection, outcomes and management action in site log
Decanting Earth Bund	Weekly	After all rain events During heavy rain (Q10)	Sediment build-up	Measure depth of sediment versus pond volume	Remove sediment when 20% full	Inspection, outcomes and management action in site log
			Damage/ erosion Blockages	Design Specifications	Rectify any damage / erosion or blockages	Inspection, outcomes and management action in site log Advise GWRC within 24hrs of significant damage and management actions
Stormwater Inlet Protection	Weekly	After all rain	Damage/ erosion Blockages	Design Specifications	Rectify any damage / erosion or blockages	Inspection, outcomes and management action in site log

Control Measure	Routine Inspection	Wet Weather And Incident Inspections	Inspect For	Performance Measures	Management Action	Reporting
Works in watercourses	Weekly	After all rain	Visual release of sediment into the water above that envisaged for works	Documented method for works	Investigate source of sediment and rectify works/modify method	Inspection, outcomes and management action in site log

11 REPORTING

No reporting above and beyond the requirements of the CEMP are required for this SSEMP section.

12 APPENDIX - CALCULATIONS

12.1 Earthworks Quantities

EARTHWORKS CATEGORY	AREA (m ²)	QUANTITY (m3)
Earthworks cut CH 20800 - 23000	69,407	688,000
Earthworks fill CH 20800 - 23000	23,593	262,000

12.2 Proposed Fill Sites

CHAINAGE	Reference	Volume (m3)	Area (m ²)
21000	Fill 1	250,000	

12.3 Chemically Treated Sediment Retention Ponds

The sediment retention pond size has been calculated on the basis of 3% of the contributing catchment.

CHAINAGE	CATCHMENT AREA (ha)	POND SIZE m ³	POND NUMBER	COMMENTS
19400	1	TBA	-	
19500	2.5	TBA	-	
19550	2.5	TBA	-	
19550	1	TBA	-	
19575	1	TBA	-	
19600	0.21	TBA	-	

12.4 Culverts

A calculation summary for culverts within the work area are as follows.

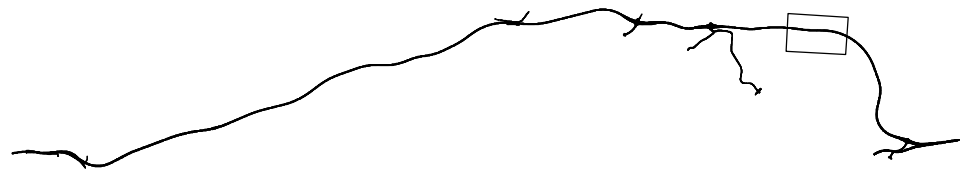
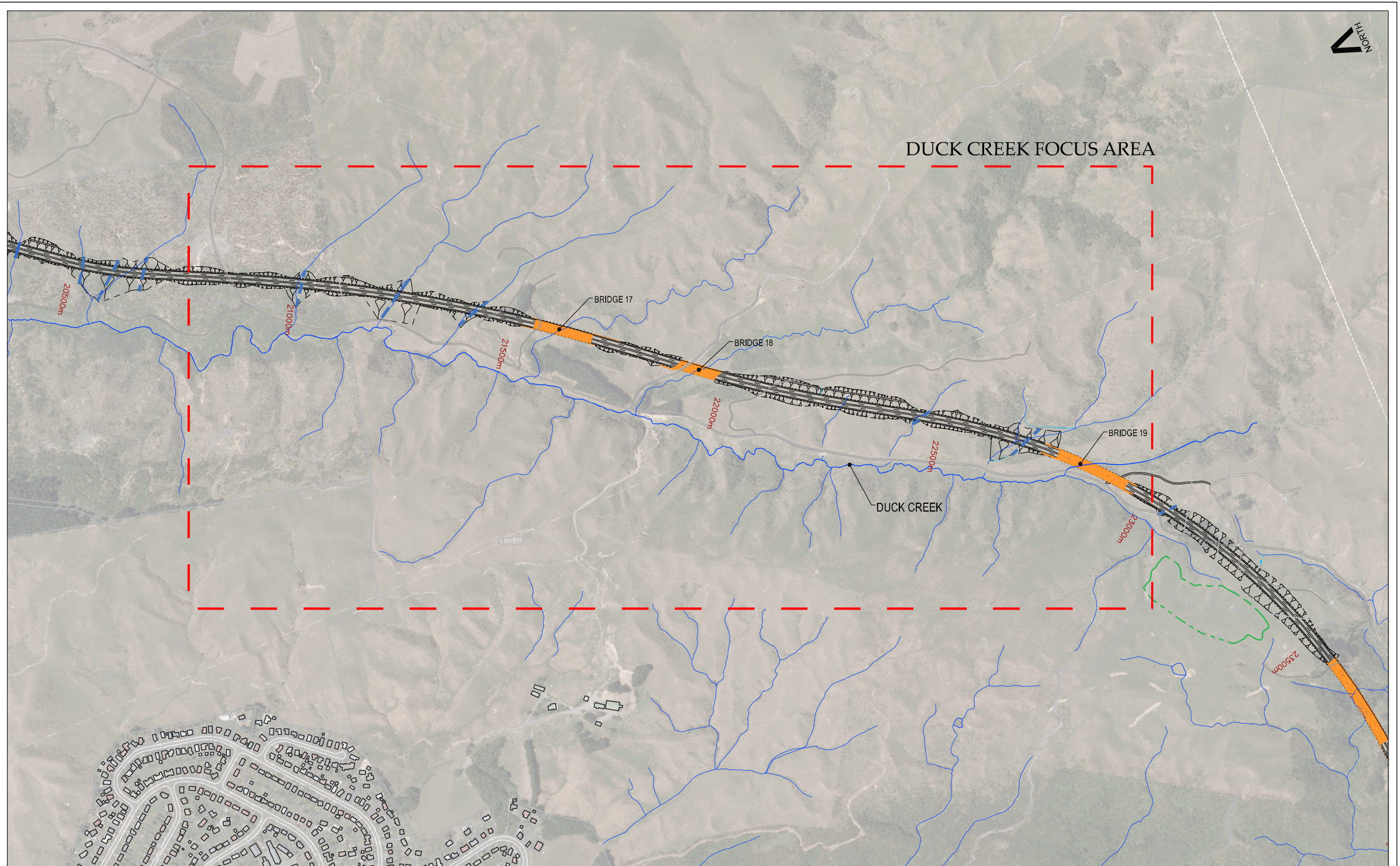
CHAINAGE	CULVERT NUMBER	CATCHMENT AREA (ha)	CULVERT SIZE (mm)	INDICATIVE GRADIENT
19,975	D1	1	600	1 in 4.48
20,100	D2	2	600	1 in 5.53
20,200	D3	2	600	1 in 5.02
20,350	D4	1	600	1 in 4.19
20,550	D5	2	600	1 in 7.79
20,600	D6	3	600	1 in 5.05
20,650	D7	39	1600	1 in 6.31
21,050	D8	13	1050	1 in 6.43
21,225	D9	18	1200	1 in 12.37
21,400	D10	9	1050	1 in 6.61
22,450	D13	2	600	1 in 10.33
22,650	D14	21	1350	1 in 30.40
23,050	D16	39	600	1 in 24.50
19,550	D17	1	600	1 in 10.33
n/a	D18	572	3.5m (W) x 4m (H) box culvert	1 in 55.00

n/a	D19	2	600	1 in 45.00
n/a	D20	3	600	1 in 5.38
n/a	D21	1	600	1 in 7.67
n/a	D22	2	600	1 in 4.34
n/a	D23	9	900	1 in 12.13
n/a	D24	5	750	1 in 7.04
n/a	D25	3	600	1 in 5.05
n/a	D26	3	600	1 in 14.67

12.5 Stormwater Treatment Devices

There are proposed to be two proprietary stormwater treatment devices for the capture and treatment of road runoff within the Upper Duck SSEMP area. Details of these devices are as follows:

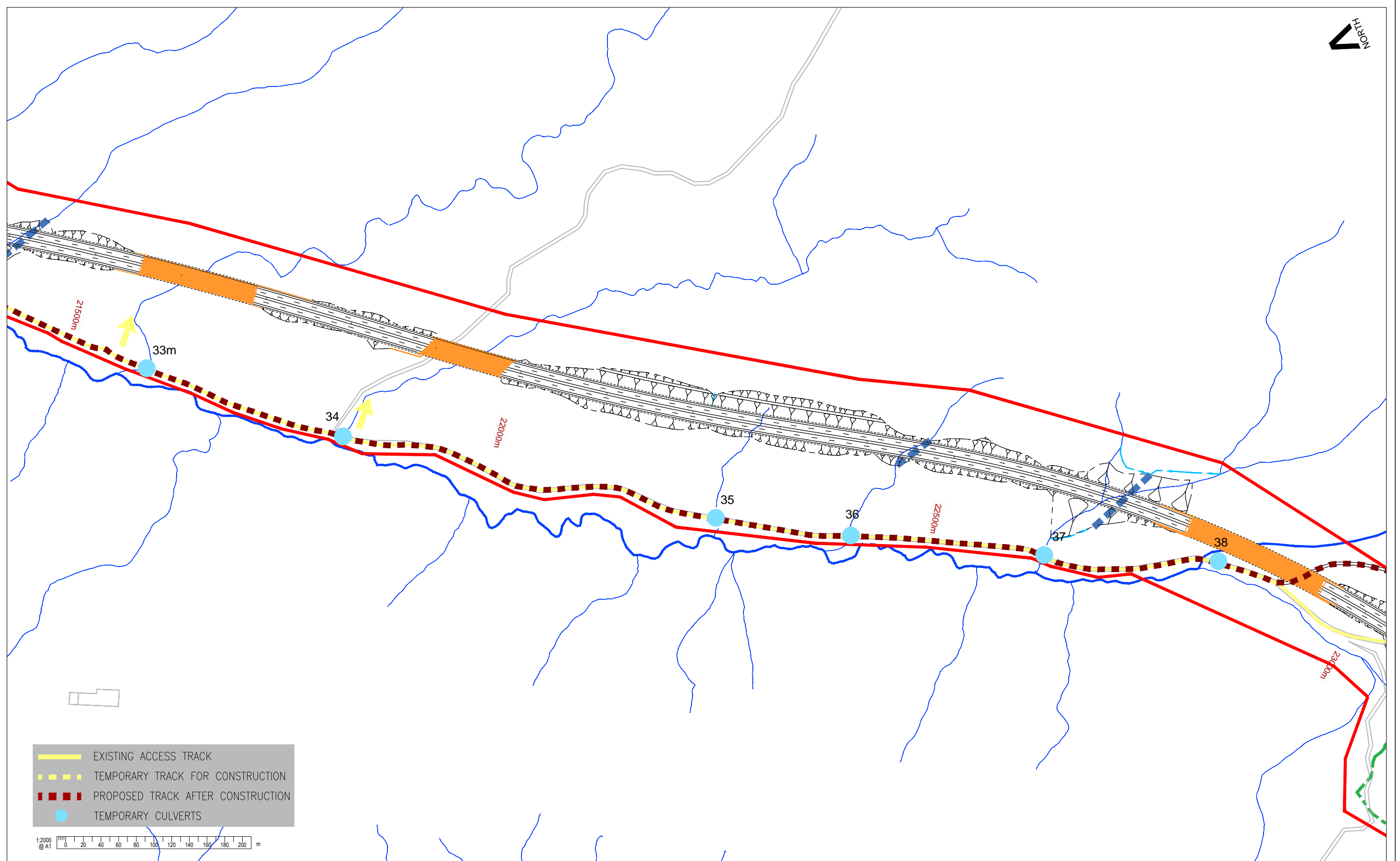
CHAINAGE	DEVICE NUMBER	CATCHMENT AREA (ha)	TYPE OF TREATMENT	COMMENTS
20100	P15	1.75	Proprietary device	-
20600	P16	2.05	Proprietary device	-



Revision	Amendment	Approved	Date

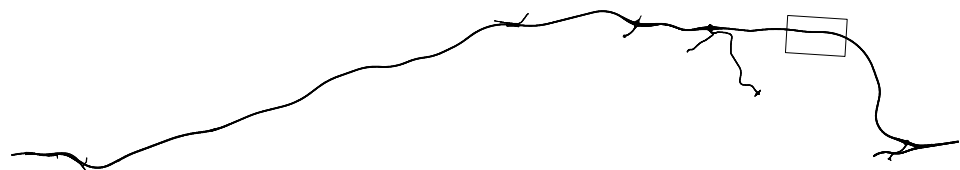


Project.		TRANSMISSION GULLY PROJECT	
Title.	Site Environmental Management Plan Duck Creek General Arrangement Plan	Status.	For Consenting
Sheet No.	SSEMP/E1	Version No.	A



- EXISTING ACCESS TRACK
- TEMPORARY TRACK FOR CONSTRUCTION
- PROPOSED TRACK AFTER CONSTRUCTION
- TEMPORARY CULVERTS

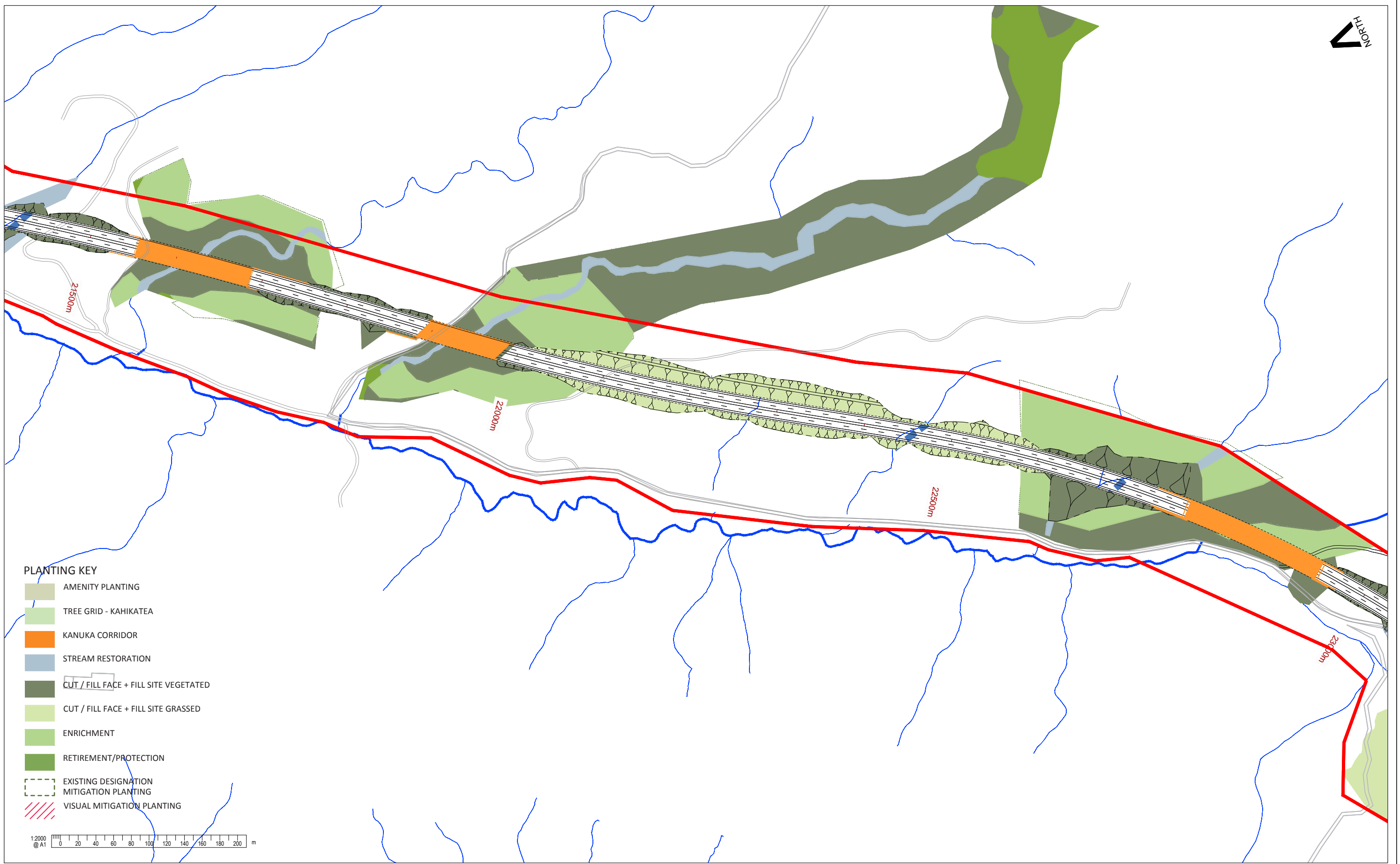
1:2000
@ A1
0 20 40 60 80 100 120 140 160 180 200 m













Revision	Amendment	Approved	Date

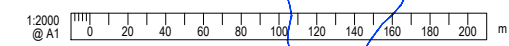


Project.		TRANSMISSION GULLY PROJECT	
Title.	Site Environmental Management Plan Duck Creek Construction Access Plan	Status.	For Consenting
Sheet. No.	SSEMP/E2	Version No.	A



PLANTING KEY

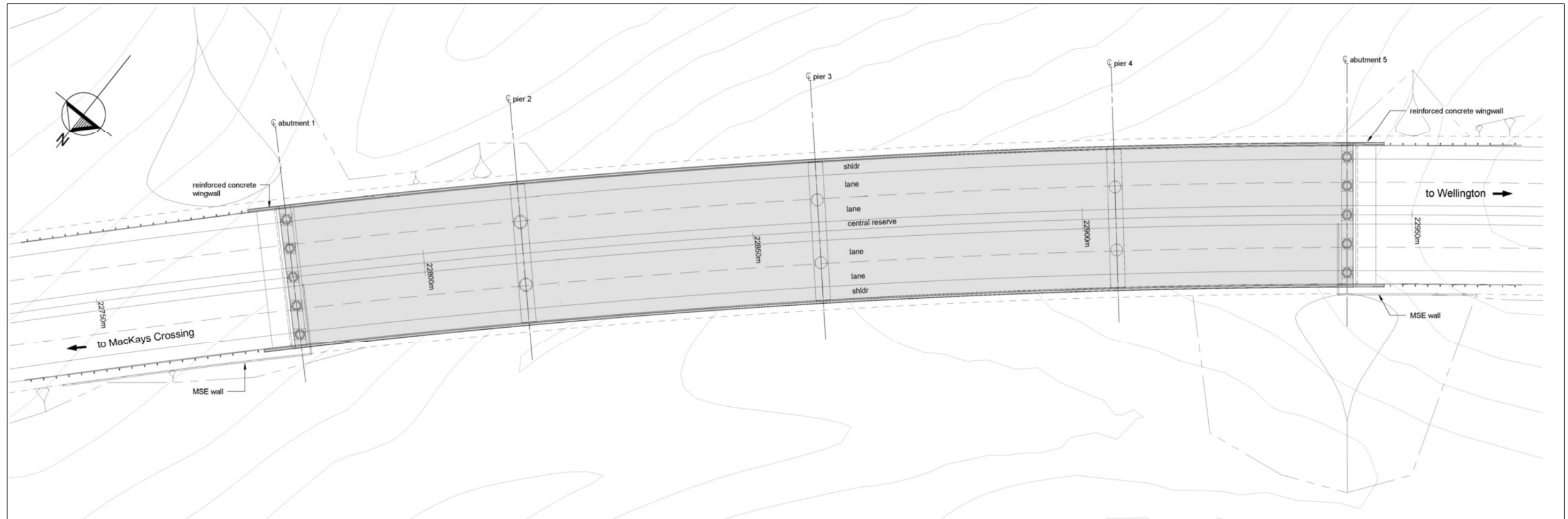
-  AMENITY PLANTING
-  TREE GRID - KAHIKATEA
-  KANUKA CORRIDOR
-  STREAM RESTORATION
-  CUT / FILL FACE + FILL SITE VEGETATED
-  CUT / FILL FACE + FILL SITE GRASSED
-  ENRICHMENT
-  RETIREMENT/PROTECTION
-  EXISTING DESIGNATION MITIGATION PLANTING
-  VISUAL MITIGATION PLANTING



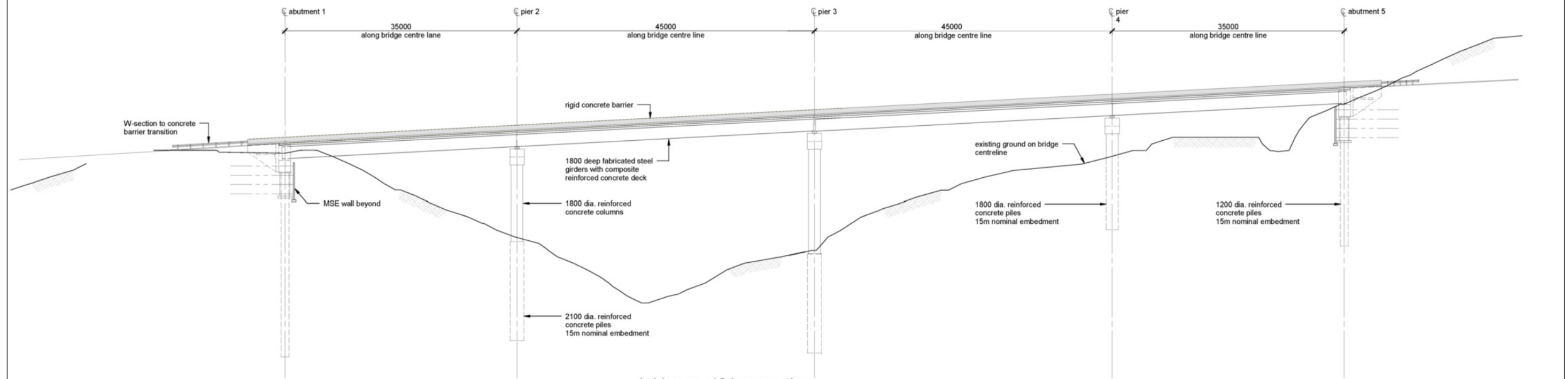
Revision	Amendment	Approved	Date



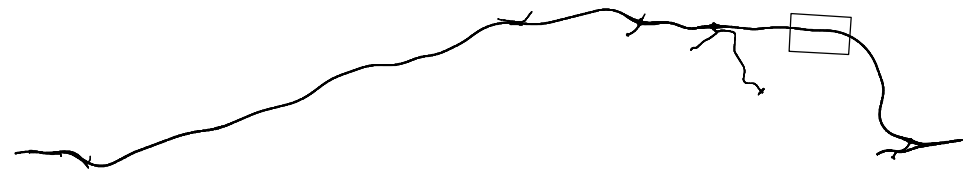
Project:		TRANSMISSION GULLY PROJECT	
Title:	Site Environmental Management Plan Duck Creek Landscape Plan	Status:	For Consenting
Sheet No.	SSEMP/E3	Version No.	A



bridge no. 19 plan
1 : 300



bridge no. 19 long section
1 : 300



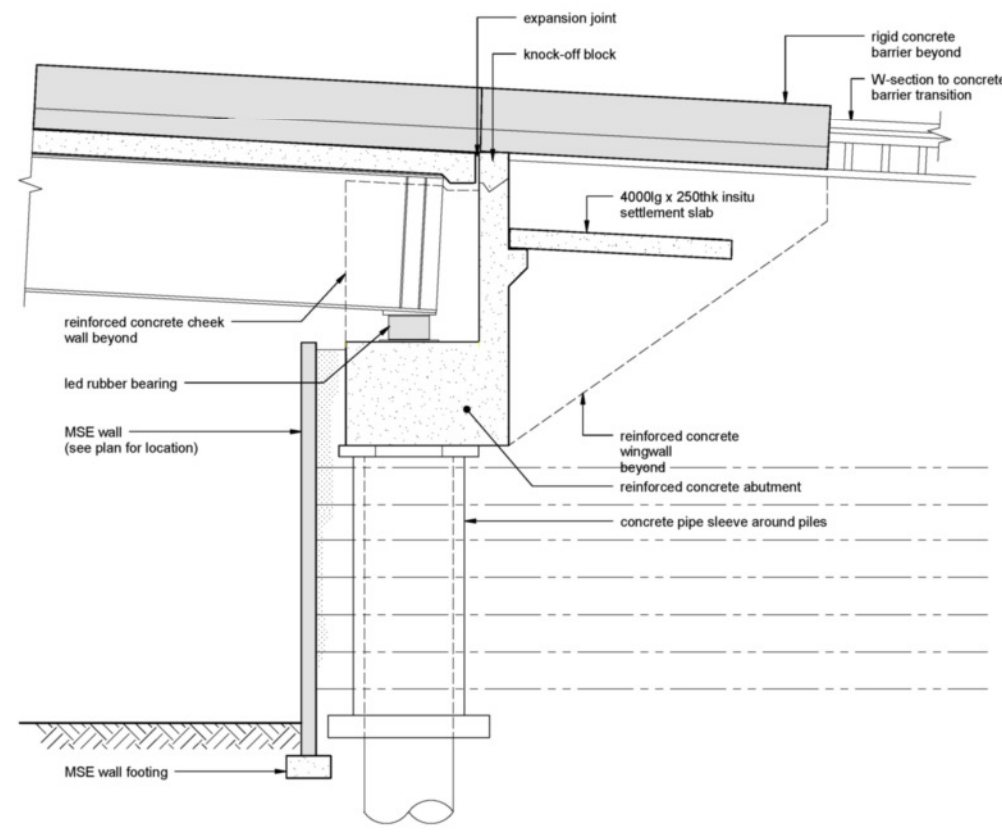
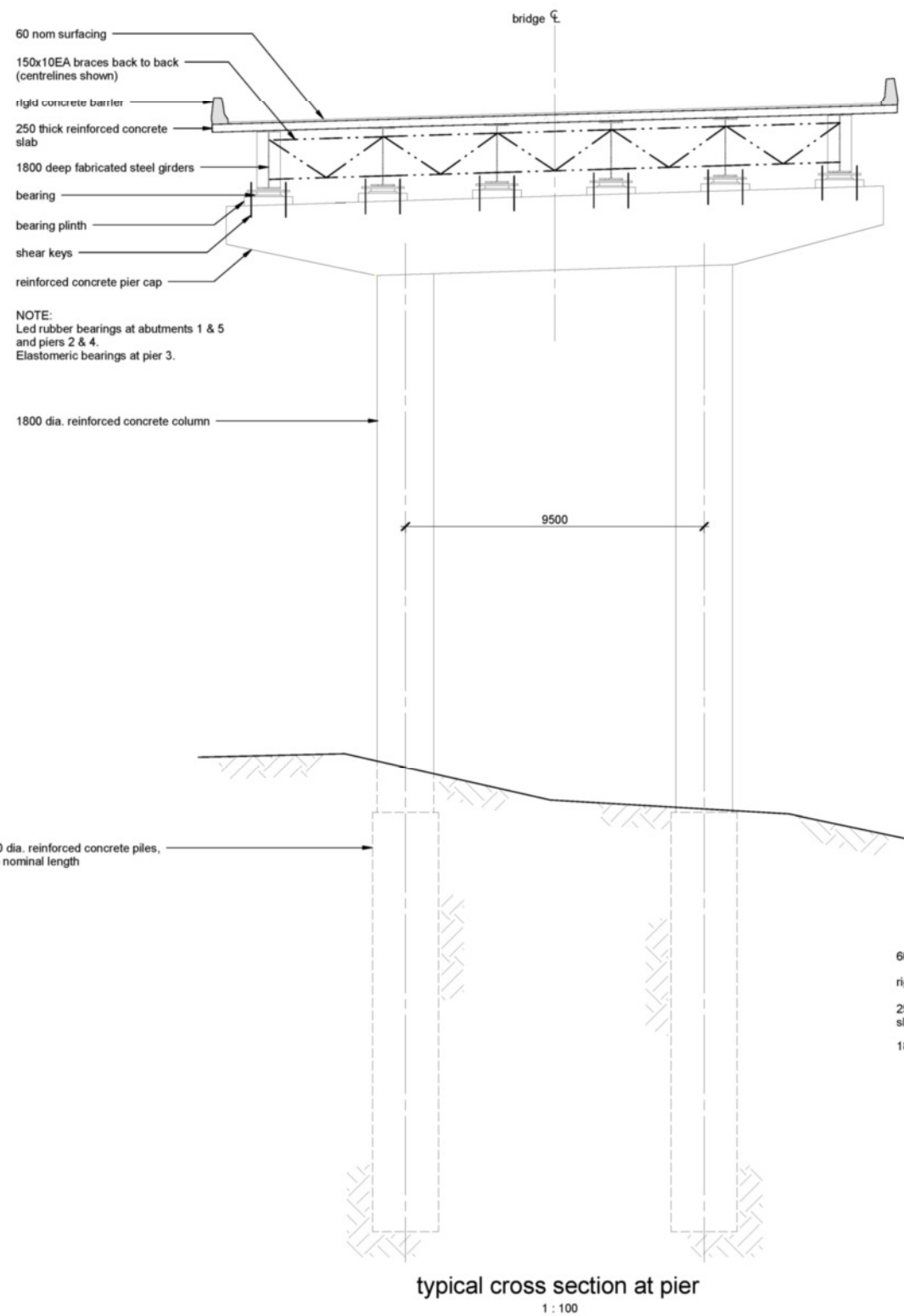
Revision	Amendment	Approved	Date



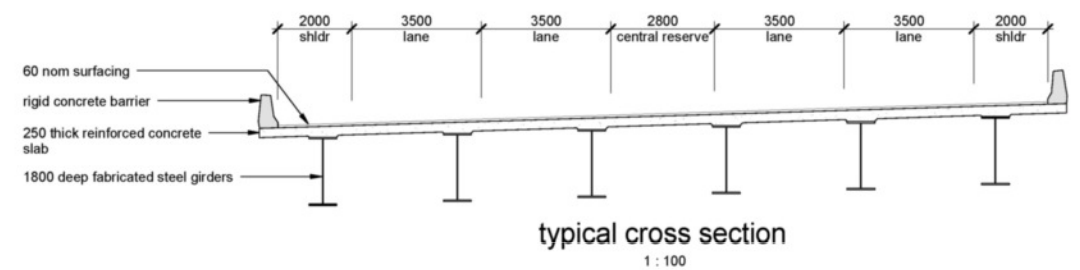
Project: TRANSMISSION GULLY PROJECT		Status: For Consenting
Title: Site Environmental Management Plan Duck Creek Bridge 19 - Plan and Elevation		Version No. A
Sheet No. SSEMP/E4		

notes:

1. Seismic resistance is to be provided by base isolation incorporating mechanical energy dissipation.
2. Settlement slabs are firmly connected to abutment cap with reinforcing steel to ensure the slabs work like friction slabs in an earthquake. The friction mobilised between slabs and ground provides additional dampening and load resistance to the bridge under earthquake actions.



typical abutment section
1 : 50



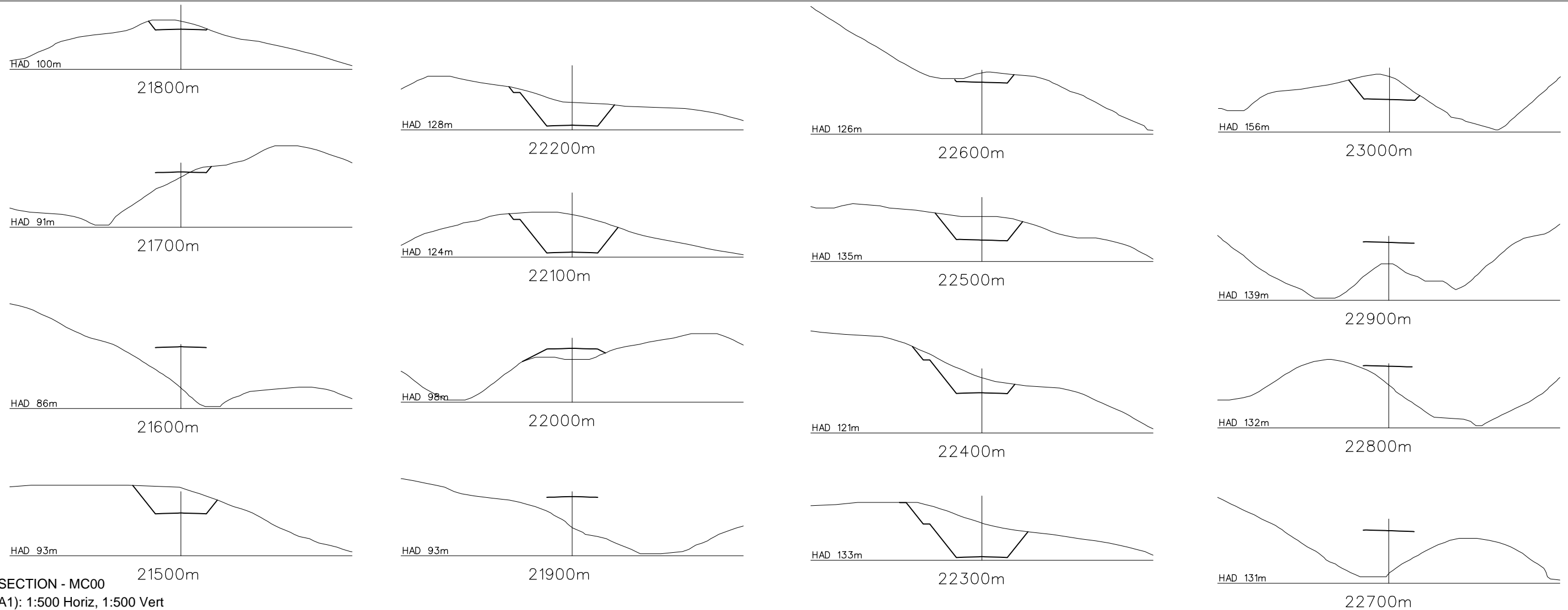
typical cross section
1 : 100



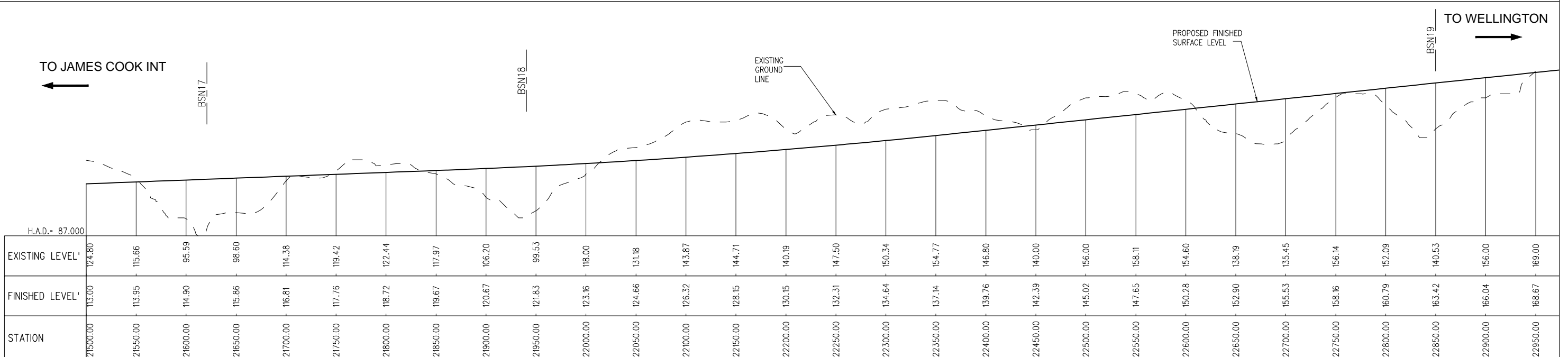
Revision	Amendment	Approved	Date



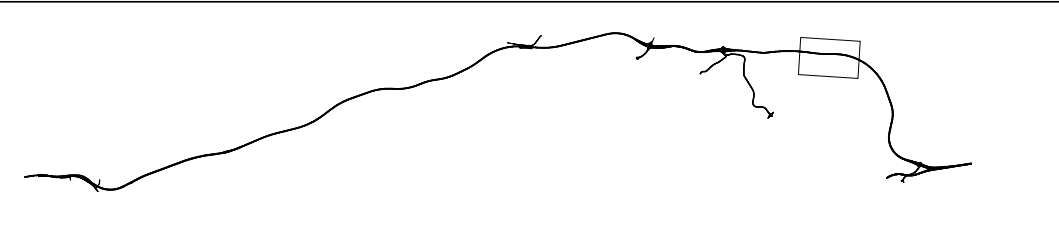
Project: TRANSMISSION GULLY PROJECT		Status: For Consenting
Title: Site Environmental Management Plan Duck Creek Bridge 19 - Details		Version No. A
		Sheet No. SSEMP/E5



CROSS SECTION - MC00
SCALE (A1): 1:500 Horiz, 1:500 Vert



LONGITUDINAL SECTION - MC00
SCALE (A1): 1:2000 Horiz, 1:1000 Vert



Revision	Amendment	Approved	Date



Project: TRANSMISSION GULLY PROJECT	
Title: Site Environmental Management Plan Duck Creek Long and Cross Sections	Status: For Consenting
Sheet No. SSEMP/E6	Version No. A