Site Specific Environmental Management Plan

– Peka Peka to Ōtaki Project

SC1: Southern Transverse Culverts

FCCL-EV-MPN-0028

June 2018 – Revision C

NZ TRANSPORT AGENCY WAKA KOTAHI | Peka Peka to Ōtaki Expressway | New Zealand Government

Contents

AUTHORISATION AND REVISION RECORD

Revision	Status	Author	Date	Description
A	Draft	Alice Naylor	16/04/18	For Review
A.1	Draft for review	Alice Naylor	27/04/18	For Review
A.2	Draft for review	Alice Naylor	25/05/18	For Review
B	Final Draft	Alice Naylor	8/06/18	For Review
C	Final	Alice Naylor	22/06/18	For Certification

Revision	Action	Name	Position	Date
A.1	Internal Review	Sevasti Hartley	Environmental Coordinator	27/04/18

Certification Record

Revision	Action	Name	Position	Date	Signature
	Approved by:	Richard Perry	Project Leader	10/7/18	
	On behalf of GWRC:				
	Approved by:				
	On behalf of KCDC:				

CERTIFIED
VIJAYSONA
Resource Consents & Compliance Manager
Kapiti Coast District Council
DATE: 29/6/18

1 INTRODUCTION

This Site Specific Environmental Management Plan (SSEMP) provides the necessary information to demonstrate how the project team plan to avoid or mitigate potential adverse environmental effects relating to construction of the Peka Peka to Ōtaki Expressway.

This document covers works relating to installation of six transverse culverts that pass beneath the main expressway alignment or local roads, three of which will require temporary stream diversions to allow construction of the culverts within the existing stream locations. This SSEMP also includes temporary works required to tie the permanent School Road Drain Diversion into the existing School Road Drain to allow permanent works to progress in accordance with SSEMP SLR1 'Southern Local Roads'.

This SSEMP reflects the requirements of the Construction Environmental Management Plan (CEMP) and its appendices, and is intended to be utilised by the construction team to clearly identify any site specific environmental requirements that must be adhered to prior to, and during works. A suite of over-arching environmental management plans have been drawn from to inform the contents of this SSEMP. All works will be carried out in general accordance with these management plans.

Works are not to commence on site until certification of this SSEMP has been confirmed in writing by Kapiti Coast District Council (KCDC) and Greater Wellington Regional Council (GWRC).

1.1 Location of works

Works will take place in the following locations:

- Culvert 23 (chainage 7260)
- Culvert 24 (chainage 7260)
- Culvert 28 (chainage 7500)
- Culvert 35 (chainage 8600)
- Culvert 36 (chainage 8640)
- Culvert 39 (chainage 8920)
- Temporary School Road Drain diversion (chainage 7660)

1.2 Programme

The expected programme for the activities covered by this SSEMP are as follows:

Table 1: Programme for southern critical culverts

Activity	Commencement	Duration
Culvert 23	June 2018	2-3 weeks
Culvert 24 and associated temporary stream diversion	July 2018	3-4 weeks
Culvert 39 and associated temporary stream diversion	July 2018	3-4 weeks
Culvert 35	August 2018	2-3 weeks
Culvert 36 and associated temporary stream diversion	July 2018	3-4 weeks
Culvert 28	August 2018	2-3 weeks
Temporary School Road Drain Diversion and associated works	August 2018	1-2 weeks

A detailed programme can be found in Appendix E.

2 PLAN IMPLEMENTATION

2.1 Responsibilities

The following provides a summary of responsibilities relevant to the planning and implementation of this SSEMP.

Table 2: Roles and responsibilities

Role	Person	Contact Details	Responsibilities
Construction Manager	Steve Findlay	stevef@fcc.co.nz	• Ensures there is a system in place so that construction works do not proceed until required environmental sign-offs are completed. • Overviews systems and processes to ensure consent requirements are captured for construction works. • Ensures adequate resources are provided to ensure environmental issues are appropriately managed. • Reviews environmental incidents and complaints with the Environmental Manager and acts to address issues where needed. • Reviews and monitors construction work methods to ensure compliance with RMA conditions
Environmental Manager	Alice Naylor	A.Naylor@Higgins.co.nz	• Develops, implements and reviews environmental management systems and environmental management plans. • Coordinates all environmental auditing functions and ensures relevant records are maintained. • Responds to and investigates all environmental complaints, issues or incidents. • Coordinates the SSEMP implementation process and pre-works requirements to ensure that environmental requirements are adhered to. • Provides training and briefings to site staff to ensure that there is sufficient

			knowledge of environmental requirements in the field. • Acts as the primary point of communication between regulatory bodies and the project. • Coordinates a team of experts in specialist disciplines such as contaminated land, ecology, groundwater, noise and vibration. • Communicates environmentally sensitive areas to the construction team.
Environmental Coordinator	Sevasti Hartley	sevastih@fcc.co.nz	• Supports the Environmental Manager and provides leadership to ensure all staff comply with environmental management systems. • Provides support in the formation of SSEMPs. • Undertakes as-builting of environmental controls. • Undertakes regular site inspections and audits. • Coordinates all site monitoring including but not limited to groundwater, water quality, ecological, dust, noise, and vibration monitoring. • Manages maintenance and monitoring of Chemical Treatment Systems (if used). • Ensures spill kits are available and stocked and provides training on equipment use. • Conducts regular site inspections of erosion and sediment control devices and co-ordinates maintenance where necessary. • Monitors site controls during rain storms. • Trains staff in site specific environmental procedures.
Stakeholder & Communications Manager	Ed Breese	ebreese@tonkintaylor.co.nz	• Organises, co-ordinates and facilitates engagement with affected property holders and community prior to and during construction.

			• Works in partnership with Environmental Manager on engagement and construction activities in accordance with RMA conditions
Site Superintendent / Supervisors / Foreman	Simon Fifield	SimonF@fcc.co.nz	• Provides leadership to the site construction team. • Ensures environmental controls including erosion and sediment control works are protected and maintained on a day to day basis. • Ensures that the SSEMPs and Archaeological Authority requirements are implemented appropriately by the construction team. • Maintains contactability 24/7 during construction and has authority to initiate immediate response actions. • Reports all environmental incidents, compliance issues and complaints to the Environmental Manager. • Reviews the need to use a water cart or sprinklers to control dust.
Project Engineers	Richard Rakovics (Civil) Craig Service (Structural)	RichardR@fcc.co.nz CraigS@fcc.co.nz	• Responsible for ensuring environmental controls and erosion and sediment control works are installed and modified as appropriate for each stage of construction. • Develop, implements and monitors construction methods and environmental protection measures to ensure compliance with the SSEMPs. • Demonstrate understanding of major environmental and community issues and environmentally sensitive areas. • Coordinate environmental interfaces with subcontractors and suppliers. • Reports all environmental incidents, compliance issues and complaints to the Environmental Manager.

Specialist support (contaminated land, ecology, noise and vibration)	Dean Miller (Principal Ecologist) Genevieve Smith – Contaminated land Brendon Shanks – Noise and Vibration	DCMiller@tonkintaylor.co.nz Genevieve.Smith@beca.co.nz Brendon.Shanks@marshallday.co.nz	• Provide expert advice to the Environmental Manager and Environmental Coordinator regarding specific site requirements. • Submits reports to the Environmental Manager to fulfil requirements of consents relevant to their field. • Briefs the construction team of site specific requirements for environmentally 'sensitive areas'.
Iwi	Te Waari Carkeek (Ngā Hapū o Ōtaki)	TeWaariC@fcc.co.nz	• Provide input into project documentation such as management plans, design processes, planning documents. • Reviews permits to work and coordinates the level of involvement of kaitiaki in site activities • Coordinates all aspects of iwi monitoring. • Key point of contact for Ngā Hapū o Ōtaki.
	Caleb Royal (Ngā Hapū o Ōtaki Consents Processing Officer)		• Reviews consents and coordinates cultural monitoring activities. • Provides specialist advice to Ngā Hapū o Ōtaki
Iwi	Muaupoko Tribal Authority		• Point of contact for any archaeological discoveries in accordance with the agreed accidental discovery protocols and MTA agreement.

2.2 SSEMP amendments

In the event that changes in works scope or methodology are required, changes may need to be made to this document in accordance with resource Consent Condition's DC.18B and / or G.21A. Any 'major'

changes will be submitted to the respective Manager for certification at least 5 working days prior to implementation of that change.

In accordance with Condition G.21A, a 'minor change' may be submitted to the Manager for certification at least 2 working days prior to implementation of that change, unless an alternative process of approving a 'minor change' is agreed to by the Manager, Greater Wellington Regional Council.

2.3 Specific consent conditions

There are a number of consent conditions specific to in-stream works which must be adhered to prior to, duration, and following works carried out under this SSEMP. The following table summarises these conditions and indicated where the relevant information can be found throughout this document.

Table 3: Specific consent conditions

Condition	Description summary	Relevant section within SSEMP
25(i)	i) Measures/methods to maintain fish passage during and following completion of the works along the stretches of stream affected by the exercise of this designation.	3.3.4 and 4.1
G.12(b)(ii)	Environmental awareness training is to be provided specific to stream requirements.	4.7
G.33(j)	Details of waterway diversions	3, 4, App C, D
G.33(l)	Measures proposed to minimise impacts on fish passage, stream habitat and water quality.	4, 5
G.40	Requirement for pre-works baseline mudfish surveys.	Section 5.2
WS.1	Natural rock and soil material shall be used where practicable to reclaim the stream bed. All material shall be placed and compacted so as to minimise any erosion and/or instability.	3.2.2

WS.2	Undertake construction works in the dry bed of the stream as far as practicable, prior to diversion of the stream into that portion of the stream bed	4.1
WS.3	Maintain the volume and velocity of stream flows in a similar state to the pre-Project situation	3.2.2, 4
WS.4	Mangaone and Mangapouri design requirements for fish passage	Appendix C
WS.6c	Bridge abutment, culvert and river/stream bank protection works shall not impede flood flows.	Appendix C
WS.7	Methodology to manage the migration of native fish.	5.2 and 4 (as well as the EMP)
WS.8	The maximum extent of reclamation or diversion of all waterbodies for the Project shall not exceed 2750 linear metres.	3.1, Appendix C
WS.9	Fish passage visual assessment 1 and 4 years post construction.	3.2.2

3 DESIGN COMPONENTS

3.1 Permanent Culvert details

Relevant culvert design details have been included as Appendix C 'Construction Drawings' based on the Culvert Design Report. The following table provides a summary of information based on the current design information.

Once final design details are confirmed for the stream diversion channels immediately upstream and downstream of these culverts (and prior to placement of any permanent features within the permanent channels), detailed design will first need to be certified by GWRC as an amendment to this SSEMP in accordance with Condition G.21A.

Table 3: Summary of Culvert Requirements (culverts specific to this SSEMP are outlined in red)

Culvert No.	Location	Chainage	Type	Size	Fish Passage	Additional requirements	Permissible "heading up" based on condition WS.6, PR A21.4.3, A21.4.5, A21.5.6 and A21.8.2					
							10% AEP CC2130	2% AEP CC2130	1% AEP CC2130	0.1% AEP CC2130	0.04% AEP CC2130	3,000m³/s on the Ōtaki River with breach of Chrystall's Stopbank
Pipe 66	Milk Station	2100	Concrete pipe	0.9m dia	N	Convey 5% AEP present climate outflow from Culvert 7 without activating existing overland flow path through private property						
Pipe 69	Milk Station	2150	Concrete pipe	0.9m dia	N							
14	Racecourse Stream	2,200	Concrete pipe	1.2m dia	N	To match existing culvert capacity (PR A21.5.3e)	0m to soffit		0.5m to road			
15b	Ōtaki flood plain	2,750	Concrete pipe	1.05m dia	N		0m to soffit		0.5m to road			No collapse in ULS
15c	Ōtaki flood plain	2,830	Concrete pipe	1.05m dia	N		0m to soffit		0.5m to road			No collapse in ULS
15d	Ōtaki flood plain	2,920	Concrete pipe	2 no. 1.05m dia	N		0m to soffit		0.5m to road			No collapse in ULS
15e	Ōtaki flood plain	3,040	Corrugated steel (multi-plate)	3.8m x 2.9m underpass (WxD)	N	Vehicle access per PR A21.5.4l as modified by NTT-083			0.5m to road			No collapse in ULS
18	Overland flow path (connects eastern and western parts of off-river storage basin)	3,200	Corrugated steel (multi-plate)	3.8m dia pipe	N	No premature flooding to the eastern part (PR A21.5.5i)			0.5m to road			No collapse in ULS
157	Swale (Ōtaki Gorge Road)	4,150	Concrete pipe	0.9m dia	N		0m to soffit		0.5m to road			
156	Swale (Southbound On-ramp)	4,250	Concrete pipe	1.05m dia	N		0m to soffit		0.5m to road			
155	Swale (Old Hautere Road)	4,320	Concrete pipe	2 no. 1.05m dia	N		0m to soffit		0.5m to road			
136	Swale (Southbound On-ramp and Expressway)	4,600	Concrete pipe	1.05m dia	N		0m to soffit		0.5m to road			
22	Overland flow path (Winiata Link)	7,120	Concrete pipe	3 no. 1.2m dia	N		0m to soffit		0.5m to road			
23a	Overland flow path (School Road)	7,200	Corrugated steel (multi-plate)	6.0mx2.9m arch (WxD)	N	Minimum width 5m (PR A21.5.6s)		0.5m to road (Importance Level 2 assumed)		No collapse in ULS		
23	Mangaone Stream (School Road)	7,350	Concrete box	5.5mx3.5m (WxD)	Y - 0.5m embedment as per condition WS.4	To match existing culvert system capacity up to 1% AEP CC2130 to maintain existing flood		0.6m to soffit (PR A21.4.5h)	0.6m to soffit (PR A21.5.6e, to be clarified)	No collapse in ULS		

Culvert No.	Location	Chainage	Type	Size	Fish Passage	Additional requirements	Permissible "heading up" based on condition WS.6, PR A21.4.3, A21.4.5, A21.5.6 and A21.8.2					
							10% AEP CC2130	2% AEP CC2130	1% AEP CC2130	0.1% AEP CC2130	0.04% AEP CC2130	3,000m³/s on the Ōtaki River with breach of Chrystall's Stopbank
24	Mangaone Stream (Expressway)	7,250	Concrete box	5.0m x 2.0m (WxD)	Y - 0.15m concreted cobbles as per A21.5.6f	patterns to the west of the Expressway (PR A21.5.6m)			0.6m to top of flood bund		No collapse in ULS	
34	Mangaone Stream (western link road)	7,250	Concrete box	4.0mx3.65m (WxD)	Y - embedment 0.85m upstream and 0.5 downstream (0.5m required by condition WS.4)			0.6m to soffit (PR A21.4.5h, WS.6iv). No flooding down Te Horo Beach Road from headwater (PR A21.5.6u)	0.6m to soffit (PR A21.5.6e, to be clarified)	No collapse in ULS		
27	Mangaone Overflow (School Road)	7,470	Corrugated steel (Supercor)	6.2mx2.9m custom arch (WxD)	N			0.3m to road (PR A21.5.6g)		No collapse in ULS		
28	Mangaone Overflow (Expressway)	7,470	Corrugated steel (Supercor)	5.7mx2.1m custom box (WxD)	N				0.6m to top of flood bund		No collapse in ULS	
35	Gear Stream (Gear Road)	8,600	Corrugated steel (multi-plate)	4.0mx2.5m pipe arch (WxD)	Y - 0.35m embedment			0.5m to road (Importance Level 2 assumed)		No collapse in ULS		
36	Gear Stream (Expressway)	8,620	Concrete box	5.0mx2.0m (WxD)	Y - 0.35m embedment				0.5m to road		No collapse in ULS	
39	Settlement Stream (Expressway)	8,920	Concrete boxes	Upper: 4.5mx2.0m (WxD) Lower: 5.0m x 2.0m (WxD)	Y - embedment 0.5m lower barrel 0.285m upper barrel				0.5m to road		No collapse in ULS	
42	Coolen Stream	9,020	Concrete pipe	1.35m dia	Y - spat ropes		0m to soffit		0.5m to road			
45	Avatar Stream	9,400	Concrete pipe	1.2m dia	N		0m to soffit		0.5m to road			
50/50a	Edwin Stream	9,950	Concrete pipes	Both 1.2m dia	Y - spat ropes		0m to soffit		0.5m to road			
53	Jewell Stream	10,080	Corrugated steel (multi-plate)	Upper and Lower: 2.9mx2.1m pipe arch (WxD)	Y - 0.25m embedment of lower barrel with concreted cobbles at regular spacing				0.5m to road		No collapse in ULS	
59	Cavallo Stream	10,830	Concrete pipe	1.2m dia	Y - 0.15m embedment		0m to soffit		0.5m to road			
61	Cording Stream	10,970	Concrete pipe	0.75m dia	N		0m to soffit		0.5m to road			
64	Awatea Stream	11,220-11,380	Concrete pipes	64a, b & c: 1.05m dia 64d: 1.2m dia 64f: 1.05m dia 64g: 1.8m dia	Y - 0.3m embedment of lower barrel 64g				0.5m to road		No collapse in ULS	
66	Kumototo Stream	11,680	Concrete pipes	Upper: 1.2m dia Lower: 1.8m dia	Y - 0.3m embedment of lower barrel		0m to soffit		0.5m to road			

3.2 Permanent Stream Diversions

The final design details for permanent stream channels will require separate approval through GWRC prior to placement of any permanent features within the channels. These details will be included as an amendment to this SSEMP in accordance with Condition G.21A. The following information provides general information regarding stream channel details based on the current Culvert Design Report.

3.2.1 Channel Shape and Erosion Protection

The geometry of the diversion channels has generally been developed to mimic the existing stream in terms of conveyance capacity, longitudinal grade, cross-sectional shape, tightness (bend radius) and frequency of meanders.

Where necessary, channel bed and erosion protection measures have been designed. These include rock rip-rap armouring, designed using the USACE method EM 1601 (implementation referenced in NCHRRP Report 568), and for validation, compared against Austroads Waterway Design Rock Size Recommendation. Reinforced turf armouring has been specified for channel design velocities under 2m/s, using Enkamat Design Guide EM-18-GB-A. Final erosion protection details have been outlined in the *Culvert Design Report.*

Typical stream diversion design is included in Appendix C drawings (refer to PP2O-DR-SW-1151). Voids in the rip-rap armouring will be filled with natural substrate material sourced from the existing stream bed excavation. The hyporheic zone within the channel will therefore comprise a mix of rip-rap and existing stream bed material thereby avoiding flows being consumed by the rip-rap voids. Diversion channels will also be formed with a cross fall to focus low flows.

To achieve the proposed hyporheic zone the construction method will require rip-rap to be placed in a layer followed by natural material to fill voids progressively, and the process completed to the desired thickness as outlined on the attached drawing.

3.2.2 Fish Passage

Fish passage will be provided where required for diversion channels through the following measures:

- Providing cantered cross section inverts to provide flow depth for fish passage at low flows. This is particularly important for intermittent streams crossed by the expressway;
- Avoiding channels that are significantly steeper than natural grades; and
- Substrate will be matched to existing stream bed material. Rip rap will be covered with material that matches stream bed material where necessary to avoid interstitial flows and ensure flow depth for fish passage during low flows.

Appendix C contains relevant drawings relating to the culverts covered in this SSEMP.

Visual checks to assess fish passage will be carried out 1 year and 4 years following construction by a suitably qualified ecologist and engineer in accordance with Condition WS.9.

A summary of permanent stream diversion information is provided in table 4 below.

Table 4: Summary of Permanent Stream Diversions (stream diversions relevant to this SSEMP are outlined in red)

Stream / Drainage Channel	Existing stream / drain removed	Proposed diversion channel	Headwall / rip rap where not included in diversion channel length	Proposed culvert
Greenwood Stream (Culvert 1)	73m	16m	10m	47m
Southern tributary to Waitohu Stream (Culvert 3)	93m	55m	5m	58m
Mangapouri Stream (Culverts 9 and 10)	131m	44m	0m	81m
Racecourse Stream (Culvert 14)	116m	83m	7m	56m
Mangaone Stream (Culverts 23, 24 and 34)	255m	142m	43m	96m
Lucinsky Overflow Weir and Channel (new section of channel not shown on drawings, located northwest of Culvert 34)	0m (overland flow, no defined channel)	40m	0m	0m (side weir off Mangaone Stream)
Mangaone Stream Overflow / Flood Diversion Channel (separate channel south of Mangaone Stream) (Culverts 27 and 28)	0m (overland flow, no defined channel)	33m	15m	83m
Gear (Culverts 35 and 36)	192m	105m	9m	72m
Settlement Heights (Culvert 39)	217m	79m	0m	39m
Coolen (Culvert 42)	131m	57m	0m	33m
Edwin (Culvert 50 and 50a)	255m	136m	0m	122m
Jewell (Culvert 53)	171m	112m	0m	91m
Cavallo (Culvert 59)	717m	421m incl wetland	0m	67m
Cording (Culvert 61)	173m	23m	0m	66m
Awatea (Culvert 64)	166m (incl separate drains to the north)	0m	33m	106m
Kumototo (Culvert 66)	38m	0m	24m	76m
	Total: 2728m			**Total: 2585m**

4 SITE MANAGEMENT

4.1 Works methodology

4.1.1 On-line culvert construction

Three culverts are to be constructed on-line of existing watercourses as follows:

- Culvert 39 (Settlement Stream)
- Culvert 36 (Gear Stream)
- Culvert 24 (Mangaone Stream)

The methodology for construction of each of these culverts will generally be as follows:

Stage One: Temporary stream diversion

- Where appropriate, early fish salvage and relocation methods will be carried out within the existing live watercourse using a combination of electric fishing and baited nets whilst fish exclusion nets are deployed to isolate the work site (refer to Section 4.2.1 for details). This will be the only stage where fish passage will temporarily be impeded. All other works will allow for fish passage during construction via use of a temporary stream diversion.
- The necessary erosion and sediment controls will be constructed in accordance with the attached drawings in Appendix C.
- The temporary stream diversion will be constructed off-line of the existing stream in accordance with the temporary stormwater information outlined in Appendix D, leaving existing ground in place at the upstream and downstream end of the stream diversion as ‘plugs’.
- Erosion and sediment controls are to be certified in accordance with Consent Condition E.6.
- Livening of the new channel and subsequent decommissioning of the existing channel can then proceed as follows:
    - Ecologist and Kaitiaki / Pūkenga to be present on site.
    - Removal of the downstream plug, allowing water to backflow up the new channel.
    - Removal of the upstream plug to fully liven the new channel.
    - Installation of an earth plug at the upstream end of the original channel.
    - Installation of an earth plug at the downstream end of the original channel.
    - Ecologist and Kaitiaki / Pūkenga are to carry out fish salvage and relocation procedures within the original channel (now blocked).
    - Following approval from the project ecologist, water can be pumped from the channel in accordance with a permit to pump and the original channel can be excavated (note that an ecologist and Kaitiaki / Pūkenga must be present to carry out final visual checks of the muds for presence of fish).
    - Construction of the new culvert can then commence.

Culvert commissioning:

- Upon completion of the new culvert and associated permanent diversions, erosion and sediment controls are to be completed and certified in accordance with Condition E.6.
- An ecologist and Kaitiaki / Pūkenga are to carry out a fish passage assessment prior to livening if necessary.
- The downstream plug can be removed, followed by the upstream plug to liven the new culvert.
- The inlet to the temporary diversion will be plugged using an earth bund, followed by the outlet to block the temporary diversion.
- The ecologist and Kaitiaki / Pūkenga are to carry out fish salvage and relocation procedures within the redundant temporary diversion. If appropriate then early fish salvage and relocation will occur within the live watercourse using a combination of electric fishing and baited nets whilst fish exclusion nets are deployed to isolate the work site.
- Following approval by the project ecologist, water can be pumped from the temporary diversion in accordance with a permit to pump and the channel can be excavated (note that an ecologist and Kaitiaki / Pūkenga must be present to carry out final visual checks of the muds for present of fish).
- Following final approval by the project ecologist, the temporary diversion channel can be backfilled.

4.1.2 Off-line culvert construction

Two culverts are to be constructed off-line of any existing watercourses as follows:

- Culvert 23
- Culvert 35
- Culvert 28

The methodology for construction of each of these culverts will be as follows:

Culvert construction and commissioning

- Installation of erosion and sediment controls in accordance with Appendix C drawings and Section 4.1 below.
- The culvert will be constructed offline of any watercourse, leaving existing ground in place as plugs at either end if adjacent to a watercourse.
- Following as-built check points and the upgrade of any erosion and sediment controls, the culvert will be livened by removing the outlet plug, followed by the inlet.

Stream decommissioning (if applicable)

The following only applies to Culvert 23 and Culvert 35 where decommissioning of the redundant Managaone Stream and Gear Road Drain sections is required following livening of Culvert 23 and Culvert 35.

- If appropriate, early fish salvage and relocation methods will be carried out within the existing live watercourse using a combination of electric fishing and baited nets whilst fish exclusion nets are deployed to isolate the work site (refer to Section 4.2.1 for details).
- Earth bunds will be installed at the inlet and the outlet of the redundant section of stream (refer to Culvert 23 and Culvert 35 methodology in Appendix C).
- The ecologist and Kaitiaki / Pūkenga are to carry out fish salvage and relocation procedures within the redundant channel.
- Following approval by the project ecologist, water can be pumped from the channel in accordance with a permit to pump and the channel can be excavated (note that an ecologist and Kaitiaki / Pūkenga must be present to carry out final visual checks of the muds for presence of fish).
- Following final approval by the project ecologist, the redundant channel can be backfilled.

4.1.3 School Road Drain diversion

- The permanent School Road Drain diversion will be constructed as part of the new local road (refer to SSEMP SLR1).
- The Permanent diversion will be extended temporarily (same dimensions) further north to tie into the existing School Road Drain downstream.
- Existing earth plugs will be left in place either end until the diversion is ready to liven.
- The downstream plug will be removed, followed by the upstream plug to liven the new permanent / temporary diversion.
- If appropriate, early fish salvage and relocation methods will be carried out within the existing live watercourse using a combination of electric fishing and baited nets whilst fish exclusion nets are deployed to isolate the work site (refer to Section 4.2.1 for details).
- The existing drain will be plugged at the inlet and outlet.
- The ecologist and Kaitiaki / Pūkenga are to carry out fish salvage and relocation procedures within the redundant channel.
- Following approval by the project ecologist, water can be pumped from the channel in accordance with a permit to pump and the channel can be excavated (note that an ecologist and Kaitiaki / Pūkenga must be present to carry out final visual checks of the muds for presence of fish).
- Following final approval by the project ecologist, the redundant channel can be backfilled.

4.1.4 Dewatering

Given the low groundwater levels in the locations covered under this SSEMP, it is not anticipated that dewatering will be required during culvert construction. If required, any localised dewatering will be carried out in accordance with an approved permit to pump and as a minimum must adhere to the following general conditions:

  - The discharge must not increase the downstream water quality within the receiving watercourse by >20% (compared to upstream levels if applicable).

- The discharge must not cause obvious visual discolouration of the downstream environment beyond 'reasonable mixing' (deemed as 30m from initial discharge point unless otherwise specified due to access restrictions).
- Permit to pump documentation must be available for inspection by GWRC upon request.

4.2 Temporary Stream Diversions

- Temporary stream diversion channels have been sized to cater for the 2 year ARI flow (present climate). This is consistent with NZTA guidelines for stream diversions of less than 30 days duration. Note that in accordance with Condition G.19, the project ESCP has been prepared in accordance with the objectives outlined in the NZTA guidelines.
- Diversion bunds along the upper banks of each temporary diversion will be sized to convey the 20 year ARI flow (refer to Figure 1 below). Confirmation that bunds have been sized accordingly will be submitted through the as-built certification process required by Condition E.6. Note that flow may be restricted by the existing downstream railway culverts and therefore consideration will be given to the whether there is value in building diversion bunds to cater for the 20 year ARI. This will be reviewed by the project stormwater team prior to construction and any deviation from sizing for the 20 year ARI event is to be approved by GWRC prior to livening the relevant stream diversion.
- HEC HMS software with the SCS method has been used to estimate design flow, applied in accordance with "Subdivision and Development Principles and Requirements" (KCDC 2012) as described in Section 3.3.4 of the PP2Ō Stormwater Design Philosophy Report Rev 2 (PP2Ō August 2017).
- Manning's equation has been used to estimate channel capacity, flow depths and velocities.
- Existing stream levels have been based on KCDC LiDAR collected in 2010, supplemented by conventional survey collected for the purposes of the PP2Ō project.
- All vertical levels are in terms of NZVD 2009.
- Temporary diversion channels will be lined such that flows do not result in erosion of the channel. As a minimum, geotextile will be used to line each of these diversion channels.
- Diversion channels will generally be constructed in accordance with the stormwater requirements outlined in Appendix D.

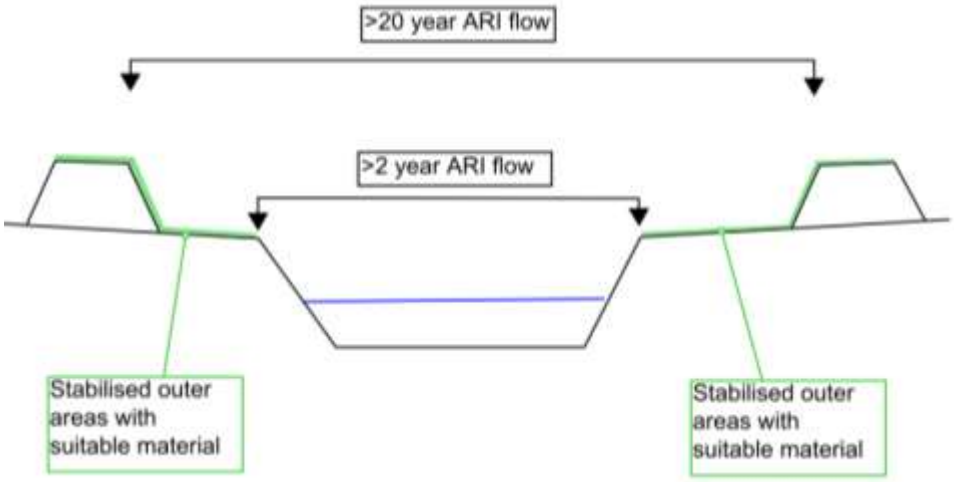


Figure 1: Typical temporary stream diversion and diversion bund set-up

4.3 Site access

Existing site access points will be utilised for these works from Old Hautere Road (SAP-8), School Road (SAP-6) and Gear Road (SAP-5) as originally identified through SSTMP PW1 'Vegetation Clearance and Enabling Works'.

The access/egress point will be stabilised using clean aggregate or sealed to avoid any construction related material leaving the site.

4.4 Construction plant

The plant items to be used are generally as follows:

- 6 – 20T excavators
- Trucks
- Water carts as required
- Light vehicles
- 50 T crane
- Concrete trucks where required

All plant will require to be inspected prior to start of works and during construction activities at regular intervals. Unwanted vegetation, seeds or contaminants will be cleared prior to plant entering the site to avoid the introduction or spread of weeds or pest species.

Plant inspections will be recorded on daily plant inspection forms to demonstrate that all plant used on this project are in good working order and have been cleared of unwanted weeds or pest species. Any faulty equipment will be stood down until the necessary repairs are carried out and the given plant is fit for purpose.

Spill control kits will be available on site at the sig-in areas (refer to Appendix C layout drawings) and areas where heavy machinery is working (as a minimum) to assist with the clean-up in the event of

any spillages. Plant storage during non-working hours will take into consideration high risk areas such as flood prone areas to ensure that machinery is located outside of these locations. Refuelling activities will take place using a mini-tanker away from watercourses to prevent additional risk of spillage to water. Machinery will not enter live watercourses at any stage throughout these works.

4.5 Disposal sites

A number of temporary stockpile sites will be required to cater for the excess topsoil / unsuitable material that is not temporarily disposed of into dirty or clean water diversion bunds. Stockpile sites have indicatively been marked on the drawings in Appendix C. These will typically be located at least 50m from watercourses, except in instances where space does not allow. In accordance with D.C 25(g), appropriate treatment of stormwater runoff from temporary stockpiles will be managed by use of a dirty water diversion bund to prevent sediment laden stormwater entering the adjacent watercourses. This level of protection is considered appropriate to provide sufficient treatment. Stockpiling of rip rap will also be required prior to use at the culvert inlet / outlets.

4.6 Water supply

Water may be required to prevent dust discharge from site during works. Water required for these works will be collected from off-site.

Any water supply bores required on site must be constructed in accordance with BC.1 – 4 and any water take done so in accordance with GT. 4-7.

4.7 General pre-works requirements

As part of the site preparation and establishment works the following mitigation measures will be implemented to avoid or minimise adverse environmental effects:

- Site specific information, including environmental constraints and requirements, will be discussed at the relevant pre-construction site meetings with input from specialists as required. All contractors involved in works under this SSEMP will be briefed on specific requirements relating to stream values, objectives for culvert and diversion design, and the importance of protecting watercourses using appropriate erosion and sediment controls.
- Prior to works commencing in this area, the project surveyors will use GPS to identify the extent of works. The works area will be clearly marked-out with regular input from the survey team throughout works as required.
- Areas identified as ‘retained vegetation’ as per the approved vegetation retention plans will be clearly delineated using physical markers on site.
- Environmental requirements for any given area will be noted on each project “Permit to Work’. These permits are required for any activity on site and must be in place and signed off by the environmental team prior to works commencement.
- Areas of the site will be set up to deal with rubbish, construction materials and other miscellaneous materials to ensure that the site is maintained in a tidy and organised state.

Majority of required supplies will be located at the main project site compound at Bridge Lodge.

5 ENVIRONMENTAL REQUIREMENTS

5.1 Erosion and Sediment Control

- Location and heights of erosion and sediment control measures are outlined on Appendix C drawings.
- Dirty and clean water diversion bunds fitted with T-Bar decants at the low points will typically be utilised for these works.
- Dirty water and clean water diversion bunds have been sized in accordance with the project ESCP to convey the 5% AEP rainfall event. Individual work sites for each culvert have varying catchment sizes which dictate the required height of diversion bunds. The attached drawings in Appendix C outline the required diversion bund heights based on these catchment sizes and in some cases dirty water diversion bunds have been increased in size to allow clean water to be accepted into the site.
- Floating T-Bar decants may need to be installed at the low points of dirty water diversion bunds with a stabilised emergency spillway in accordance with the ESCP to ensure that site runoff is sufficiently treated prior to discharge. The exact location of the floating T-Bar will be determined on site. Any decants will be held up using a pulley system or suitable alternative as the default position and be lowered as required following sufficient treatment. Any lowering of decants will be carried out under an approved permit to pump as specified in the project ESCP, and as a minimum must adhere to the following general conditions:
    - The discharge must not increase the downstream water quality within the receiving watercourse by >20% (compared to upstream levels if applicable).
    - The discharge does not cause obvious visual discolouration of the downstream environment beyond 'reasonable mixing' (deemed as 30m from initial discharge point unless otherwise specified due to access restrictions).
    - Permit to pump documentation must be available for inspection by GWRC upon request.
- In instances where it is not required to fit a decant at the low point (i.e. if ground soakage proves to be adequate) then this will be identified and documented through the Condition E.6 certification process.
- Temporary stockpile areas will be controlled within diversion bunds, or be located such that runoff is contained by existing ground topography.

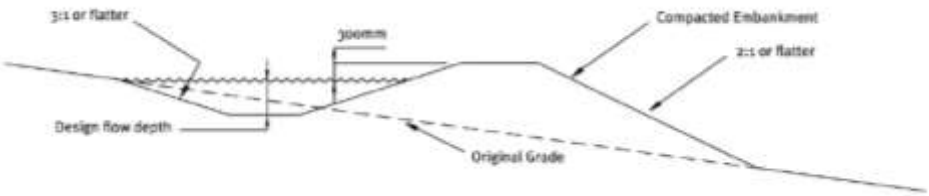


Figure 2: Typical cross section of dirty water diversion bund in accordance with the project ESCP.

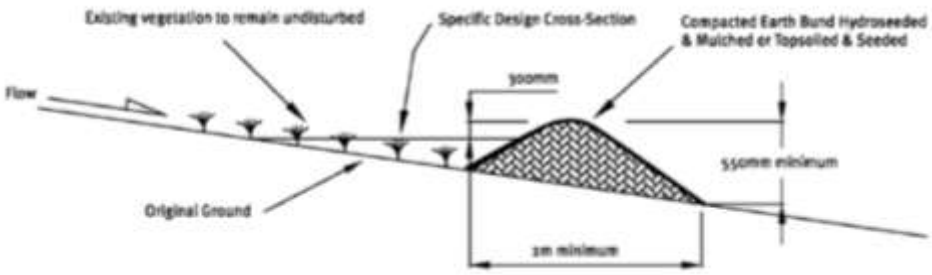


Figure 3: Typical cross section of clean water diversion bund.

5.2 Ecological requirements

Project ecological requirements are set out in the Ecological Management Plan (EMP) which outlines a number of locations that have specific requirements in regards to terrestrial and aquatic species that need to be considered prior to and during works. These have been further refined following input from the project ecologists to ensure that potential effects related to streamworks are minimised as far as practicable. Table 5 below summarises the site specific ecological requirements for each watercourse.

Table 5: Key ecological information specific to each watercourse

Culvert	Relevant watercourse	Stream classification	Actual or likely fish present	Mud fish survey required	Fish passage required	Fish migration management	Fish rescue methods	Specific requirements
Culvert 23	Mangaone Stream	Permanent	Diverse fish community	No	Yes	Focus on minimising disturbance and keeping migration pathways open as far as practicable.	Netting and electric fishing	Fish passage assessment Fish salvage and relocation Water quality / stream ecological monitoring
Culvert 24	Mangaone Stream	Permanent	Diverse fish community	No	Yes	Focus on minimising disturbance and keeping migration pathways open as far as practicable.	Netting and electric fishing	Fish passage assessment Fish salvage and relocation Water quality / stream ecological monitoring
Culvert 28	Mangaone overflow	Ephemeral	NIL	No	No	N/A	N/A	No requirements
Culvert 35	Gear Stream	Intermittent	Intermittent habitat Potential for mudfish	Yes - complete	Yes	No mudfish found during initial survey. Focus on minimising disturbance and keeping migration pathways open as far as practicable.	Netting and electric fishing (redundant stream section only)	Fish passage assessment Fish salvage and relocation Mud fish survey (complete)
Culvert 36	Gear Stream	Intermittent	Intermittent habitat Potential for mudfish	Yes - complete	Yes	No mudfish found during initial survey. Focus on minimising disturbance and keeping migration pathways open as far as practicable.	Netting and electric fishing	Fish passage assessment Fish salvage and relocation Mud fish survey (complete)
Culvert 39	Settlement Stream	Intermittent	Intermittent habitat for eels and banded kokopu	Yes - complete	Yes	Avoid peak upstream migration period for banded kokopu and eels where practicable (September to March).	Netting and electric fishing	Fish passage assessment Fish salvage and relocation Mud fish survey (complete)
n/a	School Road Drain	Intermittent	Intermittent habitat for eels	No	n/a	No particular requirements specified in the EMP.	Netting and electric fishing (redundant stream section only)	Fish salvage and relocation

5.2.1 Fish salvage and relocation

The primary methods for capturing fish will be netting with baited nets set overnight, and electric fishing. In some cases early fishing of the live watercourse will not be practical due to soft bottomed streams and fast flows placing pressure on stop nets, and instead the ecologist may advise to commence fishing once the new channel is livened and redundant channel blocked. In instances where early fish salvage and relocation *is* possible, the general fishing procedure will be as follows.

- A stop net will be deployed across the channel at the upstream and downstream ends of the works area at the commencement of the fish rescue operation to prevent fish from re-colonising the works areas. Stop nets will remain in place until a diversion at any particular site is livened.
- In non-wade-able streams baited fyke nets and gee minnow traps will be placed throughout the isolated section of water course. The fishing effort (number of nets) will vary according to the area being fished. Nets will be left over night and cleared the next morning. If high numbers of fish are encountered following the second night of trapping further trapping may be required. Subsequent nights netting will be undertaken until the catch rate is below 50% of the previous pass or less than 10 individual fish captured.
- In wade-able streams the entire length of stream will be electric fished by qualified technicians with repeat passes undertaken until the catch rate is below 50% of the previous pass or less than 10 individual fish captured in conjunction with netting if required.
- A freshwater ecologist will be present on site at the time of dewatering the stream or the pond environments to ensure that any remaining fish are captured and relocated.
- All indigenous fish recovered will be transported and released to an appropriate relocation site (with input from Nga Hapu o Ōtaki regarding preferable locations).
- Appropriate handling methods will be used to minimise stress to the fish. Fish will be held in covered bins that will be regularly refreshed with stream water and transferred and released typically within 1 hour of being caught. Bubblers will be used if necessary to prevent asphyxiation.
- Exotic species captured through fish rescue exercises will not be transferred. Any exotic fish species captured will be euthanized humanely and disposed of appropriately.
- Records of all fish relocated will be kept and provided in the written statement along with details on monitoring methodology, release location and monitoring dates.

5.3 Water quality monitoring

During livening of any culvert or diversion, turbidity monitoring will be undertaken upstream and downstream of the work site. In accordance with the EMP, if the turbidity level downstream of the works has not returned to levels within 10% of upstream levels within 48 hours of livening then GWRC will be notified and an investigation will be carried out to address the source of sediment release. Two turbidity monitoring methods will be utilised depending on the location of works as follows:

Method 1: Continuous turbidity monitoring (roaming loggers)

The following method will be applied for the livening of temporary diversions and permanent culverts within Gear Stream and Settlement Stream:

- Roaming turbidity loggers will be installed upstream and approximately 30m downstream of the diversion / new culvert at least 24 hours prior to livening.
- The loggers will record continuously throughout the livening process to record to the peak discharge and the duration of increased turbidity.
- The loggers will continue to record turbidity until it can be demonstrated that downstream levels are within 10% of upstream levels.
- If downstream levels are elevated above 10% after 48 hours from livening then GWRC will be notified and an investigation will be carried out to address the source of sediment release.
- Monitoring results will be sent to GWRC within 10 working days of livening the diversion / culvert.

Method 2: Telemetered turbidity monitoring

The following method will be applied for the livening of the temporary diversion and permanent Culvert 39 within the Mangaone Stream:

- Continuous turbidity loggers will be installed upstream and downstream of the works site prior to earthworks or streamworks commencing in the Mangaone catchment. These will remain in place for the project duration.
- Following livening, if downstream levels are elevated above 10% after 48 hours from livening then GWRC will be notified and an investigation will be carried out to address the source of sediment release.
- Monitoring results will be sent to GWRC within 10 working days of livening the diversion / culvert.

5.4 Cultural monitoring

A Kaiarahi (iwi guide / leader) is the key point of contact and coordination for Ngā Hapū o Ōtaki. The Kaiarahi will be involved in the design process, construction supervision and environmental monitoring. The Kaiarahi will be supported by Pūkenga (specialists / experts) and Kaitiaki (guardians)

who provide support in supervision, monitoring activities and provision of specialist advice in regards to cultural monitoring. Ngā Hapū o Ōtaki will be informed of all works on site and invited to be present for all works with particular emphasis placed on initial topsoil stripping and streamworks.

Contact must also be maintained with Muaupoko Tribal Authority (MTA) in accordance with MTA agreement and confirmed accidental discovery protocols, summarised in Appendix F.

5.5 Archaeology

All works under this SSEMP will be carried out in accordance with the approved archaeological authority and the Archaeological Site Management Plan. The Archaeological Site Management Plan outlines high, medium, and low probability archaeological areas across the project footprint.

One area of works associated with the construction of the new School Road Drain (and associated School Road) is considered to be 'high probability' at Matenga Moroati's house and has undergone pre-works archaeological investigations. Any works in this area will also require the presence of an archaeologist and kaitiaki to monitor the works, particularly during initial topsoil stripping. Contractors will briefed on the Accidental Discovery Protocol if the archaeologist is unable to be on site.

All remaining areas covered under this SSEMP are deemed to be low-probability areas and will be covered by Accidental Discovery Protocols. Accidental discovery protocols are outlined in the Archaeological Site Management Plan and must be adhered to in instances where subsurface archaeological remains, koiwi tangata, or taonga are exposed during construction.

The agreed protocols and high probability area are provided in Appendix F.

5.6 Noise and vibration

The Construction Noise and Vibration Management Plan (CNVMP) identifies the noise and vibration performance standards that must, where practicable, be complied with. It also sets out best practicable options for noise and vibration management for the Project, including mitigation measures, monitoring requirements, and communication and complaint procedures. All works under this SSEMP will be carried out in general accordance with the CNVMP.

High-risk areas in regards to potential noise and vibration effects as a result of works have been identified in Appendix C. Individual dwellings located within the high risk areas have also been listed below.

In accordance with the CNVMP, works carried out under this SSEMP will generally be restricted to take place between the hours of:

- 0630 and 2000hrs on weekdays; and
- 0730 and 1800hrs on Saturdays.

As far as practicable, works will be scheduled to avoid noisy activities in areas identified as sensitive receivers on the attached drawings between 0630 – 0730hrs in the morning, and between 1800 – 2000hrs in the evening to align with noise level criteria outlined in the CNVMP.

It is not anticipated that works will be required to take place outside of normal working hours for works outlined in this SSEMP. In the event that this changes, the procedures outlined in the CNVMP will be followed. Any works outside of the hours of 7am to 7pm require written approval from the Project Engineer.

The primary mitigation measure in regards to reducing the impacts from construction noise and vibration will be ongoing effective community consultation, particularly when transitioning from one works phase to another.

Noise and vibration monitoring will take place throughout the works to assess the impacts on adjacent properties at various locations. In the event that noise or vibration criteria is exceeded, mitigation options will be reassessed in an effort to comply with the construction limits, and a site specific noise 'schedule' will be submitted to Kapiti Coast District Council in accordance with the CNVMP.

Dwellings located within the noise and vibration boundary are as follows:

- 32 School Road
- 34 School Road
- 36 School Road

Dwellings within the vibration boundary only are as follows:

- 38 School Road
- 42 School Road
- 45 Gear Road
- 95 Gear Road
- 96 Gear Road
- 97 Gear Road

5.6.1 Pre-condition building surveys

Section 7 of the CNVMP outlines activities that are expected to generate vibration that will potentially cause medium and high level vibration and therefore must be assessed to determine whether a pre-condition building survey is required.

Given the nature of works and the distance from each localised work site to nearby dwellings, pre-condition building surveys will not be required prior to works carried out under this SSEMP.

5.7 Air quality

There is potential for works to generate dust discharge if the site is not managed effectively. The Construction Air Quality Management Plan (CAQMP) outlines methods to be used to prevent dust and odour nuisance during construction from the site. All works under this SSEMP will be carried out in general accordance with the CAQMP.

To ensure that dust does not become an issue across the boundary of the site, the following measures will be implemented as a minimum:

- Use of water carts as required, particularly around public interface points such as site entry/exits to local roads
- Imposing a speed limit if required
- Use of stabilising agents such as polymers if required
- Assessing wind speed and direction on a daily basis and implementing additional mitigation based on conditions (or ceasing / re-programming works as required).

Certain properties fall within the 'high risk air quality' zone as identified in Appendix C drawings. Provided that the site is managed effectively, it is not anticipated that these works will cause an adverse impact in these locations.

5.8 Contaminated land

The Bulk Earthworks Contaminated Land Management Plan (BECLMP) provides a framework and general procedures for the management of contaminated soil and other contaminated materials/structures potentially present in ground that may be disturbed or require removal to complete the Project. A number of potentially contaminated sites located within the Project corridor were identified during the desk based Phase 1 Contaminated Land Assessment. The works programmed to take place under this SSEMP are not located within any locations identified as contaminated land sites and therefore there are no specific requirements regarding handling of contaminated soils.

6 TRAFFIC

Existing site access points will be utilised for these works from Old Hautere Road (SAP-8), School Road (SAP-6) and Gear Road (SAP-5) as originally identified through SSTMP PW1 'Vegetation Clearance and Enabling Works'. A Site Specific Traffic Management Plan (SSTMP) has been included as Appendix G.

APPENDIX A – SSEMP AUTHORS

Name	Role	Company	Input
Alice Naylor	Environmental Manager	Higgins	All
Richard Rakovics	Project Civils Manager	Fletcher Construction	General sequencing and works methodology
Macu Waga	Site Engineer	Fletcher Construction	General sequencing and works methodology
Dewi Knappstein	Stormwater Lead Engineer	Tonkin & Taylor	Temporary stormwater design
Tyler Campbell	Design Engineer	Tonkin & Taylor	Temporary stormwater design
Dean Miller	Lead Ecologist	Tonkin & Taylor	Ecological input

APPENDIX B – CONSULTATION RECORD

Group	Date
Community Liaison Group	Distributed to CLG Group for comment – no comments received.

Outstanding Queries

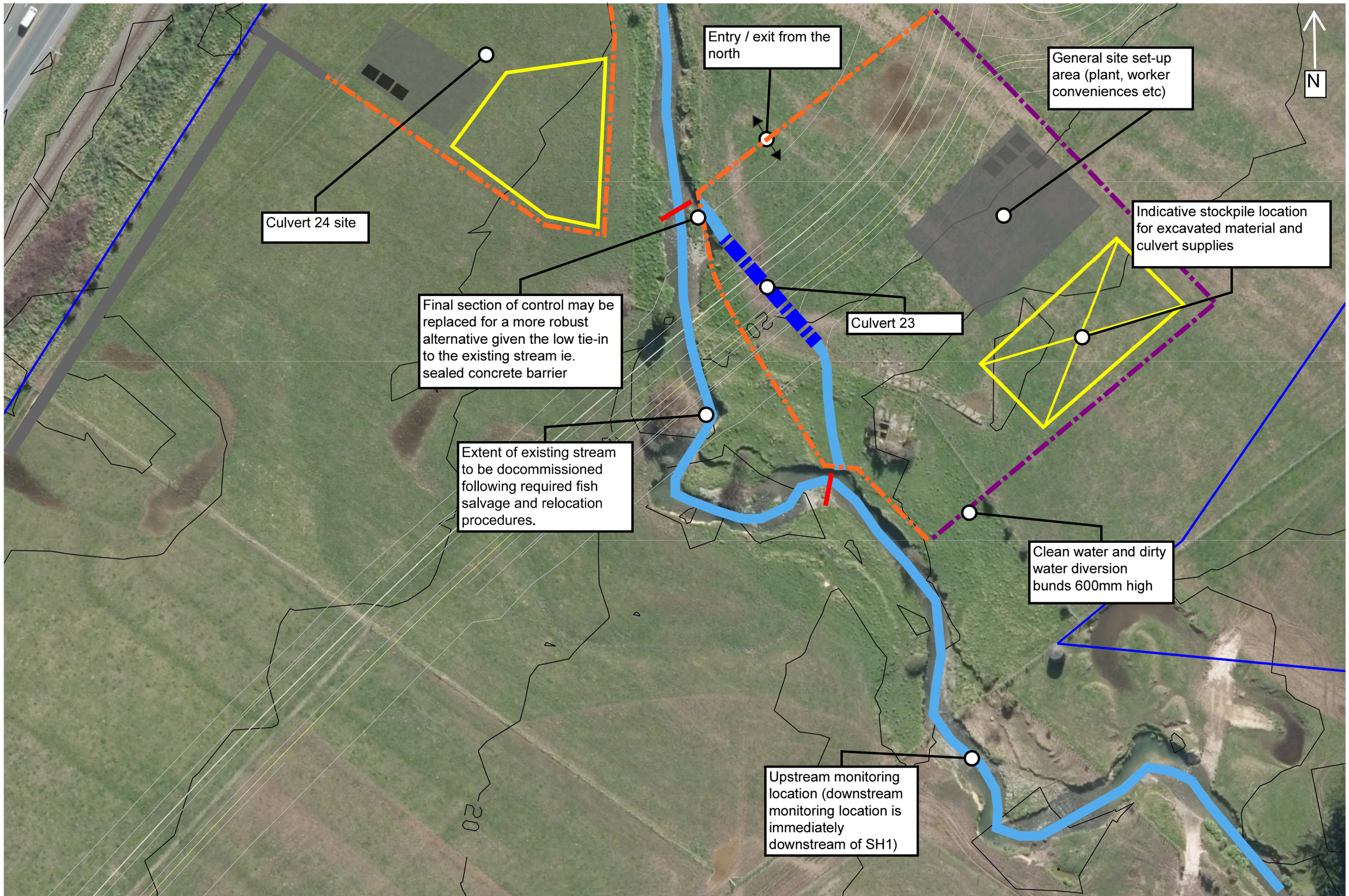
The following outlines any queries (relevant to works covered under this SSEMP) that have not been resolved through the SSEMP preparation process, but will instead be closed out via alternative project stakeholder and communication channels:

NIL

APPENDIX C – DRAWINGS

Works Methodology / Layout Plan

Culvert 23:



No.	Revision	By	Chk	Appd	Date
1	FOR CONSTRUCTION	AK	SP	BS	9.03.18

Design	S.Penman	15.08.17	Approved for Construction
Drawn	A.Kocher	15.08.17	B.Symmans
Dsg Verifier	P.Chatterley	09.03.18	
Drg Check	G.Down	09.03.18	Date 09.03.18

Scale (A1) 1:500
Scale (A3)
* Refer to Original Hardcopy for Signature

NZ TRANSPORT AGENCY | Peka Peka to Ōtaki Expressway | Fletcher HIGGINS | Beca | Tonkin+Taylor

Subject
Title: SSEMP SC1: CULVERT 23

Discipline: CIVIL
Drawing No.: SSEMP-SC1-23
Rev: 1

ORIGINAL SIZE A1 : DO NOT SCALE

IF IN DOUBT ASK

Culvert 24:

MANGAONE STREAM

APPROXIMATE DOWNSTREAM NTU MONITORING LOCATION

CULVERT 24 - STAGE ONE:

- INSTALL DIRTY WATER DIVERSION BUNDS TO DELINEATE TEMPORARY DIVERISON FOOTPRINT FROM THE EXISTING STREAM.
- CONSTRUCT TEMPORARY STREAM DIVERSION OFFLINE OF THE STREAM LEAVING PLUGS IN AT EITHER END.
- REMOVE DOWNSTREAM PLUG FOLLOWED BY THE UPSTREAM PLUG TO LIVEN THE STREAM DIVERSION.
- ENSURE THAT NTU MONITORING IS CARRIED OUT IN ACCORDANCE WITH THE SSEMP REQUIREMENTS.

EXISTING RAILWAY CULVERT

CONSTRUCT TEMPORARY STREAM DIVERSION OFFLINE OF EXISTING STREAM. REFER TO STORMWATER INFORMATION FOR DETAILS.

INDICATIVE LOCATION OF TEMPORARY STOCKPILE

APPROXIMATE UPSTREAM NTU MONITORING LOCATION

INDICATIVE ACCESS ROUTE TO BE STABILISED WITH AGGREGATE

INDICATIVE LAYDOWN AREA FOR WORKER CONVENIENCES

DWD >400MM HIGH

N

No.	Revision	By	Chk	Appd	Date
1	FOR CONSTRUCTION	AK	SP	BS	9.03.18

Scale (A1) 1:500
Scale (A3)

Design	S.Perman	15.08.17	Approved For Construction: B.Symmans
Drawn	A.Kocher	15.08.17	
Dsg Verifier	P.Chatterley	09.03.18	
Drg Check	G.Down	09.03.18	Date: 09.03.18

* Refer to Original Hardcopy for Signature

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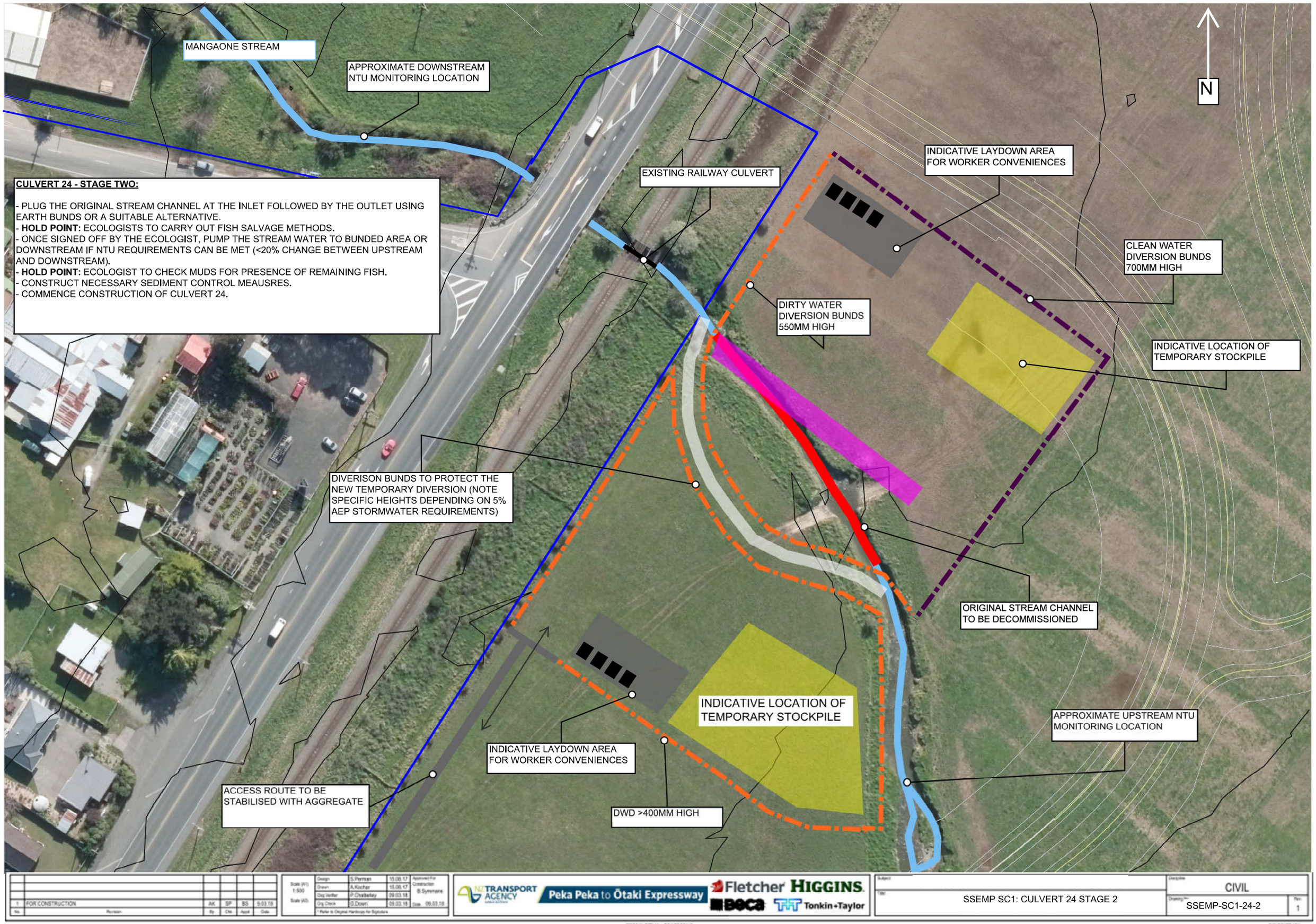
Subject:
Title: SSEMP SC1: CULVERT 24 STAGE 1

Discipline: CIVIL
Drawing No.: SSEMP-SC1-24-1
Rev: 1

ORIGINAL SIZE A1 : DO NOT SCALE

IF IN DOUBT ASK



CULVERT 24 - STAGE TWO:

- PLUG THE ORIGINAL STREAM CHANNEL AT THE INLET FOLLOWED BY THE OUTLET USING EARTH BUNDS OR A SUITABLE ALTERNATIVE.
- **HOLD POINT**: ECOLOGISTS TO CARRY OUT FISH SALVAGE METHODS.
- ONCE SIGNED OFF BY THE ECOLOGIST, PUMP THE STREAM WATER TO BUNDED AREA OR DOWNSTREAM IF NTU REQUIREMENTS CAN BE MET (<20% CHANGE BETWEEN UPSTREAM AND DOWNSTREAM).
- **HOLD POINT**: ECOLOGIST TO CHECK MUDS FOR PRESENCE OF REMAINING FISH.
- CONSTRUCT NECESSARY SEDIMENT CONTROL MEAUSRES.
- COMMENCE CONSTRUCTION OF CULVERT 24.

No.	Revision	By	Chk	Appd	Date
1	FOR CONSTRUCTION	AK	SP	BS	9.03.18

Scale (A1) 1:500
Scale (A3)

Design	S.Perreau	15.08.17	Approved For Construction
Drawn	A.Kocher	15.08.17	B.Symmans
Dsg Verifier	P.Chatterley	09.03.18	
Drg Check	G.Down	09.03.18	Date 09.03.18

* Refer to Original Hardcopy for Signature

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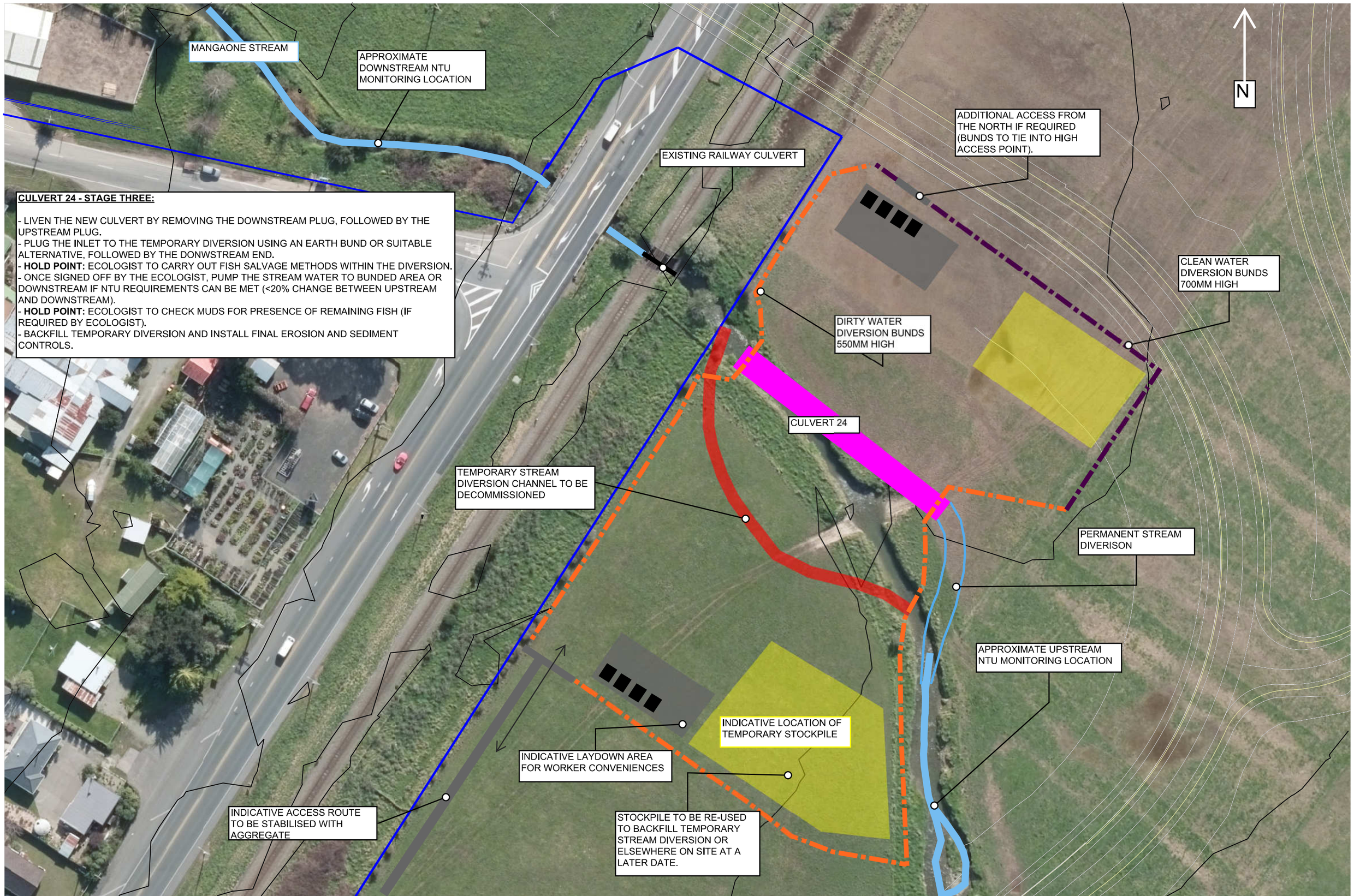
Subject: SSEMP SC1: CULVERT 24 STAGE 2
Discipline: CIVIL
Drawing No.: SSEMP-SC1-24-2
Rev: 1

ORIGINAL SIZE A1 - DO NOT SCALE
IF IN DOUBT ASK



No.	Revision	By	Chk	Appd	Date
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Scale (A3)

Design	S.Perreau	15.08.17	Approved for Contractor B.Symmans
Drawn	A.Kocher	15.08.17	
Dsg Verifier	P.Chatterley	09.03.18	
Drg Check	G.Down	09.03.18	Date 09.03.18

* Refer to Original Hardcopy for Signature

NZ TRANSPORT AGENCY | Peka Peka to Ōtaki Expressway | Fletcher HIGGINS | Beca | Tonkin+Taylor

Subject:
Title: SSEMP SC1: CULVERT 24 STAGE 3

Discipline: CIVIL
Drawing No.: SSEMP-SC1-24-3
Rev: 1

ORIGINAL SIZE A1 : DO NOT SCALE

IF IN DOUBT ASK

Culvert 28:

METHODOLOGY:

- INSTALL DIRTY WATER DIVERSION AND CLEAN WATER DIVERSION BUNDS AROUND THE SITE, ALLOWING FOR ROOM FOR TEMPORARY STOCKPILING OF EXCAVATED MATERIAL (NOTE THAT CONTROL MAY ALREADY BE IN PLACE DEPENDING ON THE TIMING OF LOCAL ROAD WORKS.
- ACCESS THE SITE FROM SCHOOL ROAD.
- CULVERT 28 IS TO REMAIN AS A DEAD CULVERT UNTIL THE NEXT STAGE (BULK EARTHWORKS).
- CLEAN WATER DIVERSIONS ARE OF SUFFICIENT HEIGHT TO DIVERT THE 5% AEP (MANGAONE STREAM OVERFLOW) AWAY FROM THE SITE AND INSTEAD FLOW TO THE EXISTING RAILWAY CULVERT. FLOWS WILL BE CONTAINED WITHIN THE MANGAONE STREAM CHANNEL UP TO A MEAN ANNUAL FLOOD WITHOUT INUNDATING THE CULVERT 28 WORKSITE.

MANGAONE STREAM

N

EXISTING RAILWAY CULVERT

CULVERT 28

CWD >800MM HIGH (TO CONVEY 5% AEP FLOWS FORM MANGAONE STREAM.

DWD >400MM HIGH

INDICATIVE LAYDOWN AREA FOR WORKER CONVENIENCES

INDICATIVE LOCATION OF TEMPORARY STOCKPILES.

SCHOOL ROAD DRAIN

ACCESS FROM SCHOOL ROAD

20

20

20

No.	Revision	By	Chk	Appd	Date
1	FOR CONSTRUCTION	AK	SP	BS	9.03.18

Scale (A1) 1:500
Scale (A3)

Design	S.Perman	15.08.17
Drawn	A.Kocher	15.08.17
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Drg Check	G.Down	09.03.18

Approved For Construction: B.Symmans Date: 09.03.18

* Refer to Original Hardcopy for Signature

NZ TRANSPORT AGENCY | Peka Peka to Ōtaki Expressway | Fletcher HIGGINS | Beca | Tonkin+Taylor

Subject:

Title: SSEMP SC1: CULVERT 28

Discipline: CIVIL

Drawing No.: SSEMP-SC1-28

Rev.: 1

ORIGINAL SIZE A1 : DO NOT SCALE

IF IN DOUBT ASK

Culvert 35:

CULVERT 35 - STAGE ONE:

- INSTALL DIRTY WATER AND CLEAN WATER DIVERSION BUNDS AROUND THE WORKSITE, ALLOWING FOR ROOM FOR TEMPORARY STOCKPILING OF EXCAVATED MATERIAL.
- DEPENDING ON THE PROGRESS OF WORKS ON THE LOCAL ROAD, SEDIMENT CONTROLS MAY ALREDAY BE IN PLACE TO THE WEST OF THE DRAIN.
- ACCESS THE SITE FROM GEAR ROAD
- CONSTRUCT CULVERT 35 IN THE DRY, OFFLINE OF ANY WATERCOURSE.
- REMOVE THE SECTIONS OF DIVERSION BUNDS AT THE CULVERT OUTLET AND INLET TO THE PERMANENT DIVERSION TO LIVEN THE CULVERT (GREEN).

DWD BUNDS >650MM HIGH MAY ALREADY BE IN PLACE FOR THE CONSTRUCTION OF THE LOCAL ROAD (SSEMP SLR1)

INDICATIVE LOCATION OF TEMPORARY STOCKPILE

INDICATIVE LAYDOWN AREA FOR WORKER CONVENIENCES

DWD BUNDS >400MM HIGH

GEAR STREAM

CWD >500mm HIGH

PERMANENT STREAM DIVERSION

CULVERT 35

SITE ACCESS POINT OFF GEAR ROAD

GEAR ROAD

N

No	Revision	By	Chk	Appd	Date
1	FOR CONSTRUCTION	AK	SP	BS	9.03.18

Design	S.Perman	15.08.17	Approved For Construction
Drawn	A.Kocher	15.08.17	B.Symmans
Dsg Verifier	P.Chatterley	09.03.18	
Drg Check	G.Down	09.03.18	Date 09.03.18

Scale (A1) 1:500
Scale (A3)
* Refer to Original Hardcopy for Signature

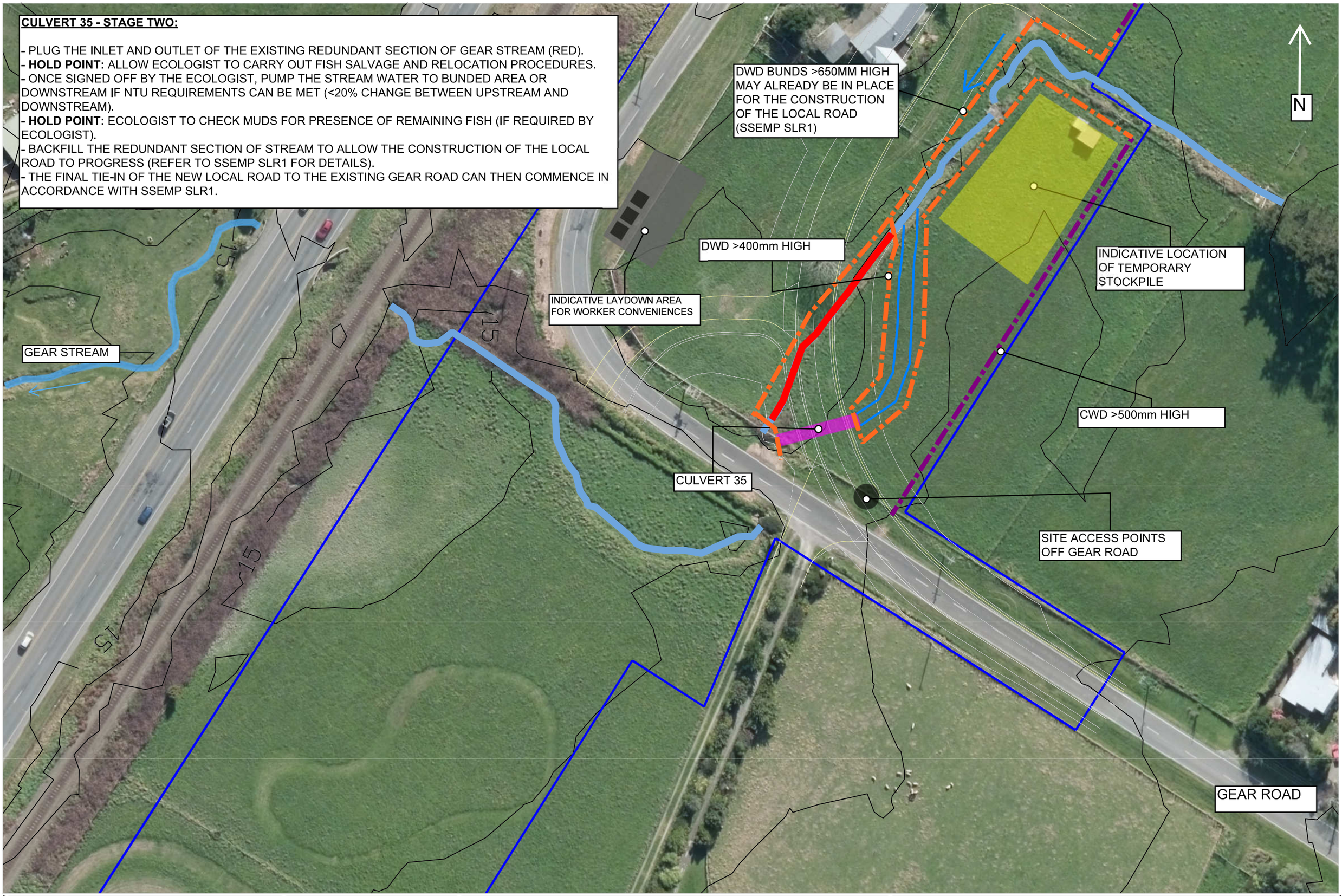
NZ TRANSPORT AGENCY | Peka Peka to Ōtaki Expressway | Fletcher HIGGINS | Beca | Tonkin+Taylor

Subject:
Title: SSEMP SC1: CULVERT 35 STAGE 1

Discipline: CIVIL
Drawing No: SSEMP-SC1-35-1
Rev: 1

ORIGINAL SIZE A1 : DO NOT SCALE

IF IN DOUBT ASK



No.	Revision	By	Chk	Appd	Date
1	FOR CONSTRUCTION	AK	SP	BS	9.03.18

Design	S.Penman	15.06.17	Approved for Construction
Drawn	A.Kocher	15.06.17	B.Symmans
Dsg Verifier	P.Chatterley	09.03.18	
Drg Check	G.Down	09.03.18	Date 09.03.18

Scale (A1) 1:500
Scale (A3)
* Refer to Original Hardcopy for Signatures

NZ TRANSPORT AGENCY
Peka Peka to Ōtaki Expressway
Fletcher HIGGINS
Beca Tonkin+Taylor

Subject:
Title: SSEMP SC1: CULVERT 35 STAGE 2

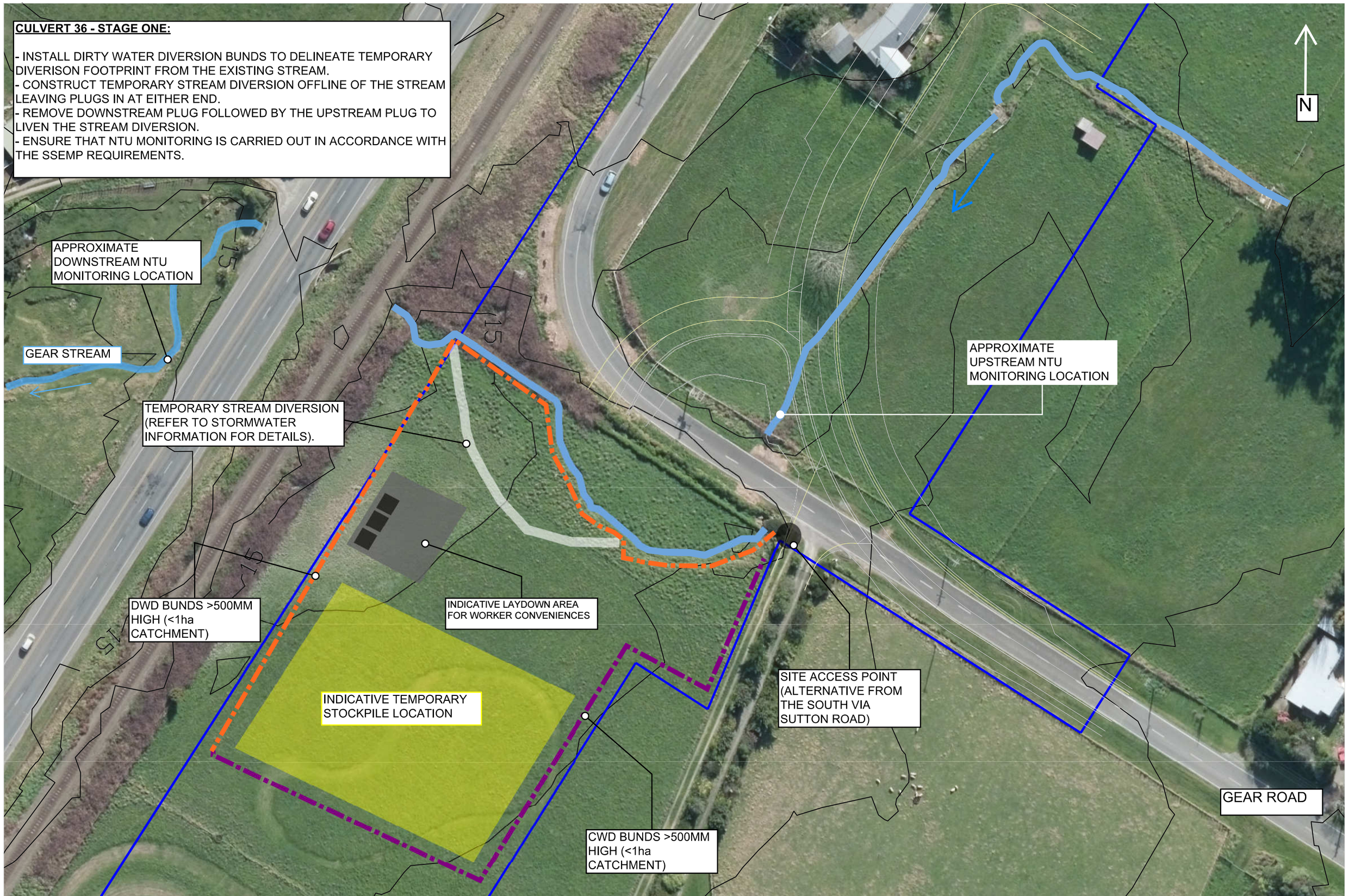
Discipline: CIVIL
Drawing No.: SSEMP-SC1-35-2
Rev: 1

ORIGINAL SIZE A1 : DO NOT SCALE
IF IN DOUBT ASK

Culvert 36:

CULVERT 36 - STAGE ONE:

- INSTALL DIRTY WATER DIVERSION BUNDS TO DELINEATE TEMPORARY DIVERISON FOOTPRINT FROM THE EXISTING STREAM.
- CONSTRUCT TEMPORARY STREAM DIVERSION OFFLINE OF THE STREAM LEAVING PLUGS IN AT EITHER END.
- REMOVE DOWNSTREAM PLUG FOLLOWED BY THE UPSTREAM PLUG TO LIVEN THE STREAM DIVERSION.
- ENSURE THAT NTU MONITORING IS CARRIED OUT IN ACCORDANCE WITH THE SSEMP REQUIREMENTS.



No.	Revision	By	Chk	Appd	Date
1	FOR CONSTRUCTION	AK	SP	BS	9.03.18

Design	S.Perman	15.06.17	Approved for Construction: B.Symmons
Drawn	A.Kocher	15.06.17	
Dsg Verifier	P.Chatterley	09.03.18	
Drg Check	G.Dixon	09.03.18	Date: 09.03.18

Scale (A1): 1:500 Scale (A3):

* Refer to Original Hardcopy for Signatures

NZ TRANSPORT AGENCY | Peka Peka to Ōtaki Expressway | Fletcher HIGGINS | Beca | Tonkin+Taylor

Subject: SSEMP SC1: CULVERT 36 STAGE 1

Discipline: CIVIL

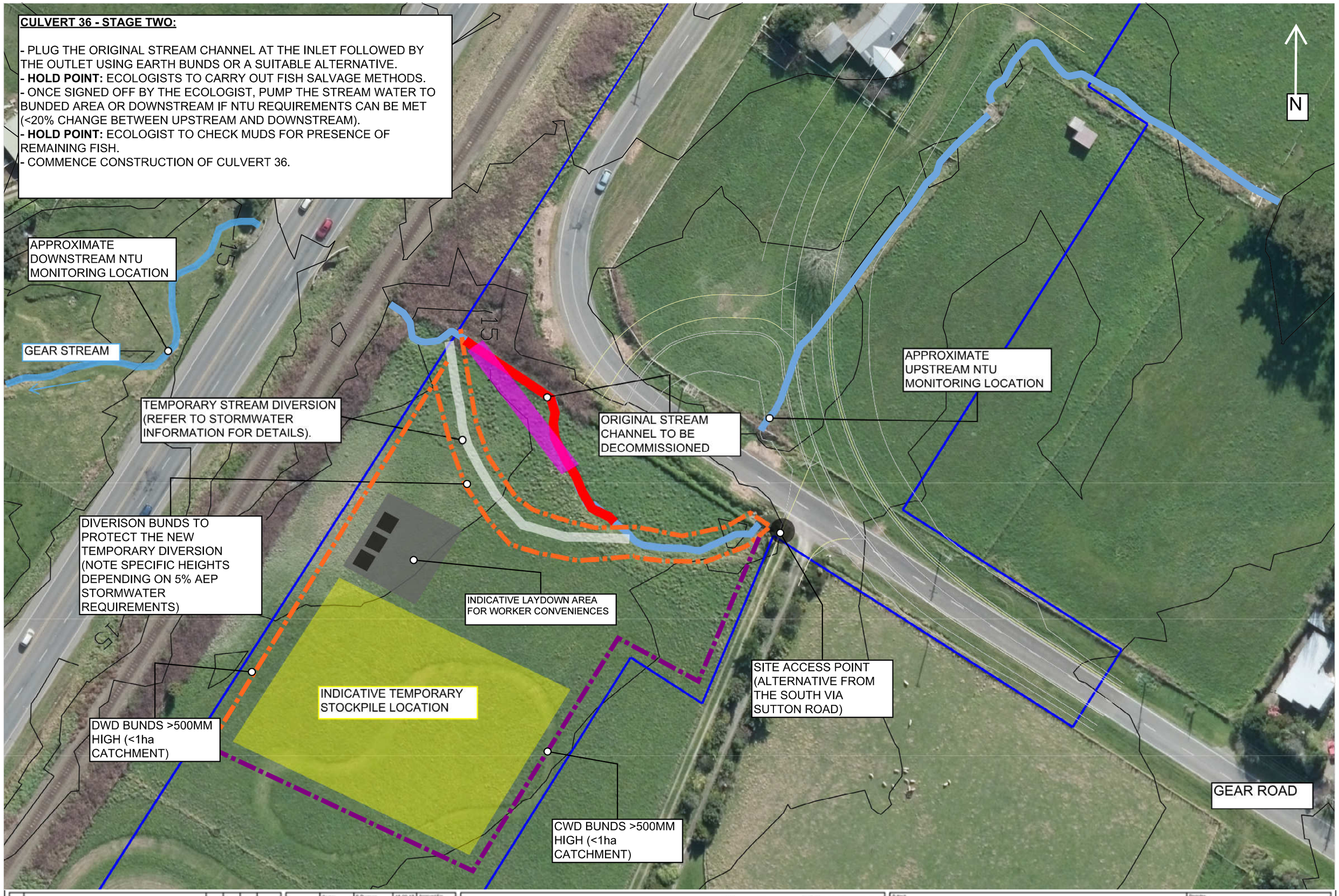
Title: SSEMP SC1: CULVERT 36 STAGE 1

Drawing No.: SSEMP-SC1-36-1

Rev: 1

ORIGINAL SIZE A1 - DO NOT SCALE

IF IN DOUBT ASK



No.	Revision	By	Chk	Appd	Date
1	FOR CONSTRUCTION	AK	SP	BS	9.03.18

Design	S.Penman	15.08.17	Approved For Construction: B.Symmans
Drawn	A.Kocher	15.08.17	
Dsg Verifier	P.Chatterley	09.03.18	
Drg Check	G.Down	09.03.18	Date: 09.03.18

Scale (A1): 1:500
Scale (A3):
* Refer to Original Hardcopy for Signature

NZ TRANSPORT AGENCY | Peka Peka to Ōtaki Expressway | Fletcher HIGGINS | Beca | Tonkin+Taylor

Subject:
Title: SSEMP SC1: CULVERT 36 STAGE 2
Discipline: CIVIL
Drawing No.: SSEMP-SC1-36-2
Rev: 1

ORIGINAL SIZE A1 : DO NOT SCALE
IF IN DOUBT ASK

CULVERT 36 - STAGE THREE:

- LIVEN THE NEW CULVERT BY REMOVING THE DOWNSTREAM PLUG, FOLLOWED BY THE UPSTREAM PLUG.
- PLUG THE INLET TO THE TEMPORARY DIVERSION USING AN EARTH BUND OR SUITABLE ALTERNATIVE, FOLLOWED BY THE DONWSTREAM END.
- **HOLD POINT:** ECOLOGIST TO CARRY OUT FISH SALVAGE METHODS WITHIN THE DIVERSION.
- ONCE SIGNED OFF BY THE ECOLOGIST, PUMP THE STREAM WATER TO BUNDED AREA OR DOWNSTREAM IF NTU REQUIREMENTS CAN BE MET (<20% CHANGE BETWEEN UPSTREAM AND DOWNSTREAM).
- **HOLD POINT:** ECOLOGIST TO CHECK MUDS FOR PRESENCE OF REMAINING FISH (IF REQUIRED BY ECOLOGIST).
- BACKFILL TEMPORARY DIVERSION AND INSTALL FINAL EROSION AND SEDIMENT CONTROLS.

N

CULVERT 36

APPROXIMATE DOWNSTREAM NTU MONITORING LOCATION

GEAR STREAM

NEW SITE ACCESS POINT ACROSS NEW CULVERT

APPROXIMATE UPSTREAM NTU MONITORING LOCATION

TEMPORARY STREAM DIVERSION (REFER TO STORMWATER INFORMATION FOR DETAILS).

INDICATIVE LAYDOWN AREA FOR WORKER CONVENIENCES

DWD BUNDS >500MM HIGH

INDICATIVE TEMPORARY STOCKPILE LOCATION

CWD BUNDS >500MM HIGH

GEAR ROAD

No.	Revision	By	Chk	Appd	Date
1.	FOR CONSTRUCTION	AK	SP	BS	9.03.18

Scale (A1) 1:500 Scale (A3)

Design	S.Perman	15.06.17
Drawn	A.Kochar	15.06.17
Dsg Verifier	P.Chatterley	09.03.18
Orig Check	G.Down	09.03.18

Approved For Construction: B.Symmans Date: 09.03.18

* Refer to Original Hardcopy for Signature

NZ TRANSPORT AGENCY | Peka Peka to Ōtaki Expressway | Fletcher HIGGINS | Beca | Tonkin+Taylor

Subject:

Title: SSEMP SC1: CULVERT 36 STAGE 3

Discipline: CIVIL

Drawing No.: SSEMP-SC1-36-3

Rev: 1

ORIGINAL SIZE A1 : DO NOT SCALE

IF IN DOUBT ASK

Culvert's 35 and 36 - General sequencing

Save Date: 12 Jan 2018 1:52 p.m.

KEY PLAN

Step 1: Construct Culvert 36 once the stream has been temporarily diverted to the south.

Step 2: Construct Culvert 35 and associated permanent stream diverison

Step 3: Construct the local road section while existing Gear Road is still live to traffic. Construct final road tie-in under stop-go traffic (in accordance with SSEMP SLR1 'Southern Local Roads'.

Step 4: Liven the new Gear Road to traffic

Step 5: Construct the permanent stream diverison section between Culvert's 35 and 36 in conjunction with decommissioning of the original Gear Road.

MATCHLINE - REFER SHEET 33

MATCHLINE - REFER SHEET 35

Existing Gear Road

GEAR STREAM

CULVERT No.35
CM PIPE ARCH 21PA5-14 (TBC)
IL US = 13.8m
IL DS = 13.7m

NOTE SWALE LINES TO BE UPDATED TO MATCH LATEST EARTHWORKS AND PIPEWORK

NOTE SWALE LINES TO BE UPDATED TO MATCH LATEST EARTHWORKS AND PIPEWORK

EXISTING CULVERTS TO BE ABANDONED

MAINLINE EXPRESSWAY

SW7890-8590E

CW7860-8590E

SW7500-8590E

SW8630-8630E

HW-147A

HW-147B

8300

8400

8500

8600

LEGEND:

- DESIGNATION BOUNDARY
- RAIL DESIGNATION BOUNDARY
- COBBLED SWALE
- CONVEYANCE/ATTENUATION SWALE
- TREATMENT SWALE
- SOAKAGE SWALE
- CLEAN WATER CUT-OFF DRAIN
- DISH DRAIN
- KERB AND CHANNEL
- TL-4 BARRIER FOR FLOOD MANAGEMENT
- STREAM DIVERSION/FLOOD DIVERSION CHANNELS
- PROPOSED CULVERTS
- EXISTING CULVERTS
- PROPOSED STORMWATER COLLECTION PIPE
- EXISTING STREAM
- EXISTING STREAM TO BE REMOVED
- PROPERTY BOUNDARY
- PROPOSED MAINTENANCE ACCESS - EXCAVATOR
- PROPOSED MAINTENANCE ACCESS - PEDESTRIAN
- PROPOSED CATCHPIT / DOUBLE CATCHPIT (CP/DCP)
- PROPOSED MANHOLE (MH)
- PROPOSED CATCH PIT MANHOLE / DOUBLE CATCHPIT MANHOLE (CPMH/DCPMH)
- PROPOSED GRILLE MANHOLE (GMH)
- PROPOSED SCRUFFY DOME MANHOLE (SD)
- PROPOSED INLET/OUTLET STRUCTURE (HW)
- PROPOSED SWALE ATTENUATION STRUCTURE
- PROPOSED RIPRAP
- PROPOSED WETLAND/BASIN
- HP/LP HIGH POINT/LOW POINT
- K4 | KC KERB AND CHANNEL TYPE MARKERS (REFER TO GEOMETRIC DRAWINGS)

A1 SCALE 1:500
A3 SCALE 1:1000
0 10 20 30 40 50 (m)

NOTES:
1. SWALE LINEWORK AND EARTHWORKS CONTOURS ARE TO BE RECONCILED AT 100% STAGE.
2. FOR LONGITUIDNAL PIPE SECTIONS REFER TO DRAWINGS PP2O-DR-SW-0201 TO 0237.

ORIGINAL IN COLOUR

PRELIMINARY
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
A	80% DESIGN	GD	MK	BS	15.12.17

Design	D.Knappstein	29.09.17	Approved For Construction
Drawn	S.Halliday	15.12.17	
Dsg Verifier			
Drg Check			Date

Scale (A1) 1:500
Scale (A3)
* Refer to Original Hardcopy for Signature

NZ Transport Agency Waka Kotahi | Peka Peka to Ōtaki Expressway | Fletcher HIGGINS | Beca | Tonkin+Taylor

Subject: GENERAL ARRANGEMENTS
Title: STORMWATER LAYOUT PLANS
SHEET 34 OF 47

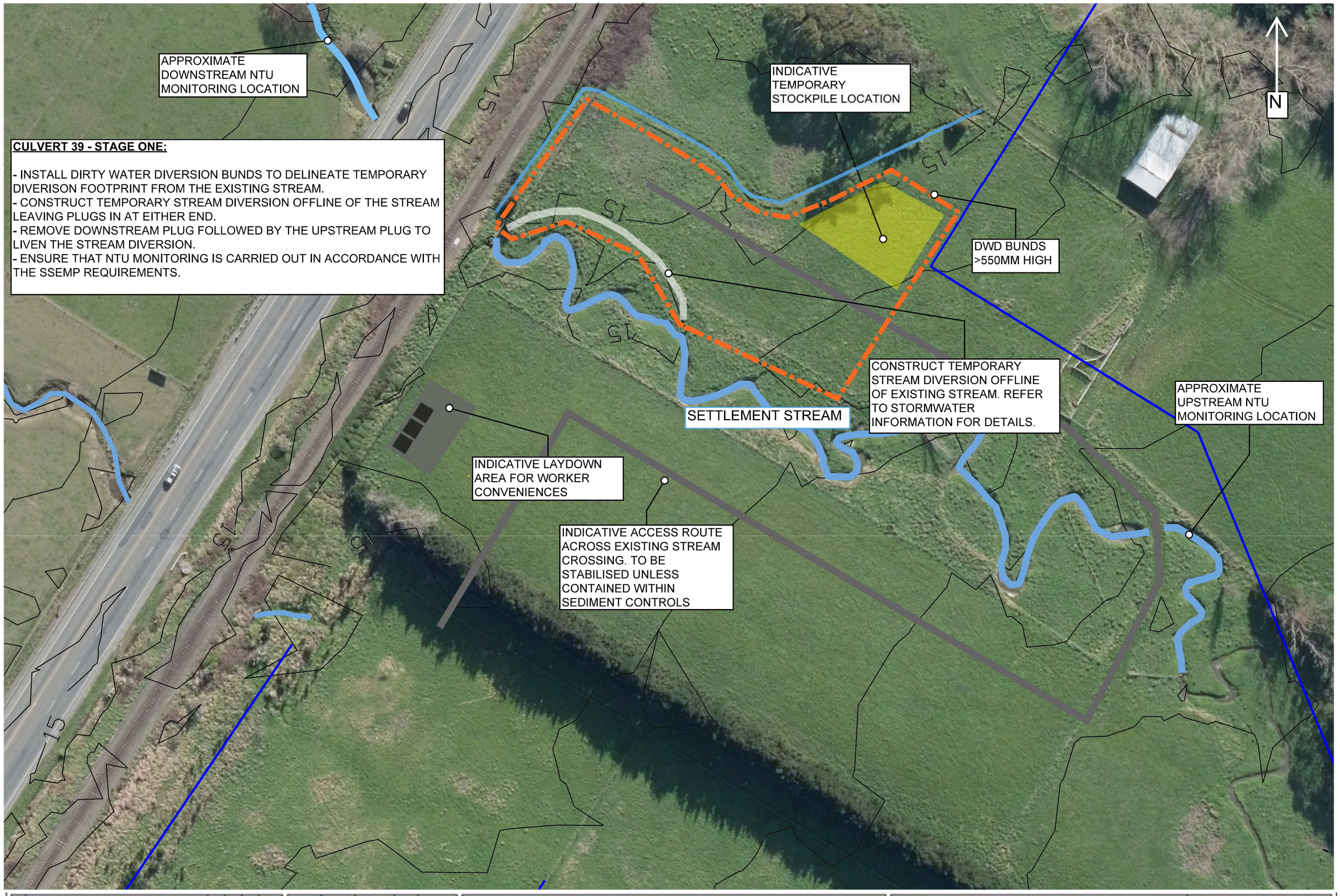
Discipline: STORMWATER
Rev. A

Document No. R:\30DD - DESIGN DEVELOPMENT GENERAL\09 CAD\DRAWINGS\SW\PP2O-DR-SW-0101-0147.DWG

ORIGINAL SIZE A1 : DO NOT SCALE

IF IN DOUBT ASK

Culvert 39:



No.	Revision	By	Chk	Appd	Date
1	FOR CONSTRUCTION	AK	SP	BS	9.03.18

Scale (A1) 1:500
Scale (A2)

Design	S.Perman	15.06.17
Drawn	A.Kocher	15.06.17
Dsg Verifier	P.Chatterley	09.03.18
Drg Check	G.Down	09.03.18

Approved For Construction: S.Symmans Date: 09.03.18

* Refer to Original Hardcopy for Signature

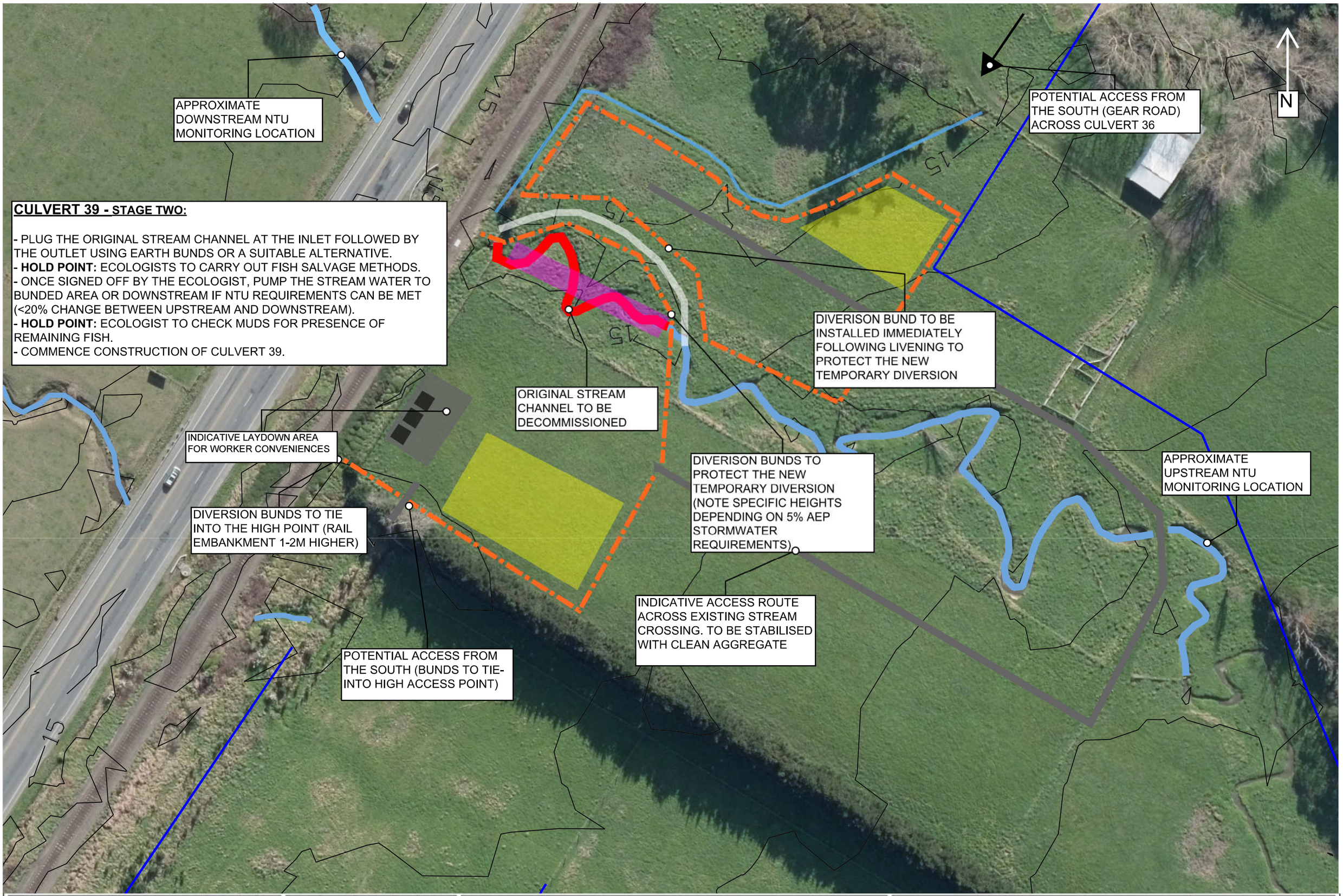
NZ TRANSPORT AGENCY | Peka Peka to Ōtaki Expressway | Fletcher HIGGINS | Beca | Tonkin+Taylor

Subject:
Title: SSEMP SC1: CULVERT 39 STAGE 1

Discipline: CIVIL
Drawing No.: SSEMP-SC1-39-1
Rev: 1

ORIGINAL SIZE A1 : DO NOT SCALE

IF IN DOUBT ASK



No.	Revision	By	Chk	Appd	Date
1	FOR CONSTRUCTION	AK	SP	BS	9.03.18

Scale (A1) 1:500
Scale (A3)

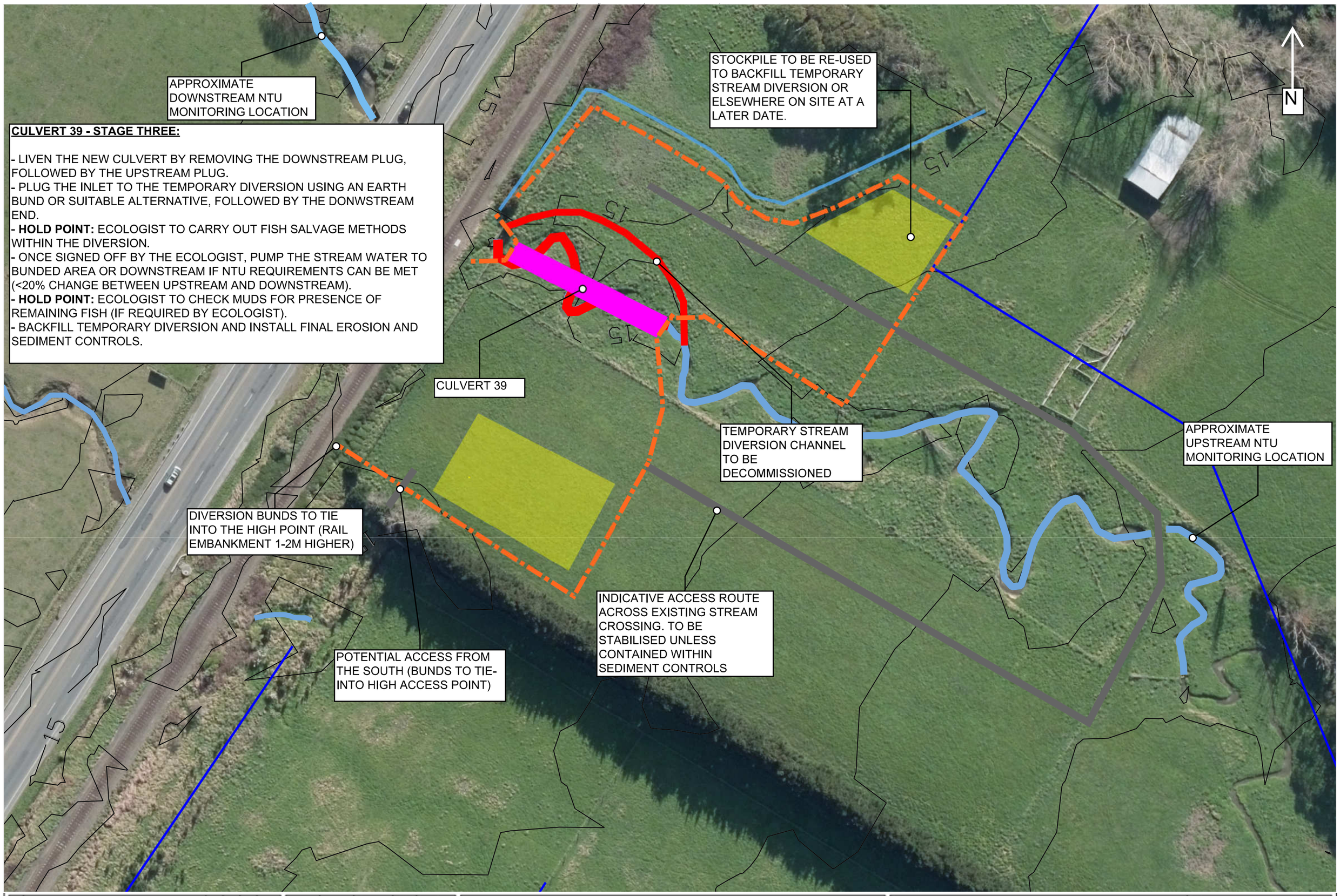
Design	S.Penman	15.08.17	Approved For Construction: B.Symmans
Drawn	A.Kocher	15.08.17	
Dsg Verifier	P.Chatterley	09.03.18	
Dsg Check	G.Down	09.03.18	Date: 09.03.18

* Refer to Original Hardcopy for Signature

NZ TRANSPORT AGENCY | Peka Peka to Ōtaki Expressway | Fletcher HIGGINS | Beca | Tonkin+Taylor

Subject:
Title: SSEMP SC1: CULVERT 39 STAGE 2
Discipline: CIVIL
Drawing No: SSEMP-SC1-39-2
Rev: 1

ORIGINAL SIZE A1 : DO NOT SCALE
IF IN DOUBT ASK



No.	Revision	By	Chk	Appd	Date
1	FOR CONSTRUCTION	AK	SP	BS	9.03.18

Scale (A1) 1:500	Design	S.Perman	15.08.17
Scale (A3)	Drawn	A.Kocher	15.08.17
	Dsg Verifier	P.Chatterley	09.03.18
	Drg Check	G.Down	09.03.18

Approved For Construction: B.Symmans Date: 09.03.18

* Refer to Original Hardcopy for Signature

NZ TRANSPORT AGENCY | Peka Peka to Ōtaki Expressway | Fletcher HIGGINS | Beca | Tonkin+Taylor

Subject:

Title: SSEMP SC1: CULVERT 39 STAGE 3

Discipline: CIVIL

Drawing No: SSEMP-SC1-39-3

Rev: 1

ORIGINAL SIZE A1 : DO NOT SCALE

IF IN DOUBT ASK

School Road Drain Diversion:

METHODOLOGY: STAGE ONE

- CONSTRUCT PERMANENT SCHOOL ROAD DRAIN DIVERSION ALONG THE EASTERN EDGE OF THE NEW SCHOOL ROAD ALIGNMENT.
- EXTEND THE DIVERSION TO THE NORTH TEMPORARILY.
- LEAVE EXISTING EARTH PLUGS AT THE INLET AND OUTLET OF THE DIVERSION DURING CONSTRUCTION.

DOWNSTREAM MONITORING LOCATION

TEMPORARY CROSSING MAY BE REQUIRED. CULVERT TO BE SIZED TO CONVEY 50% AEP

TEMPORARY STOCKPILES FOR DIVERSION DIG-OUT AND LOCAL ROAD WORKS (REFER TO SSEMP SLR1 FOR DETAILS)

N

INITIAL ACCESS ACROSS EXISTING CULVERT (SAP-6)

ADDITIONAL TEMPORARY SECTION OF DRAIN TO BE CONSTRUCTED TO TIE-IN TO THE EXISTING DRAIN AT THE DOWNSTREAM END

PERMANENT SCHOOL ROAD DIVERSION TO BE CONSTRUCTED OFFLINE IN CONJUNCTION WITH CONSTRUCTION OF THE NEW SCHOOL ROAD (SSEMP SLR1)

DIRTY WATER DIVERSION BUND 650MM HIGH WILL ALREADY BE IN PLACE FOR LOCAL ROAD CONSTRUCTION (SSEMP SLR1).

INDICATIVE LAYDOWN AREA FOR WORKER CONVENIENCES

UPSTREAM MONITORING LOCATION

No.	Revision	By	Chk	Appd	Date
1	FOR CONSTRUCTION	AK	SP	BS	9.03.18

Scale (A1) 1:500
Scale (A3)

Design	S.Perman	15.06.17	Approved for Construction
Drawn	A.Kocher	15.06.17	S.Symmans
Dsg Verifier	P.Chatterley	09.03.18	
Drg Check	G.Down	09.03.18	Date 09.03.18

* Refer to Original Hardcopy for Signatures

NZ TRANSPORT AGENCY | Peka Peka to Ōtaki Expressway | Fletcher HIGGINS | Beca | Tonkin+Taylor

Subject:
Title: SSEMP SC1: SCHOOL ROAD DRAIN STAGE 1

Discipline: CIVIL
Drawing No: SSEMP-SC1-SRD1
Rev: 1

ORIGINAL SIZE A1 - DO NOT SCALE

IF IN DOUBT ASK

METHODOLOGY: STAGE TWO

- CONSTRUCT NECESSARY EROSION AND SEDIMENT CONTROL MEASURES AS PER THE DRAWINGS AND CERTIFY.
- REMOVE THE DOWNSTREAM PLUG, FOLLOWED BY THE UPSTREAM PLUG TO LIVEN THE NEW PERMANENT (AND PARTIAL TEMPORARY) DRAIN DIVERSION.
- PLUG THE EXISTING DRAIN AT THE INLET AND OUTLET.
- HOLD POINT: ECOLOGIST TO CARRY OUT FISH SALVAGE AND RELOCATION.
- ONCE SIGNED OFF BY THE ECOLOGIST, PUMP THE WATER TO BUNDED AREA OR DOWNSTREAM IF NTU REQUIREMENTS CAN BE MET (<20% CHANGE BETWEEN UPSTREAM AND DOWNSTREAM).
- HOLD POINT: ECOLOGIST / KAITIAKI TO CHECK MUDS FOR PRESENCE OF REMAINING FISH IF REQUIRED.
- BACKFILL THE REDUNDANT SECTION OF STREAM.
- THE REMAINING TIE-IN WORKS RELATING TO CONSTRUCTION OF THE LOCAL ROAD (AND TEMPORARY ROAD DIVERSION) CAN THEN PROGRESS (REFER TO SSEMP SLR1 FOR FURTHER DETAILS REGARDING THE LOCAL ROAD WORKS).

DOWNSTREAM MONITORING LOCATION

TEMPORARY CROSSING MAY BE REQUIRED. CULVERT TO BE SIZED TO CONVEY 50% AEP

TEMPORARY STOCKPILES FOR DIVERSION DIG-OUT AND LOCAL ROAD WORKS (REFER TO SSEMP SLR1 FOR DETAILS)

N

CWD >800MM HIGH

ADDITIONAL TEMPORARY SECTION OF DRAIN TO BE CONSTRUCTED TO TIE-IN TO THE EXISTING DRAIN AT THE DOWNSTREAM END

DIRTY WATER DIVERSION BUNDS >400MM TO BE CONSTRUCTED ALONG TEMPORARY DIVERSION PRIOR TO LIVENING.

LENGTH OF SCHOOL ROAD DRAIN TO BE DECOMMISSIONED ONCE THE NEW SCHOOL ROAD DRAIN HAS BEEN LIVENED.

INDICATIVE LAYDOWN AREA FOR WORKER CONVENIENCES

PERMANENT SCHOOL ROAD DIVERSION TO BE CONSTRUCTED OFFLINE IN CONJUNCTION WITH CONSTRUCTION OF THE NEW SCHOOL ROAD (SSEMP SLR1)

DIRTY WATER DIVERSION BUNDS >550MM TO BE CONSTRUCTED ALONG THE NEW LOCAL ROAD EDGE PRIOR TO LIVENING THE DRAIN DIVERSION

UPSTREAM MONITORING LOCATION

No.	Revision	By	Chk	Appd	Date
1	FOR CONSTRUCTION	AK	SP	BS	9.03.18

Design	S.Perrasi	15.06.17	Approved For Construction: B.Symmans
Drawn	A.Kocher	15.06.17	
Dsg Verifier	P.Chatterley	09.03.18	
Drg Check	G.Down	09.03.18	Date: 09.03.18

Scale (A1) 1:500
Scale (A3)
* Refer to Original Hardcopy for Signature

NZ TRANSPORT AGENCY | Peka Peka to Ōtaki Expressway | Fletcher HIGGINS | Beca | Tonkin+Taylor

Subject: SSEMP SC1: SCHOOL ROAD DRAIN STAGE 2
Discipline: CIVIL
Drawing No: SSEMP-SC1-SRD2
Rev: 1

ORIGINAL SIZE A1 - DO NOT SCALE
IF IN DOUBT ASK

Environmental Constraints Drawings

ECOLOGY LEGEND:

TERRESTRIAL ECOLOGY REQUIREMENTS:

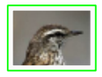
LIZARD SURVEYS, SALVAGING AND MONITORING

NATIVE TREE LOG SALVAGE

PERIPATUS MANAGEMENT

POWELLIPHANTA TRAVERSI OTAKI SURVEY

BIRD SURVEY



PIPIT SURVEY

BANDED DOTTEREL SURVEY

NOISE VIBRATION LEGEND:

VIBRATION - LOW RISK (RESIDENTIAL)

VIBRATION - LOW RISK (COMMERCIAL)

COMMERCIAL STRUCTURES WITHIN VIBRATION BOUNDARY

DWELLINGS WITHIN VIBRATION BOUNDARY

DWELLINGS WITHIN BOTH NOISE AND VIBRATION BOUNDARIES

AIR QUALITY:

AIR QUALITY SENSITIVE RECEIVERS

DRAINAGE LEGEND:

DESIGNATION

RAILWAY DESIGNATION

EXISTING STREAMS

STORMWATER WETLAND/POND

SITE COMPOUNDS:

HARD STAND AREA

SITE ENTRY AND EXIT

ARCHAEOLOGICAL HIGH-RISH AREAS:

SITE ARCHAEOLOGICAL

SITES ARCHAEOLOGICAL-AERIAL-PHOTO

LANDSCAPE:

EXISTING VEGETATION RETAINED

ORIGINAL IN COLOUR

FOR INFORMATION
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
B	SSEMP FOR INFORMATION	WW			14.09.17
A	SSEMP FOR INFORMATION	AR	GD	AN	28.07.17

Scale (A1) 1:1000
Scale (A3)

Design	AN	13.07.17	Approved For Construction
Drawn	AR	13.07.17	
Dsg Verifier			
Drg Check			Date

* Refer to Original Hardcopy for Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Peka Peka to Ōtaki Expressway | Fletcher HIGGINS | Beca | Tonkin+Taylor

Subject: SSEMP PW2
Title: LEGENDS

Discipline: CIVIL
Drawing No.: SSEMP PW2-00
Rev.: B

Document No. \\MZPPSP-FCC.INTERNAL\DAV\WWWROOT\2000\27270 SECTOR GENERAL\PRECAST WORKING SHOP DRAWINGS\PP2O\FOR ALICE\PP2O-DR-CE-0801-0818 2017-09-28= STANDARD\PP2O-DR-CE-0801-0818_14.09-ZMIANA TABELKI REWIZJI= DO WYRZUCANIA.DWG

ORIGINAL SIZE A1 : DO NOT SCALE

IF IN DOUBT ASK

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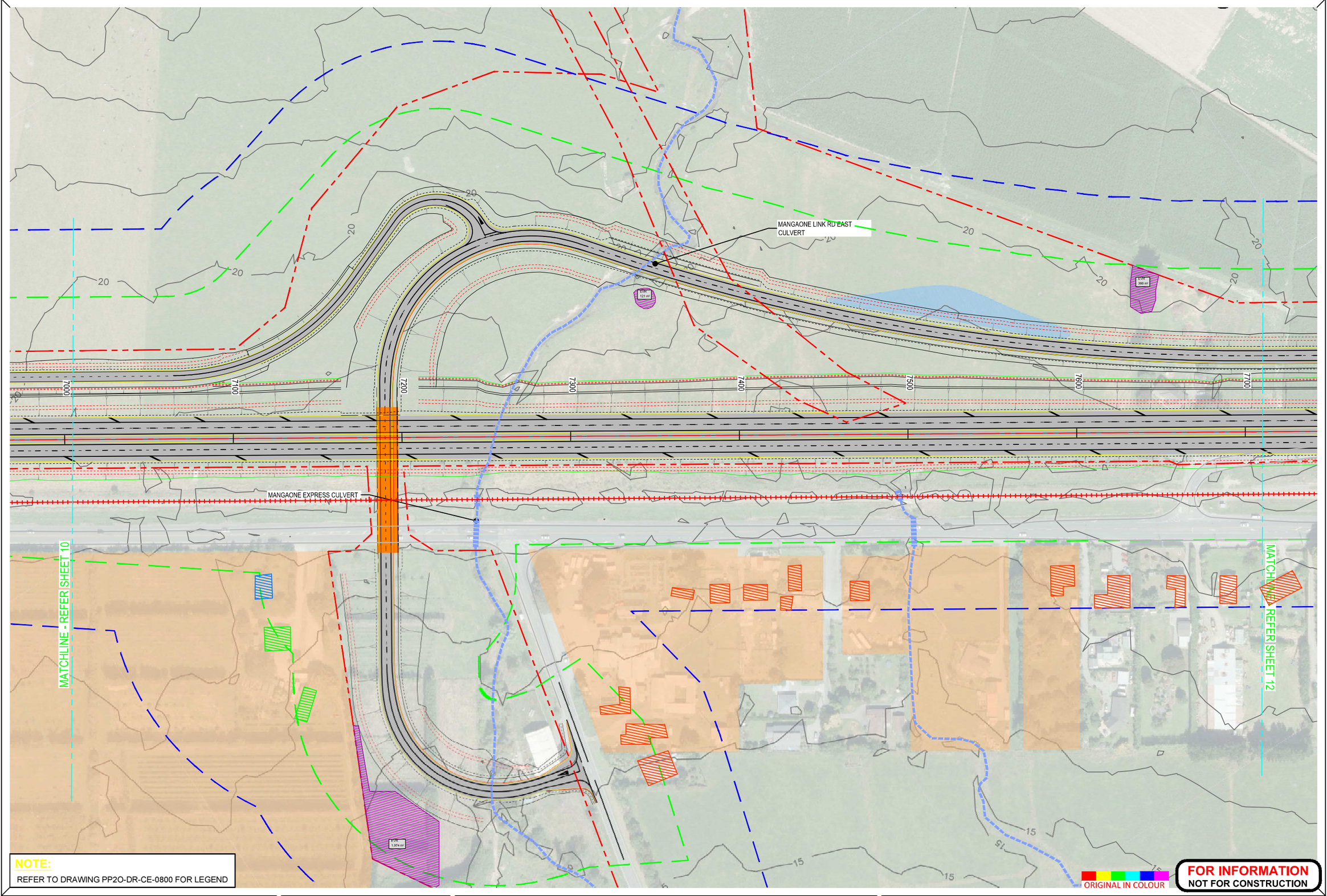


NOTE:
REFER TO DRAWING PP2O-DR-CE-0800 FOR LEGEND

ORIGINAL IN COLOUR

FOR INFORMATION
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
B	SSEMP FOR INFORMATION	WW			14.09.17
A	SSEMP FOR INFORMATION	AK	GD	AK	20.07.17

Design	AK	13.07.17	Approved For Construction	
Drawn	AK	13.07.17		
Dsg Verifier	-	-		
Drg Check	-	-	Date	

Scale (A1) 1:1000
Scale (A3)
* Refer to Original Hardcopy for Signature

NZ TRANSPORT AGENCY WAKA KOTAHI
Peka Peka to Ōtaki Expressway
-FC_Logo_SMALL_Colour_40%.jpg
Beca
HIGGINS
Tonkin+Taylor

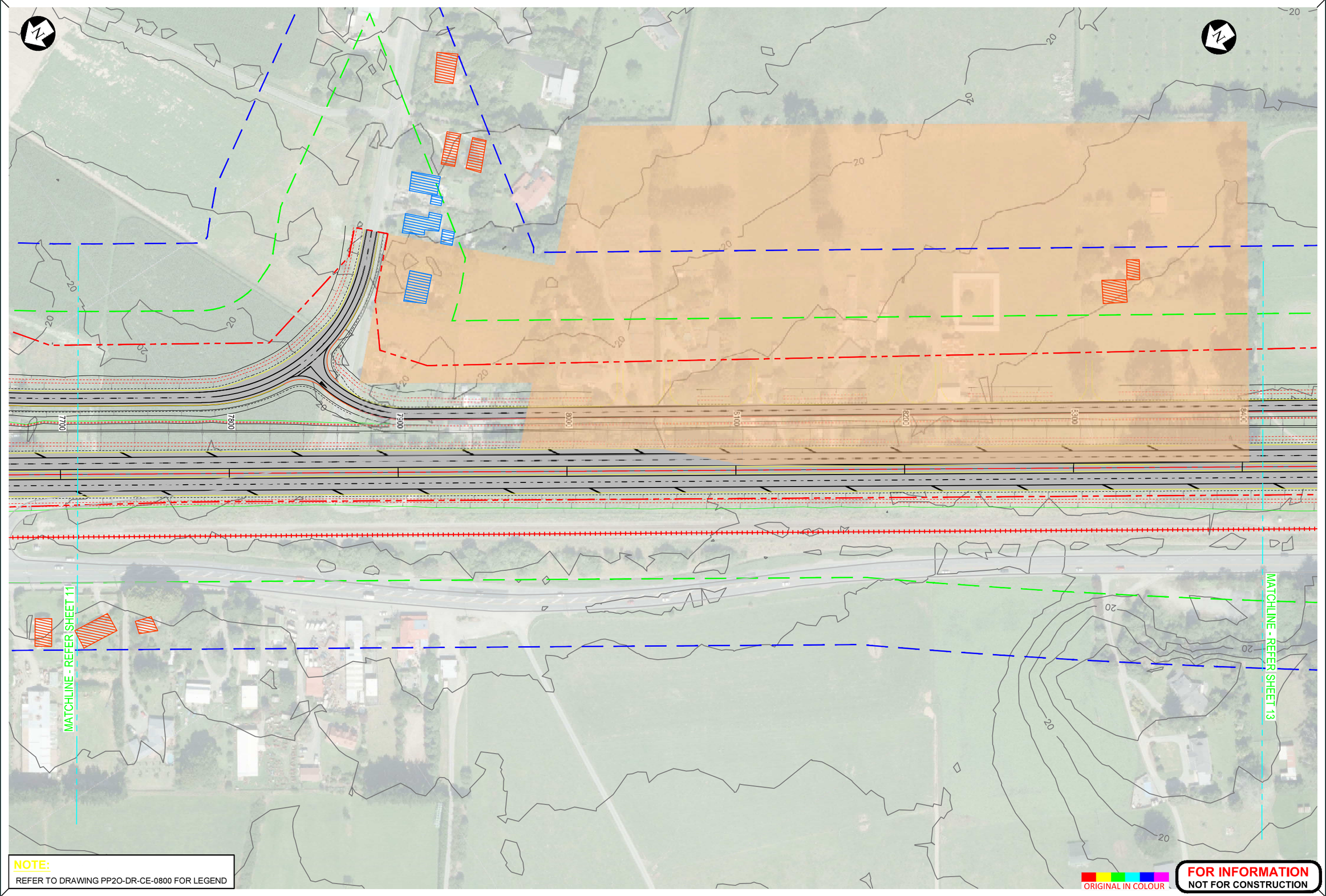
Subject: ENVIRO
Title: SHEET 1
Discipline: CIVIL
Rev. B

ORIGINAL SIZE A1 : DO NOT SCALE

IF IN DOUBT ASK

Document No. \\MZPPSP-FCI.INTERNAL\DAV\WWROOT\2020\27\270 SECTOR GENERAL\PRECAST WORKING SHOP DRAWINGS\PP2O\FOR ALICE\PP2O-DR-CE-0801-0818 2017-08-28- STANDARD\PP2O-DR-CE-0801-0818_29JSN-SET2.DWG

Save Date: 02 Nov 2017 10:18 a.m.



NOTE:
REFER TO DRAWING PP2O-DR-CE-0800 FOR LEGEND

ORIGINAL IN COLOUR

FOR INFORMATION
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
B	SSEMP FOR INFORMATION	WW			14.09.17
A	SSEMP FOR INFORMATION	AR	GD	AN	28.07.17

Scale (A1) 1:1000
Scale (A3)

Design	AN	13.07.17	Approved For Construction
Drawn	AR	13.07.17	
Dsg Verifier			
Drg Check			Date

* Refer to Original Hardcopy for Signature

NZ TRANSPORT AGENCY WAKA KOTAHI
Peka Peka to Ōtaki Expressway
:FC_Logo_SMALL_Colour_40%.jpg
HIGGINS
Beca
Tonkin+Taylor

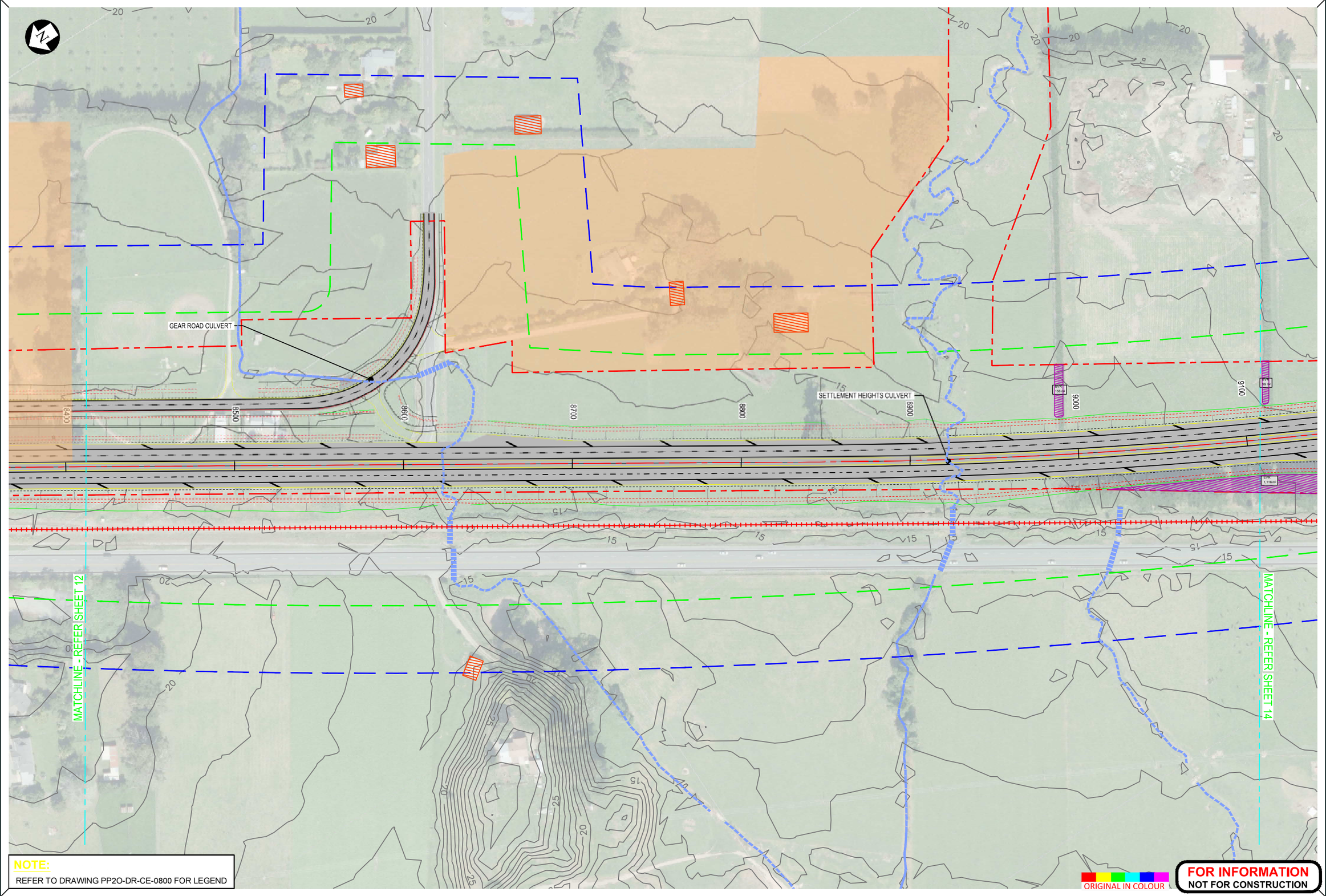
Subject: ENVIRO
Title: SHEET 2
Discipline: CIVIL
Rev. B

Document No. \\MZPPSP.FCC.INTERNAL\DAV\WWWROOT\2000\27\270 SECTOR GENERAL\PRECAST WORKING SHOP DRAWINGS\PP2O\FOR ALICE\PP2O-DR-CE-0801-0818 2017-08-28- STANDARD\PP2O-DR-CE-0801-0818_29.09-SET2.DWG

ORIGINAL SIZE A1 : DO NOT SCALE

IF IN DOUBT ASK

Save Date: 02 Nov 2017 10:18 a.m.



No.	Revision	By	Chk	Appd	Date
B	SSEMP FOR INFORMATION	WW			14.09.17
A	SSEMP FOR INFORMATION	AR	GD	AN	20.07.17

Scale (A1) 1:1000
Scale (A3)

Design	AR	13.07.17	Approved For Construction
Drawn	AR	13.07.17	
Dsg Verifier			
Drg Check			Date

* Refer to Original Hardcopy for Signature

NZ TRANSPORT AGENCY WAKA KOTAHI

Peka Peka to Ōtaki Expressway

Beca HIGGINS Tonkin+Taylor

Subject: ENVIRO

Title: SHEET 3

Discipline: CIVIL

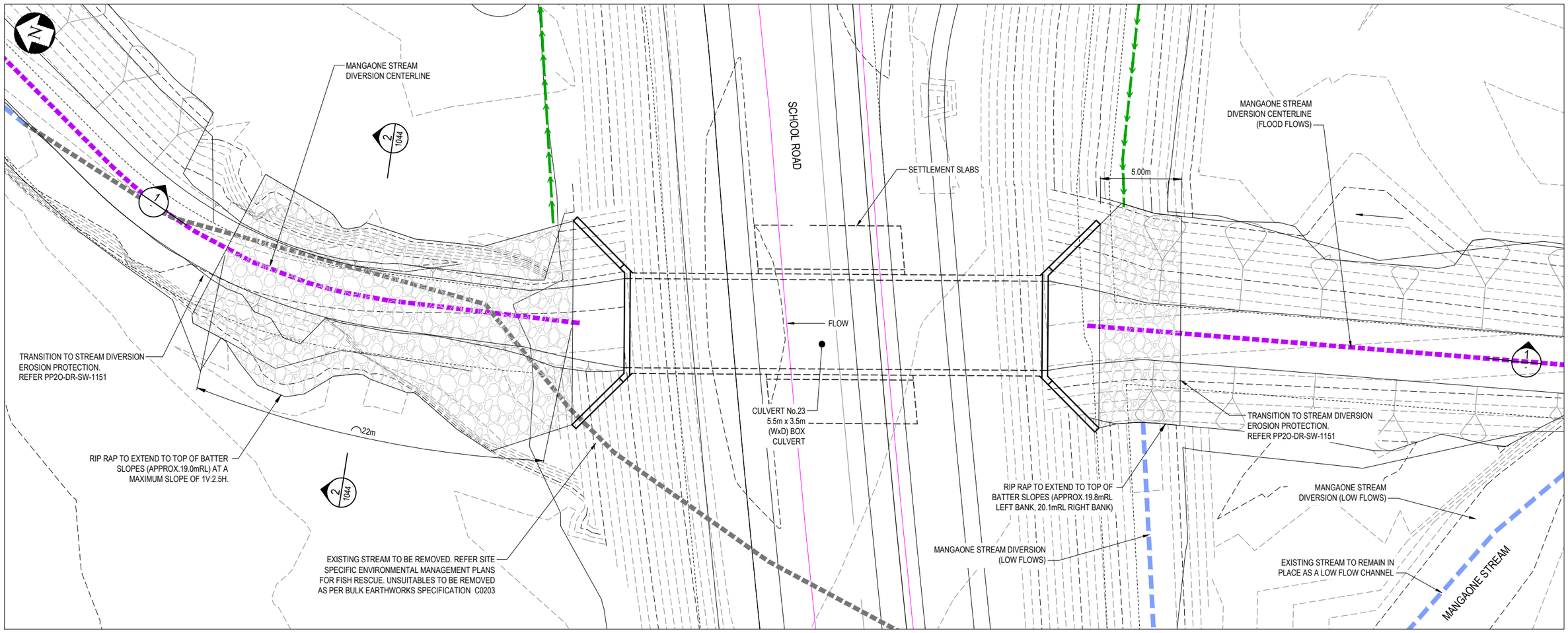
Rev. B

Document No. \\WZPSP FCC.INTERNAL\DAV\WWROOT\600271270 SECTOR GENERAL\PRECAST WORKING SHOP DRAWINGS\PP2O\FOR ALICE\PP2O-DR-CE-0801-0818 2017-08-28- STANDARD\PP2O-DR-CE-0801-0818_29JSN-SET2.DWG

ORIGINAL SIZE A1 : DO NOT SCALE

IF IN DOUBT ASK

Construction Drawings

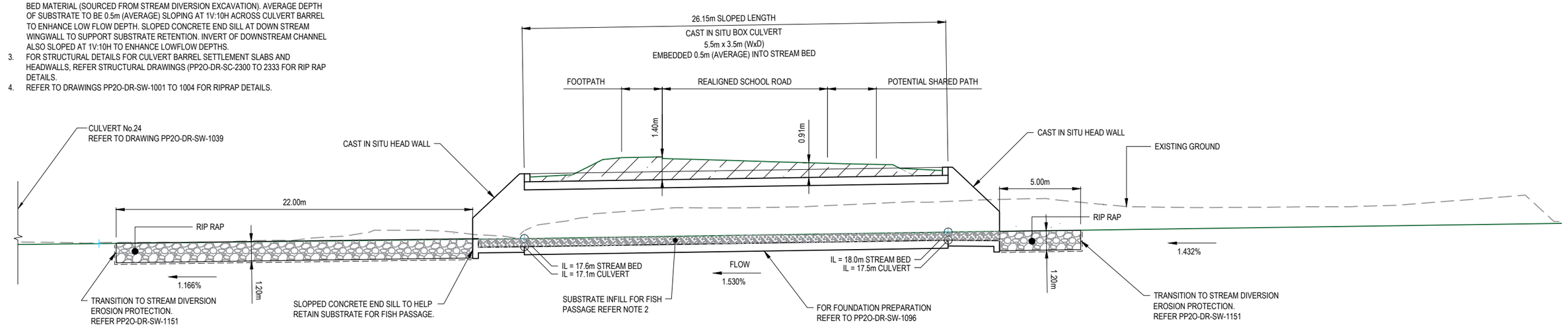


PLAN - LAYOUT

SCALE 1:125 (A1)

NOTES:

1. COVER MEASURED FROM FINISHED SURFACE TO TOP OF CULVERT ROOF.
2. FISH PASSAGE PROVIDED BY EMBEDDING CULVERT IN STREAM BED. SUBSTRATE TO BE PLACED IN CULVERT DURING CONSTRUCTION AND TO MATCH EXISTING STREAM BED MATERIAL (SOURCED FROM STREAM DIVERSION EXCAVATION). AVERAGE DEPTH OF SUBSTRATE TO BE 0.5m (AVERAGE) SLOPING AT 1V:10H ACROSS CULVERT BARREL TO ENHANCE LOW FLOW DEPTH. SLOPED CONCRETE END SILL AT DOWN STREAM WINGWALL TO SUPPORT SUBSTRATE RETENTION. INVERT OF DOWNSTREAM CHANNEL ALSO SLOPED AT 1V:10H TO ENHANCE LOWFLOW DEPTHS.
3. FOR STRUCTURAL DETAILS FOR CULVERT BARREL SETTLEMENT SLABS AND HEADWALLS, REFER STRUCTURAL DRAWINGS (PP2O-DR-SC-2300 TO 2333 FOR RIP RAP DETAILS.
4. REFER TO DRAWINGS PP2O-DR-SW-1001 TO 1004 FOR RIPRAP DETAILS.



A1 SCALE 1:125
A3 SCALE 1:250

0 5 10 15 (m)

1 - LONGITUDINAL SECTION

SCALE 1:125 (A1)

ORIGINAL IN COLOUR

FOR INFORMATION
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
B	100% DESIGN	GD	DK	BS	18.05.18
A	80% DESIGN ALL CULVERTS	SJH	AH	BS	02.02.18

Design	A.Houldsworth	15.12.17	Approved For Construction
Drawn	S.Halliday	24.07.17	
Dsg Verifier			
Drg Check			Date

Scale (A1) AS SHOWN
Scale (A3)

* Refer to Original Hardcopy for Signature

NZ TRANSPORT AGENCY WAKA KOTAHI
Peka Peka to Ōtaki Expressway
Fletcher HIGGINS
Beca Tonkin+Taylor

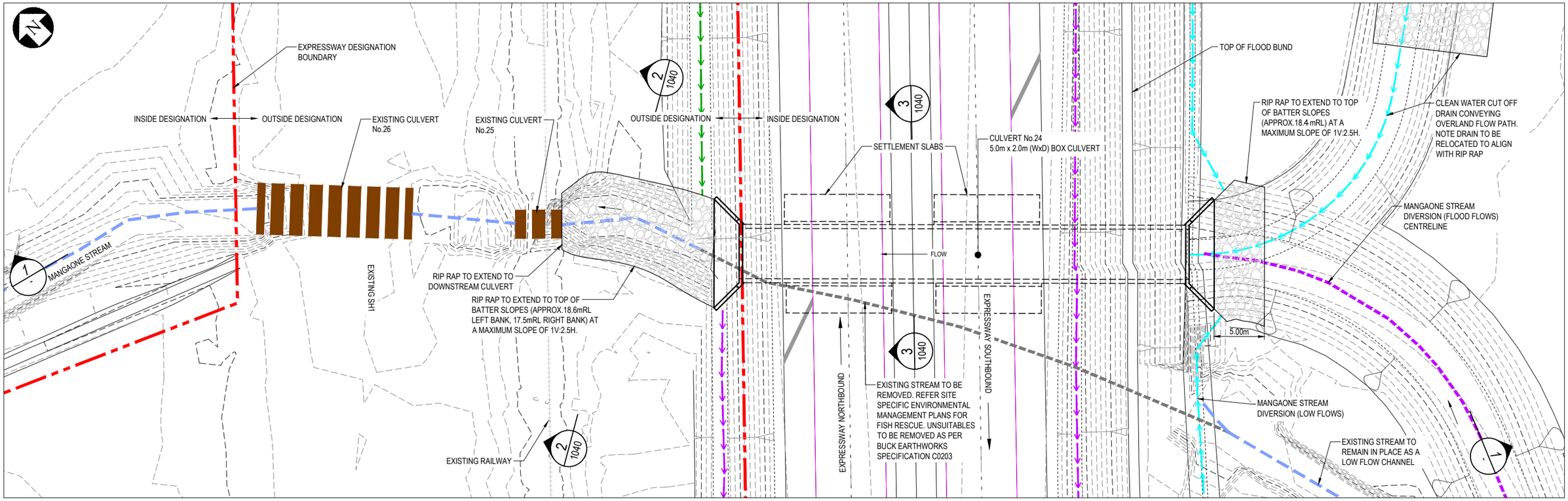
Subject: CULVERTS
Title: CULVERT No.23 (CH 7,350, MANGAONE STREAM EAST) PLAN AND LONGITUDINAL SECTION

Discipline: STORMWATER
Drawing No.: PP2O-DR-SW-1043
Rev.: B

Document No. R/30DD - DESIGN DEVELOPMENT GENERAL\09 CAD\DRAWINGS\WP\PP2O-DR-SW-1043-1044.DWG

ORIGINAL SIZE A1 : DO NOT SCALE

IF IN DOUBT ASK

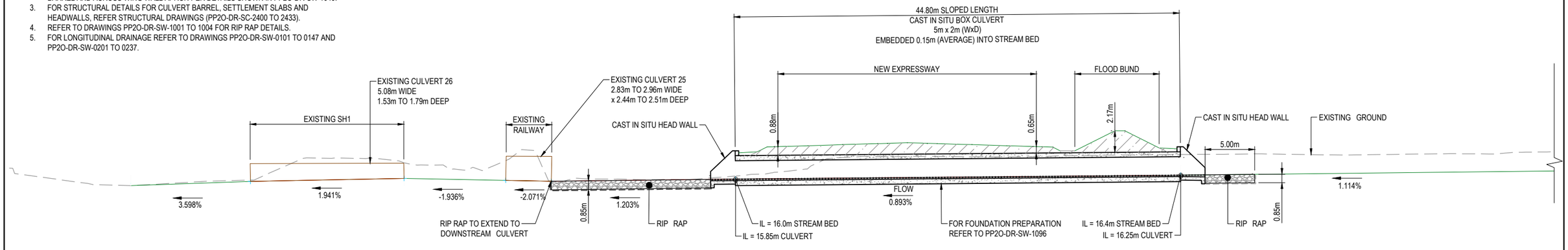


PLAN - LAYOUT

SCALE: 1:200 (A1) 1:400 (A3)

NOTES:

1. COVER MEASURED FROM FINISHED SURFACE TO TOP OF CULVERT ROOF.
2. FISH PASSAGE TO BE PROVIDED BY EMBEDDING CULVERT 0.15m (AVERAGE) IN STREAM BED. SUBSTRATE TO BE CONCRETED IN PLACE AS THROUGH CULVERT BARREL AND ACROSS WING WALL APRON PER DETAILS SHOWN IN PP2O-DR-SW-1040.
3. FOR STRUCTURAL DETAILS FOR CULVERT BARREL, SETTLEMENT SLABS AND HEADWALLS, REFER STRUCTURAL DRAWINGS (PP2O-DR-SC-2400 TO 2433).
4. REFER TO DRAWINGS PP2O-DR-SW-1001 TO 1004 FOR RIP RAP DETAILS.
5. FOR LONGITUDINAL DRAINAGE REFER TO DRAWINGS PP2O-DR-SW-0101 TO 0147 AND PP2O-DR-SW-0201 TO 0237.



1/- LONGITUDINAL SECTION

SCALE: 1:200 (A1) 1:400 (A3)

A1 SCALE 1:200
A3 SCALE 1:400

0 5 10 15 20 25 (m)

ORIGINAL IN COLOUR

FOR INFORMATION
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
C	100% DESIGN	GD	DK	BS	18.05.18
B	80% DESIGN ALL CULVERTS	GD	DK	BS	2.02.18
A	80% P1 CULVERT DESIGN	SJH	AH	BS	15.09.17

Scale (A1) 1:200
Scale (A3) 1:400

Design	A.Houldsworth	24.07.17	Approved For Construction
Drawn	S.Halliday	24.07.17	
Dsg Verifier			
Drg Check			Date

* Refer to Original Hardcopy for Signature

NZ TRANSPORT AGENCY WAKA KOTAHI
Peka Peka to Ōtaki Expressway
Fletcher HIGGINS
Beca
Tonkin+Taylor

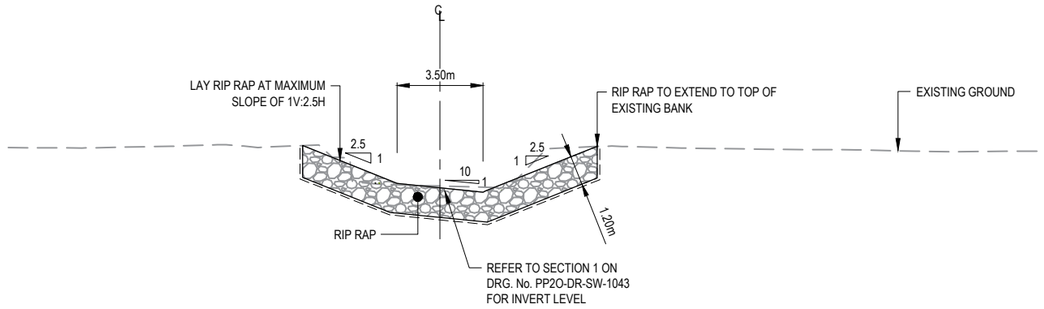
Subject: CULVERTS
Title: CULVERT No.24 (CH 7,250, MANGAONE STREAM CENTRAL) PLAN AND LONGITUDINAL SECTION

Discipline: STORMWATER
Drawing No.: PP2O-DR-SW-1039
Rev.: C

Document No. R:\30DD - DESIGN\DEVELOPMENT GENERAL\09 CAD\DRAWINGS\SW\PP2O-DR-SW-1039-1040.DWG

NOTES:

1. REFER TO DRAWING PP2O-DR-SW-1001-1004 FOR RIPRAP SCHEDULE.



2 / 1043 SECTION
SCALE 1:125 (A1)

A1 SCALE 1:125
A3 SCALE 1:250
0 5 10 15 (m)

ORIGINAL IN COLOUR

FOR INFORMATION
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
A	100% DESIGN	GD	DK	BS	30.05.18

Scale (A1) AS SHOWN
Scale (A3)

Design			Approved For Construction
Drawn	S.Halliday	24.07.17	
Dsg Verifier			
Drg Check			Date

* Refer to Original Hardcopy for Signature

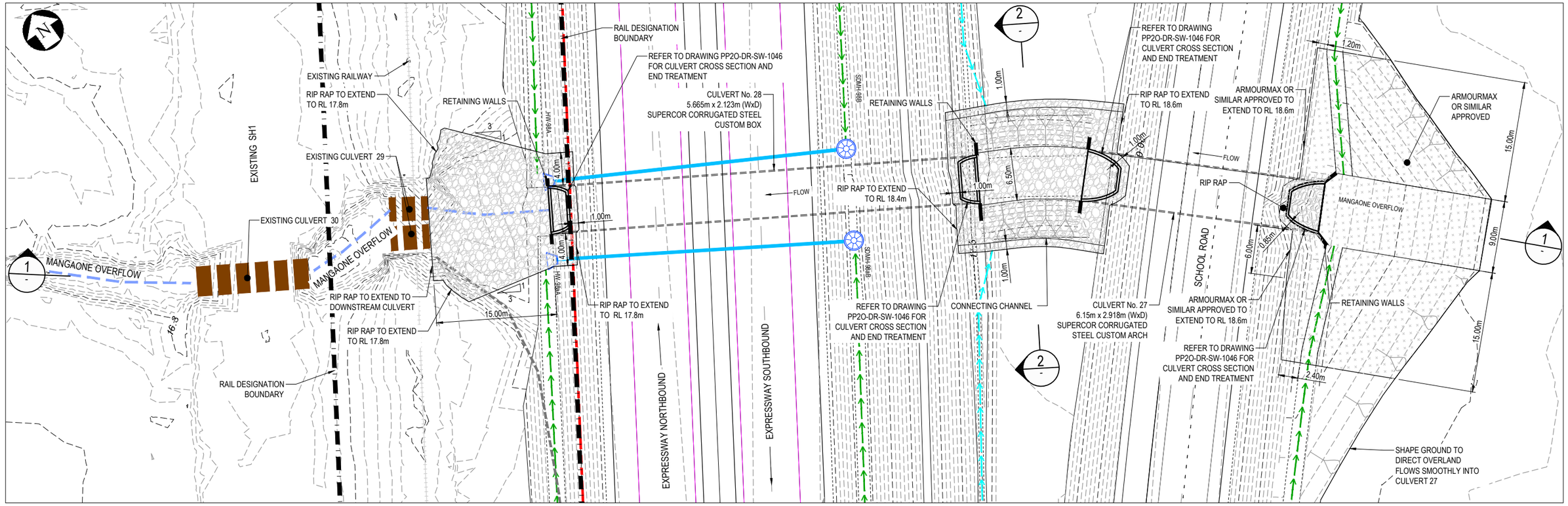
NZ TRANSPORT AGENCY WAKA KOTAHI
Peka Peka to Ōtaki Expressway
Fletcher HIGGINS
Beca Tonkin+Taylor

Subject: CULVERTS
Title: CULVERT No.23 (CH 7350, MANGAONE STREAM EAST) DETAILS

Discipline: STORMWATER
Drawing No.: PP2O-DR-SW-1044
Rev.: A

Document No. R:\30DD - DESIGN DEVELOPMENT GENERAL\09 CAD\DRAWINGS\SW\PP2O-DR-SW-1043-1044.DWG

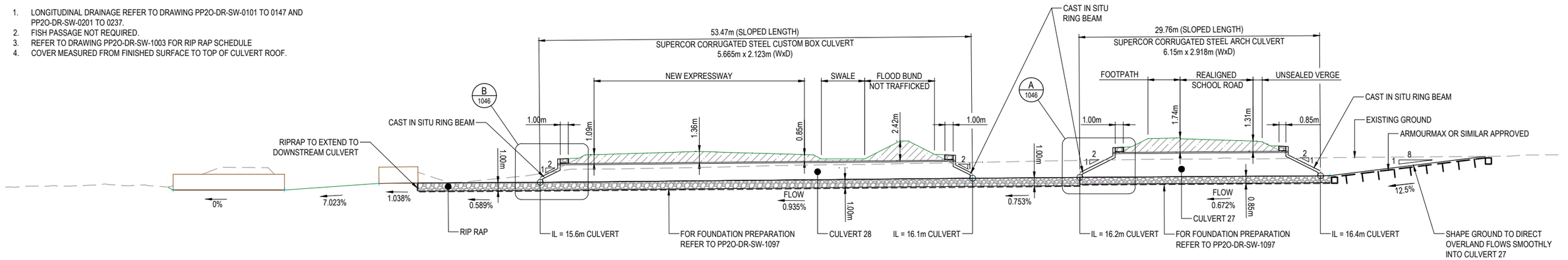
Save Date: 06 Jun 2018 4:56 p.m.



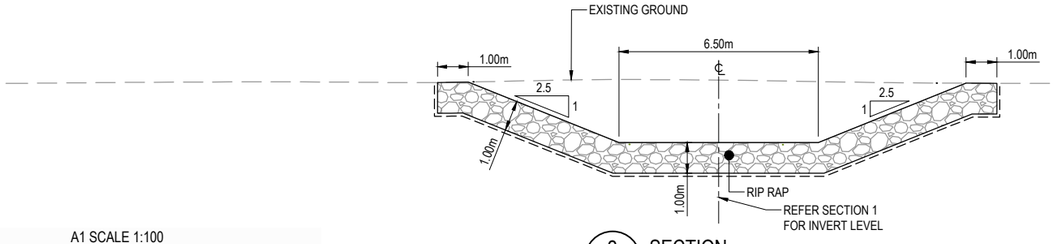
PLAN - LAYOUT
SCALE: 1:250 (A1) 1:500 (A3)

NOTES:

1. LONGITUDINAL DRAINAGE REFER TO DRAWING PP2O-DR-SW-0101 TO 0147 AND PP2O-DR-SW-0201 TO 0237.
2. FISH PASSAGE NOT REQUIRED.
3. REFER TO DRAWING PP2O-DR-SW-1003 FOR RIP RAP SCHEDULE
4. COVER MEASURED FROM FINISHED SURFACE TO TOP OF CULVERT ROOF.



1 - LONGITUDINAL SECTION
SCALE: 1:250 (A1) 1:500 (A3)



2 - SECTION
SCALE: 1:100 (A1) 1:200 (A3)

A1 SCALE 1:250
A3 SCALE 1:500
0 10 20 30 (m)

A1 SCALE 1:100
A3 SCALE 1:200
0 1 2 3 4 6 8 10 (m)

ORIGINAL IN COLOUR

FOR INFORMATION
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
C	100% DESIGN	RMT	DK	BS	28.05.18
B	80% DESIGN ALL CULVERTS	AK	AH	BS	02.02.18
A	80% P1 CULVERT DESIGN	SJH	AH	BS	15.09.17

Scale (A1) AS SHOWN	Design	A.Houldsworth	15.12.17
Scale (A3) 1/2 SHOWN	Drawn	A.Kochar	29.01.18
	Dsg Verifier		
	Drg Check		

Approved For Construction
Date
* Refer to Original Hardcopy for Signature

NZ TRANSPORT AGENCY WAKA KOTAHI
Peka Peka to Ōtaki Expressway
Fletcher HIGGINS
Beca
Tonkin+Taylor

Subject: CULVERTS
Title: CULVERTS No.27 & 28 (CH7470, MANGAONE OVERFLOW) PLAN AND LONGITUDINAL SECTION

Discipline: STORMWATER
Drawing No.: PP2O-DR-SW-1045
Rev.: C

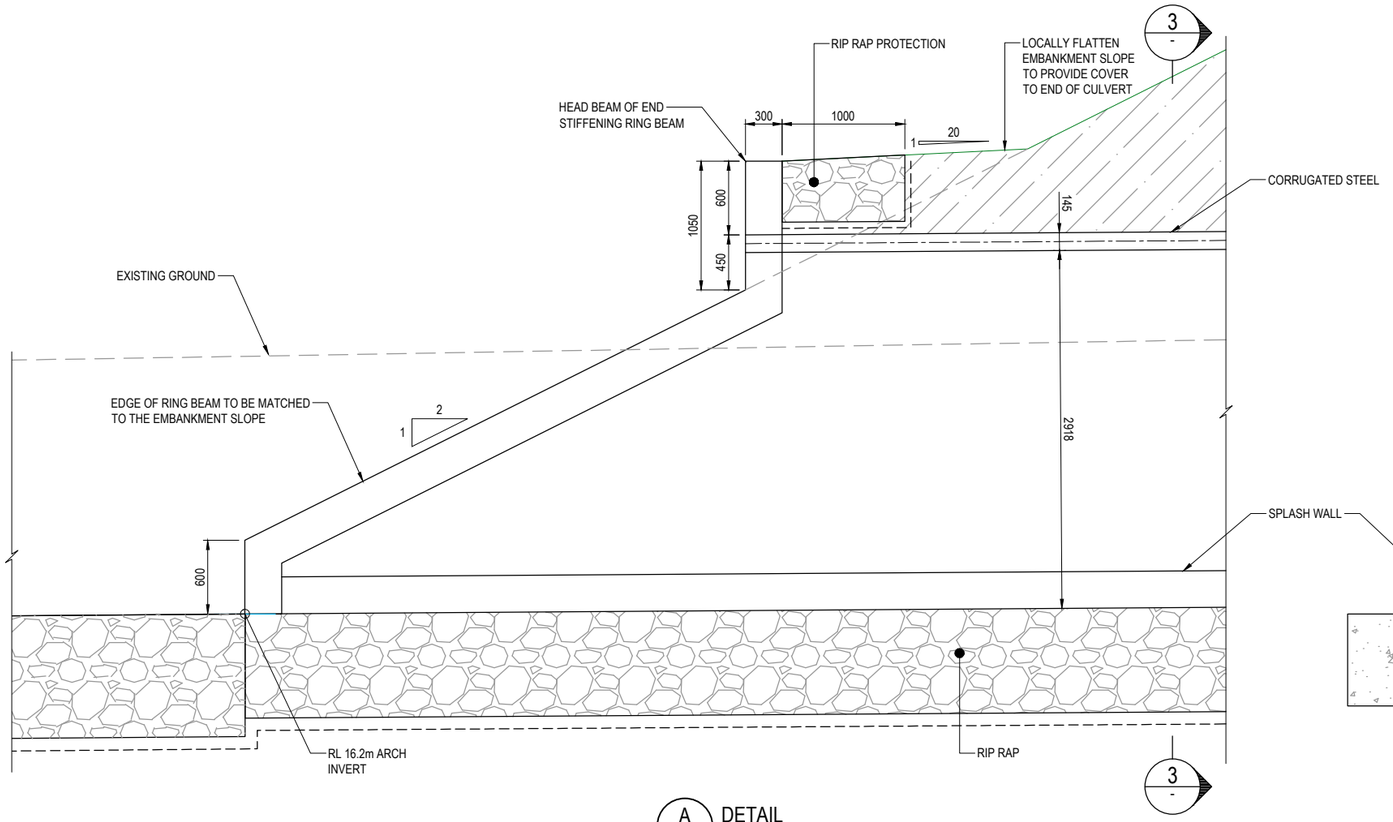
Document No. R:\30DD - DESIGN DEVELOPMENT GENERAL\09 CAD\DRAWINGS\SW\PP2O-DR-SW-1045-1046.DWG

ORIGINAL SIZE A1 : DO NOT SCALE

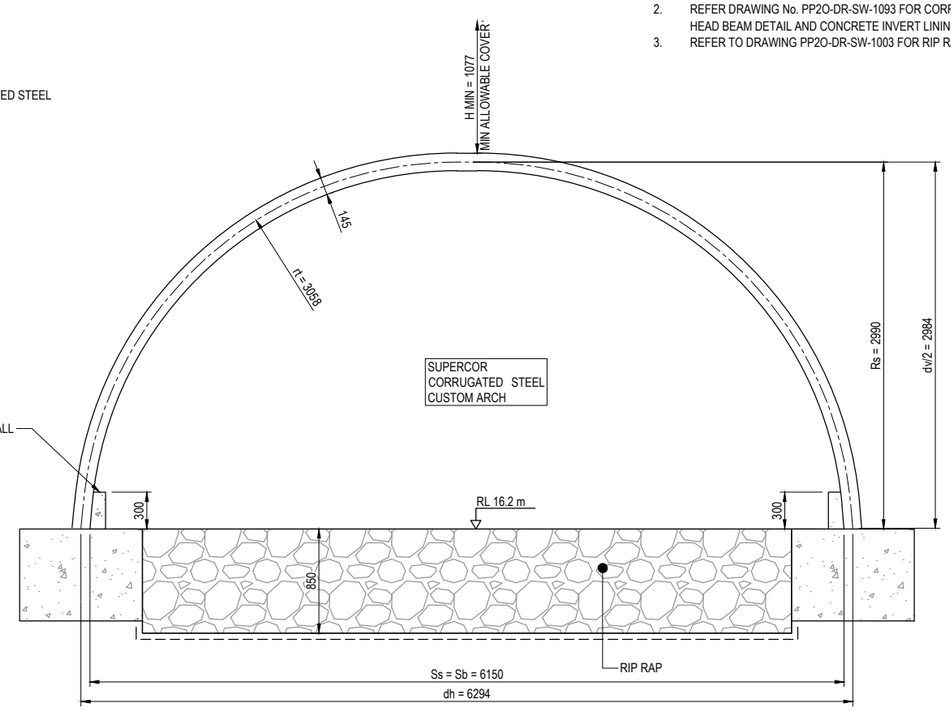
IF IN DOUBT ASK

NOTES:

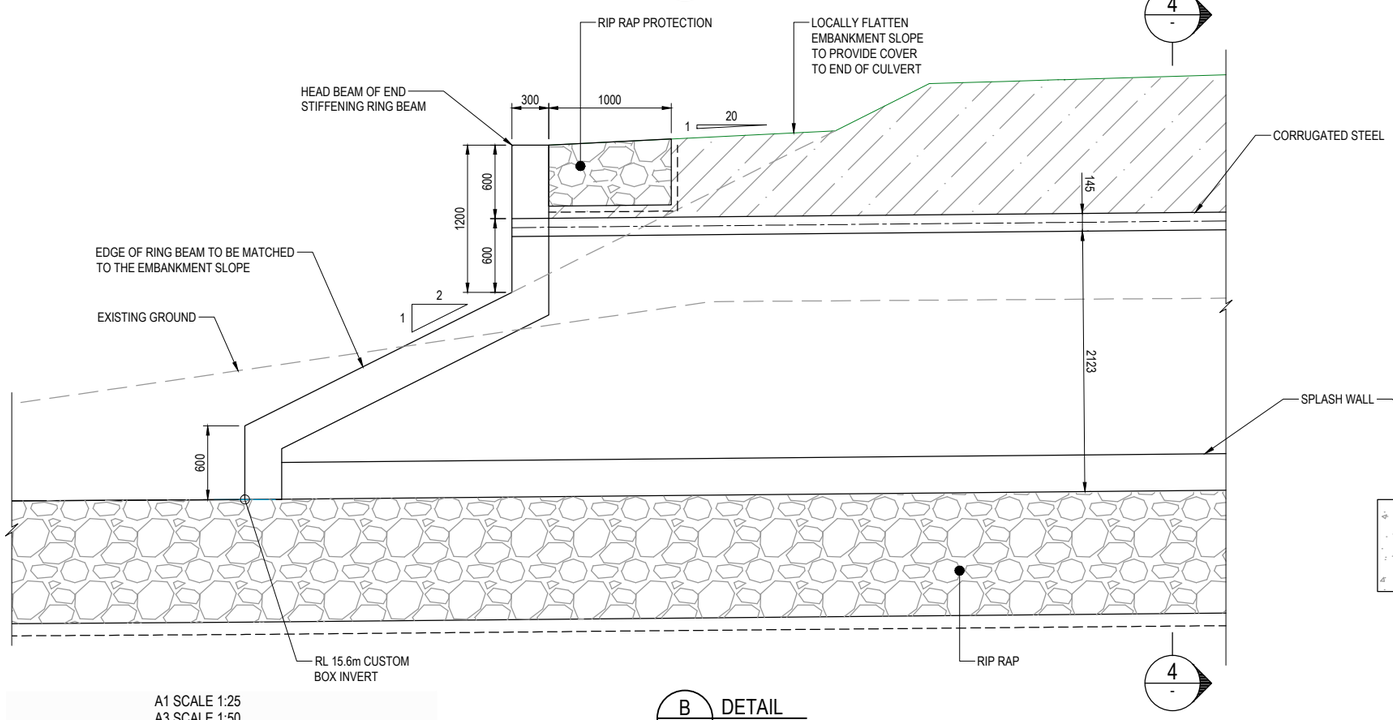
1. FOR CULVERTS 27 AND 28 PLAN AND LONGSECTION REFER TO DRAWING PP2O-DR-SW-1045.
2. REFER DRAWING No. PP2O-DR-SW-1093 FOR CORRUGATION DETAIL, HEAD BEAM DETAIL AND CONCRETE INVERT LINING DETAIL.
3. REFER TO DRAWING PP2O-DR-SW-1003 FOR RIP RAP SCHEDULE.



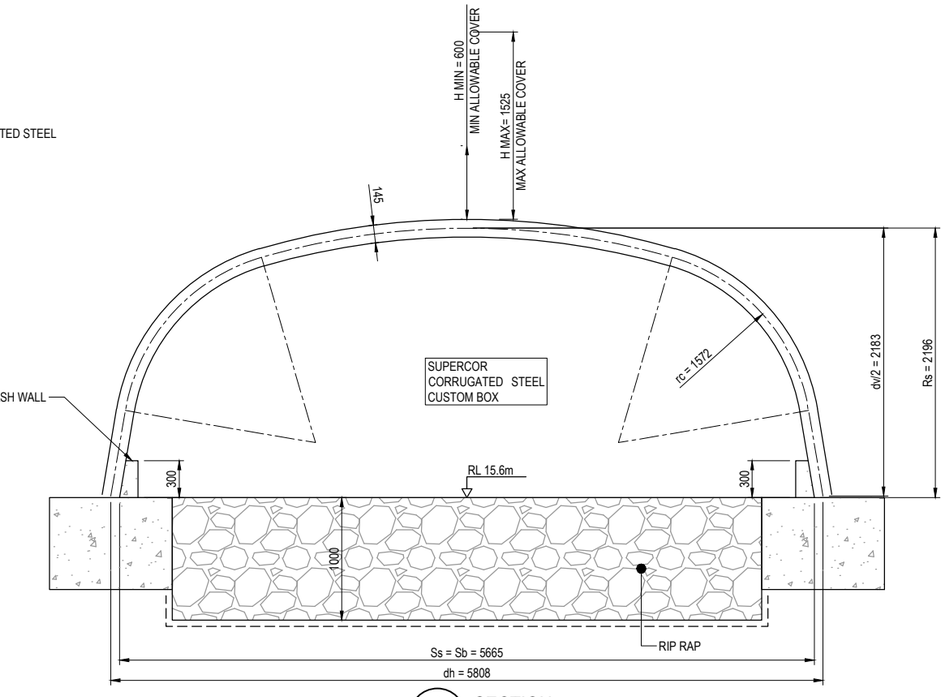
A 1045 DETAIL
SCALE: 1:25 (A1) 1:50 (A3)



3 - SECTION
SCALE: 1:25 (A1) 1:50 (A3)



B 1045 DETAIL
SCALE: 1:25 (A1) 1:50 (A3)



4 - SECTION
SCALE: 1:25 (A1) 1:50 (A3)

A1 SCALE 1:25
A3 SCALE 1:50
0 1.0 2.0 3.0 (m)

ORIGINAL IN COLOUR

FOR INFORMATION
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
B	100% DESIGN	LW	DK	BS	18.05.18
A	80% DESIGN ALL CULVERTS	SJH	AH	BS	02.02.18

Design	A.Houldsworth	15.12.17	Approved For Construction
Drawn	S.Halliday	24.07.17	
Dsg Verifier			
Drg Check			Date

Scale (A1) 1:25
Scale (A3) 1:50
* Refer to Original Hardcopy for Signature

NZ TRANSPORT AGENCY WAKA KOTAHI
Peka Peka to Ōtaki Expressway
Fletcher HIGGINS
Beca Tonkin+Taylor

Subject: CULVERTS
Title: CULVERTS No.27 & 28 (CH7,470, MANGAONE OVERFLOW) DETAILS

Discipline: STORMWATER
Drawing No.: PP2O-DR-SW-1046
Rev.: B

Document No. R:\3DDD - DESIGN DEVELOPMENT GENERAL\09 CAD\DRAWINGS\SW\PP2O-DR-SW-1045-1046.DWG

ORIGINAL SIZE A1 : DO NOT SCALE

IF IN DOUBT ASK

Save Date: 06 Jun 2018 4:59 p.m.

EXISTING CULVERT TO BE REMOVED

PROPOSED CULVERT 36. REFER PP2O-DR-SW-1051

SWALE

REFER TO DRAWING PP2O-DR-SW-1050 FOR CULVERT CROSS SECTION AND END TREATMENT

TRANSITION TO STREAM DIVERSION EROSION PROTECTION. REFER TO DRG. PP2O-DR-SW-1151

11.20m

0.85m

GEAR STREAM DIVERSION CENTERLINE

TRANSITION TO STREAM DIVERSION EROSION PROTECTION. REFER TO DRG. PP2O-DR-SW-1151

RETAINING WALL

RIP RAP TO EXTEND UP TO 15.5mRL

EXISTING STREAM TO REMAIN AS HABITAT

GEAR STREAM

EXISTING CULVERT TO BE REMOVED OR CUT SHORT

GEAR ROAD

EXISTING STREAM TO BE REMOVED

CULVERT No. 35
3.965m x 2.505m (WxD)
MULTI-PLATE CORRUGATED STEEL PIPE ARCH 21PA5-14
EMBEDDED 0.35m BELOW STREAM BED.
CONCRETE INVERT LINING.

FLOW

5.00m

RETAINING WALL

RIP RAP TO EXTEND UP TO 15.6mRL

TRANSITION TO STREAM DIVERSION EROSION PROTECTION. REFER TO DRG. PP2O-DR-SW-1151

HOLD
POTENTIAL CLASH WITH NEW POWER PYLON

GEAR STREAM DIVERSION CENTERLINE

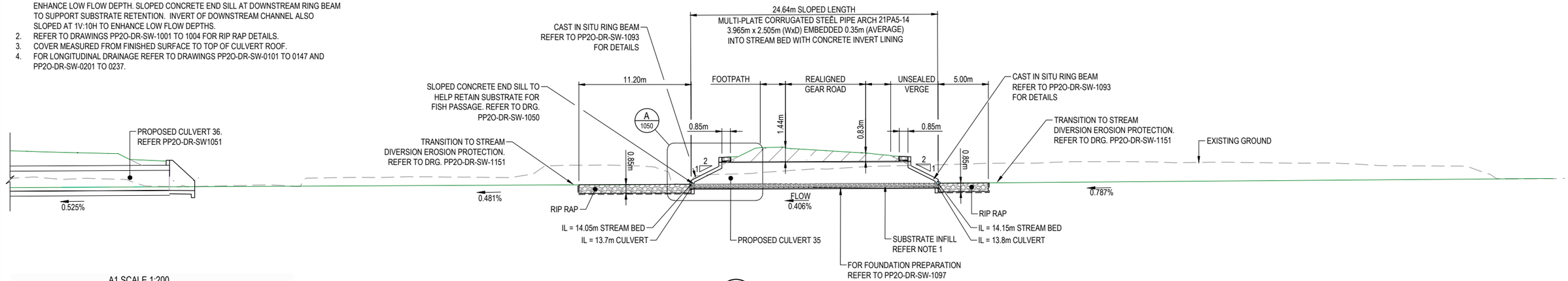
EXPRESSWAY DESIGNATION BOUNDARY

NOTES:

1. FISH PASSAGE PROVIDED BY EMBEDDING CULVERT IN STREAM BED. SUBSTRATE TO BE PLACED IN CULVERT DURING CONSTRUCTION AND TO MATCH EXISTING STREAM BED MATERIAL (SOURCED FROM STREAM DIVERSION EXCAVATION). AVERAGE DEPTH OF SUBSTRATE TO BE 0.35m, SLOPING AT 1V:10H ACROSS THE CULVERT BARREL TO ENHANCE LOW FLOW DEPTH. SLOPED CONCRETE END SILL AT DOWNSTREAM RING BEAM TO SUPPORT SUBSTRATE RETENTION. INVERT OF DOWNSTREAM CHANNEL ALSO SLOPED AT 1V:10H TO ENHANCE LOW FLOW DEPTHS.
2. REFER TO DRAWINGS PP2O-DR-SW-1001 TO 1004 FOR RIP RAP DETAILS.
3. COVER MEASURED FROM FINISHED SURFACE TO TOP OF CULVERT ROOF.
4. FOR LONGITUDINAL DRAINAGE REFER TO DRAWINGS PP2O-DR-SW-0101 TO 0147 AND PP2O-DR-SW-0201 TO 0237.

PLAN - LAYOUT

SCALE: 1:200 (A1) 1:400 (A3)



1 - LONGITUDINAL SECTION

SCALE 1:200 (A1) 1:400 (A3)

A1 SCALE 1:200
A3 SCALE 1:400

0 5 10 15 20 25 (m)

ORIGINAL IN COLOUR

FOR INFORMATION
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
C	100% DESIGN	RMT	DK	BS	18.05.18
B	80% DESIGN ALL CULVERTS	JL	AH	BS	02.02.18
A	80% P1 CULVERT DESIGN	SJH	AH	BS	15.09.17

Design	A.Houldsworth	15.12.17	Approved For Construction
Drawn	A.Kochar	29.01.18	
Dsg Verifier			
Drg Check			Date

Scale (A1) 1:200
Scale (A3) 1:400
* Refer to Original Hardcopy for Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Peka Peka to Ōtaki Expressway | Fletcher HIGGINS | Beca | Tonkin+Taylor

Subject: CULVERTS
Title: CULVERT No.35 (CH 8600, GEAR STREAM EAST) PLAN AND LONGITUDINAL SECTION

Discipline: STORMWATER
Drawing No.: PP2O-DR-SW-1049
Rev.: C

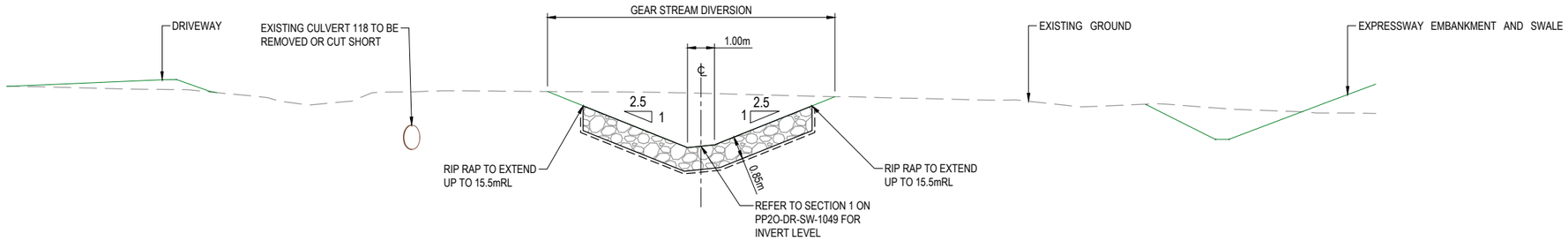
Document No. R/300D - DESIGN DEVELOPMENT GENERAL\09 CAD\DRAWINGS\WPP2O-DR-SW-1049-1050.DWG

ORIGINAL SIZE A1 : DO NOT SCALE

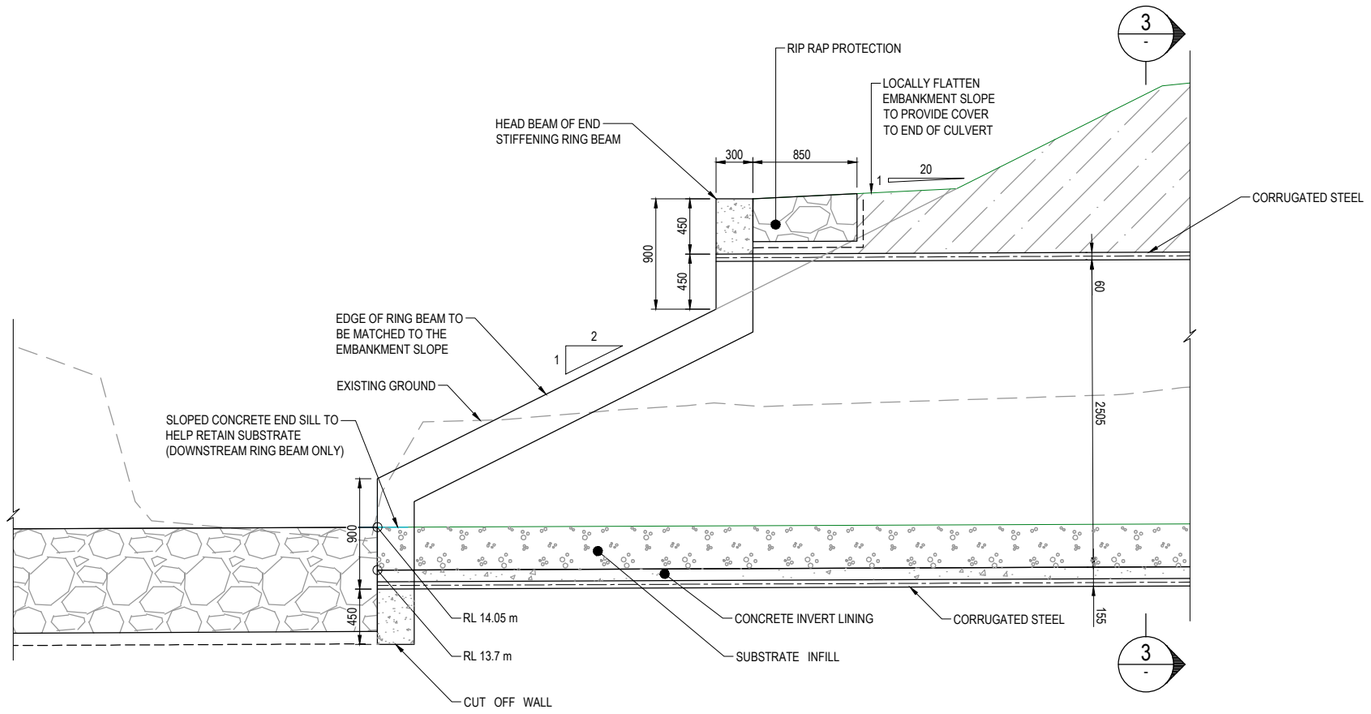
IF IN DOUBT ASK

NOTES:

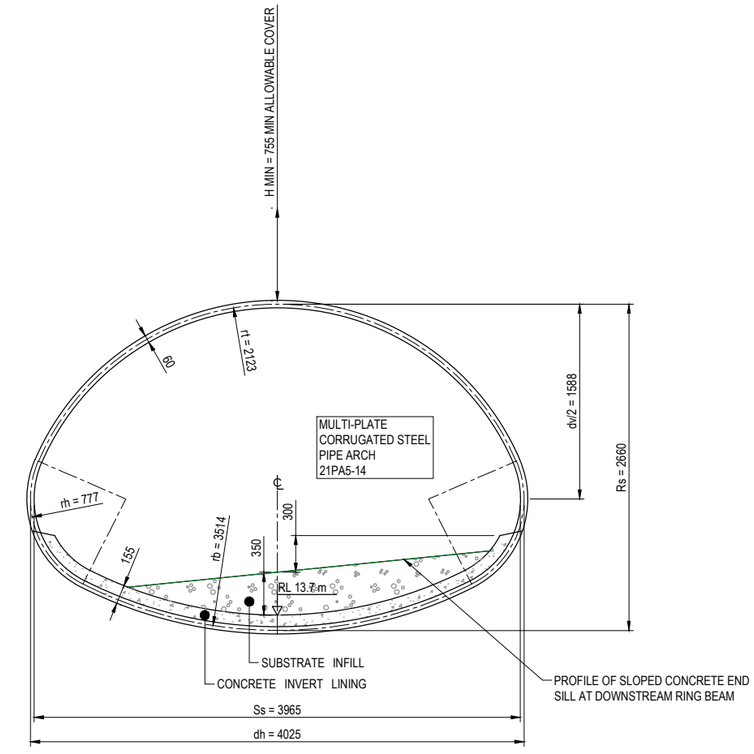
1. FOR CULVERT 35 PLAN AND LONGSECTION REFER TO DRAWING PP2O-DR-SW-1049.
2. REFER DRAWING PP2O-DR-SW-1093 FOR CORRUGATION DETAIL, HEAD BEAM DETAIL AND CONCRETE INVERT LINING DETAIL.
3. REFER TO DRAWING PP2O-DR-SW-1003 FOR RIP RAP SCHEDULE.



2 / 1049 SECTION
SCALE: 1:100 (A1) 1:200 (A3)



A / 1049 DETAIL
SCALE: 1:25 (A1) 1:50 (A3)



3 / - SECTION
SCALE: 1:25 (A1) 1:50 (A3)

A1 SCALE 1:25
A3 SCALE 1:50
0 1.0 2.0 3.0 (m)

A1 SCALE 1:100
A3 SCALE 1:200
0 1 2 3 4 6 8 10 (m)

ORIGINAL IN COLOUR

FOR INFORMATION
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
B	100% DESIGN	LW	DK	BS	18.05.18
A	80% DESIGN ALL CULVERTS	SJH	AH	BS	02.02.18

Scale (A1) AS SHOWN
Scale (A3) 1/2 SHOWN

Design	A.Houldsworth	15.12.17	Approved For Construction
Drawn	A.Kochar	29.01.18	
Dsg Verifier			
Drg Check			Date

* Refer to Original Hardcopy for Signature

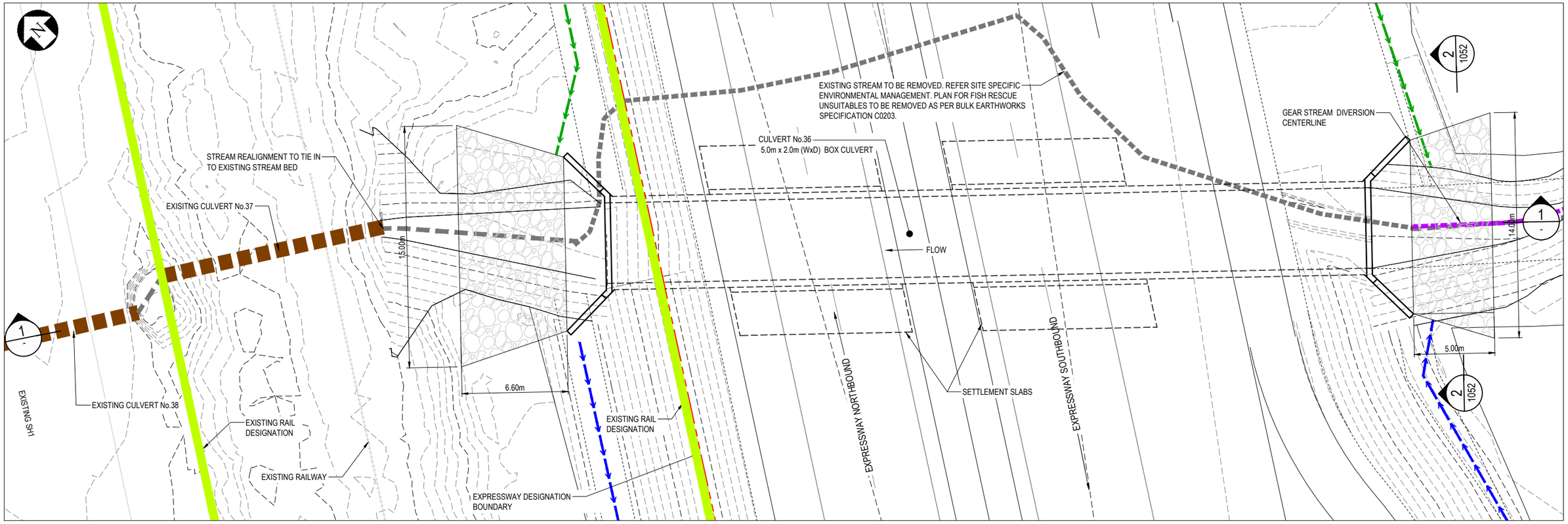
NZ TRANSPORT AGENCY WAKA KOTAHI
Peka Peka to Ōtaki Expressway
Fletcher HIGGINS
Beca
Tonkin+Taylor

Subject: CULVERTS
Title: CULVERT No.35 (CH 8,600, GEAR STREAM EAST) DETAILS
Discipline: STORMWATER
Drawing No.: PP2O-DR-SW-1050
Rev.: B

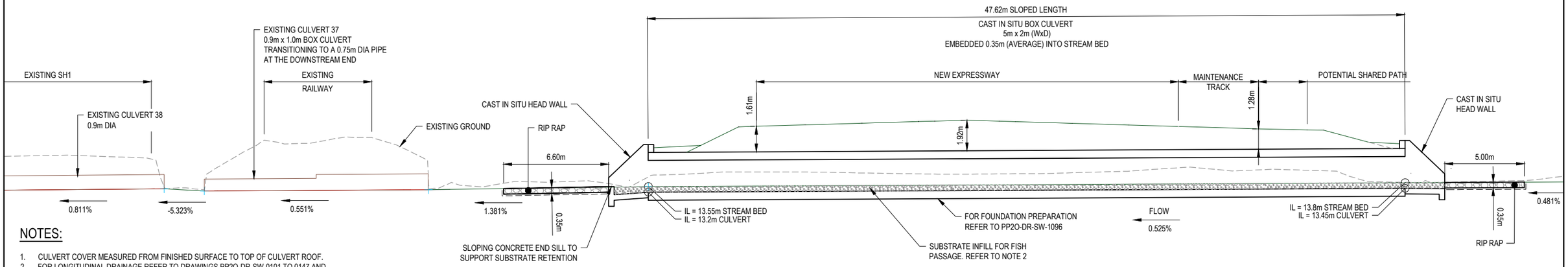
Document No. R:\30DD - DESIGN DEVELOPMENT GENERAL\09 CAD\DRAWINGS\SW\PP2O-DR-SW-1049-1050.DWG

ORIGINAL SIZE A1 : DO NOT SCALE

IF IN DOUBT ASK



PLAN - LAYOUT
SCALE 1:125(A1)



NOTES:

1. CULVERT COVER MEASURED FROM FINISHED SURFACE TO TOP OF CULVERT ROOF.
2. FOR LONGITUDINAL DRAINAGE REFER TO DRAWINGS PP2O-DR-SW-0101 TO 0147 AND PP2O-DR-SW-0201 TO 023.
3. FISH PASSAGE PROVIDED BY EMBEDDING CULVERT IN STREAM BED. SUBSTRATE TO BE PLACED IN CULVERT DURING CONSTRUCTION AND TO MATCH EXISTING STREAM BED MATERIAL (SOURCED FROM STREAM DIVERSION EXCAVATION). AVERAGE DEPTH OF SUBSTRATE TO BE 0.35m, SLOPING 1T 1V:10H ACROSS THE CULVERT BARREL TO ENHANCE LOW FLOW DEPTH. SLOPED CONCRETE END SILL AT DOWNSTREAM WING WALL TO SUPPORT SUBSTRATE RETENTION.
4. FOR STRUCTURAL DETAILS FOR CULVERT BARREL, SETTLEMENT SLABS AND HEADWALLS REFER STRUCTURAL DRAWINGS (PP2O-DR-SC-3600 TO 3633).
5. REFER TO DRAWINGS PP2O-DR-SW-1001 TO 1004 FOR RIP RAP DETAILS.

1 - LONGITUDINAL SECTION
SCALE 1:125 (A1)

A1 SCALE 1:125
A3 SCALE 1:250
0 5 10 15 (m)

ORIGINAL IN COLOUR

FOR INFORMATION
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
C	100% DESIGN	GD	DK	BS	18.05.18
B	80% DESIGN ALL CULVERTS	JL	AH	BS	2.02.18
A	80% P1 CULVERT DESIGN	SJH	AH	BS	15.09.17

Scale (A1) AS SHOWN
Scale (A3)

Design	A.Houldsworth	15.12.17	Approved For Construction
Drawn	S.Halliday	24.07.17	
Dsg Verifier			
Drg Check			Date

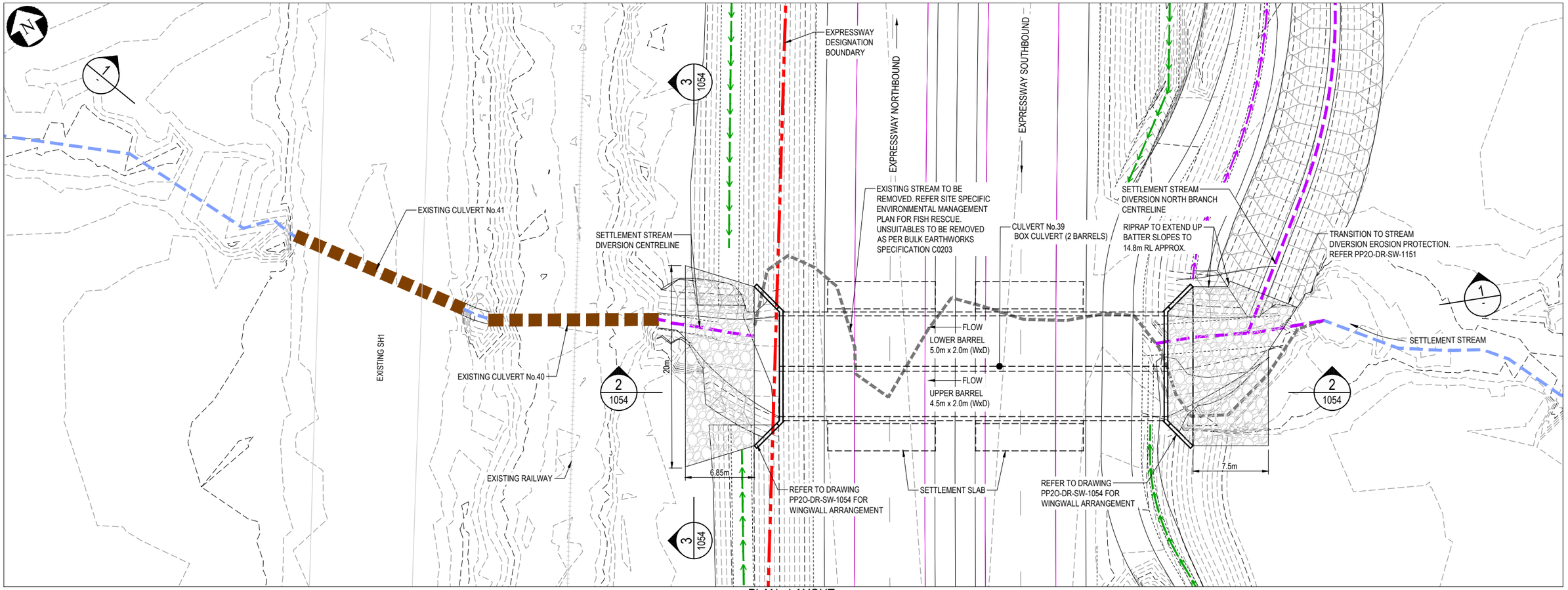
* Refer to Original Hardcopy for Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Peka Peka to Ōtaki Expressway | Fletcher HIGGINS | Beca | Tonkin+Taylor

Subject: CULVERTS
Title: CULVERT No.36 (CH8620, GEAR STREAM WEST) PLAN AND LONGITUDINAL SECTION

Discipline: STORMWATER
Drawing No.: PP2O-DR-SW-1051
Rev.: C

Document No. R130DD - DESIGN DEVELOPMENT GENERAL\09 CAD\DRAWINGS\SW\PP2O-DR-SW-1051-1052.DWG

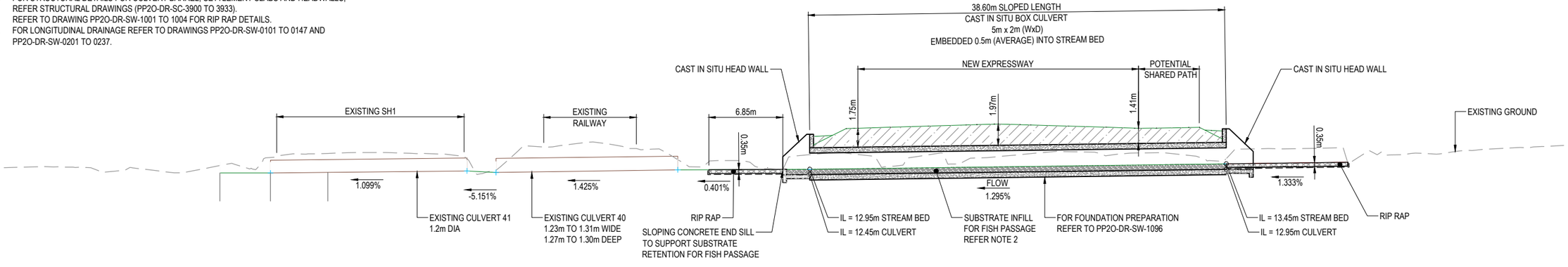


PLAN - LAYOUT

SCALE 1:200 (A1) 1:400 (A3)

NOTES:

1. CULVERT COVER MEASURED FROM FINISHED SURFACE TO TOP OF CULVERT ROOF.
2. FISH PASSAGE TO BE PROVIDED BY CONSTRUCTING ONE BARREL OF CULVERT LOWER, AND EMBEDDING CULVERT IN STREAM BED. SUBSTRATE TO BE PLACED IN CULVERT DURING CONSTRUCTION AND TO MATCH EXISTING STREAMBED MATERIAL. AVERAGE DEPTH OF SUBSTRATE TO BE 0.285m AVERAGE IN UPPER BARREL AND 0.5m AVERAGE IN LOWER BARREL, SLOPING AT 1V:10H ACROSS CULVERT BARREL TO ENHANCE LOW FLOW DEPTH. SLOPED CONCRETE END SILL AT DOWNSTREAM WING WALL TO SUPPORT SUBSTRATE RETENTION. REFER PP2O-DR-SW-1054.
3. FOR STRUCTURAL DETAILS FOR CULVERT BARREL, SETTLEMENT SLABS AND HEADWALLS, REFER STRUCTURAL DRAWINGS (PP2O-DR-SC-3900 TO 3933).
4. REFER TO DRAWING PP2O-DR-SW-1001 TO 1004 FOR RIP RAP DETAILS.
5. FOR LONGITUDINAL DRAINAGE REFER TO DRAWINGS PP2O-DR-SW-0101 TO 0147 AND PP2O-DR-SW-0201 TO 0237.



1 - LONGITUDINAL SECTION

SCALE 1:200 (A1) 1:400 (A3)

A1 SCALE 1:200
A3 SCALE 1:400

0 5 10 15 20 25 (m)

ORIGINAL IN COLOUR

FOR INFORMATION
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
C	100% DESIGN	RMT	DK	BS	30.05.18
B	80% DESIGN ALL CULVERTS	LW	AH	BS	2.02.18
A	80% P1 CULVERT DESIGN	SJH	AH	BS	15.09.17

Scale (A1) 1:200
Scale (A3) 1:400

Design	A.Houldsworth	24.07.17	Approved For Construction -
Drawn	S.Halliday	24.07.17	
Dsg Verifier	-	-	
Drg Check	-	-	Date -

* Refer to Original Hardcopy for Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Peka Peka to Ōtaki Expressway | Fletcher HIGGINS | Beca | Tonkin+Taylor

Subject: CULVERTS
Title: CULVERT No.39 (CH 8,920 SETTLEMENT STREAM) PLAN AND LONGITUDINAL SECTION

Discipline: STORMWATER
Drawing No.: PP2O-DR-SW-1053
Rev.: C

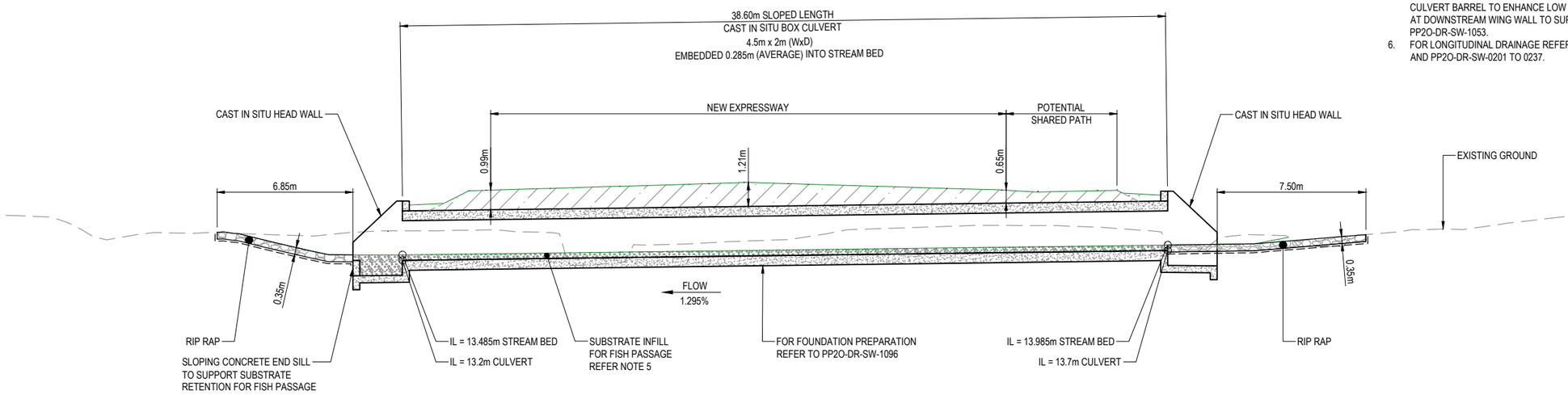
Document No. R:\30DD - DESIGN\DEVELOPMENT GENERAL\09 CAD\DRAWINGS\SW\PP2O-DR-SW-1053-1054.DWG

ORIGINAL SIZE A1 : DO NOT SCALE

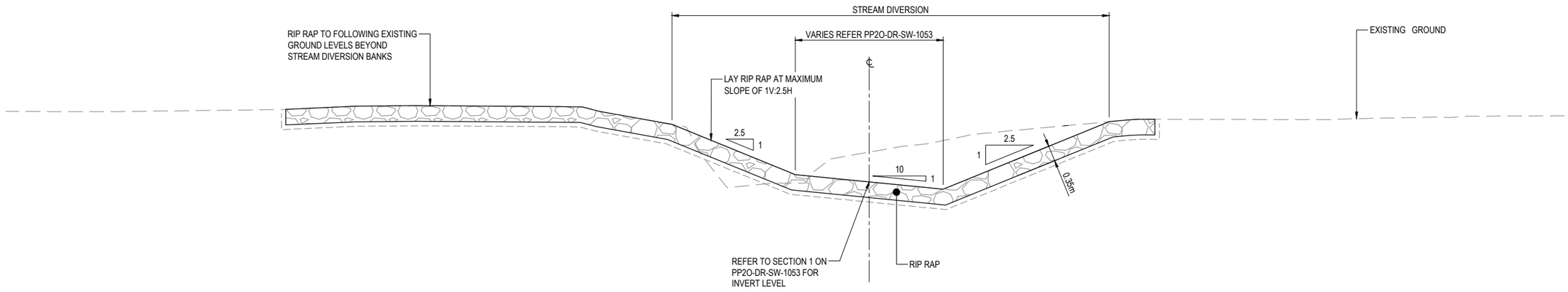
IF IN DOUBT ASK

NOTES:

1. LONGSECTION AND PLAN REFER TO DRAWING PP2O-DR-SW-1053.
2. REFER TO DRAWING PP2O-DR-SW-1002 FOR HEADWALL AND RIP RAP SCHEDULE.
3. CULVERT COVER MEASURED FROM FINISHED SURFACE TO TOP OF CULVERT ROOF.
4. FOR STRUCTURAL DETAILS FOR CULVERT BARREL AND HEADWALLS, REFER STRUCTURAL DRAWINGS PP2O-DR-SC-3900-3933.
5. FISH PASSAGE TO BE PROVIDED BY CONSTRUCTING ONE BARREL OF CULVERT LOWER, AND EMBEDDING CULVERT IN STREAM BED. SUBSTRATE TO BE PLACED IN CULVERT DURING CONSTRUCTION AND TO MATCH EXISTING STREAMBED MATERIAL. AVERAGE DEPTH OF SUBSTRATE TO BE 0.285m AVERAGE IN UPPER BARREL AND 0.5m AVERAGE IN LOWER BARREL, SLOPING AT 1V:10H ACROSS CULVERT BARREL TO ENHANCE LOW FLOW DEPTH. SLOPED CONCRETE END SILL AT DOWNSTREAM WING WALL TO SUPPORT SUBSTRATE RETENTION. REFER PP2O-DR-SW-1053.
6. FOR LONGITUDINAL DRAINAGE REFER TO DRAWINGS PP2O-DR-SW-0101 TO 0147 AND PP2O-DR-SW-0201 TO 0237.



2 / 1053 LONGITUDINAL SECTION
SCALE: 1:125 (A1) 1:250 (A3)



3 / 1053 SECTION
SCALE: 1:50 (A1) 1:100 (A3)

A1 SCALE 1:50
A3 SCALE 1:100
0 1 2 3 4 5 (m)

A1 SCALE 1:125
A3 SCALE 1:250
0 5 10 15 (m)

No.	Revision	By	Chk	Appd	Date
C	100% DESIGN	RMT	DK	BS	30.05.18
B	80% DESIGN ALL CULVERTS	G.G.	D.K.	B.S.	02.02.18
A	80% P1 CULVERT DESIGN	SJH	AH	BS	12.09.17

Scale (A1) AS SHOWN
Scale (A3) 1/2 SHOWN

Design	A.Houldsworth	24.07.17	Approved For Construction -
Drawn	S.Halliday	24.07.17	
Dsg Verifier	-	-	
Drg Check	-	-	Date -

* Refer to Original Hardcopy for Signature

NZ TRANSPORT AGENCY WAKA KOTAHI
Peka Peka to Ōtaki Expressway
Fletcher HIGGINS
Beca Tonkin+Taylor

ORIGINAL IN COLOUR

FOR INFORMATION
NOT FOR CONSTRUCTION

Subject: CULVERTS
Title: CULVERT No.39 (CH 8,920 SETTLEMENT STREAM) SECTIONS AND DETAILS
Discipline: STORMWATER
Drawing No.: PP2O-DR-SW-1054
Rev.: C

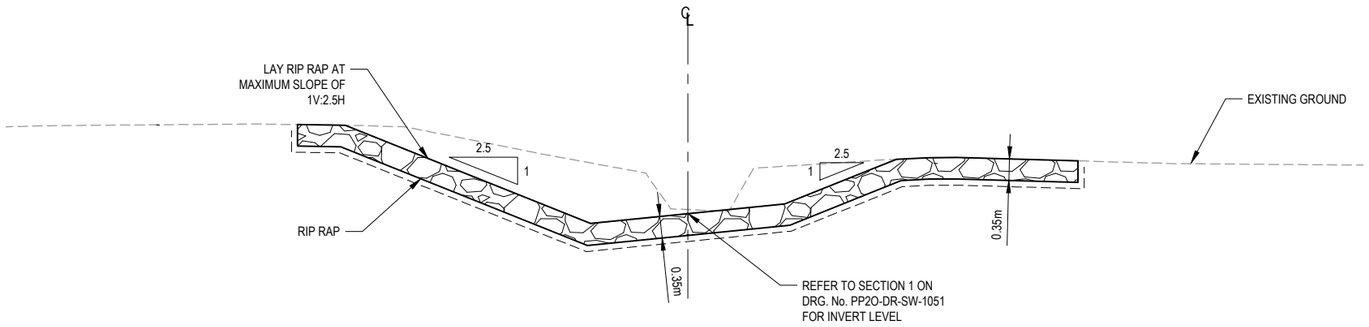
Document No. R:\30DD - DESIGN DEVELOPMENT GENERAL\09 CAD\DRAWINGS\WPP2O-DR-SW-1053-1054.DWG

ORIGINAL SIZE A1 : DO NOT SCALE

IF IN DOUBT ASK

NOTES:

1. REFER TO DRAWINGS PP2O-DR-SW-1001 TO 1004 FOR RIP RAP DETAILS.
2. FOR CULVERT 36 PLAN AND LONG SECTION REFER TO DRG. No. PP2O-DR-SW-1051



2 / 1051 SECTION
SCALE 1:50 (A1)

A1 SCALE 1:50
A3 SCALE 1:100
0 1 2 3 4 5 (m)

ORIGINAL IN COLOUR

FOR INFORMATION
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
A	100% DESIGN	GD	DK	BS	18.05.18

Scale (A1) AS SHOWN
Scale (A3)

Design	D.Knappstein	16.05.18	Approved For Construction
Drawn	G.Down	18.05.18	
Dsg Verifier			
Drg Check			Date

* Refer to Original Hardcopy for Signature

NZ TRANSPORT AGENCY WAKA KOTAHI
Peka Peka to Ōtaki Expressway
Fletcher HIGGINS
Beca Tonkin+Taylor

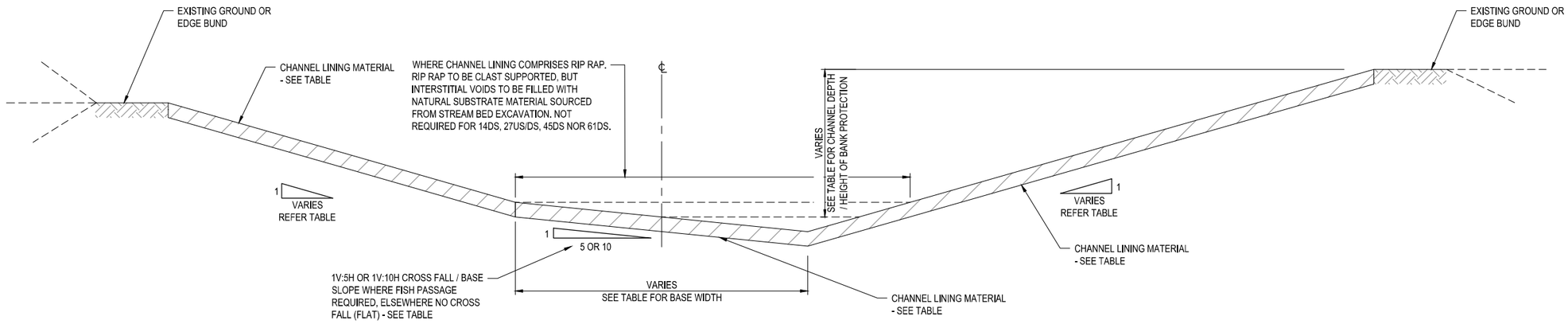
Subject: CULVERTS
Title: CULVERT No.36 (CH 8,620, GEAR STREAM WEST) DETAILS

Discipline: STORMWATER
Drawing No.: PP2O-DR-SW-1052
Rev.: A

Document No. R/30DD - DESIGN DEVELOPMENT GENERAL\09 CAD\DRAWINGS\WPP2O-DR-SW-1051-1052.DWG

NOTES:

1. REFER TO PP2O-DR-SW-1001 FOR ROCK CLASS GRADING.
2. REFER PP2O-DR-SW-1002 TO 1004 FOR DETAILS ON THE CULVERT INLET AND OUTLET PROTECTION IMMEDIATELY UPSTREAM AND DOWNSTREAM OF EACH CULVERT.



PERMANENT STREAM DIVERSION CHANNEL TYPICAL SECTION

SCALE: 1:50 (A1) 1:100 (A3)

Permanent Stream Diversion ID = Culvert Number, US for Upstream, DS for Downstream	Base width (m)	Base Slope (H/V)	Side slopes (1V:)	Slope (%)	Channel Depth (m)	Total Stream Diversion Channel Length (m)	Height of bank protection (m)	Design Velocity (m/s)	Channel Lining Material	Length of channel lining material required (upstream/downstream of culvert inlet/outlet protection) (m)	Rip Rap Class	Rip Rap Layer Thickness (m)
1 US	0.50	10	2.5	1.86	1.00	16	1.00	2.5	Rock rip rap - class 2 on channel base and banks	11	2	0.60
3 DS	3.00	10	2.5	0.30	1.00	55	1.00	1.4	No special requirements (grass only) until the 3 DS final section.	30		
3 DS final section	2.00	10	2.5	5.00	1.00		1.00	3.5	Rock rip rap chute - class 4 on channel base and banks	9	4	0.85
9-10 US	2.50	10	2.5	1.89	1.25	30	1.25	2.2	Rock rip rap - class 1 on channel banks and class 2 on channel base*	0*	1	0.35
											2	0.60
9-10 DS	2.50	10	2.5	-0.80	1.60	14	1.60	1.6	Rock rip rap - class 1 on channel base and banks	3	1	0.35
14 DS	3.00	Flat	2.5	0.34	2.20	83	N/A	1.2	No special protection requirements (grass only)	62		
23 US	3.50	10	2.5	1.43	1.80	42	1.80	3.2	Rock rip rap - class 3 on channel base and banks	37	3	0.70
23 DS	3.50	10	2.5	1.17	1.80	100	1.80	3.0	Rock rip rap - class 2 on channel banks and class 3 rip rap on channel base	73	2	0.60
											3	0.70
27 US	9.00	Flat	8.0	12.50	1.30	20	1.30	6.0	ArmorMax (or similar approved) reinforced turf protection upstream of culvert inlet	0*		
27 DS	6.50	Flat	2.5	0.75	1.85	13	1.85	2.5	Rock rip rap - class 5 rip rap*	0*	5	1.00
35 US	0.50	10	2.5	0.79	1.60	55	1.60	2.0	Rock rip rap - class 1 on channel base and banks	50	1	0.35
35 DS	1.00	10	2.5	0.48	1.40	50	1.40	1.6	Rock rip rap - class 1 on channel base and banks	33	1	0.35
39 US North Trib	1.00	10	2.5	0.83	0.50	60	N/A	1.4	No special protection requirements (grass only)	60		
42 US	0.50	10	2.5	0.99	0.65	42	N/A	1.4	No special protection requirements (grass only)	37		
42 DS	0.50	10	2.5	1.19	0.65	15	N/A	1.5	No special protection requirements (grass only)	10		
45 DS	0.50	Flat	2.5	5.33	0.75	42	0.75	3.0	Rock rip rap - class 3 on channel base and banks	35	3	0.70
50a US	0.50	10	2.5	1.56	2.10	37	N/A	1.1	No special protection requirements (grass only)	32		
50 US	0.50	10	2.5	1.29	1.25	19	1.25	1.9	Enkamat A20, or similar approved - on channel base and banks	9		
50 DS	1.00	10	2.5	1.26	0.60	80	0.60	1.8	Enkamat A20, or similar approved - on channel base and banks	65		
53 US	0.50	10	2.5	2.25	1.25	52	1.25	3.1	Rock rip rap - class 3 on channel base and banks	47	3	0.70
53 DS	2.00	10	2.5	1.97	0.60	60	0.60	2.2	Rock rip rap - class 2 on channel base and banks	45	2	0.60
59 US	1.50	10	2.5	0.22	0.70	21	N/A	0.8	No special protection requirements (grass only)	17		
59 DS	1.50	10	2.5	0.20	0.60	150	N/A	0.8	No special protection requirements (grass only)	146		
61 DS	0.75	Flat	2.5	0.63	0.54	23	N/A	0.8	No special protection requirements (grass only)	20		

* Channel lining for stream diversion is the same type and length as proposed for the culvert inlet/outlet protection, refer PP2Ō-DR-SW-1002 to 1004

A1 SCALE 1:50
A3 SCALE 1:100
0 1 2 3 4 5 (m)

ORIGINAL IN COLOUR

For Information

No.	Revision	By	Chk	Appd	Date
1	ISSUED FOR CONSTRUCTION (CULVERTS)	LW	DK	SW	29.06.18

Scale (A1) 1:50
Scale (A3) 1:100

Design	D. K	31.01.18	Approved For Construction
Drawn	L. Wang	31.01.18	
Dsg Verifier			
Drg Check			Date

* Refer to Original Hardcopy for Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Peka Peka to Ōtaki Expressway | Fletcher HIGGINS | Beca | Tonkin+Taylor

Subject: STREAM DIVERSIONS
Title: STREAM DIVERSION STANDARD DETAILS SHEET 1

Discipline: STORMWATER
Drawing No.: PP2O-DR-SW-1151
Rev.: 1

Document No. R130DD - DESIGN DEVELOPMENT GENERAL\09 CAD\DRAWINGS\SW\PP2O-DR-SW-1151.DWG

ORIGINAL SIZE A1 : DO NOT SCALE

IF IN DOUBT ASK

Landscape Plans

Planting Key

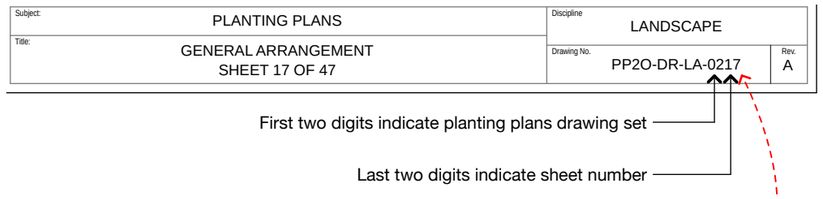
- MP-XX — Mass Planting
- MP-D-XX — Mass Planting Dune
- MPT-XX — Mass Planting with Tree Enrichment
- MPT-D-XX — Mass Planting Dune with Tree Enrichment
- MPS-XX — Mass Planting Steep Sites
- LP-XX — Low Planting
- LP-D-XX — Low Planting Dune
- SC-XX — Swale - Cobbled
- SG-XX — Swale - Grassed
- SP-XX — Swale - Planted
- RPA-XX — Riparian Planting - Standing Water
- RPB-XX — Riparian Planting - Lower Bank
- RPC-XX — Riparian Planting - Upper Bank
- WPA-XX — Wetland Planting - Land Edge
- WPB-XX — Wetland Planting - Periodically Inundated
- WPC-XX — Wetland Planting - Wet Margin (0.0-0.3m depth)
- WPD-XX — Wetland Planting - Shallow Zone (0.3+m depth)
- RVP-XX — River Planting
- TP-XX — Terrestrial Revegetation Planting
- TPM-XX — Terrestrial Mitigation Planting Makahuri/Mary Crest
- LSW-XX — Low Stature Wetland Planting
- SWF-XX — Swamp Forest Mitigation Planting
- RPMA-XX — Riparian Mitigation Planting - Standing Water
- RPMB-XX — Riparian Mitigation Planting - Lower Bank
- RPMC-XX — Riparian Mitigation Planting - Upper Bank
- G-XX — Grass
- SHB-XX — Shelter Belt Planting
- EVR — Existing Vegetation Retained
- Bottom/Base of Channel
- Designation Boundary
- Existing Road/Rail
- Back of Verge
- Embankment Ground Interface
- Kerb Face
- TOP / BOTTOM — Slope/Embankment
- Rip-Rap

Notes:

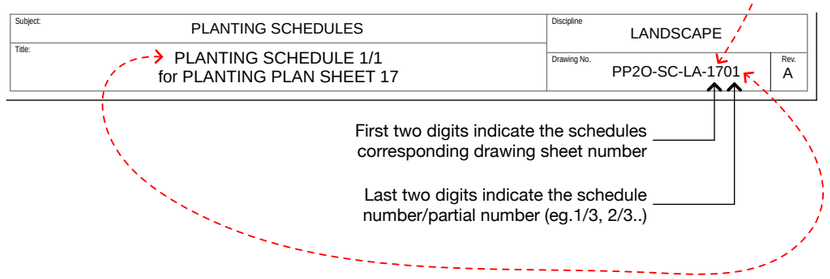
1. Read plans in conjunction with relevant Specifications
2. Read plans in conjunction with relevant Planting Schedules (refer PP2O-SC-LA-XXXX for schedules)
3. Read plans in conjunction with relevant Planting Details (Planting Details TBC)
4. Final boundary configuration to be confirmed between: Land owners / Transport Agency / Kiwi Rail / KCDC
5. Difference between SC-01 (cobbled swale) areas in plan vs schedules due to only sides being planted. Ratio of 50% of plan area has been applied for schedules. IFC will show an exact area in drawings and schedules.

Drawing Numbering and Linking Plans with Schedules

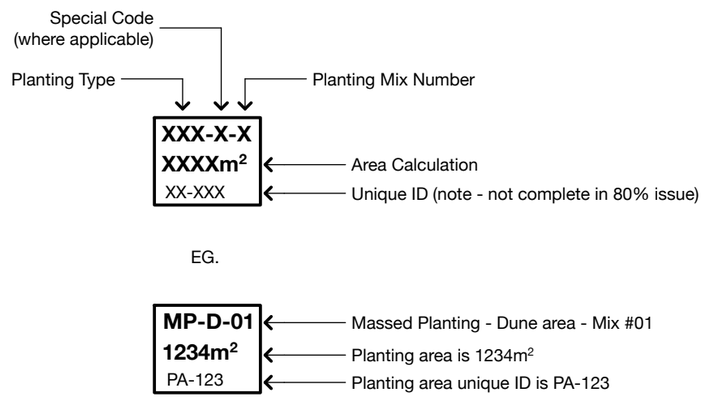
Planting Plan:



Planting Schedule:



Planting Label Key



No.	Revision	By	Chk	Appd	Date
A	SOUTH 80% ISSUE	MB	SD		23/03/18

Scale (A1) 1:500
Scale (A3) 1:1000

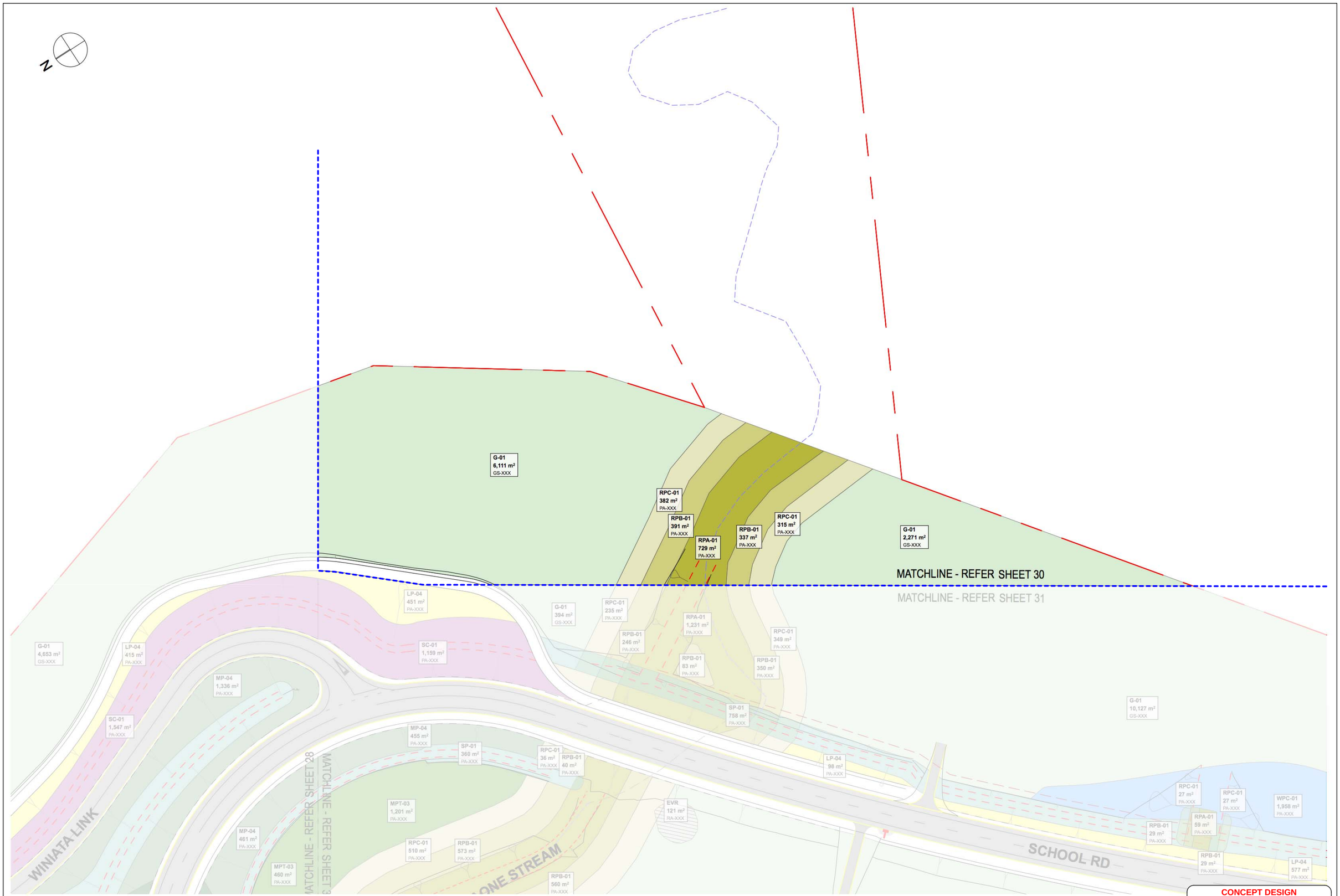
Design	SD/SH	23/03/18	Approved For Construction
Drawn	MB		
Dsg Verifier			
Drg Check			Date

* Refer to Original Hardcopy for Signature

NZ Transport Agency Waka Kotahi — Peka Peka to Ōtaki Expressway — Fletcher HIGGINS — Beca — Tonkin+Taylor

CONCEPT DESIGN
NOT FOR CONSTRUCTION

Subject: PLANTING PLANS
Title: KEY / GENERAL INFORMATION
Discipline: LANDSCAPE
Drawing No.: PP2O-DR-LA-0000
Rev.: A



CONCEPT DESIGN
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
A	SOUTH 80% ISSUE	MB	SD		23/03/18

Scale (A1) 1:500
Scale (A3) 1:1000

Design	SD/SH	23/03/18	Approved For Construction
Drawn	MB		
Dsg Verifier			
Drg Check			Date

* Refer to Original Hardcopy for Signature

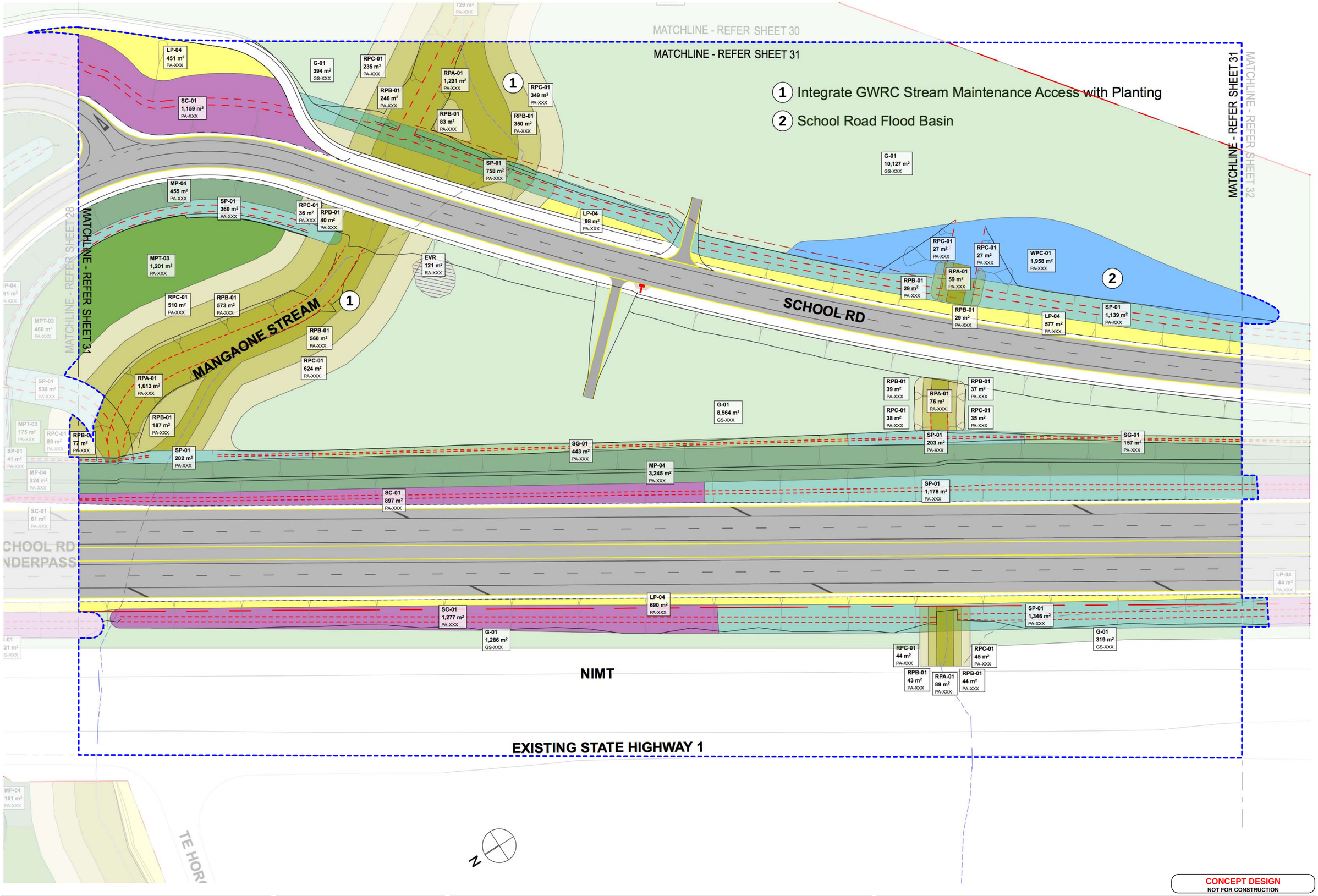
NZ TRANSPORT AGENCY WAKA KOTAHI
Peka Peka to Ōtaki Expressway
Fletcher HIGGINS
Beca Tonkin+Taylor

Subject: PLANTING PLANS
Title: GENERAL ARRANGEMENT SHEET 30 OF 47

Discipline: LANDSCAPE
Drawing No.: PP2O-DR-LA-0230
Rev.: A

ORIGINAL SIZE A3 : DO NOT SCALE

IF IN DOUBT ASK



CONCEPT DESIGN
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
A	SOUTH 80% ISSUE	MB	SD		23/03/18

Scale (A1) 1:500
Scale (A3) 1:1000

Design	SD/SH	23/03/18	Approved For Construction
Drawn	MB		
Dsg Verifier			
Drg Check			Date

* Refer to Original Hardcopy for Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Peka Peka to Ōtaki Expressway | Fletcher | HIGGINS | Beca | Tonkin+Taylor

Subject: PLANTING PLANS
Title: GENERAL ARRANGEMENT SHEET 31 OF 47

Discipline: LANDSCAPE
Drawing No.: PP2O-DR-LA-0231
Rev.: A

ORIGINAL SIZE A3 : DO NOT SCALE

IF IN DOUBT ASK

MATCHLINE - REFER SHEET 31

MATCHLINE - REFER SHEET 32

N

EVR
366 m²
PA-XXX

G-01
6,855 m²
GS-XXX

LP-04
321 m²
PA-XXX

SP-01
924 m²
PA-XXX

LP-04
80 m²
PA-XXX

SP-01
944 m²
PA-XXX

SP-01
68 m²
PA-XXX

LP-05
76 m²
PA-XXX

SCHOOL RD

LP-05
71 m²
PA-XXX

G-01
1,054 m²
GS-XXX

LP-05
696 m²
PA-XXX

SC-01
382 m²
PA-XXX

GEAR RD

G-01
2,615 m²
GS-XXX

SP-01
102 m²
PA-XXX

SG-01
780 m²
PA-XXX

MP-04
2,979 m²
PA-XXX

SC-01
1,763 m²
PA-XXX

LP-04
44 m²
PA-XXX

SC-01
2,809 m²
PA-XXX

G-01
1,635 m²
GS-XXX

NIMT

EXISTING STATE HIGHWAY 1

MATCHLINE - REFER SHEET 32

MATCHLINE - REFER SHEET 33

CONCEPT DESIGN
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
A	SOUTH 80% ISSUE	MB	SD		23/03/18

Scale (A1) 1:500
Scale (A3) 1:1000

Design	SD/SH	23/03/18	Approved For Construction
Drawn	MB		
Dsg Verifier			
Drg Check			Date

* Refer to Original Hardcopy for Signature

NZ TRANSPORT AGENCY WAKA KOTAHI
Peka Peka to Ōtaki Expressway
Fletcher HIGGINS
Beca Tonkin+Taylor

Subject: PLANTING PLANS

Title: GENERAL ARRANGEMENT
SHEET 32 OF 47

Discipline: LANDSCAPE

Drawing No.: PP2O-DR-LA-0232

Rev.: A

ORIGINAL SIZE A3 : DO NOT SCALE

IF IN DOUBT ASK

MATCHLINE - REFER SHEET 32

MATCHLINE - REFER SHEET 33

MATCHLINE - REFER SHEET 33

MATCHLINE - REFER SHEET 34

N

LP-05
256 m²
PA-XXX

SC-01
656 m²
PA-XXX

LP-05
62 m²
PA-XXX

SC-01
129 m²
PA-XXX

LP-05
160 m²
PA-XXX

SC-01
349 m²
PA-XXX

G-01
5,298 m²
GS-XXX

LP-05
100 m²
PA-XXX

SC-01
264 m²
PA-XXX

LP-05
96 m²
PA-XXX

SC-01
252 m²
PA-XXX

LP-05
213 m²
PA-XXX

SC-01
404 m²
PA-XXX

LP-05
99 m²
PA-XXX

SC-01
145 m²
PA-XXX

GEAR RD

SP-01
577 m²
PA-XXX

MP-04
3,039 m²
PA-XXX

SC-01
1,817 m²
PA-XXX

SC-01
2,293 m²
PA-XXX

G-01
2,611 m²
GS-XXX

NIMT

EXISTING STATE HIGHWAY 1

CONCEPT DESIGN
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No.	Revision	By	Chk	Appd	Date
A	SOUTH 80% ISSUE	MB	SD		23/03/18

Scale (A1) 1:500
Scale (A3) 1:1000

Design	SD/SH	23/03/18	Approved For Construction
Drawn	MB		
Dsg Verifier			
Drg Check			Date

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NZ TRANSPORT AGENCY WAKA KOTAHI
Peka Peka to Ōtaki Expressway
Fletcher HIGGINS
Beca Tonkin+Taylor

Subject: PLANTING PLANS

Title: GENERAL ARRANGEMENT
SHEET 33 OF 47

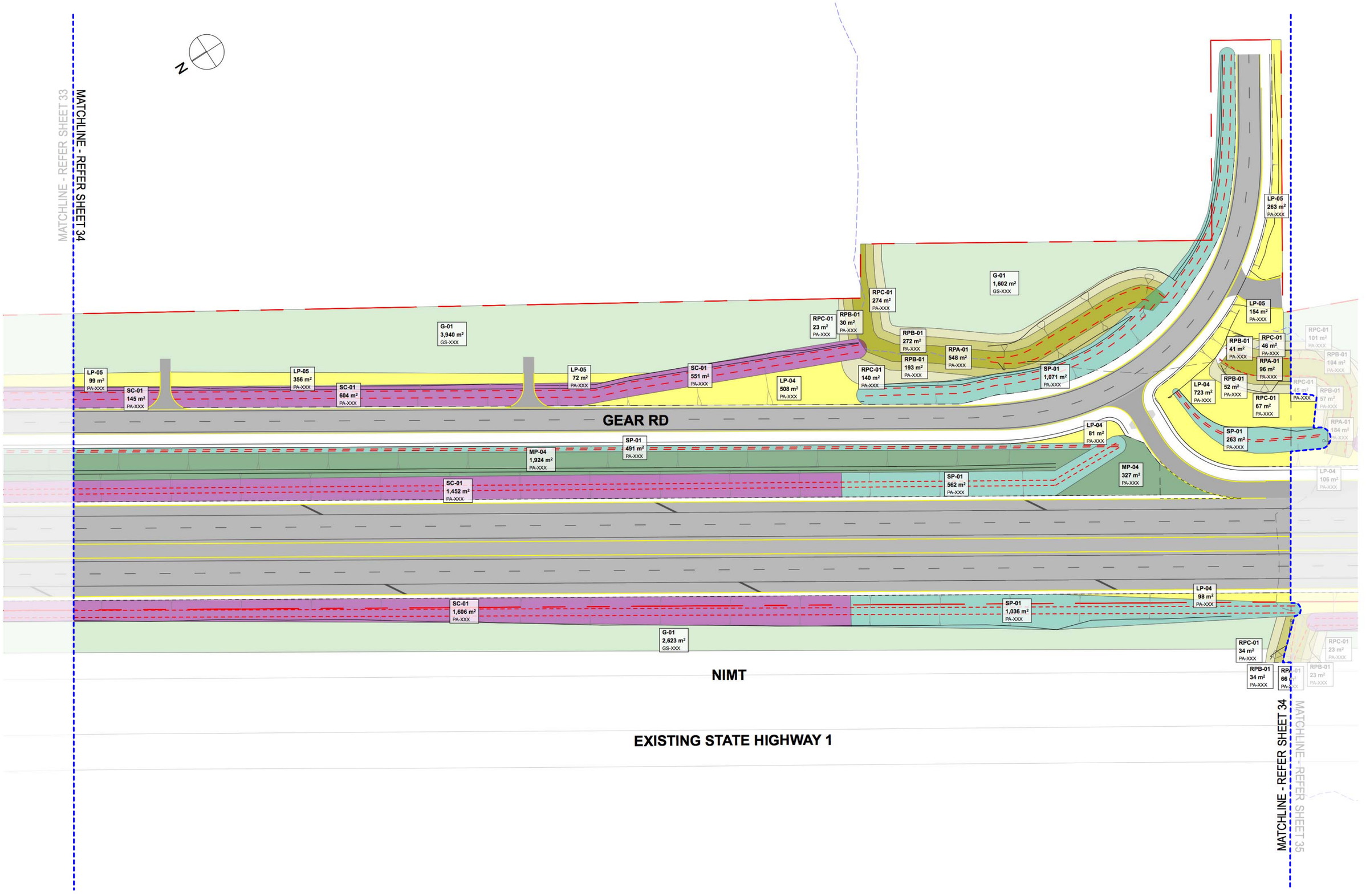
Discipline: LANDSCAPE

Drawing No.: PP2O-DR-LA-0233

Rev.: A

ORIGINAL SIZE A3 : DO NOT SCALE

IF IN DOUBT ASK



CONCEPT DESIGN
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
A	SOUTH 80% ISSUE	MB	SD		23/03/18

Scale (A1) 1:500
Scale (A3) 1:1000

Design	SD/SH	23/03/18	Approved For Construction
Drawn	MB		
Dsg Verifier			
Drg Check			Date

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NZ TRANSPORT AGENCY WAKA KOTAHI
Peka Peka to Ōtaki Expressway
Fletcher HIGGINS
Beca Tonkin+Taylor

Subject: PLANTING PLANS
Title: GENERAL ARRANGEMENT
SHEET 34 OF 47

Discipline: LANDSCAPE
Drawing No.: PP2O-DR-LA-0234
Rev.: A

ORIGINAL SIZE A3 : DO NOT SCALE

IF IN DOUBT ASK

N

SETTLEMENT ST

MATCHLINE - REFER SHEET 35

MATCHLINE - REFER SHEET 36

MATCHLINE - REFER SHEET 34

MATCHLINE - REFER SHEET 35

NIMT

EXISTING STATE HIGHWAY 1

EMENT STREAM

LP-05 263 m² PA-XXX

LP-05 154 m² PA-XXX

RPB-01 41 m² PA-XXX

RPC-01 46 m² PA-XXX

RPA-01 96 m² PA-XXX

RPB-01 52 m² PA-XXX

RPC-01 67 m² PA-XXX

SP-01 263 m² PA-XXX

RPC-01 101 m² PA-XXX

RPB-01 104 m² PA-XXX

RPC-01 45 m² PA-XXX

RPB-01 57 m² PA-XXX

RPA-01 184 m² PA-XXX

SC-01 78 m² PA-XXX

LP-04 106 m² PA-XXX

G-01 7,503 m² GS-XXX

SG-01 197 m² GS-XXX

SC-01 833 m² PA-XXX

LP-04 1,047 m² PA-XXX

SP-01 641 m² PA-XXX

RPC-01 90 m² PA-XXX

RPC-01 92 m² PA-XXX

RPB-01 92 m² PA-XXX

RPB-01 92 m² PA-XXX

RPA-01 188 m² PA-XXX

G-01 1,256 m² GS-XXX

SG-01 50 m² GS-XXX

SP-01 112 m² PA-XXX

RPB-01 90 m² PA-XXX

RPA-01 182 m² PA-XXX

RPC-01 86 m² PA-XXX

G-01 360 m² GS-XXX

EVR 156 m² RA-XXX

LP-04 1,622 m² PA-XXX

SC-01 1,604 m² PA-XXX

SP-01 768 m² PA-XXX

RPC-01 10 m² PA-XXX

RPB-01 10 m² PA-XXX

RPA-01 51 m² PA-XXX

RPB-01 12 m² PA-XXX

RPC-01 14 m² PA-XXX

G-01 249 m² GS-XXX

G-01 1,072 m² GS-XXX

RPC-01 34 m² PA-XXX

RPB-01 34 m² PA-XXX

RPC-01 23 m² PA-XXX

RPB-01 23 m² PA-XXX

RPA-01 66 m² PA-XXX

No.	Revision	By	Chk	Appd	Date
A	SOUTH 80% ISSUE	MB	SD		23/03/18

Scale (A1) 1:500

Scale (A3) 1:1000

Design	SD/SH	23/03/18	Approved For Construction
Drawn	MB		
Dsg Verifier			
Drg Check			Date

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NZ TRANSPORT AGENCY WAKA KOTAHI

Peka Peka to Ōtaki Expressway

Fletcher HIGGINS Beca Tonkin+Taylor

Subject: PLANTING PLANS

Title: GENERAL ARRANGEMENT SHEET 35 OF 47

CONCEPT DESIGN
NOT FOR CONSTRUCTION

Discipline: LANDSCAPE

Drawing No.: PP2O-DR-LA-0235

Rev.: A

ORIGINAL SIZE A3 : DO NOT SCALE

IF IN DOUBT ASK

Swale Planting (SP-01)					Area (m2)	6477
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants
Apodasmia similis	Oioi / Jointed Wire Rush	50%	0.5L	1.8	Base	5,829
Ficinia nodosa	Knobby Club Rush	50%	0.5L	1.8	Sides	5,829
	Total %	100%			Total	11,658

Cobbled Swale (SC-01)					Area (m2)	2562
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants
Ficinia nodosa	Knobby Club Rush	100%	0.5L	1.8	Sides	4,612
	Total %	100%			Total	4,612

Riparian Planting - C (RPC-01): Upper Bank					Area (m2)	88
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants
Carex dipsacea	Autumn Sedge	5%	PB2	1.8	Front	8
Carex geminata	Rautahi	5%	0.5L	1.8	Mid	8
Coprosma propinqua	Mingimingi	5%	PB2	1	Mid	4
Cordyline australis	Cabbage Tree	3%	PB2	1	Mid	3
Cortaderia fulvida	Toetoe	15%	PB2	1	Front/mid	13
Hebe stricta	Koromiko	10%	PB2	1	Mid	9
Olearia paniculata	Akiraho	12%	PB2	1	Mid	11
Phormium tenax	NZ Swamp Flax	25%	PB2	1	Mid	22
Pittosporum tenuifolium	Kohuhu	15%	PB2	1	Mid/Back	13
Plagianthus regius	Ribbonwood	5%	PB2	1	Back	4
	Total %	100%			Total	95

Low Planting - Hautere Plains/Te Horo (LP-04)					Area (m2)	1008
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants
Acaena novae-zelandiae	Piripiri	10%	PB2	1.8	Front	181
Carex dipsacea	Autumn Sedge	15%	PB2	1.8	Front	272
Carex solandri	Forest Sedge	15%	PB2	1.8	Front	272
Coprosma propinqua	Mingimingi	10%	PB2	1	Mid/Back	101
Cortaderia fulvida	Toetoe	5%	PB2	1	Back	50
Hebe stricta	Koromiko	15%	PB2	1	Mid	151
Melicope simplex	Poataniwha	10%	PB2	1	Mid/Back	101
Olearia paniculata	Akiraho	15%	PB2	1	Mid/Back	151
Phormium tenax	NZ Swamp Flax	5%	PB2	1	Back	50
	Total %	100%			Total	1,329

Massed Planting Steep Sites (MPS-01)					Area (m2)	1435
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants
Carex dipsacea	Autumn Sedge	5%	PB2	1.8	Front	129
Carex solandri	Forest Sedge	5%	PB2	1.8	Front	129
Coprosma rhamnoides	Twiggy Coprosma	10%	PB2	1	Mid/Back	144
Cortaderia fulvida	Toetoe	20%	PB2	1	Back	287
Muehlenbeckia complexa	Pohuehue	10%	PB2	1	Mid	144
Phormium tenax	NZ Swamp Flax	50%	PB2	1	Front/Mid	718
	Total %	100%			Total	1,551

Massed Planting - Hautere Plains (MP-03)					Area (m2)	2640
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants
Carex dipsacea	Autumn Sedge	2%	PB2	1.8	Front	95
Carex solandri	Forest Sedge	2%	PB2	1.8	Front	95
Carpodetus Serratus	Marble leaf	10%	PB2	1	Mid	264
Coprosma propinqua	Mingimingi	3%	PB2	1	Mid/Back	79
Coprosma robusta	Karamu	8%	PB2	1	Mid/Back	211
Cortaderia fulvida	Toetoe	6%	PB2	1	Back	158
Dodonea viscosa	Ake Ake (Green Only)	4%	PB2	1	Back	106
Griselenia littoralis	Kapuka	8%	PB2	1	Mid	211
Hebe stricta	Koromiko	8%	PB2	1	Front/Mid	211
Kunzea robusta	Kanuka	2%	PB2	1	Back	53
Leptospermum scoparium	Manuka	2%	PB2	1	Back	53
Myoporum laetum	Ngiao	4%	PB2	1	Mid/Back	106
Myrsine australis	Red Matipo	7%	PB2	1	Mid/Back	185
Olearia paniculata	Akiraho	4%	PB2	1	Front/Mid	106
Phormium tenax	NZ Swamp Flax	10%	PB2	1	Front/Mid	264
Pittosporum eugenioides	Lemonwood	10%	PB2	1	Mid/Back	264
Pittosporum tenuifolium	Kohuhu	10%	PB2	1	Mid/Back	264
	Total %	100%			Total	2,725

Massed Planting - Te Horo (MP-04)					Area (m2)	2021
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants
Carex dipsacea	Autumn Sedge	2%	PB2	1.8	Front	73
Carex solandri	Forest Sedge	2%	PB2	1.8	Front	73
Carpodetus Serratus	Marble leaf	10%	PB2	1	Mid	202
Coprosma propinqua	Mingimingi	3%	PB2	1	Mid/Back	61
Coprosma rhamnoides	Twiggy Coprosma	3%	PB2	1	Mid/Back	61
Dodonea viscosa	Ake Ake (Green Only)	4%	PB2	1	Back	81
Hebe stricta	Koromiko	10%	PB2	1	Front/Mid	202
Kunzea robusta	Kanuka	2%	PB2	1	Back	40
Leptospermum scoparium	Manuka	2%	PB2	1	Back	40
Melicytus ramiflorus	Mahoe	8%	PB2	1	Back	162
Myoporum laetum	Ngiao	4%	PB2	1	Mid/Back	81
Myrsine australis	Red Matipo	10%	PB2	1	Mid/Back	202
Olearia paniculata	Akiraho	10%	PB2	1	Front/Mid	202
Phormium tenax	NZ Swamp Flax	10%	PB2	1	Front/Mid	202
Pittosporum eugenioides	Lemonwood	10%	PB2	1	Mid/Back	202
Pittosporum tenuifolium	Kohuhu	10%	PB2	1	Mid/Back	202
	Total %	100%			Total	2,086

Massed Planting Tree Enrichment - Pioneer Species - Te Horo (MPT-03)					Area (m2)	635
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants
Carex dipsacea	Autumn Sedge	2%	PB2	1.8	Front	23
Carex solandri	Forest Sedge	2%	PB2	1.8	Front	23
Carpodetus Serratus	Marble leaf	10%	PB2	1	Mid	64
Coprosma propinqua	Mingimingi	3%	PB2	1	Mid/Back	19
Coprosma rhamnoides	Twiggy Coprosma	3%	PB2	1	Mid/Back	19
Dodonea viscosa	Ake Ake (Green Only)	4%	PB2	1	Back	25
Hebe stricta	Koromiko	10%	PB2	1	Front/Mid	64
Kunzea robusta	Kanuka	2%	PB2	1	Back	13
Leptospermum scoparium	Manuka	2%	PB2	1	Back	13
Melicytus ramiflorus	Mahoe	8%	PB2	1	Back	51
Myoporum laetum	Ngiao	4%	PB2	1	Mid/Back	25
Myrsine australis	Red Matipo	10%	PB2	1	Mid/Back	64
Olearia paniculata	Akiraho	10%	PB2	1	Front/Mid	64
Phormium tenax	NZ Swamp Flax	10%	PB2	1	Front/Mid	64
Pittosporum eugenioides	Lemonwood	10%	PB2	1	Mid/Back	64
Pittosporum tenuifolium	Kohuhu	10%	PB2	1	Mid/Back	64
	Total %	100%			Total	659

Massed Planting Tree Enrichment - Enrichment Species - Te Horo (MPT-03)

Alectryon excelsus	Titoki	15%	PB15	0.1	Enrich	10
Nestegis lancelota	White Maire	5%	PB15	0.1	Enrich	3
Nestegis montana	Narrow-Leaved Maire	5%	PB15	0.1	Enrich	3
Podocarpus totara	Totara	60%	PB15	0.1	Enrich	38
Prumnopitys taxifolia	Matai	15%	PB15	0.1	Enrich	10
	Total %	100%			Total	64

CONCEPT DESIGN
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
A	SOUTH 80% ISSUE	MB	SD		23/03/18

Scale (A1) 1:500
Scale (A3) 1:1000

Design	SD/SH	23/03/18	Approved For Construction
Drawn	MB		
Dsg Verifier			
Drg Check			Date

* Refer to Original Hardcopy for Signature

NZ TRANSPORT AGENCY WAKA KOTAHI
Peka Peka to Ōtaki Expressway
Fletcher HIGGINS
Beca Tonkin+Taylor

Subject: PLANTING SCHEDULES
Title: PLANTING SCHEDULE 1/1 for PLANTING PLAN SHEET 28

Discipline: LANDSCAPE
Drawing No.: PP2O-SC-LA-2801
Rev.: A

ORIGINAL SIZE A3 : DO NOT SCALE

IF IN DOUBT ASK

Swale Planting (SP-01)					Area (m2)	5186
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants
Apodasmia similis	Oioi / Jointed Wire Rush	50%	0.5L	1.8	Base	4,667
Ficinia nodosa	Knobby Club Rush	50%	0.5L	1.8	Sides	4,667
	Total %	100%			Total	9,334

Cobbled Swale (SC-01)					Area (m2)	1667
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants
Ficinia nodosa	Knobby Club Rush	100%	0.5L	1.8	Sides	3,001
	Total %	100%			Total	3,001

Grassed Swales (SG)					Area (m2)	600
Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants
Perenial Ryegrass		50%				
Fescue Grass		50%				
	Total %	100%			Total	-

Riparian Planting - A (RPA-01): Standing Water/Waters Edge					Area (m2)	3068
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants
Apodasmia similis	Oioi / Jointed Wire Rush	10%	0.5L	1.8	Front/Mid	552
Carex secta	Pukio	10%	0.5L	1.8	Front	552
Carex virgata	Pukio	10%	0.5L	1.8	Front	552
Coprosma tenuicaulis	Swamp Coprosma	8%	PB2	1	Back	245
Cyperus ustulatus	Giant Umbrella Sedge	20%	0.5L	1	Front/Mid	614
Ficinia nodosa	Knobby Club Rush	10%	0.5L	1.8	Front/Mid	552
Phormium tenax	NZ Swamp Flax	30%	PB2	1	Mid	920
Typha orientalis	Raupo	2%	PB2	1		61
	Total %	100%			Total	4,048

Riparian Planting - B (RPB-01): Lower Bank					Area (m2)	2337
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants
Apodasmia similis	Oioi / Jointed Wire Rush	3%	0.5L	1.8	Front/Mid	126
Carex dipsacea	Autumn Sedge	4%	PB2	1.8	Front	168
Carex secta	Pukio	4%	0.5L	1.8	Front	168
Carex virgata	Pukio	4%	0.5L	1.8	Front	168
Coprosma tenuicaulis	Swamp Coprosma	8%	PB2	1	Mid	187
Cordyline australis	Cabbage Tree	6%	PB2	1	Mid	140
Cortaderia fulvida	Toetoe	20%	PB2	1	Front/mid	467
Cyperus ustulatus	Giant Umbrella Sedge	8%	0.5L	1	Front/Mid	187
Hebe stricta	Koromiko	10%	PB2	1	Mid	234
Ficinia nodosa	Knobby Club Rush	3%	0.5L	1.8	Front/Mid	126
Phormium tenax	NZ Swamp Flax	30%	PB2	1	Mid	701
	Total %	100%			Total	2,672

Riparian Planting - C (RPC-01): Upper Bank					Area (m2)	1970
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants
Carex dipsacea	Autumn Sedge	5%	PB2	1.8	Front	177
Carex geminata	Rautahi	5%	0.5L	1.8	Mid	177
Coprosma propinqua	Mingimingi	5%	PB2	1	Mid	99
Cordyline australis	Cabbage Tree	3%	PB2	1	Mid	59
Cortaderia fulvida	Toetoe	15%	PB2	1	Front/mid	296
Hebe stricta	Koromiko	10%	PB2	1	Mid	197
Olearia paniculata	Akiraho	12%	PB2	1	Mid	236
Phormium tenax	NZ Swamp Flax	25%	PB2	1	Mid	493
Pittosporum tenuifolium	Kohuhu	15%	PB2	1	Mid/Back	296
Plagianthus regius	Ribbonwood	5%	PB2	1	Back	99
	Total %	100%			Total	2,129

Low Planting - Hautere Plains/Te Horo (LP-04)					Area (m2)	1816
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants
Acaena novae-zelandiae	Piripiri	10%	PB2	1.8	Front	327
Carex dipsacea	Autumn Sedge	15%	PB2	1.8	Front	490
Carex solandri	Forest Sedge	15%	PB2	1.8	Front	490
Coprosma propinqua	Mingimingi	10%	PB2	1	Mid/Back	182
Cortaderia fulvida	Toetoe	5%	PB2	1	Back	91
Hebe stricta	Koromiko	15%	PB2	1	Mid	272
Melicope simplex	Poataniwha	10%	PB2	1	Mid/Back	182
Olearia paniculata	Akiraho	15%	PB2	1	Mid/Back	272
Phormium tenax	NZ Swamp Flax	5%	PB2	1	Back	91
	Total %	100%			Total	2,397

Massed Planting - Te Horo (MP-04)					Area (m2)	3860
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants
Carex dipsacea	Autumn Sedge	2%	PB2	1.8	Front	139
Carex solandri	Forest Sedge	2%	PB2	1.8	Front	139
Carpodetus Serratus	Marble leaf	10%	PB2	1	Mid	386
Coprosma propinqua	Mingimingi	3%	PB2	1	Mid/Back	116
Coprosma rhamnoides	Twiggy Coprosma	3%	PB2	1	Mid/Back	116
Dodonea viscosa	Ake Ake (Green Only)	4%	PB2	1	Back	154
Hebe stricta	Koromiko	10%	PB2	1	Front/Mid	386
Kunzea robusta	Kanuka	2%	PB2	1	Back	77
Leptospermum scoparium	Manuka	2%	PB2	1	Back	77
Melicytus ramiflorus	Mahoe	8%	PB2	1	Back	309
Myoporum laetum	Ngiao	4%	PB2	1	Mid/Back	154
Myrsine australis	Red Matipo	10%	PB2	1	Mid/Back	386
Olearia paniculata	Akiraho	10%	PB2	1	Front/Mid	386
Phormium tenax	NZ Swamp Flax	10%	PB2	1	Front/Mid	386
Pittosporum eugenioides	Lemonwood	10%	PB2	1	Mid/Back	386
Pittosporum tenuifolium	Kohuhu	10%	PB2	1	Mid/Back	386
	Total %	100%			Total	3,983

Massed Planting Tree Enrichment - Pioneer Species - Te Horo (MPT-03)					Area (m2)	1201
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants
Carex dipsacea	Autumn Sedge	2%	PB2	1.8	Front	43
Carex solandri	Forest Sedge	2%	PB2	1.8	Front	43
Carpodetus Serratus	Marble leaf	10%	PB2	1	Mid	120
Coprosma propinqua	Mingimingi	3%	PB2	1	Mid/Back	36
Coprosma rhamnoides	Twiggy Coprosma	3%	PB2	1	Mid/Back	36
Dodonea viscosa	Ake Ake (Green Only)	4%	PB2	1	Back	48
Hebe stricta	Koromiko	10%	PB2	1	Front/Mid	120
Kunzea robusta	Kanuka	2%	PB2	1	Back	24
Leptospermum scoparium	Manuka	2%	PB2	1	Back	24
Melicytus ramiflorus	Mahoe	8%	PB2	1	Back	96
Myoporum laetum	Ngiao	4%	PB2	1	Mid/Back	48
Myrsine australis	Red Matipo	10%	PB2	1	Mid/Back	120
Olearia paniculata	Akiraho	10%	PB2	1	Front/Mid	120
Phormium tenax	NZ Swamp Flax	10%	PB2	1	Front/Mid	120
Pittosporum eugenioides	Lemonwood	10%	PB2	1	Mid/Back	120
Pittosporum tenuifolium	Kohuhu	10%	PB2	1	Mid/Back	120
	Total %	100%			Total	1,238

Massed Planting Tree Enrichment - Enrichment Species - Te Horo (MPT-03)

Alectryon excelsus	Titoki	15%	PB15	0.1	Enrich	18
Nestegis lancelota	White Maire	5%	PB15	0.1	Enrich	6
Nestegis montana	Narrow-Leaved Maire	5%	PB15	0.1	Enrich	6
Podocarpus totara	Totara	60%	PB15	0.1	Enrich	72
Prumnopitys taxifolia	Matai	15%	PB15	0.1	Enrich	18
	Total %	100%			Total	120

CONCEPT DESIGN
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
A	SOUTH 80% ISSUE	MB	SD		23/03/18

Scale (A1) 1:500
Scale (A3) 1:1000

Design	SD/SH	23/03/18	Approved For Construction
Drawn	MB		
Dsg Verifier			
Drg Check			Date

* Refer to Original Hardcopy for Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Peka Peka to Ōtaki Expressway | Fletcher HIGGINS | Beca | Tonkin+Taylor

Subject: PLANTING SCHEDULES
Title: PLANTING SCHEDULE 1/1 for PLANTING PLAN SHEET 31

Discipline: LANDSCAPE
Drawing No.: PP2O-SC-LA-3101
Rev.: A

ORIGINAL SIZE A3 : DO NOT SCALE

IF IN DOUBT ASK

Swale Planting (SP-01)					Area (m2)	3423
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants
Apodasmia similis	Oioi / Jointed Wire Rush	50%	0.5L	1.8	Base	3,081
Ficinia nodosa	Knobby Club Rush	50%	0.5L	1.8	Sides	3,081
	Total %	100%			Total	6,162

Cobbled Swale (SC-01)					Area (m2)	2179
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants
Ficinia nodosa	Knobby Club Rush	100%	0.5L	1.8	Sides	3,922
	Total %	100%			Total	3,922

Riparian Planting - A (RPA-01): Standing Water/Waters Edge					Area (m2)	644
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants
Apodasmia similis	Oioi / Jointed Wire Rush	10%	0.5L	1.8	Front/Mid	116
Carex secta	Pukio	10%	0.5L	1.8	Front	116
Carex virgata	Pukio	10%	0.5L	1.8	Front	116
Coprosma tenuicaulis	Swamp Coprosma	8%	PB2	1	Back	52
Cyperus ustulatus	Giant Umbrella Sedge	20%	0.5L	1	Front/Mid	129
Ficinia nodosa	Knobby Club Rush	10%	0.5L	1.8	Front/Mid	116
Phormium tenax	NZ Swamp Flax	30%	PB2	1	Mid	193
Typha orientalis	Raupo	2%	PB2	1		13
	Total %	100%			Total	851

Riparian Planting - B (RPB-01): Lower Bank					Area (m2)	622
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants
Apodasmia similis	Oioi / Jointed Wire Rush	3%	0.5L	1.8	Front/Mid	34
Carex dipsacea	Autumn Sedge	4%	PB2	1.8	Front	45
Carex secta	Pukio	4%	0.5L	1.8	Front	45
Carex virgata	Pukio	4%	0.5L	1.8	Front	45
Coprosma tenuicaulis	Swamp Coprosma	8%	PB2	1	Mid	50
Cordyline australis	Cabbage Tree	6%	PB2	1	Mid	37
Cortaderia fulvida	Toetoe	20%	PB2	1	Front/mid	124
Cyperus ustulatus	Giant Umbrella Sedge	8%	0.5L	1	Front/Mid	50
Hebe stricta	Koromiko	10%	PB2	1	Mid	62
Ficinia nodosa	Knobby Club Rush	3%	0.5L	1.8	Front/Mid	34
Phormium tenax	NZ Swamp Flax	30%	PB2	1	Mid	187
	Total %	100%			Total	713

Riparian Planting - C (RPC-01): Upper Bank					Area (m2)	584
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants
Carex dipsacea	Autumn Sedge	5%	PB2	1.8	Front	53
Carex geminata	Rautahi	5%	0.5L	1.8	Mid	53
Coprosma propinqua	Mingimingi	5%	PB2	1	Mid	29
Cordyline australis	Cabbage Tree	3%	PB2	1	Mid	18
Cortaderia fulvida	Toetoe	15%	PB2	1	Front/mid	88
Hebe stricta	Koromiko	10%	PB2	1	Mid	58
Olearia paniculata	Akiraho	12%	PB2	1	Mid	70
Phormium tenax	NZ Swamp Flax	25%	PB2	1	Mid	146
Pittosporum tenuifolium	Kohuhu	15%	PB2	1	Mid/Back	88
Plagianthus regius	Ribbonwood	5%	PB2	1	Back	29
	Total %	100%			Total	632

Low Planting - Hautere Plains/Te Horo (LP-04)					Area (m2)	1410
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants
Acaena novae-zelandiae	Piripiri	10%	PB2	1.8	Front	254
Carex dipsacea	Autumn Sedge	15%	PB2	1.8	Front	381
Carex solandri	Forest Sedge	15%	PB2	1.8	Front	381
Coprosma propinqua	Mingimingi	10%	PB2	1	Mid/Back	141
Cortaderia fulvida	Toetoe	5%	PB2	1	Back	71
Hebe stricta	Koromiko	15%	PB2	1	Mid	212
Melicope simplex	Poataniwha	10%	PB2	1	Mid/Back	141
Olearia paniculata	Akiraho	15%	PB2	1	Mid/Back	212
Phormium tenax	NZ Swamp Flax	5%	PB2	1	Back	71
	Total %	100%			Total	1,864

Low Planting - Driveways (LP-05)					Area (m2)	944
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants
Acaena novae-zelandiae	Piripiri	15%	PB2	1.8	Front	255
Carex dipsacea	Autumn Sedge	15%	PB2	1.8	Front	255
Carex solandri	Forest Sedge	15%	PB2	1.8	Front	255
Coprosma propinqua	Mingimingi	15%	PB2	1	Mid/Back	142
Hebe stricta	Koromiko	25%	PB2	1	Mid	236
Olearia paniculata	Akiraho	15%	PB2	1	Mid/Back	142
	Total %	100%			Total	1,285

Massed Planting - Te Horo (MP-04)					Area (m2)	2251
Botanical Name	Common Name	Percentage Mix	Grade	Density (x/m2)	Notes	No. of Plants
Carex dipsacea	Autumn Sedge	2%	PB2	1.8	Front	81
Carex solandri	Forest Sedge	2%	PB2	1.8	Front	81
Carpodetus Serratus	Marble leaf	10%	PB2	1	Mid	225
Coprosma propinqua	Mingimingi	3%	PB2	1	Mid/Back	68
Coprosma rhamnoides	Twiggy Coprosma	3%	PB2	1	Mid/Back	68
Dodonea viscosa	Ake Ake (Green Only)	4%	PB2	1	Back	90
Hebe stricta	Koromiko	10%	PB2	1	Front/Mid	225
Kunzea robusta	Kanuka	2%	PB2	1	Back	45
Leptospermum scoparium	Manuka	2%	PB2	1	Back	45
Melicytus ramiflorus	Mahoe	8%	PB2	1	Back	180
Myoporum laetum	Ngiao	4%	PB2	1	Mid/Back	90
Myrsine australis	Red Matipo	10%	PB2	1	Mid/Back	225
Olearia paniculata	Akiraho	10%	PB2	1	Front/Mid	225
Phormium tenax	NZ Swamp Flax	10%	PB2	1	Front/Mid	225
Pittosporum eugenioides	Lemonwood	10%	PB2	1	Mid/Back	225
Pittosporum tenuifolium	Kohuhu	10%	PB2	1	Mid/Back	225
	Total %	100%			Total	2,323

CONCEPT DESIGN
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
A	SOUTH 80% ISSUE	MB	SD		23/03/18

Scale (A1) 1:500
Scale (A3) 1:1000

Design	SD/SH	23/03/18	Approved For Construction
Drawn	MB		
Dsg Verifier			
Drg Check			Date

* Refer to Original Hardcopy for Signature

NZ TRANSPORT AGENCY WAKA KOTAHI
Peka Peka to Ōtaki Expressway
Fletcher HIGGINS
Beca
Tonkin+Taylor

Subject: PLANTING SCHEDULES
Title: PLANTING SCHEDULE 1/1 for PLANTING PLAN SHEET 34
Discipline: LANDSCAPE
Drawing No.: PP2O-SC-LA-3401
Rev.: A

ORIGINAL SIZE A3 : DO NOT SCALE

IF IN DOUBT ASK

APPENDIX D – STORMWATER INFORMATION

Culvert 24:

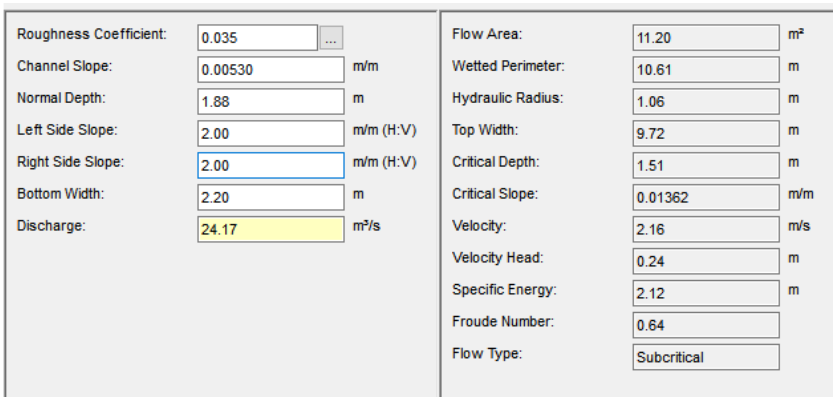
Culvert 24 Temporary Diversion Works

Name	Signed	Date
Tyler Campbell		09/03/2018
Bruce Symmans		09/03/2018

Comments

Option 1: Full Diversion

- 72 m long diversion channel
- US invert 16.28mRL, DS invert 15.9mRL (NZVD 2009)
- Sized to convey a 2.3 year ARI without climate change flow (mean annual flood event) of 24.1 m3/s (as per flood frequency analysis for Mangaone Stream, previously presented in the Stormwater Design Philosophy Report Rev 2 (PP2O August 2017))
- Note that temporary diversion ties into permanent Mangaone Stream diversion at upstream end
- Channel plan, dimensions and calcs as below



Option 2: Partial Diversion

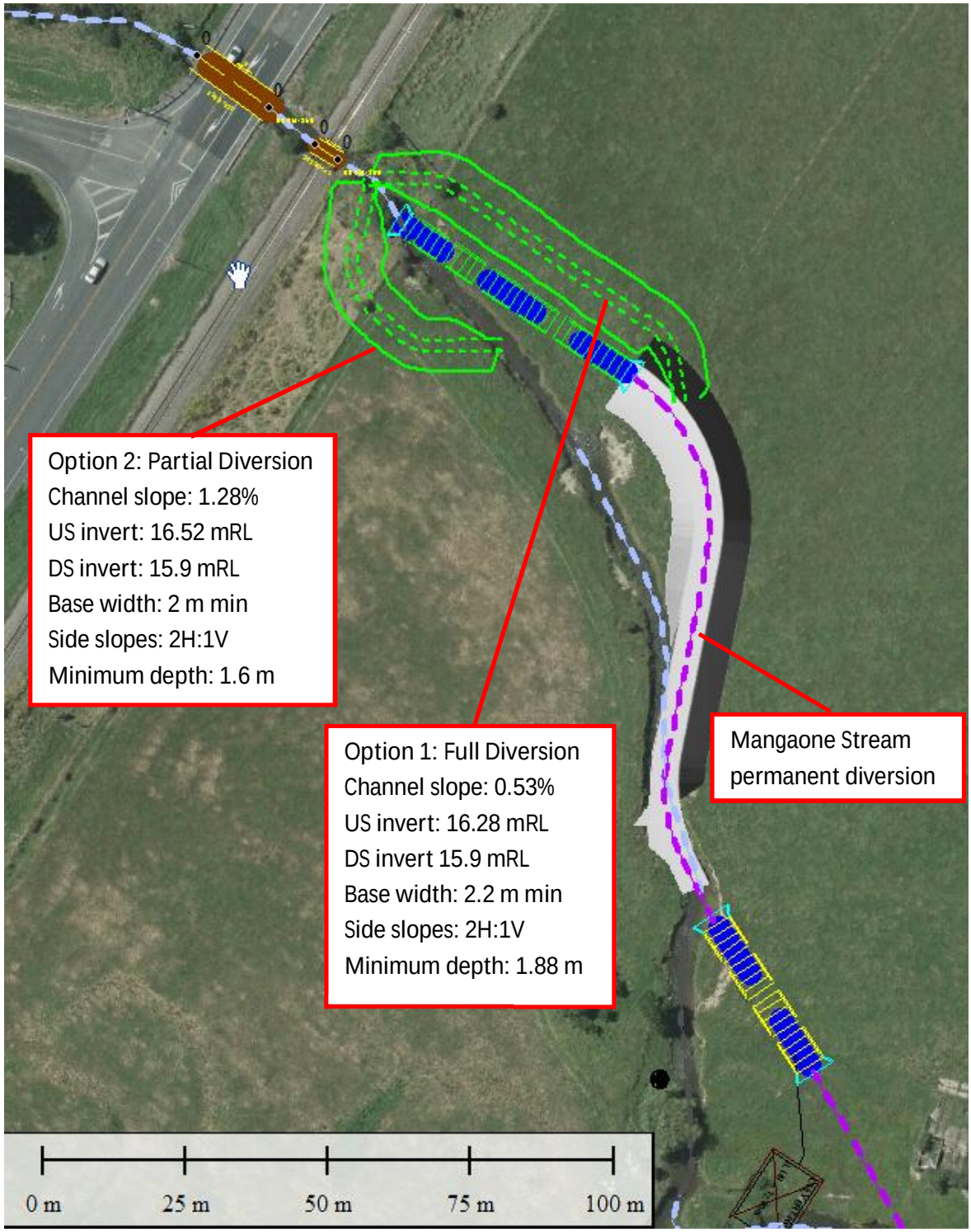
- 48 m long diversion channel
- US invert 16.52mRL, DS invert 15.9mRL (NZVD 2009)
- Sized to convey a 2.3 year ARI without climate change flow (mean annual flood event) of 24.1 m3/s (as per flood frequency analysis for Mangaone Stream, previously presented in the Stormwater Design Philosophy Report Rev 2 (PP2O August 2017))
- Channel plan, dimensions and calcs as below

Roughness Coefficient:	0.035	...	Flow Area:	8.32	m²
Channel Slope:	0.01280	m/m	Wetted Perimeter:	9.16	m
Normal Depth:	1.60	m	Hydraulic Radius:	0.91	m
Left Side Slope:	2.00	m/m (H:V)	Top Width:	8.40	m
Right Side Slope:	2.00	m/m (H:V)	Critical Depth:	1.58	m
Bottom Width:	2.00	m	Critical Slope:	0.01356	m/m
Discharge:	25.23	m³/s	Velocity:	3.03	m/s
			Velocity Head:	0.47	m
			Specific Energy:	2.07	m
			Froude Number:	0.97	
			Flow Type:	Subcritical	

Channel Lining:

The channel will require scour protection from velocities of up to 2.2 m/s and 3.0 m/s for option 1 & 2 respectively in the 2 year ARI event. Possible solutions are outlined below, similar solutions could also be used as approved:

- Rock rip rap
- Erosion Control Blankets
- Turf reinforcement mats



Levels in terms of NZVD 2009

Culvert 28:

Stormwater Review

Culvert 28 Temporary Works

Name	Signed	Date
Tyler Campbell		9/03/2018
Bruce Symmans		9/03/2018

Comments

A permanent Culvert 28 is proposed on the Mangaone floodplain, noting that it will not be within a defined stream channel. In large floods, flows break out of the Mangaone Stream and spread across this flood plain. A portion of the flood plain flows are diverted through an existing rail and SH1 culvert on what is known as the "Mangaone Overflow". A drain alongside School Road also enters these existing culverts from the south. The figure following illustrates the flood pattern in the 10 yr ARI CC event in the pre project situation (of similar magnitude to the 20 yr ARI present climate event).

The existing culverts are located close to the downstream end of proposed Culvert 28. In the post project situation, Culvert 28 will convey the School Road drain and Mangaone Overflow under the expressway embankment. An embankment for a School Road realignment and further permanent Culvert 27 are proposed upstream of the expressway embankment and Culvert 28. The construction of the expressway embankment and Culvert 28 are expected to be complete prior to construction of the School Road embankment and Culvert 27 in this area (as advised by the construction team).

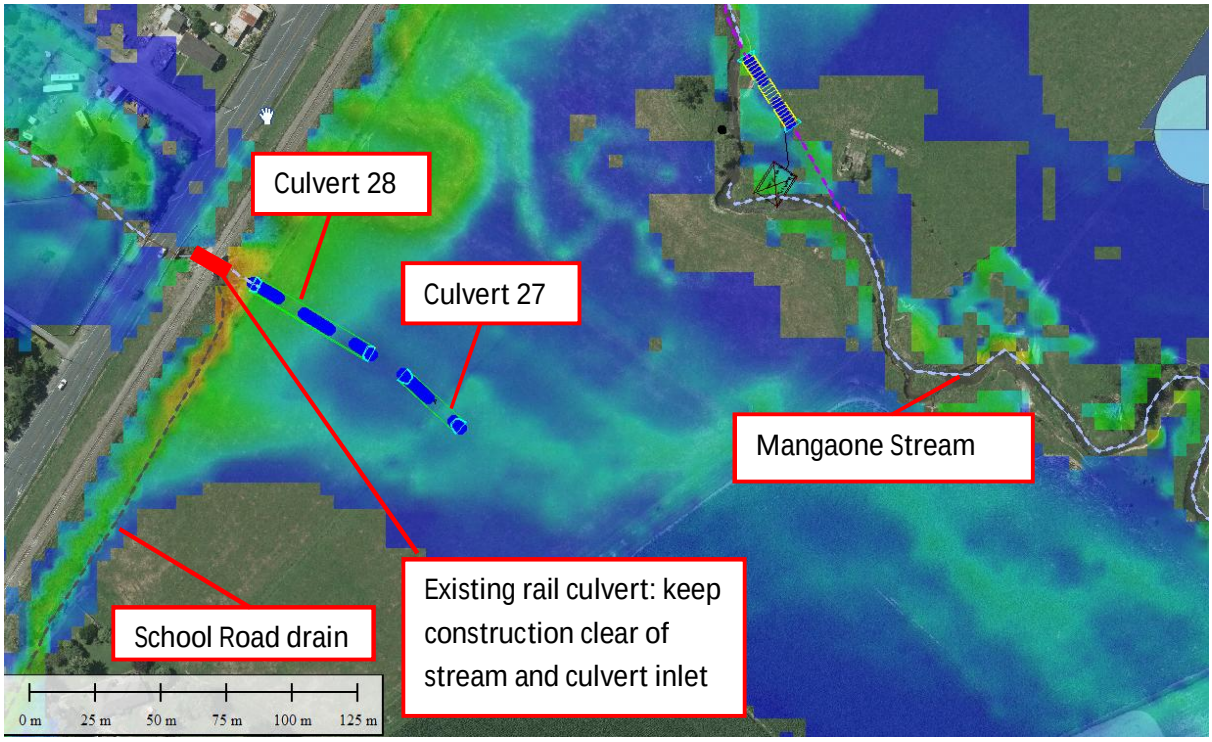
Our findings are as follows:

- Culvert 28 is located within a flood plain but not within a defined existing stream channel.
- The mean annual flood on the Mangaone Stream is estimated to be 24.1 m3/s as per flood frequency analysis for Mangaone Stream, previously presented in the Stormwater Design Philosophy Report Rev 2 (PP2O August 2017).
- In the mean annual flood, which would typically be the design flood event for a temporary stream diversion of less than 30 days, flood flows are expected to be contained within the existing Mangaone Stream channel, without breaking out and inundating the Culvert 28 construction site.
- The existing rail and SH1 culverts located downstream of Culvert 28 will still convey the School Road drain flows in the mean annual flood.
- The pre-project 10 year ARI flood event with the effects of climate change (approx. equal to present day 20 year ARI event) is expected to cause inundation of the Culvert 28 works site with water depths of up to 0.8 m.

Our recommendations are as follows:

- No temporary stream diversion is necessarily required for construction of Culvert 28 as it is not located within a defined existing stream channel.
- Construction of Culvert 28 should be complete before the expressway embankment causes any significant obstruction of the flood plain to avoid adverse impacts on flood plain capacity. If this is not practicable, further assessment and specific measures will likely be required.
- Provision should be made for the continuity of the School Road drain flows during construction.

- Construction works for Culvert 28 should be kept clear of inlet to the existing rail culvert downstream of Culvert 28, so as not to obstruct flow from the School Road drain in smaller events, and also breakout flows from the Mangaone Stream in larger events.



Inundation of works site during pre-project 10 yr CC2130 flood event

Culvert 36:

TEMPORARY STREAM DIVERSION FOR CONSTRUCTION OF CULVERT 36

Introduction

A temporary partial stream diversion is proposed to enable the construction of proposed permanent culvert 36 for the Peka Peka to Qtaki Expressway.

A specific works methodology has been developed for this diversion to minimise adverse water quality and fish passage effects during construction as per the PP2Q Environmental Management Plan (EMP). Sizing of the channel and construction methodology is set out as per the NZTA Erosion and Sediment Control Guidelines.

Diversion sizing

- The diversion will consist of a temporary coffer dam and channel diversion. x The temporary diversion channel has been designed to convey a 2 year ARI flow (present climate). This is consistent with NZTA guidelines for stream diversions of less than 30 days (15 day construction period anticipated for Culvert 36).
- HEC HMS software with the SCS method has been used to estimate design flow, applied in accordance with Appendix 1 of "Subdivision and Development Principles and Requirements" (KCDC 2012) as described in Section 3.3.4 of the PP2Q Stormwater Design Philosophy Report Rev 2 (PP2Q August 2017).
- Manning's equation has been used to estimate channel capacity, flow depths and velocities.
- Existing stream levels have been based on KCDC LiDAR collected in 2010, supplemented by conventional survey collected for the purposes of the PP2Q project.
- All vertical levels are in terms of NZVD 2009.

Diversion channel requirements:

Trapezoidal channel:

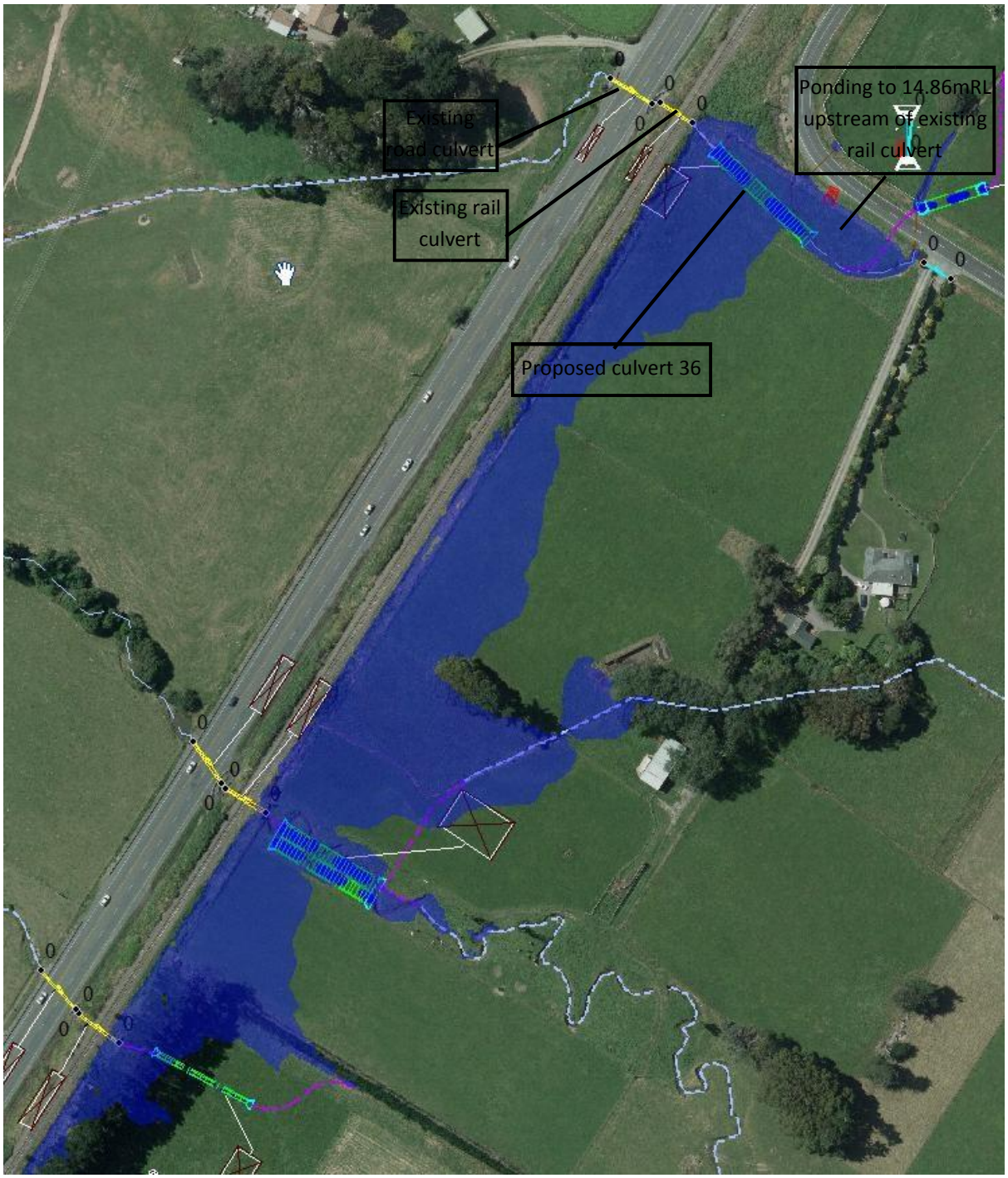
- 0.53% grade (minimum)
- Trapezoidal cross section
- 2.5 m base width
- 2:1 H:V side slopes
- 0.55 m depth (minimum)
- 0.035 manning's roughness, n value.
- Assuming a grassed or gravel/cobble substrate.
- 2.2 m^3/s, 2 year ARI flow (present climate)
- 1.12 m/s assuming above parameters

Plan and cross sections are attached showing two indicative locations of the temporary stream diversion for a trapezoidal channel with a 2.5 m base width.

Construction of the upstream Culvert 35 with permanent stream diversion is anticipated to have been completed at the time of construction of Culvert 36.

Although the channel has been sized to convey the 2 year ARI flow, we note that there is likely to be some ponding into the proposed Culvert 36 works area in relatively small flood events due to the limited capacity of the downstream rail and road culverts.

Ponding up to 14.86 mRL is anticipated in the vicinity of the Culvert 36 works area in the 2 year ARI (present climate) flow as shown in figure below. This is based on a calculation in HY-8 assuming flows are shared between the road and rail culverts for the Gear, Settlement and Coolen catchments (2 year ARI flow 5.88m^3/s for these three catchments combined). The tail water conditions for the road culvert capacity calculation were based on the downstream channel geometry. The tail water conditions for the rail culvert capacity calculation were based in turn on the headwater conditions from the road culvert capacity calculation.



Plan view showing ponding to 14.86mRL upstream of existing rail culvert in 2 year ARI flood

Reinstatement

Unless otherwise agreed in writing with GWRC, upon the completion of any temporary in-stream works, the stream bed and margins will, as far as practicable, be restored to a state that closely matches the upstream and downstream riparian and in-stream habitats and visual appearance.

Applicability

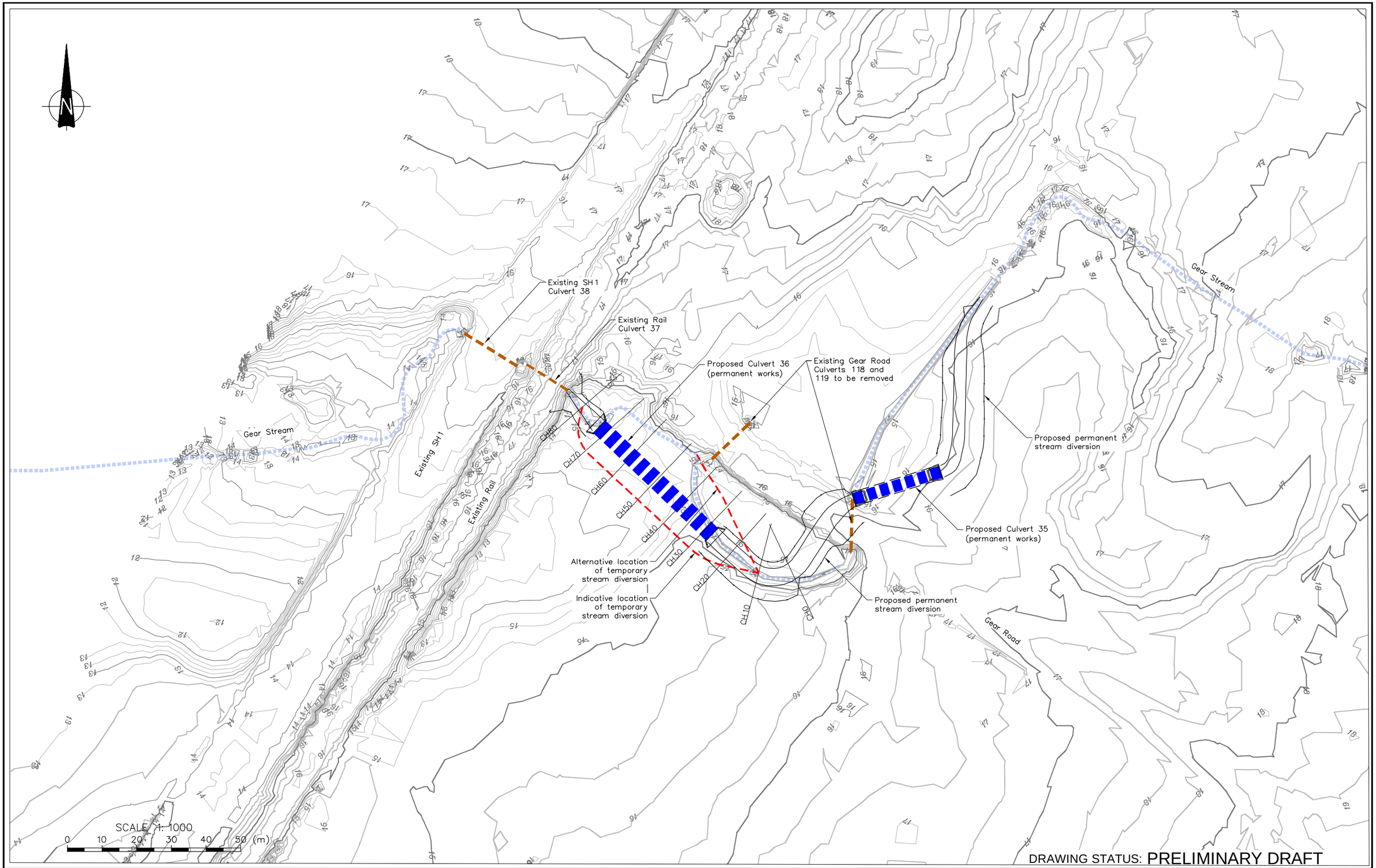
This report has been prepared for the exclusive use of our client, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

Tonkin & Taylor Ltd

Environmental and Engineering Consultants

Report prepared by:	Authorised for Tonkin & Taylor Ltd by:
	
.....	.....
Tyler Campbell	Bruce Symmans
Civil Engineer, Water Engineering	Design Manager

Reviewed by Dean Miller, Environmental Lead, and Dewi Knappstein, Stormwater Lead.



DRAWING STATUS: PRELIMINARY DRAFT

REVISION	DESCRIPTION	BY	DATE
0	First Issue		

DESIGNED :	TJAC	Mar. 18
DRAWN :	DMK	Mar. 18
DESIGN CHECKED :		
DRAFTING CHECKED :		

CADFILE : \\Culv 36 & 35 Temp Works_plan.dwg

APPROVED : NOT FOR CONSTRUCTION

This drawing is not to be used for construction purposes unless signed as approved

NOTES :
1. All dimensions are in millimetres unless noted otherwise.

REFERENCE :

Peka Peka to Ōtaki Expressway

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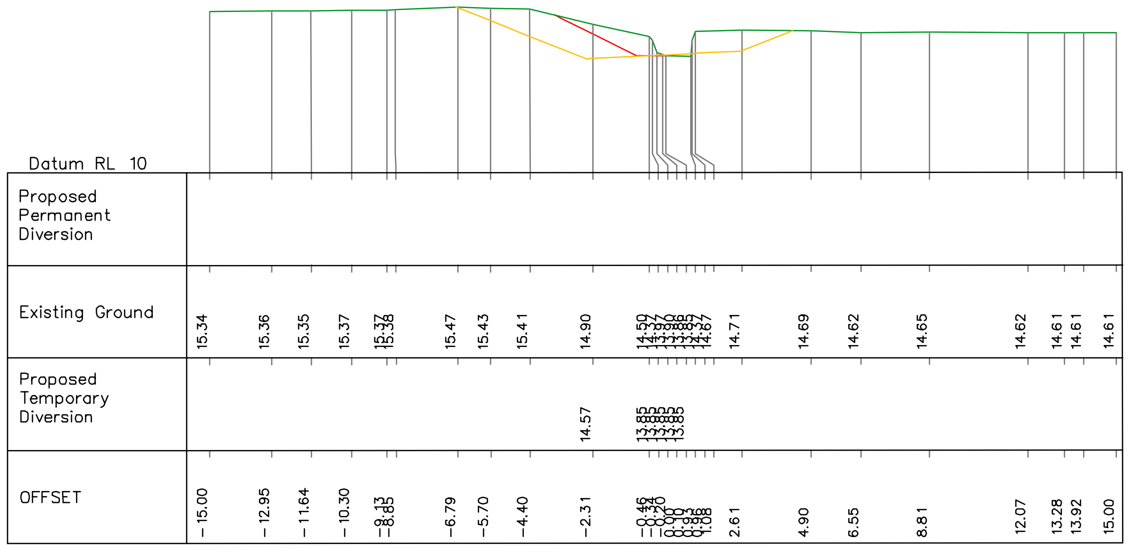
NZ TRANSPORT AGENCY
PEKA PEKA TO OTAKI EXPRESSWAY

TITLE
TEMPORARY WORKS
Culvert 36 Stream Diversion

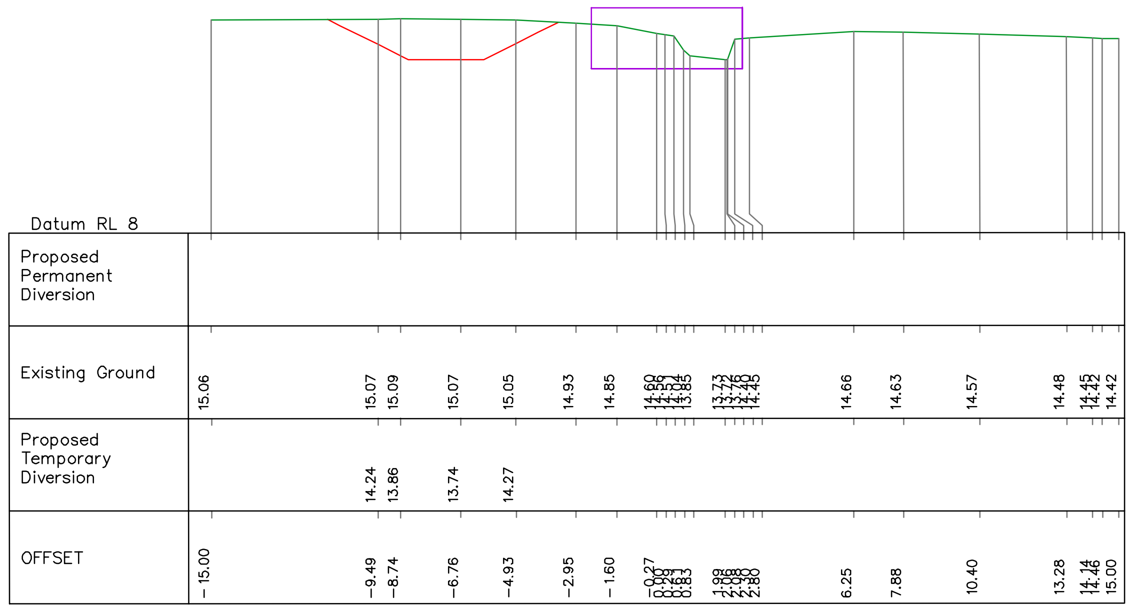
SCALES (AT A3 SIZE)	DWG. No.	REV.
1: 1000	Figure 1	0

LEGEND

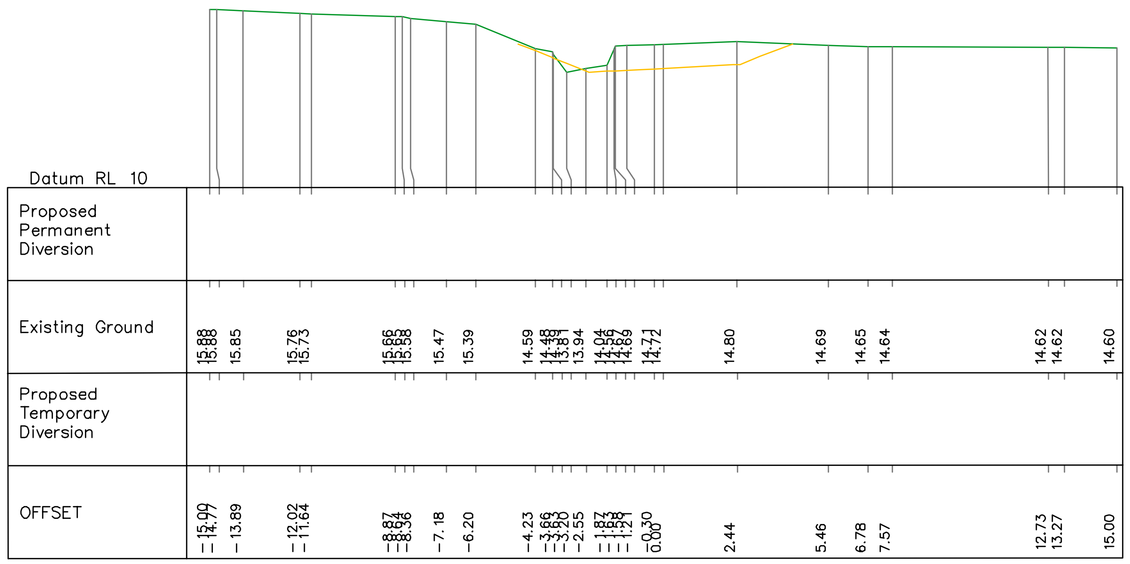
- Existing ground
- Temporary diversion
- Permanent diversion
- Permanent culvert



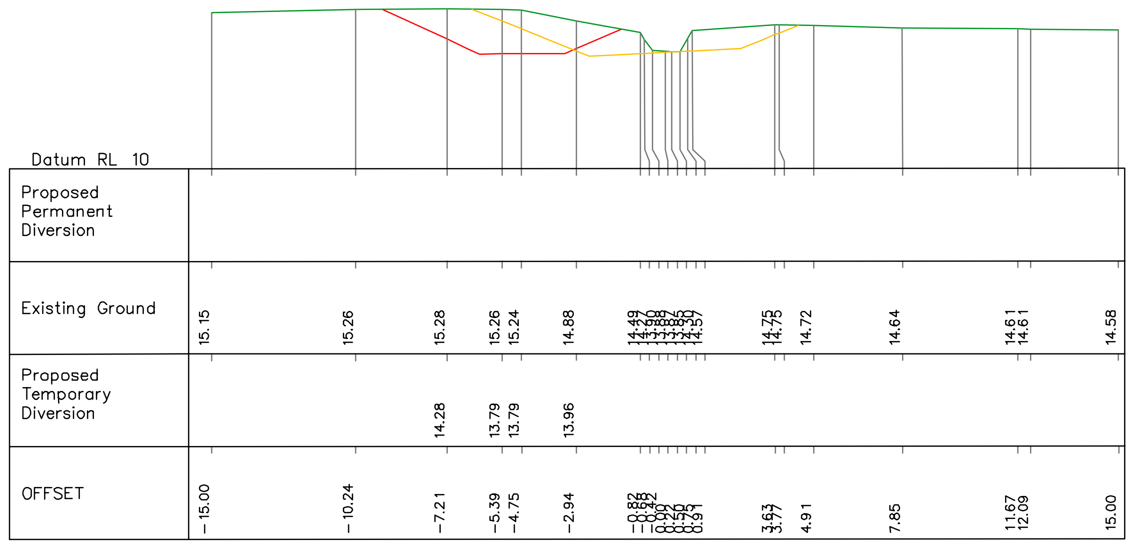
SECTION 10



SECTION 30



SECTION 0



SECTION 20

SCALE 1:250

DRAWING STATUS: PRELIMINARY DRAFT

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REVISION DESCRIPTION		BY	DATE

DESIGNED :	TJAC	Mar. 18
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DESIGN CHECKED :		
DRAFTING CHECKED :		

CADFILE : \\Culv 36 & 35 Temp Works_plan.dwg

APPROVED :

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NOTES :

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REFERENCE :

Peka Peka to Ōtaki Expressway

NZ TRANSPORT AGENCY WAKA KOTAHI · Fletcher

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CLIENT, PROJECT

NZ TRANSPORT AGENCY

PEKA PEKA TO OTAKI EXPRESSWAY

TITLE

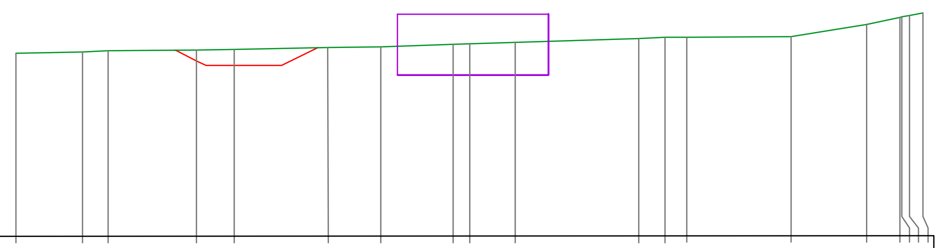
TEMPORARY WORKS

Culvert 36 Stream Diversion

SCALES (AT A3 SIZE)	DWG. No.	REV.
1:250	Figure 2	0

LEGEND

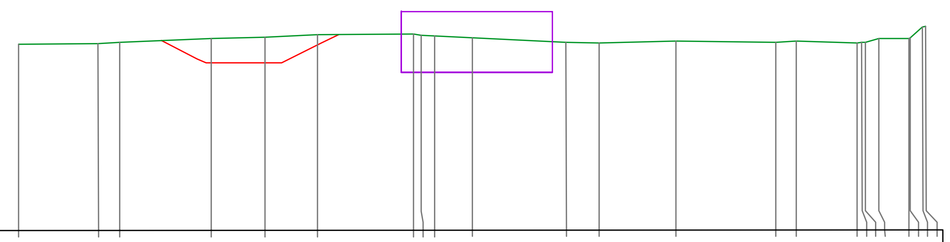
(green line)	Existing ground
(red line)	Temporary diversion
(yellow line)	Permanent diversion
(purple line)	Permanent culvert



Datum RL 8

OFFSET	Proposed Permanent Diversion	Existing Ground	Proposed Temporary Diversion
−15.00		14.04	
−12.79		14.08	
−11.95		14.14	
−9.04		14.16	13.80
−7.79		14.17	13.63
−4.68		14.24	
−2.94		14.25	
−0.55		14.34	
0.00		14.35	
1.52		14.40	
5.60		14.53	
6.46		14.56	
7.18		14.57	
10.64		14.59	
13.12		14.98	
14.24		15.22	
14.30		15.24	
14.56		15.28	
15.00		15.36	

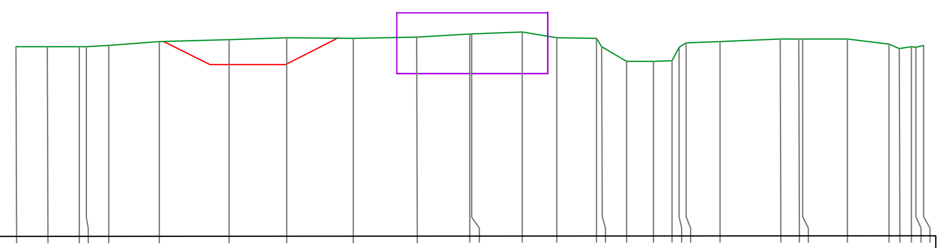
SECTION 50



Datum RL 8

OFFSET	Proposed Permanent Diversion	Existing Ground	Proposed Temporary Diversion
−15.00		14.14	
−12.37		14.17	
−11.66		14.20	
−8.63		14.33	13.52
−6.85		14.38	13.52
−5.12		14.46	14.11
−1.94		14.47	
−1.68		14.45	
−1.25		14.42	
0.00		14.36	
3.11		14.19	
4.20		14.19	
6.74		14.23	
10.04		14.20	
10.71		14.24	
12.72		14.18	
12.88		14.19	
12.99		14.21	
13.44		14.32	
14.44		14.33	
14.48		14.34	
14.89		14.71	
15.00		14.72	

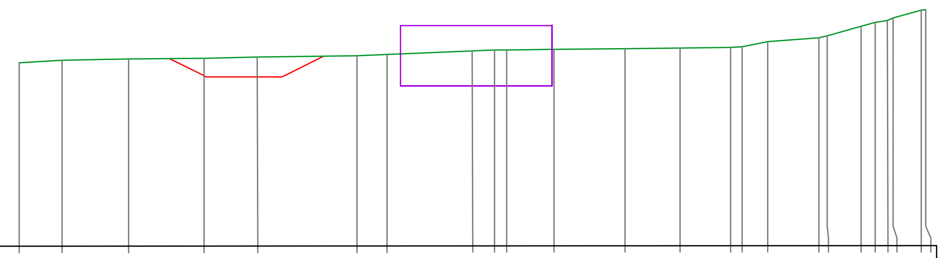
SECTION 70



Datum RL 8

OFFSET	Proposed Permanent Diversion	Existing Ground	Proposed Temporary Diversion
−15.00		14.28	
−13.96		14.28	
−12.92		14.27	
−12.69		14.27	
−11.94		14.32	
−10.26		14.45	
−7.95		14.51	13.68
−6.05		14.57	13.71
−3.86		14.55	
−1.75		14.59	
0.00		14.68	
0.05		14.69	
1.73		14.75	
2.87		14.56	
4.18		14.53	
4.37		14.26	
5.18		13.77	
6.07		13.78	
6.69		13.80	
6.92		14.24	
7.16		14.39	
8.28		14.42	
10.27		14.52	
10.89		14.51	
11.01		14.50	
12.49		14.52	
13.85		14.35	
14.21		14.20	
14.60		14.26	
14.75		14.23	
15.00		14.30	

SECTION 40



Datum RL 8

OFFSET	Proposed Permanent Diversion	Existing Ground	Proposed Temporary Diversion
−15.00		14.03	
−13.58		14.12	
−11.37		14.17	
−8.88		14.18	13.62
−7.11		14.23	13.58
−3.83		14.27	
−2.82		14.31	
0.00		14.42	
0.74		14.45	
1.13		14.45	
2.70		14.47	
5.05		14.49	
6.88		14.52	
8.54		14.53	
8.93		14.55	
9.77		14.72	
11.47		14.86	
11.73		14.92	
12.86		15.22	
13.32		15.36	
13.74		15.42	
13.92		15.50	
14.86		15.75	
15.00		15.79	

SECTION 60

SCALE 1:250

0 5 10 15 (m)

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0	First Issue		
REVISION DESCRIPTION		BY	DATE

DESIGNED :	TJAC	Mar. 18
DRAWN :	DMK	Mar. 18
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DRAFTING CHECKED :		

CADFILE : \\Culv 36 & 35 Temp Works_plan.dwg

APPROVED :

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NOTES :

1. All dimensions are in millimetres unless noted otherwise.

REFERENCE :

Peka Peka to Ōtaki Expressway

www.tonkintaylor.co.nz

CLIENT, PROJECT

NZ TRANSPORT AGENCY

PEKA PEKA TO OTAKI EXPRESSWAY

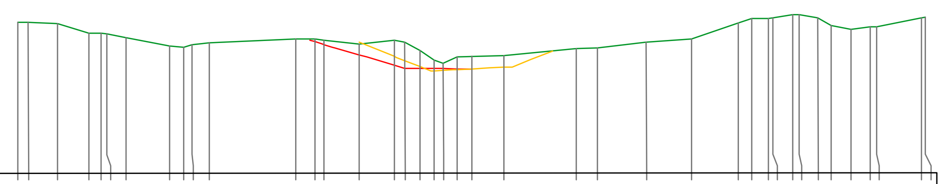
TITLE

TEMPORARY WORKS

Culvert 36 Stream Diversion

SCALES (AT A3 SIZE)	DWG. No.	REV.
1:250	Figure 3	0

LEGEND
Existing ground
Temporary diversion
Permanent diversion
Permanent culvert



Datum RL 10

OFFSET	Proposed Permanent Diversion	Existing Ground	Proposed Temporary Diversion
−15.00		14.99	
−14.65		15.01	
−13.68		14.96	
−12.66		14.64	
−12.24		14.64	
−12.05		14.61	
−11.42		14.49	
−9.98		14.20	
−9.51		14.16	
−9.24		14.25	
−8.66		14.31	
−5.82		14.45	
−5.18		14.44	14.35
−4.89		14.41	14.26
−3.71	14.33	14.26	13.91
−2.55	13.86	14.41	13.57
−2.20	13.72	14.33	13.47
−1.71	13.52	14.05	13.46
−1.24	13.39	13.75	13.46
−0.93	13.40	13.64	13.46
−0.48	13.42	13.85	13.45
0.00	13.45	13.86	
1.06	13.50	13.89	
3.47		14.12	
4.15		14.13	
5.78		14.32	
7.27		14.44	
8.82		14.96	
9.27		15.12	
9.80		15.11	
9.95		15.14	
10.61		15.24	
10.82		15.23	
11.45		15.13	
11.89		14.87	
12.54		14.75	
13.16		14.83	
13.39		14.84	
14.87		15.13	
15.00		15.16	

SECTION 80

SCALE 1:250

0 5 10 15 (m)

DRAWING STATUS: PRELIMINARY DRAFT

0	First Issue		
REVISION	DESCRIPTION	BY	DATE

DESIGNED :	TJAC	Mar. 18
DRAWN :	DMK	Mar. 18
DESIGN CHECKED :		
DRAFTING CHECKED :		

CADFILE : \\Culv 36 & 35 Temp Works_plan.dwg

APPROVED :

NOT FOR CONSTRUCTION

This drawing is not to be used for construction purposes unless signed as approved

NOTES :

1. All dimensions are in millimetres unless noted otherwise.

REFERENCE :

Peka Peka to Ōtaki Expressway

NZ TRANSPORT AGENCY WAKA KOTAHI

Fletcher

www.tonkintaylor.co.nz

CLIENT, PROJECT

NZ TRANSPORT AGENCY

PEKA PEKA TO OTAKI EXPRESSWAY

TITLE

TEMPORARY WORKS

Culvert 36 Stream Diversion

SCALES (AT A3 SIZE) 1:250

DWG. No. Figure 4

REV. 0

Culvert 39:

TEMPORARY STREAM DIVERSION FOR CONSTRUCTION OF CULVERT 39

Introduction

A temporary stream diversion is proposed to enable the construction of proposed permanent culvert 39 for the Peka Peka to Qtaki Expressway.

A specific works methodology has been developed for this diversion to minimise adverse water quality and fish passage effects during construction as per the PP2Q Environmental Management Plan (EMP). Sizing of the channel and construction methodology is set out as per the NZTA Erosion and Sediment Control Guidelines.

Diversion sizing

- The diversion will consist of a temporary coffer dam and channel diversion.
- The temporary diversion channel has been designed to convey a 2 year ARI flow. This is consistent with NZTA guidelines for stream diversions of less than 30 days (2-3 week construction period anticipated for Culvert 39).
- HEC HMS software with the SCS method has been used to estimate design flow, applied in accordance with Appendix 1 of "Subdivision and Development Principles and Requirements" (KCDC 2012) as also described in Section 3.3.4 of the PP2Q Stormwater Design Philosophy Report Rev 2 (PP2Q August 2017)
- Manning's equation has been used to estimate channel capacity, flow depths and velocities
- Existing stream levels have been based on KCDC LiDAR collected in 2010, supplemented by conventional survey collected for the purposes of the PP2Q project
- All vertical levels are in terms of NZVD 2009 Diversion

Channel requirements:

Option A – Trapezoidal channel:

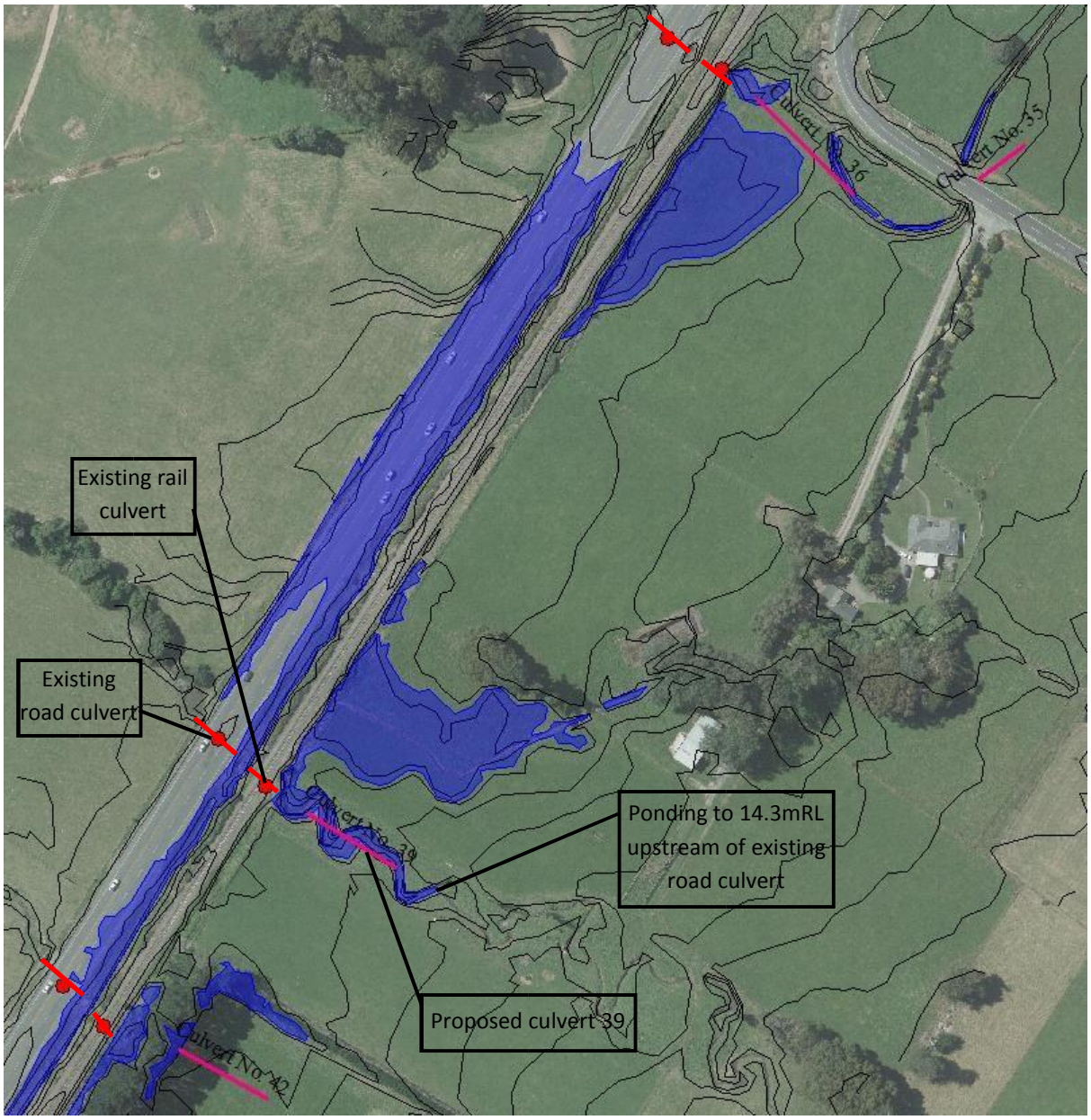
- 2% grade (1.5% minimum)
- Trapezoidal cross section
- 0.5 - 2 m base width
- 1:2.5 V/H
- 0.5 m (2 m base width)
- 0.7 m (0.5 m base width)
- 0.03 manning's roughness n value
- 3.4 m^3/s 2 year ARI flow (present climate)
- 2.3 m/s assuming above parameters

Option B – V channel:

- 2% grade (1.5% minimum)
- V cross section
- 1:2.5 V/H
- 0.8 m minimum depth
- 0.03 manning's roughness, n value
- 3.4 m^3/s 2 year ARI flow (present climate)
- 2.4 m/s assuming above parameters

Plan and cross sections are attached showing an indicative location of the stream diversion for a trapezoidal channel with a 2 m base width.

Although the channel has been sized to convey the 2 year ARI flow, we note that there is likely to be some ponding into the proposed Culvert 39 works area in relatively small flood events due to the limited capacity of the downstream rail and road culverts. Ponding up to 14.3 mRL (NZVD 2009) is anticipated for flows > 2.6 m^3/s through the existing road culvert (threshold at which road starts to overtop), and up to 15.65 mRL (NZVD 2009) with flows > 6.1 m^3/s through the existing rail culvert (threshold at which significant flows over rail start to occur).



Plan view showing ponding to 14.3mRL upstream of existing road culvert (threshold at which road starts to overtop, 2.6m³/s approx)

Channel lining

The channel will require scour protection from the high velocities of up to 2.3 m/s in the 2 year ARI event. Possible solutions are outlined below, similar solutions could also be used as approved;

- Rock rip rap
- Erosion Control Blankets
- Turf Reinforcement Mats

Reinstatement

Unless otherwise agreed in writing with GWRC, upon the completion of any temporary in-stream works, the stream bed and margins will, as far as practicable, be restored to a state that closely matches the upstream and downstream riparian and in-stream habitats and visual appearance.

Applicability

This report has been prepared for the exclusive use of our client, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

Tonkin & Taylor Ltd

Environmental and Engineering Consultants

Report prepared by:

.....

Tyler Campbell

Civil Engineer, Water Engineering

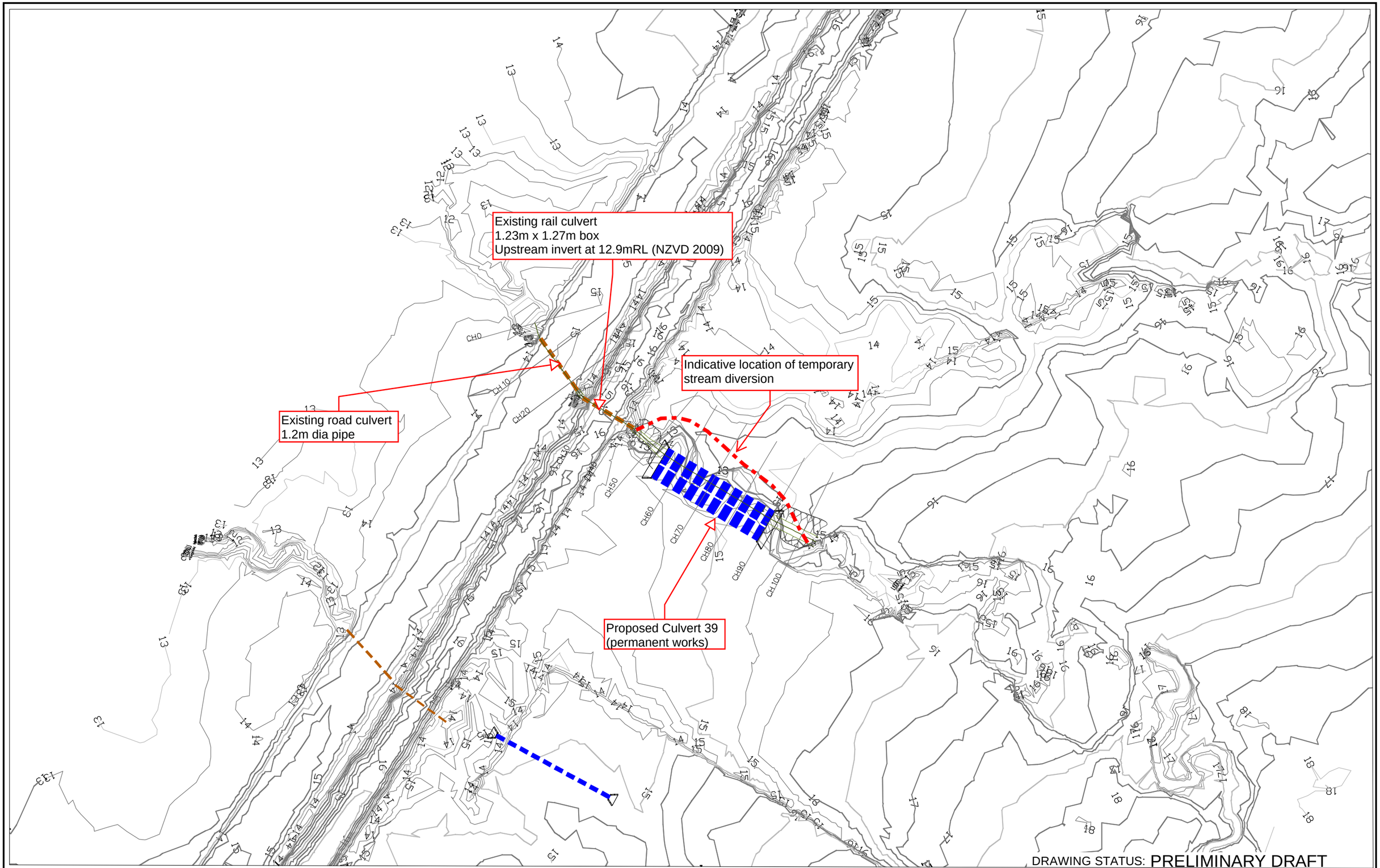
Authorised for Tonkin & Taylor Ltd by:

.....

Bruce Symmans

Design Manager

Reviewed by Dean Miller, Environmental Lead, and Dewi Knappstein, Stormwater Lead.



REVISION	DESCRIPTION	BY	DATE
0	First Issue		

DESIGNED :	XXX	Dec. 17
DRAWN :	XXX	Dec. 17
DESIGN CHECKED :		
DRAFTING CHECKED :		

CADFILE : \\Culv 39 Temp Works_plan.dwg

APPROVED :

NOT FOR CONSTRUCTION

This drawing is not to be used for construction purposes unless signed as approved

NOTES :

1. All dimensions are in millimetres unless noted otherwise.

REFERENCE :

NZ TRANSPORT AGENCY
WAKA KOTAHI

Peka Peka to Ōtaki Expressway

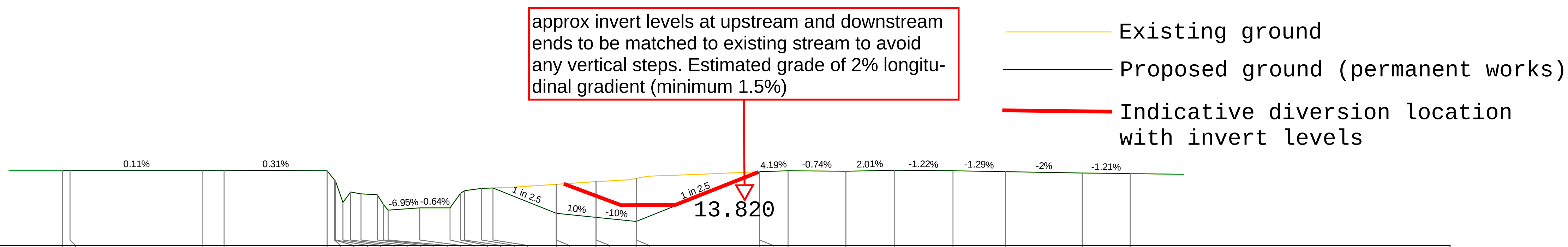
NZ TRANSPORT AGENCY
PEKA PEKA TO ŌTAKI EXPRESSWAY

Temporary Works
Culvert 39 Stream Diversion

SCALES (AT A3 SIZE) 1: 1000

Figure 1

REV. 0



DESIGN	15.315	15.316	15.311	15.312	15.300	14.953	14.955	14.938	14.119	14.504	14.425	14.398	14.029	13.820	13.902	13.910	14.444	14.553	14.635	14.652	13.704	13.704	13.554	13.554	13.404	13.404	15.254	15.254	15.299	15.283	15.319	15.292	15.267	15.209	15.188
PROP GROUND	15.315	15.316	15.311	15.312	15.300	14.953	14.955	14.938	14.119	14.504	14.425	14.398	14.029	13.820	13.902	13.910	14.444	14.553	14.635	14.652	13.704	13.704	13.554	13.554	13.404	13.404	15.254	15.254	15.299	15.283	15.319	15.292	15.267	15.209	15.188
EX GROUND	15.315	15.316	15.311	15.312	15.300	14.953	14.955	14.938	14.119	14.504	14.425	14.398	14.029	13.820	13.902	13.910	14.444	14.553	14.635	14.652	14.786	14.786	14.884	14.884	15.014	15.014	15.254	15.254	15.299	15.283	15.319	15.292	15.267	15.209	15.188
OFFSET	-20.000	-19.705	-14.732	-13.945	-10.074	-9.810	-9.802	-9.774	-9.482	-9.203	-8.806	-8.196	-7.954	-7.784	-6.607	-5.475	-5.078	-4.934	-4.283	-3.870	-1.501	-1.500	0.000	0.000	1.500	1.500	6.125	6.126	7.193	9.357	11.169	13.372	15.335	18.220	20.000

CHAINAGE 100

DRAWING STATUS: PRELIMINARY DRAFT

0	First Issue		
	REVISION DESCRIPTION	BY	DATE

DESIGNED : XXX ----
DRAWN : XXX ----
DESIGN CHECKED :
DRAFTING CHECKED :
CADFILE : \\Drawing2.dwg
APPROVED :
NOT FOR CONSTRUCTION
This drawing is not to be used for construction purposes unless signed as approved

NOTES :
1. All dimensions are in millimetres unless noted otherwise.
2. Levels are in terms of NZVD 2009.

REFERENCE :

NZ TRANSPORT AGENCY
WAKA KOTAHI
Peka Peka to Ōtaki Expressway

NZ TRANSPORT AGENCY
PEKA PEKA TO ŌTAKI EXPRESSWAY

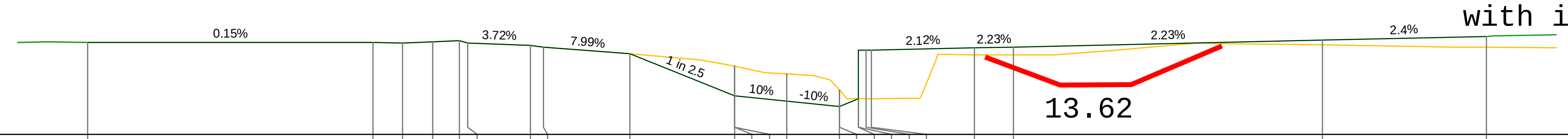
Temporary Works
Culvert 39 Stream Diversion

SCALES (AT A3 SIZE) 1: 200 | Figure 2 | REV. 0

Existing ground
Proposed ground (permanent works)
Proposed Culvert 39 (permanent works)
Indicative diversion location
with invert levels

Centreline Data
X = 1778321.371
Y = 5479921.371
Z = 13.451

DATUM RL 12.500

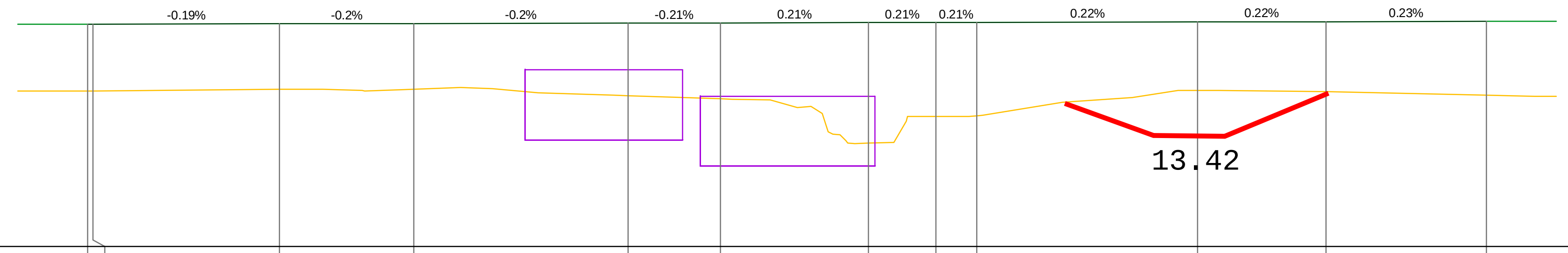


DESIGN	15.133	15.121	15.114	15.143	15.168	15.115	15.048	14.993	14.795	13.601	13.601	13.601	13.451	13.301	13.301	13.520	13.520	14.902	14.905	14.968	14.993	15.190	15.303
PROP GROUND	15.133	15.121	15.114	15.143	15.168	15.115	15.048	14.993	14.795	13.601	13.601	13.601	13.451	13.301	13.301	13.520	13.520	14.902	14.905	14.968	14.993	15.190	15.303
EX GROUND	15.133	15.121	15.114	15.143	15.168	15.115	15.048	14.993	14.795	14.441	14.440	14.440	14.224	13.772	13.771	13.520	13.520	13.520	13.521	14.776	14.770	15.051	14.990
OFFSET	-20.000	-11.840	-10.991	-10.122	-9.358	-9.124	-7.338	-6.962	-4.486	-1.501	-1.500	-1.500	0.000	1.500	1.500	2.047	2.047	2.264	2.418	5.361	6.485	15.312	20.000

CHAINAGE 90

Centreline Data
X = 1778312.779
Y = 5479926.485
Z = 16.914

DATUM RL 10.500

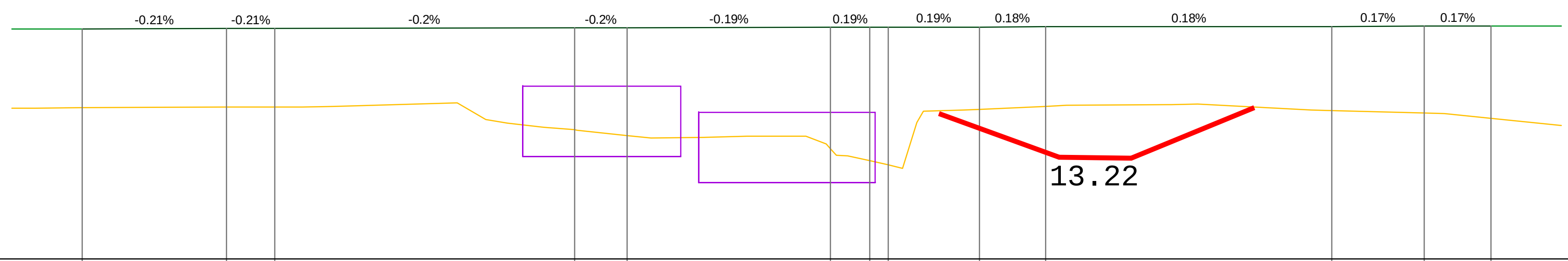


DESIGN	16.874	16.875	16.885	16.892	16.904	16.910	16.919	16.923	16.925	16.939	16.947	16.958
PROP GROUND	16.874	16.875	16.885	16.892	16.904	16.910	16.919	16.923	16.925	16.939	16.947	16.958
EX GROUND	14.965	14.966	15.001	15.011	14.825	14.738	13.466	14.223	14.252	14.983	14.938	14.843
OFFSET	-20.000	-19.840	-14.510	-10.671	-4.536	-1.897	2.332	4.260	5.438	11.752	15.412	20.000

CHAINAGE 80

Centreline Data
X = 1778304.204
Y = 5479931.631
Z = 17.084

DATUM RL 10.500



DESIGN	17.044	17.052	17.055	17.073	17.076	17.087	17.089	17.090	17.095	17.098	17.113	17.117	17.121
PROP GROUND	17.044	17.052	17.055	17.073	17.076	17.087	17.089	17.090	17.095	17.098	17.113	17.117	17.121
EX GROUND	14.798	14.815	14.823	14.174	14.012	13.627	13.296	13.178	14.755	14.839	14.722	14.647	14.500
OFFSET	-20.000	-15.901	-14.532	-6.019	-4.525	1.253	2.366	2.884	5.482	7.362	15.490	18.115	20.000

CHAINAGE 70

DRAWING STATUS: PRELIMINARY DRAFT

REV.	REVISION DESCRIPTION	BY	DATE
0	First Issue		

DESIGNED : XXX ----
DRAWN : XXX ----
DESIGN CHECKED :
DRAFTING CHECKED :
CADFILE : \\Drawing2.dwg
APPROVED :
NOT FOR CONSTRUCTION
This drawing is not to be used for construction purposes unless signed as approved

NOTES :
1. All dimensions are in millimetres unless noted otherwise.
2. Levels are in terms of NZVD 2009.

REFERENCE :

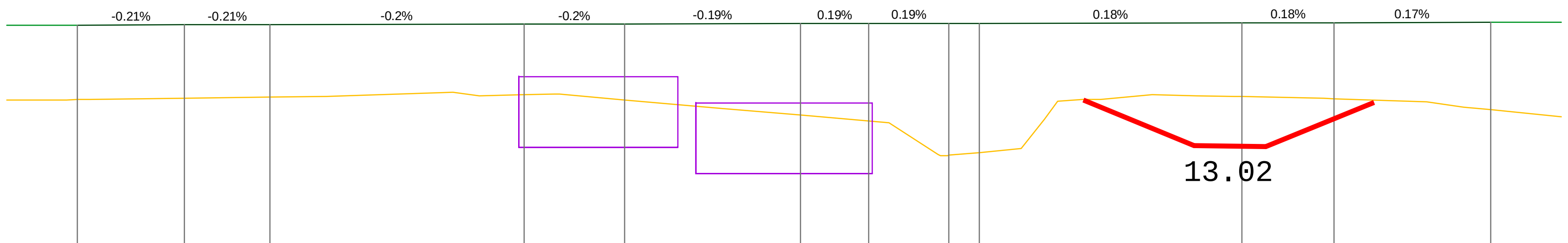
NZ TRANSPORT AGENCY
WAKA KOTAHI
Peka Peka to Ōtaki Expressway

NZ TRANSPORT AGENCY
PEKA PEKA TO ŌTAKI EXPRESSWAY

Temporary Works
Culvert 39 Stream Diversion

SCALES (AT A3 SIZE) 1: 200
Figure 3
REV. 0

Existing ground
Proposed ground (permanent works)
Proposed Culvert 39 (permanent works)
Indicative diversion location with invert levels



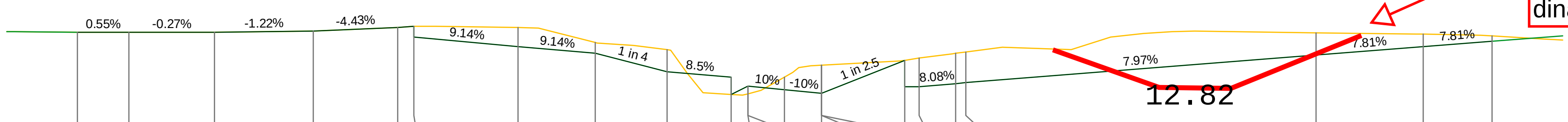
Centreline Data
X = 1778295.629
Y = 5479936.776
Z = 16.784

DATUM RL 10.500

DESIGN	16.744	16.750	16.755	16.770	16.776	16.785	16.789	16.793	16.795	16.808	16.813	16.820
PROP GROUND	16.744	16.750	16.755	16.770	16.776	16.785	16.789	16.793	16.795	16.808	16.813	16.820
EX GROUND	14.631	14.670	14.699	14.772	14.626	14.193	14.033	13.055	13.136	14.715	14.661	14.344
OFFSET	-20.000	-16.963	-14.554	-7.357	-4.514	0.465	2.401	4.666	5.527	12.965	15.568	20.000

CHAINAGE 60

approx invert levels at upstream and downstream ends to be matched to existing stream to avoid any vertical steps. Estimated grade of 2% longitudinal gradient (minimum 1.5%)



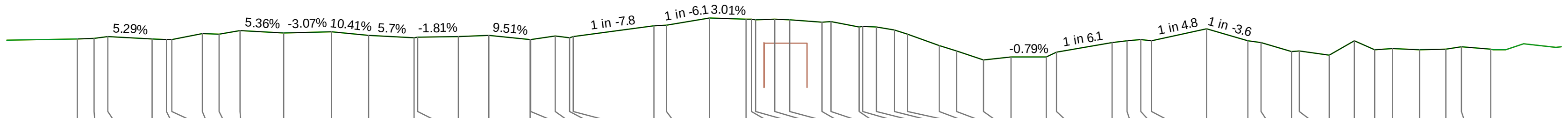
Centreline Data
X = 1778287.497
Y = 5479942.575
Z = 12.932

DATUM RL 12.000

DESIGN	14.562	14.554	14.560	14.595	14.700	14.726	14.160	13.962	13.448	13.294	13.036	13.036
PROP GROUND	14.562	14.554	14.560	14.595	14.700	14.430	14.160	13.962	13.448	13.294	13.036	13.036
EX GROUND	14.562	14.554	14.560	14.595	14.700	14.726	14.695	14.271	14.074	12.803	12.820	12.820
OFFSET	-20.000	-18.537	-16.116	-13.319	-10.943	-10.487	-7.531	-5.360	-3.318	-1.504	-1.038	-1.038

DESIGN	12.932	12.828	12.828	12.828	13.774	13.028	13.111	13.134	13.924	14.160	14.311
PROP GROUND	12.932	12.828	12.828	12.828	13.774	13.028	13.111	13.134	13.924	14.160	14.311
EX GROUND	13.288	13.634	13.634	13.634	13.774	13.829	13.968	14.004	14.544	14.504	14.460
OFFSET	0.000	1.038	1.038	1.039	3.403	3.814	4.843	5.126	15.036	18.065	20.000

CHAINAGE 50



Centreline Data
X = 1778279.662
Y = 5479948.772
Z = 14.806

DATUM RL 12.000

DESIGN	14.258	14.265	14.324	14.257	14.235	14.243	14.409	14.385	14.489	14.423	14.464
PROP GROUND	14.258	14.265	14.324	14.257	14.235	14.243	14.409	14.385	14.489	14.423	14.464
EX GROUND	14.258	14.265	14.324	14.257	14.235	14.243	14.409	14.385	14.489	14.423	14.464
OFFSET	-20.000	-19.516	-19.132	-17.878	-17.482	-17.315	-16.468	-15.983	-15.388	-14.160	-12.811

DESIGN	14.354	14.280	14.307	14.328	14.353	14.242	14.244	14.338	14.283	14.331	14.622
PROP GROUND	14.354	14.280	14.307	14.328	14.353	14.242	14.244	14.338	14.283	14.331	14.622
EX GROUND	14.354	14.280	14.307	14.328	14.353	14.242	14.244	14.338	14.283	14.331	14.622
OFFSET	-11.755	-10.463	-10.365	-9.211	-8.352	-7.178	-7.157	-6.470	-6.062	-5.956	-3.676

DESIGN	14.651	14.849	14.818	14.820	14.802	14.819	14.798	14.726	14.744	14.589	14.609
PROP GROUND	14.651	14.849	14.818	14.820	14.802	14.819	14.798	14.726	14.744	14.589	14.609
EX GROUND	14.651	14.849	14.818	14.820	14.802	14.819	14.798	14.726	14.744	14.589	14.609
OFFSET	-3.314	-2.102	-1.064	-0.919	-0.791	-0.263	0.161	1.078	1.342	2.138	2.229

DESIGN	14.587	14.505	14.383	14.074	13.908	13.655	13.748	13.740	13.885	14.145	14.205
PROP GROUND	14.587	14.505	14.383	14.074	13.908	13.655	13.748	13.740	13.885	14.145	14.205
EX GROUND	14.587	14.505	14.383	14.074	13.908	13.655	13.748	13.740	13.885	14.145	14.205
OFFSET	2.621	3.134	3.503	4.392	4.886	5.658	6.432	7.436	7.710	9.290	9.717

DESIGN	14.230	14.206	14.535	14.211	14.158	13.897	13.924	13.790	14.197	13.944	13.983
PROP GROUND	14.230	14.206	14.535	14.211	14.158	13.897	13.924	13.790	14.197	13.944	13.983
EX GROUND	14.230	14.206	14.535	14.211	14.158	13.897	13.924	13.790	14.197	13.944	13.983
OFFSET	10.100	10.406	11.975	13.134	13.500	14.365	14.598	15.440	16.140	16.731	17.227

DESIGN	13.945	13.959	14.030	13.959
PROP GROUND	13.945	13.959	14.030	13.959
EX GROUND	13.945	13.959	14.030	13.959
OFFSET	17.988	18.742	19.181	20.000

CHAINAGE 40

DRAWING STATUS: PRELIMINARY DRAFT

0	First Issue		
REVISION DESCRIPTION		BY	DATE

DESIGNED : XXX ----
DRAWN : XXX ----
DESIGN CHECKED :
DRAFTING CHECKED :
CADFILE : \\Drawing2.dwg
APPROVED :
NOT FOR CONSTRUCTION
This drawing is not to be used for construction purposes unless signed as approved

NOTES :
1. All dimensions are in millimetres unless noted otherwise.
2. Levels are in terms of NZVD 2009.

REFERENCE :

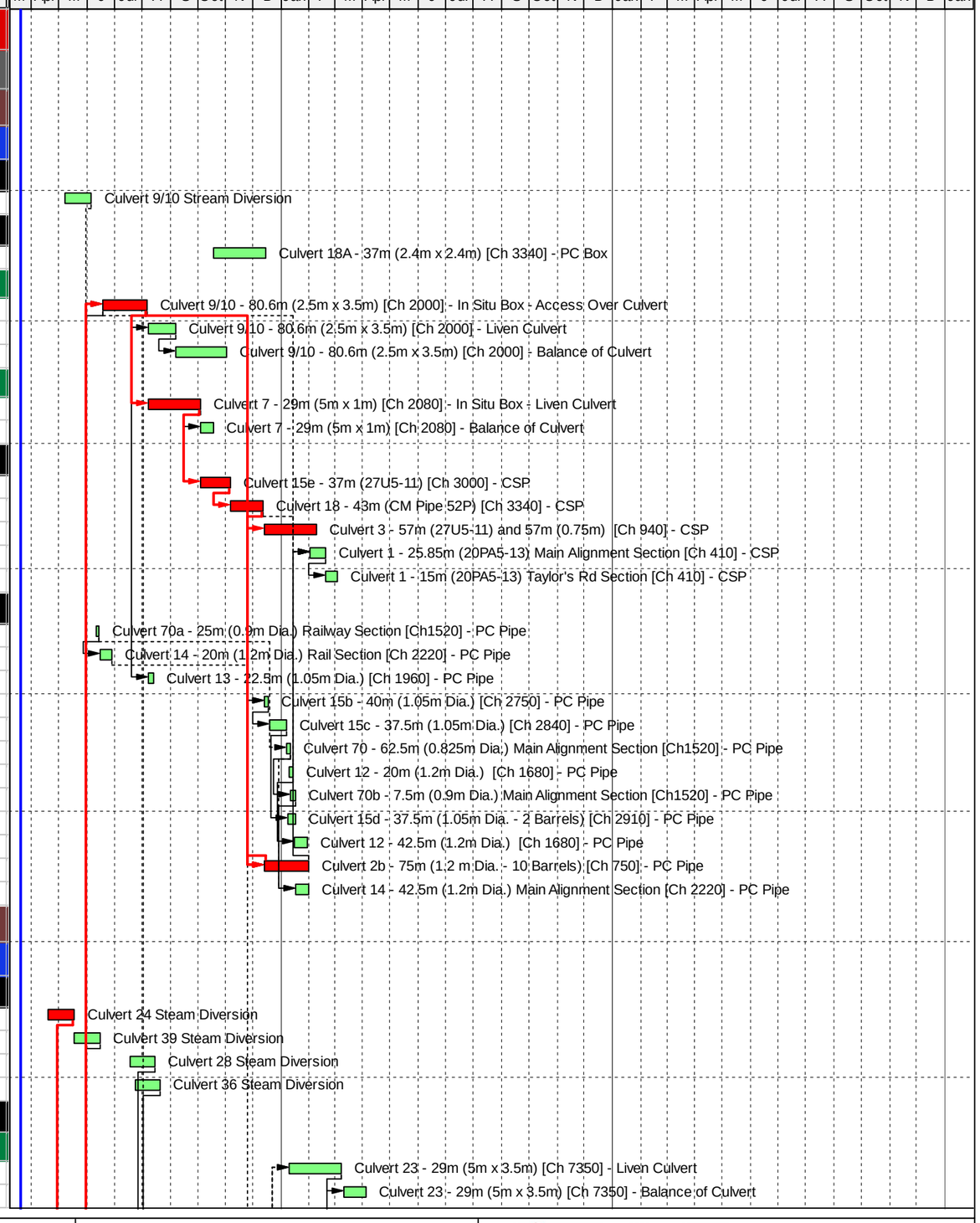
NZ TRANSPORT AGENCY
PEKA PEKA TO ŌTAKI EXPRESSWAY

Temporary Works
Culvert 39 Stream Diversion

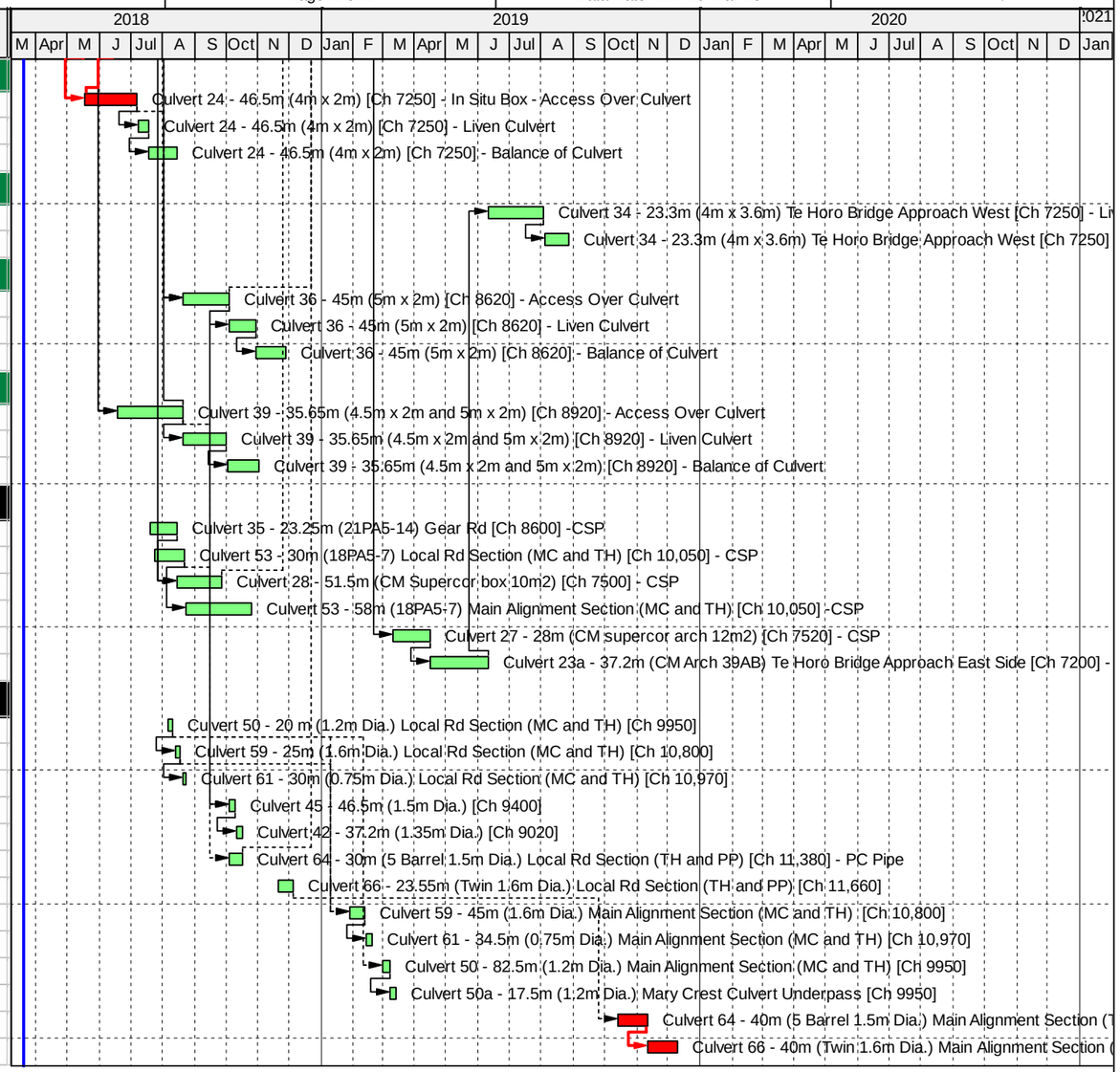
SCALES (AT A3 SIZE) 1: 200
Figure 4
REV. 0

APPENDIX E – PROGRAMME

Activity Name	Orig Dur	Rem Dur	Start	Finish
Peka Peka to Otaki Expressway - Master	408d	408d	19-Apr-18	09-Dec-19
Construction	408d	408d	19-Apr-18	09-Dec-19
Zone 1 (North): Ch 0 - 3800	201d	201d	08-May-18	04-Mar-19
Drainage	201d	201d	08-May-18	04-Mar-19
Stream Diversions	20d	20d	08-May-18	05-Jun-18
Culvert 9/10 Stream Diversion	20d	20d	08-May-18	05-Jun-18
Box Culverts	129d	129d	18-Jun-18	14-Dec-18
Culvert 18A - 37m (2.4m x 2.4m) [Ch 3340] - PC Box	40d	40d	19-Oct-18	14-Dec-18
Culvert 9/10	99d	99d	18-Jun-18	02-Nov-18
Culvert 9/10 - 80.6m (2.5m x 3.5m) [Ch 2000] - In Situ Box - Access Over Culvert	36d	36d	18-Jun-18	06-Aug-18
Culvert 9/10 - 80.6m (2.5m x 3.5m) [Ch 2000] - Liven Culvert	23d	23d	07-Aug-18	06-Sep-18
Culvert 9/10 - 80.6m (2.5m x 3.5m) [Ch 2000] - Balance of Culvert	40d	40d	07-Sep-18	02-Nov-18
Culvert 7	53d	53d	07-Aug-18	18-Oct-18
Culvert 7 - 29m (5m x 1m) [Ch 2080] - In Situ Box - Liven Culvert	42d	42d	07-Aug-18	03-Oct-18
Culvert 7 - 29m (5m x 1m) [Ch 2080] - Balance of Culvert	11d	11d	04-Oct-18	18-Oct-18
CSP Culverts	95d	95d	04-Oct-18	04-Mar-19
Culvert 15e - 37m (27U5-11) [Ch 3000] - CSP	22d	22d	04-Oct-18	05-Nov-18
Culvert 18 - 43m (CM Pipe 52P) [Ch 3340] - CSP	27d	27d	06-Nov-18	12-Dec-18
Culvert 3 - 57m (27U5-11) and 57m (0.75m) [Ch 940] - CSP	30d	30d	13-Dec-18	08-Feb-19
Culvert 1 - 25.85m (20PA5-13) Main Alignment Section [Ch 410] - CSP	11d	11d	01-Feb-19	18-Feb-19
Culvert 1 - 15m (20PA5-13) Taylor's Rd Section [Ch 410] - CSP	10d	10d	19-Feb-19	04-Mar-19
Circular Culverts	157d	157d	11-Jun-18	31-Jan-19
Culvert 70a - 25m (0.9m Dia.) Railway Section [Ch1520] - PC Pipe	4d	4d	11-Jun-18	14-Jun-18
Culvert 14 - 20m (1.2m Dia.) Rail Section [Ch 2220] - PC Pipe	10d	10d	15-Jun-18	28-Jun-18
Culvert 13 - 22.5m (1.05m Dia.) [Ch 1960] - PC Pipe	5d	5d	07-Aug-18	13-Aug-18
Culvert 15b - 40m (1.05m Dia.) [Ch 2750] - PC Pipe	4d	4d	13-Dec-18	18-Dec-18
Culvert 15c - 37.5m (1.05m Dia.) [Ch 2840] - PC Pipe	4d	4d	19-Dec-18	07-Jan-19
Culvert 70 - 62.5m (0.825m Dia.) Main Alignment Section [Ch1520] - PC Pipe	4d	4d	07-Jan-19	10-Jan-19
Culvert 12 - 20m (1.2m Dia.) [Ch 1680] - PC Pipe	4d	4d	09-Jan-19	14-Jan-19
Culvert 70b - 7.5m (0.9m Dia.) Main Alignment Section [Ch1520] - PC Pipe	4d	4d	11-Jan-19	16-Jan-19
Culvert 15d - 37.5m (1.05m Dia. - 2 Barrels) [Ch 2910] - PC Pipe	8d	8d	08-Jan-19	17-Jan-19
Culvert 12 - 42.5m (1.2m Dia.) [Ch 1680] - PC Pipe	10d	10d	15-Jan-19	29-Jan-19
Culvert 2b - 75m (1.2 m Dia. - 10 Barrels) [Ch 750] - PC Pipe	25d	25d	13-Dec-18	31-Jan-19
Culvert 14 - 42.5m (1.2m Dia.) Main Alignment Section [Ch 2220] - PC Pipe	10d	10d	17-Jan-19	31-Jan-19
Zone 2 (South): 3800 - 12200	408d	408d	19-Apr-18	09-Dec-19
Drainage	408d	408d	19-Apr-18	09-Dec-19
Stream Diversions	86d	86d	19-Apr-18	20-Aug-18
Culvert 24 Steam Diversion	20d	20d	19-Apr-18	17-May-18
Culvert 39 Steam Diversion	20d	20d	18-May-18	15-Jun-18
Culvert 28 Steam Diversion	20d	20d	18-Jul-18	14-Aug-18
Culvert 36 Steam Diversion	20d	20d	24-Jul-18	20-Aug-18
Box Culverts	315d	315d	18-May-18	27-Aug-19
Culvert 23	59d	59d	10-Jan-19	04-Apr-19
Culvert 23 - 29m (5m x 3.5m) [Ch 7350] - Liven Culvert	40d	40d	10-Jan-19*	08-Mar-19
Culvert 23 - 29m (5m x 3.5m) [Ch 7350] - Balance of Culvert	19d	19d	11-Mar-19*	04-Apr-19



Activity Name	Orig Dur	Rem Dur	Start	Finish
Culvert 24	62d	62d	18-May-18	14-Aug-18
Culvert 24 - 46.5m (4m x 2m) [Ch 7250] - In Situ Box - Access Over Culvert	35d	35d	18-May-18	06-Jul-18
Culvert 24 - 46.5m (4m x 2m) [Ch 7250] - Liven Culvert	8d	8d	09-Jul-18*	18-Jul-18
Culvert 24 - 46.5m (4m x 2m) [Ch 7250] - Balance of Culvert	19d	19d	19-Jul-18*	14-Aug-18
Culvert 34	56d	56d	11-Jun-19	27-Aug-19
Culvert 34 - 23.3m (4m x 3.6m) Te Horo Bridge Approach West [Ch 7250] - Liver	39d	39d	11-Jun-19	02-Aug-19
Culvert 34 - 23.3m (4m x 3.6m) Te Horo Bridge Approach West [Ch 7250] - Bala	17d	17d	05-Aug-19	27-Aug-19
Culvert 36	70d	70d	21-Aug-18	27-Nov-18
Culvert 36 - 45m (5m x 2m) [Ch 8620] - Access Over Culvert	32d	32d	21-Aug-18	03-Oct-18
Culvert 36 - 45m (5m x 2m) [Ch 8620] - Liven Culvert	17d	17d	04-Oct-18	29-Oct-18
Culvert 36 - 45m (5m x 2m) [Ch 8620] - Balance of Culvert	21d	21d	30-Oct-18	27-Nov-18
Culvert 39	99d	99d	18-Jun-18	02-Nov-18
Culvert 39 - 35.65m (4.5m x 2m and 5m x 2m) [Ch 8920] - Access Over Culvert	46d	46d	18-Jun-18	20-Aug-18
Culvert 39 - 35.65m (4.5m x 2m and 5m x 2m) [Ch 8920] - Liven Culvert	30d	30d	21-Aug-18	01-Oct-18
Culvert 39 - 35.65m (4.5m x 2m and 5m x 2m) [Ch 8920] - Balance of Culvert	23d	23d	02-Oct-18	02-Nov-18
CSP Culverts	215d	215d	20-Jul-18	10-Jun-19
Culvert 35 - 23.25m (21PA5-14) Gear Rd [Ch 8600] -CSP	18d	18d	20-Jul-18*	14-Aug-18
Culvert 53 - 30m (18PA5-7) Local Rd Section (MC and TH) [Ch 10,050] - CSP	22d	22d	24-Jul-18	22-Aug-18
Culvert 28 - 51.5m (CM Supercor box 10m2) [Ch 7500] - CSP	32d	32d	15-Aug-18	27-Sep-18
Culvert 53 - 58m (18PA5-7) Main Alignment Section (MC and TH) [Ch 10,050] -CS	45d	45d	23-Aug-18	25-Oct-18
Culvert 27 - 28m (CM supercor arch 12m2) [Ch 7520] - CSP	26d	26d	11-Mar-19	15-Apr-19
Culvert 23a - 37.2m (CM Arch 39AB) Te Horo Bridge Approach East Side [Ch 720	36d	36d	16-Apr-19	10-Jun-19
Circular Culverts	333d	333d	06-Aug-18	09-Dec-19
Culvert 50 - 20 m (1.2m Dia.) Local Rd Section (MC and TH) [Ch 9950]	5d	5d	06-Aug-18	10-Aug-18
Culvert 59 - 25m (1.6m Dia.) Local Rd Section (MC and TH) [Ch 10,800]	5d	5d	13-Aug-18	17-Aug-18
Culvert 61 - 30m (0.75m Dia.) Local Rd Section (MC and TH) [Ch 10,970]	4d	4d	20-Aug-18	23-Aug-18
Culvert 45 - 46.5m (1.5m Dia.) [Ch 9400]	5d	5d	04-Oct-18	10-Oct-18
Culvert 42 - 37.2m (1.35m Dia.) [Ch 9020]	5d	5d	11-Oct-18	17-Oct-18
Culvert 64 - 30m (5 Barrel 1.5m Dia.) Local Rd Section (TH and PP) [Ch 11,380]	10d	10d	04-Oct-18	17-Oct-18
Culvert 66 - 23.55m (Twin 1.6m Dia.) Local Rd Section (TH and PP) [Ch 11,660]	10d	10d	21-Nov-18	04-Dec-18
Culvert 59 - 45m (1.6m Dia.) Main Alignment Section (MC and TH) [Ch 10,800]	10d	10d	29-Jan-19	12-Feb-19
Culvert 61 - 34.5m (0.75m Dia.) Main Alignment Section (MC and TH) [Ch 10,970]	5d	5d	13-Feb-19	19-Feb-19
Culvert 50 - 82.5m (1.2m Dia.) Main Alignment Section (MC and TH) [Ch 9950]	5d	5d	01-Mar-19	07-Mar-19
Culvert 50a - 17.5m (1.2m Dia.) Mary Crest Culvert Underpass [Ch 9950]	5d	5d	08-Mar-19	14-Mar-19
Culvert 64 - 40m (5 Barrel 1.5m Dia.) Main Alignment Section (TH and PP) [Ch 11	20d	20d	14-Oct-19	11-Nov-19
Culvert 66 - 40m (Twin 1.6m Dia.) Main Alignment Section (MC and TH) [Ch 11,6	20d	20d	12-Nov-19	09-Dec-19



APPENDIX F – ACCIDENTAL DISCOVERY PROTOCOLS

Accidental Discovery Protocols

The protocols for accidental archaeological discovery set out below will be followed if subsurface archaeological remains, koiwi tangata (human remains) or taonga are exposed during construction in areas that are not being monitored by an archaeologist or when archaeologists are not present on site.

Information provided below outlines procedures to be followed in the case of suspected unrecorded archaeological sites being located during the course of work.

Discovery of Suspected Archaeological Features or Deposits

If suspected archaeological remains are exposed in the course of works, the following procedure will be implemented:

1. Contractors shall cease all work within the vicinity of the suspected archaeological site, and immediately notify the Site Project Manager.

2. The area of the suspected archaeological deposit or feature is to be made secure, ensuring that the area (and any objects contained within) remains undisturbed and meets health and safety requirements.

3. The Project Manager will arrange for the Project Archaeologist to visit the site, to confirm the nature of the archaeological site, and to define the extent of the deposit or feature.

4. Following confirmation of the site as archaeological, the Project Manager will notify the Regional Archaeologist HNZPT, The Transport Agency, Nga Hapū o Ōtaki and M.T.A representatives and, if appropriate, district and city council representatives.

5. The archaeological remains will be investigated and recorded in accordance with archaeological best practice, and in line with the legal conditions of any authority granted by HNZPT.

6. Works can resume once the Project Archaeologist confirms that the required investigation and recording are complete and Nga Hapū o Ōtaki and M.T.A representatives and HNZPT give their agreement.

Discovery of Koiwi Tangata (Human Remains)

If suspected human remains are identified, the following protocol will be adopted:

1. Earthworks shall cease within 20 meters of the find while an appropriately qualified archaeologist is consulted to establish whether the bone is human.

2. The area of the site containing koiwi will be secured, ensuring that the area (and any objects contained within) remains undisturbed and meets health and safety requirements.

3. If it is determined that bone is human, earthworks will not resume in the immediate vicinity (as determined by the Project Archaeologist) until HNZPT, Nga Hapū o ōtaki and M.T.A representatives, the New Zealand Police and district council representatives have been notified.

4. Nga Hapū o ōtaki and M.T.A representatives will be given the opportunity to conduct karakia in association with appropriate tikanga Māori prior to the removal of koiwi for reburial.

5. If Nga Hapū o ōtaki and M.T.A representatives so request, koiwi may be further analysed by a specialist osteo-archaeologist prior to reburial.

6. Work within the area can recommence as soon as the remains have been removed from site, and with the agreement of all relevant agencies.

Discovery of Taonga

Maori artefacts such as carvings, stone adzes, and greenstone are considered to be taonga (treasures). These objects are identified as taonga tuturu in the Protected Objects Act 1975. Taonga may be discovered in isolated contexts, but are generally found within archaeological sites, modification of which is subject to the provisions of the HNZPT Act.

If taonga are discovered, the procedure established for the discovery of archaeological sites (as detailed above) must be followed, and the following procedure will apply to the taonga itself:

1. The area of the site containing the taonga will be secured in such a way that protects the taonga from further disturbance or damage.
2. The archaeologist will inform HNZPT and Nga Hapū o ōtaki and M.T.A representatives so that appropriate actions can be determined, and appropriate tikanga protocols to be undertaken.
3. If the object is identified as taonga tuturu the Project Archaeologist will notify the Ministry for Culture and Heritage of the finding, as required under the Protected Objects Act 1975.
4. The Ministry for Culture and Heritage, in consultation with Nga Hapū o ōtaki and M.T.A representatives, will decide on custodianship of the taonga. If the taonga requires conservation treatment this can be carried out by the Archaeological Conservation Laboratory, University of Auckland.

Specific Tikanga Maori Protocols

1. Nga Hapū o ōtaki and M.T.A shall be informed **48 hours** before the start and finish of the archaeological work.

2. Any alterations to the Archaeological Site Management Plan will be discussed with Nga Hapū o ōtaki and M.T.A.

3. Access for Nga Hapū o ōtaki and M.T.A shall be enabled in order to undertake tikanga Maori protocols consistent with any requirements of site safety.

4. Nga Hapū o Ōtaki and M.T.A shall be provided with a copy of all reports completed as a result of the archaeological work associated with this authority(s) and be given an opportunity to discuss it with the archaeologist if required.

5. Nga Hapū o Ōtaki will notify other iwi parties of any archaeological finds (e.g. taonga or kōiwi tangata) and subsequent ceremonies as deemed appropriate by Nga Hapū o Ōtaki and M.T.A.

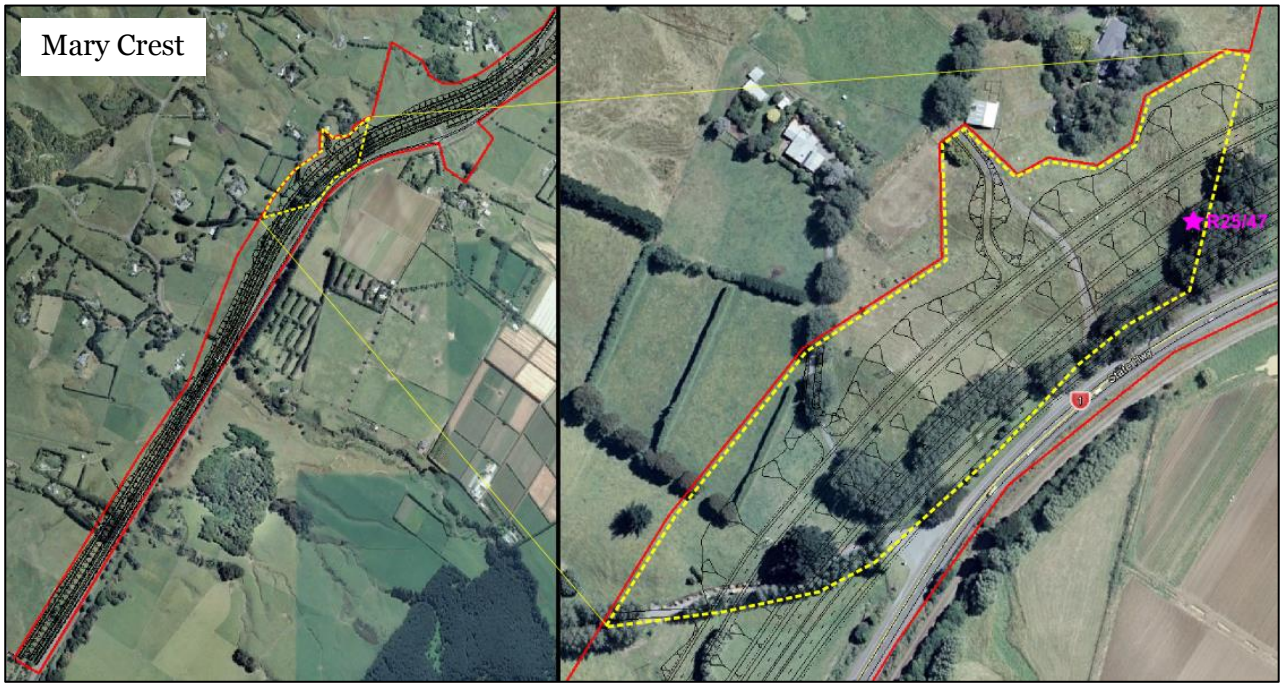


Figure 1: Area of pre-construction investigation (outlined in yellow) at the Mary Crest dunes, showing the location of recorded site R25/47 (in pink).

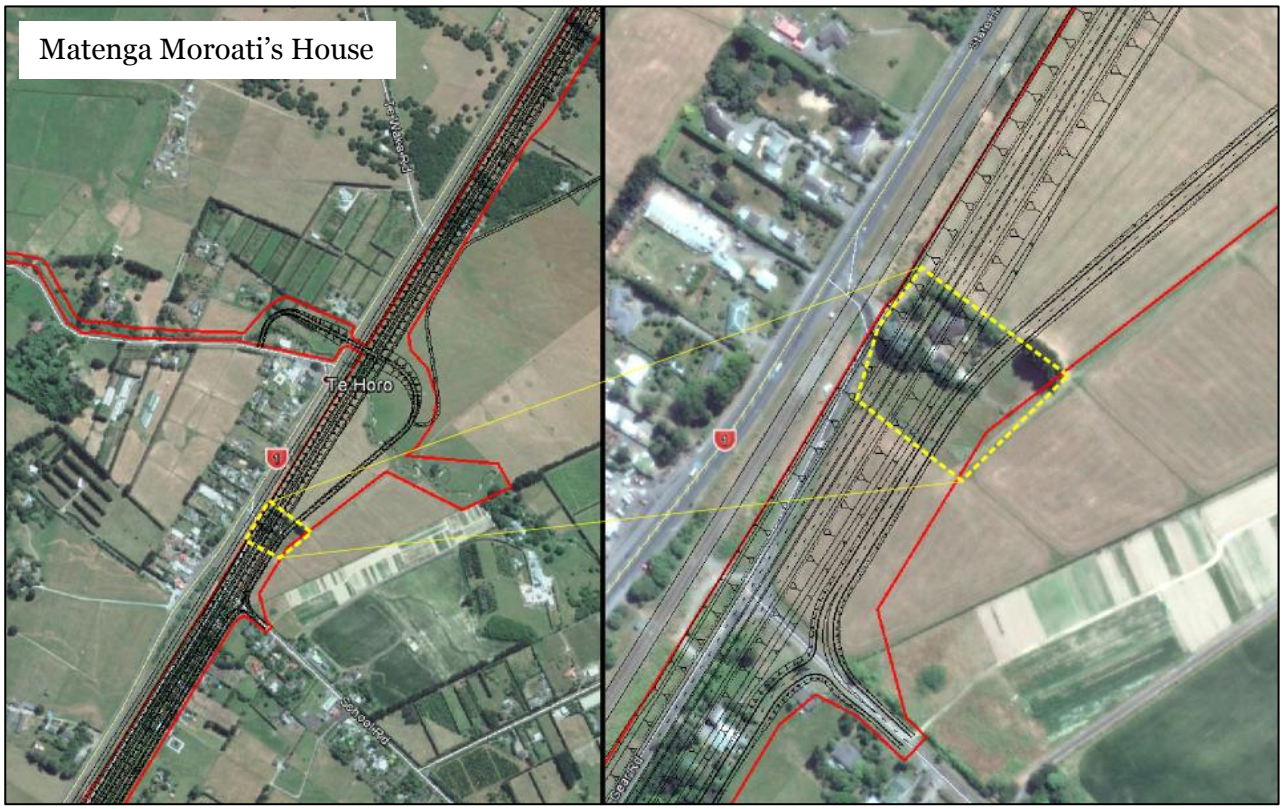


Figure 2: Area of pre-construction investigation (outlined in yellow) at Matenga Moroati's House.

APPENDIX G – SITE SPECIFIC TRAFFIC MANAGEMENT PLAN

Site Specific Traffic Management Plan

– Peka to Ōtaki Project

Southern Culverts

March 2018

NZ TRANSPORT AGENCY WAKA KOTAHI | Peka Peka to Ōtaki Expressway | New Zealand Government

Contents

1 INTRODUCTION

This Site Specific Traffic Management Plan (SSTMP) provides the necessary information to demonstrate how the project team plan to avoid or mitigate potential construction traffic effects from activities associated with construction of five transverse culverts in the southern zone of the project as follows:

- Culvert 24 (chainage 7260)
- Culvert 28 (chainage 7500)
- Culvert 35 (chainage 8600)
- Culvert 36 (chainage 8640)
- Culvert 39 (chainage 8920)

This SSTMP reflects the requirements of the Construction Traffic Management Plan (CTMP) including sections 1.3 (Performance Standards) and section 3.2.1 - specifically the need to interface with TTM on other networks. This plan is also consistent with the requirements set out in the over-arching Construction Environmental Management Plan (CEMP).

This document is intended to be utilised by the construction team to clearly identify any site specific traffic management requirements that must be adhered to prior to, and during works in any given area.

Specific Traffic Management methodologies will be finalised and submitted to the relevant Road Controlling Authority as the construction programme is finalised and becomes more detailed. These more specific Traffic Management Plans (TMPs) will cover specific mitigation for each individual temporary traffic management requirement. This document will be a living document that will have multiple stages and traffic layouts that will be amended as and when required to suit varying construction stages and required traffic management.

1.1 The SSTMP and TMP Process

This SSTMP provides the necessary information from a project level on how the effects of construction traffic related to the site activities will be avoided or mitigated across the two roading networks in the location of the expressway works i.e. the State Highway Network (NZTA) and the local road network (KCDC)

Each of the two Road Controlling Authorities (RCA's) has its own processes and procedures for the approvals (TMP's) and implementation of temporary Traffic management within their respective networks which is separate to the SSTMP process.

It is recognised that approval / implementation of TMPs associated with this SSTMP will be staged and implemented at differing times over the course of the works. In addition, it is recognised that the TMP's themselves may alter due to both project and surrounding community requirements.

The purpose of this SSTMP is to provide the base (minimum) standard of service / maximum practical level of mitigation to be incorporated into the development of the respective TMP's all the while ensuring that the BOI consent conditions and subsequent CTMP requirements are met during the construction process.

2 SSTMP CONSENT CONSIDERATIONS

Reference should also be made to section 3.2 of the CTMP.

2.1 Proposed Temporary Traffic Management Measures - BOI condition 34 b (i)

Each of the work areas will have the required (CoPTTM) signage and early warning delineation provided by a combination of cones and line marking – all in accordance with the respective RCA TMP requirements. Each Traffic Management Plan will be submitted to the relevant RCA and Approved prior to implementation. Until site specific construction plans are finalised a location specific Traffic Management Plan cannot be prepared. Once methodologies are finalised location specific Traffic Management plans will be prepared and submitted to KCDC for approval.

2.2 Assessment of delays - BOI condition 34 b (ii)

Each Traffic Management plan will incorporate an assessment of expected delays and will also provide delay calculations where any are expected to occur. It is not envisaged that any significant delays will occur at any time.
Any oversized loads will be escorted with Pilot Vehicles again with no anticipated delays with their operations covered by Oversized Vehicle Permits. These oversized movements will be of an occasional nature only to move large plant in and off site.

2.3 Detour Routes - BOI condition 34 b (iii)

There are no expected detours associated with the Temporary Traffic Management measures included within this SSTMP. Should a Detour Route be identified a Site Specific Traffic Management Plan will be subject to review by the relevant RCA before implementation. It is expected that should any Detour be required this will be for short term activities only and Approved on a case by case basis by the RCA.

2.4 Existing Accesses - BOI condition 34 b (iv)

The proposed Temporary Traffic Management measures do not knowingly affect existing accesses to private or commercial properties. Should this occur consultation will be undertaken with affected parties to ensure they retain access at all times.

2.5 Pedestrian and Cyclist Access - BOI condition 34 b (v)

The work area does not affect any dedicated cycle paths or lanes though their set out and operation will be mindful of cyclists in accordance with CoPTTM and applicable RCA requirements.

2.6 Maintaining Existing Transport Services - BOI condition 34 b (vi)

The proposed Temporary Traffic Management measures for implementation of the work areas will not affect any existing public transport services and facilities such as bus stops.

2.7 Temporary Speed Limits (TSL) - BOI condition 34 b (vii)

The use of TSL's will be kept to a minimum and will be identified as and when required in Site Specific Traffic Management Plans submitted to and approved by the relevant RCA. It is expected that a Temporary Speed Limit of 30km/h will only be used during Stop Go operations or should an unsealed surface be required to be left trafficked.

2.8 Access to & From the Construction Site - BOI condition 34 b (viii)

The primary objective of this SSTMP is the planning (TMP's), approvals (RCA's) and incorporation of Site Access Points (SAP's) as outlined in this SSTMP appended to **SSEMP SLR1** to ensure the safe and efficient access to and from site of construction related traffic.

The operating hours of the SAP's will be in accordance with the proposed hours of work included within the **CNVMP i.e.**

- Monday to Friday 6.30am to 8pm
- Saturday 7.30am to 6pm

Operation outside those hours will be at the approval of the Engineer and in accordance with the provisions of the **CNVMP.**

2.9 Communications and Stakeholders - BOI condition 34 b (ix)

As the effects of the proposed measures are as yet unknown, implementation and operation of the SSTMP's will be communicated to stakeholders, road users and the community via the methods and processes as included within the project Stake Holder and Communications Management Plan, with particular emphasis on the key groups identified in Section 3.1 of the CTMP as required.

3 ADDITIONAL CTMP CONSIDERATIONS

3.1 Kiwirail NIMTR - CTMP section 2.1.2

The implementation and operation of some SSTMP's may involve the need to collaborate with Kiwirail as sites may cross the NIMT Railway or existing at grade carriageway crossings. Traffic Management strategies will include having no delays created for Kiwirail and the NIMT.

3.2 Emergency Action Plan(s) – CTMP section 3.2.3.8

All emergency services shall have unimpeded access along all State Highway and local roads 24 hrs. per day. Should any roads be affected by temporary traffic management any likely delays will be communicated prior to works to all Emergency Service Providers by way of weekly Road Works Reporting procedures as required by both RCA's. All major works that impact the roading network will have SSTMP's developed with consultation of Emergency Services.

3.3 Access to KCDC Owned and Operated Water and Waste Water Assets – CTMP section 3.2.1.1.7

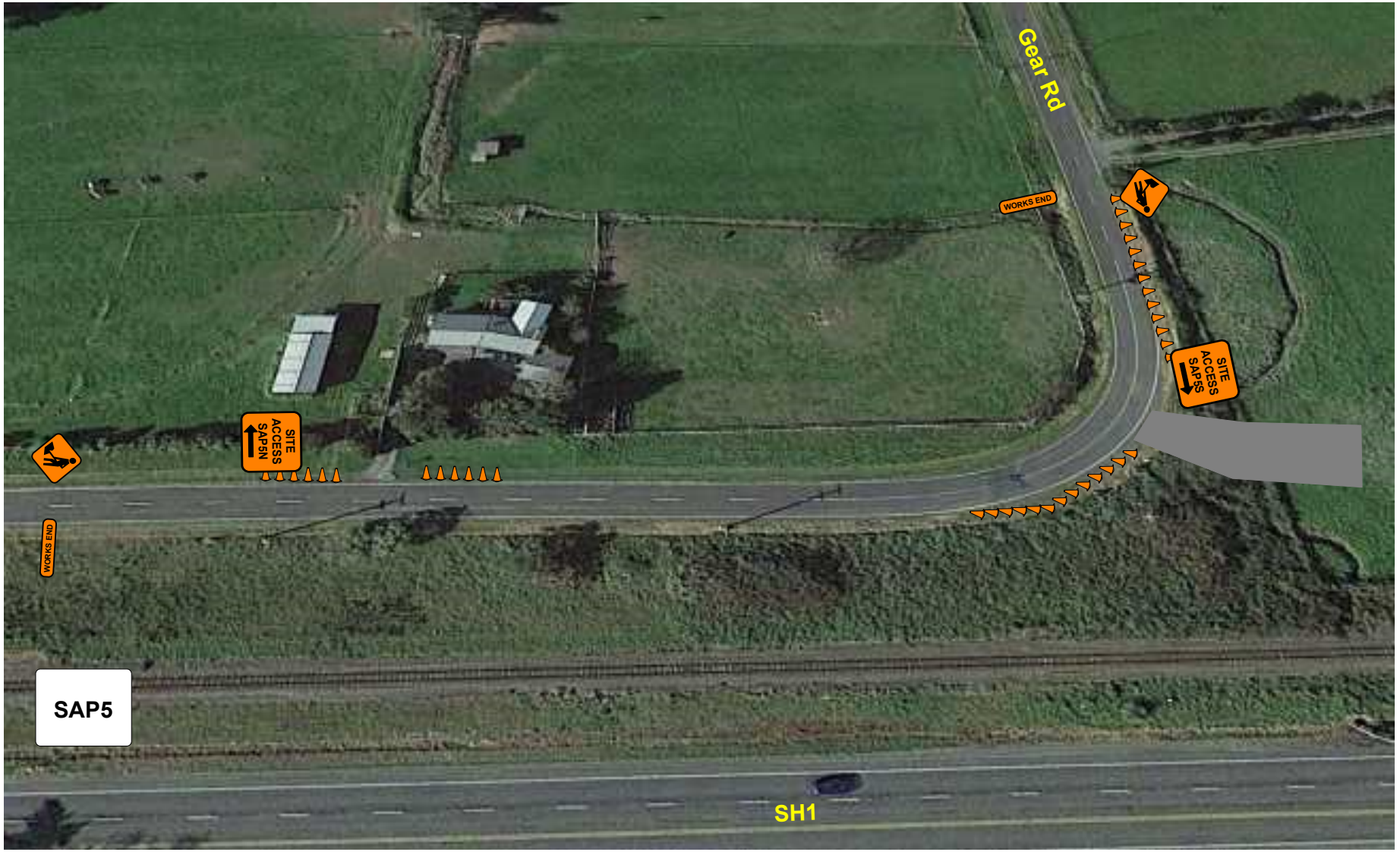
Access to existing KCDC water and waste water assets will not be impeded by any SSTMP's.

3.4 Monitoring, Auditing & Reporting – CTMP sections 3.3 & 3.4

Monitoring, Auditing and Reporting of the Traffic Management Measure (once implemented) shall be in accordance with the CTMP and CoPTTM guidelines.

3.5 Complaints – CTMP sections 3.5

Feedback including complaints received related to the implementation of Temporary Traffic Management measures covered within this SSTMP shall be recorded and processed in line with the CTMP.



Situation: Site Access Point 5 - Gear Rd	Drawing No: SAP 5	Revision: 1	
Drawing Title:		Drawing By: Chris Harmer	
		Checked:	
		Date: 17/07/17	
		TMC Approval:	

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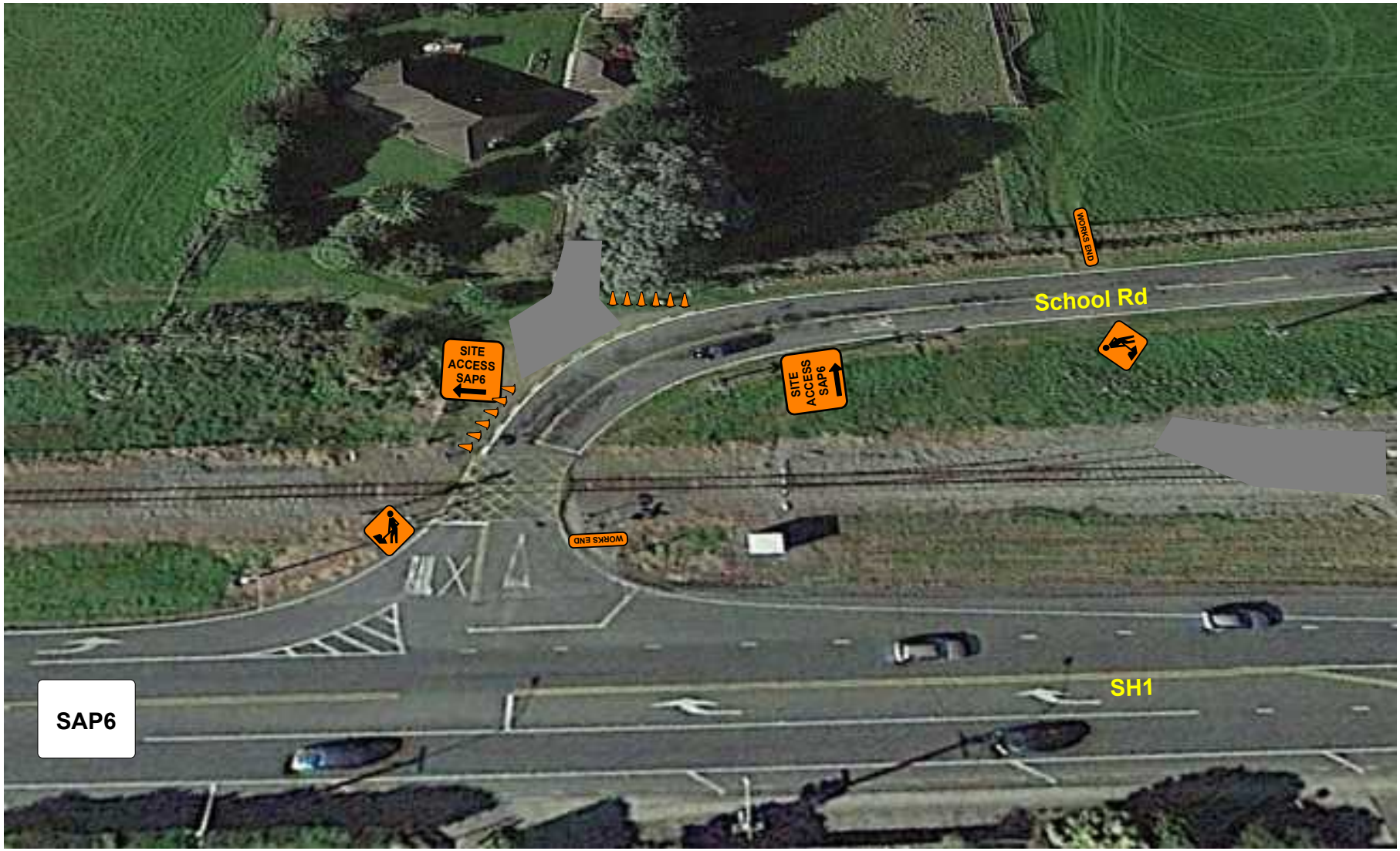

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Drawing Title:		Drawing By: Chris Harmer	
		Checked:	
		Date: 17/07/17	
		TMC Approval:	