APPENDIX D – STORMWATER REPORT

Stormwater Report for Resource Consent Application – Stage 1

State Highway 16: Huapai to Waimauku Safety Improvements

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Revision A - Draft for Review

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Engineering Staff	Name & Surname	Signature	Date
Prepared by: (Designer)	Jerry Liu		
Reviewed by: (Design Manager)	Craig Hatley		
Reviewed by: (Planner)	Catherine Richards		
Verified by: (Technical Subject Specialist)	Roger Seyb		
Approval: (Regional Delivery Manager)	Lloyd de Beer		

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1 INTRODUCTION

The State Highway 16 (SH16) corridor between Brigham Creek to Waimauku was identified within the *Safer Journeys - Delivering State Highway Safer Roads and Roadsides Programme Business Case (PBC) March 2014* as a rural state highway to be investigated further based on criteria within the High Risk Rural Roads Guide (HRRRG).

The PBC is based on a strategy of reducing the number of New Zealanders that are killed or seriously injured on our roads annually, minimising the social harm and economic impact of road crashes, by delivering against the NZ Transport Agency's (NZTA) commitments to safer roads and roadsides. Benefits have been identified within the strategic and programme business cases, to improve our roads and roadsides, and lead to a reduction of deaths and serious injuries.

The potential benefits of successful intervention have been identified as the following:

- **Benefit 1**: Reduction in Death and Serious Injuries (DSI) casualties on the SH16 Brigham Creek to Waimauku corridor (65%).
- **Benefit 2**: Maintain or improve travel time between Kumeu and Brigham Creek Road (35%).

1.1 Purpose and Scope

This report has been prepared on behalf of the NZTA to accompany an application for resource consent. This report summaries the stormwater related features of the safety improvement works and highlights the measures proposed to mitigate stormwater effects as guided by the Auckland Unitary Plan.

This report documents the Stage 1 (Section E) safety improvements treatments along SH16 between Huapai and Waimauku and the stormwater related features of the design to accommodate the works. The safety improvement treatments considered to address the safety issues identified in the Business Case for Section E are:

- Posted limit change (100 km/h and 70km/h) east of Wintour Road, Waimauku;
- New median and shoulder safety barrier, with safe turnaround facilities specific locations;
- Widened shoulders where required to accommodate new barriers; and
- Improved road vertical and horizontal geometry to enhance visibility.

1.2 Corridor Overview

The SH16: Brigham Creek to Waimauku corridor extends from the end of the Auckland North-Western Motorway at the intersection (roundabout) of SH16, Brigham Creek Road and Fred Taylor Drive through to the posted speed limit change (to 70 km/h) east of Waimauku.

The corridor is divided into five sections:

- Section A: Brigham Creek roundabout through to Coatesville-Riverhead Highway intersection;
- Section B: Coatesville-Riverhead Highway intersection;

- Section C: Coatesville-Riverhead Highway intersection through to Taupaki Road / Old North Rd intersection;
- Section D: Taupaki Road / Old North Road intersection through to the posted speed limit change (80km/h and 60km/h) east of Old Railway Road intersection, Kumeu; and
- Section E: From Station Road intersection, Huapai to the posted limit change (100 km/h and 70km/h) east of Wintour Road, Waimauku.

This assessment relates only to Section E.

Figure 1: The State Highway 16 Safety Improvements – section locality map

1.3 Existing Condition

Stage 1 of the project traverses the Kumeu Huapai catchment which drains to Kumeu River and into the Kaipara Harbour. The total catchment area upstream of Stage 1 is approximately 89km².

The Stage 1 section is underlain by Tauranga group Holocene soils (alluvium/colluvium, estuarine, lacustrine, fan and swamp deposits) and late Pleistocene soils (alluvium/colluvium and fan deposits). This soil type is free draining, however, not as porous as basalt or high gravel content soils. A curve number of 74 has been adopted for pervious portions of this catchment to reflect this soil type in accordance with TP108.

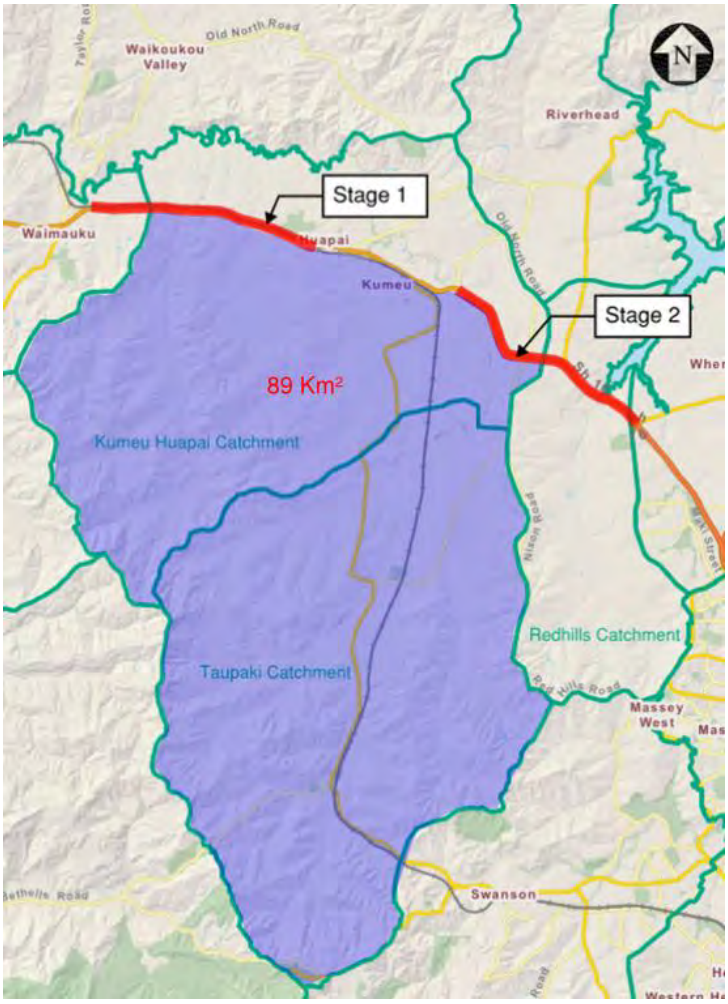

Figure 2: Catchments Upstream of Stage 1

Under the current Unitary Plan, the upper catchments that are intercepted by the Stage 1 portion of the project are generally zoned for Future Urban and Rural. Only a small portion of the Kumeu Huapai catchment is zoned for Residential – Single House Zone for areas closer to the town ship. Refer to the Unitary Plan for details and definitions of the various zones.

Observations based on existing aerial photographs confirms that most of the area under the Future Urban and Rural within the catchments are currently mostly rural and undeveloped, and are assumed to continue to be so for the purpose of this project.

Based on visual assessments of the existing aerial photographs, the rural catchments are assumed to have 7% of impervious area for runoff calculations.

1.3.1 Flood Risk to Road and Others

It is identified through review of the existing Auckland Council GIS (AC GIS) maps that there are many locations along the road or in adjacent private properties that could be inundated with stormwater during a large rainfall event. Refer to Appendix D for a copy of the AC GIS flood map. As per AC GIS flood map, key risk areas identified are shown in Table 1.

Table 1: Existing key flood risk areas as per AC GIS

Reference Property Address (Or lot description)	Reference Chainage
529 State Highway 16 Huapai 0891	Ch 196750
Lot 2 DP 168981, Tapu Road Huapai 0810	
551 State Highway 16 Huapai 0891	Ch 197200 to 197300
601 State Highway 16 Huapai 0891	Ch 197550
623 State Highway 16 Huapai 0891	Ch 197760
647/653 State Highway 16 Huapai 0891	Ch 198140
665 State Highway 16 Huapai 0891	
695 State Highway 16 Huapai 0891	Ch 198650 to 198700
23 Foster Road Huapai 0891	
727 State Highway 16 Huapai 0883	
757 State Highway 16 Waimauku 0883	Ch 199190
771 State Highway 16 Waimauku 0883	Ch 199360 to 199850
779 State Highway 16 Waimauku 0883	
791 State Highway 16 Waimauku 0883	
805 State Highway 16 Waimauku 0883	
Lot 2 DP 311972, State Highway 16 Waimauku 0883	
815 State Highway 16 Waimauku 0883	
2 Cloverfields Drive Waimauku 0812	Ch 200080

1.3.2 Cross Culverts

Existing culverts have been identified using a combination of survey, RAMM, GIS and aerial photography and the locations of these are shown on the plans (SR1003-01-VE-2101 to 2123) and sketch SR1003-01-VE-9004. Appendix C contains figures showing the catchment of each culvert.

Due to lack of detailed survey information of location and invert levels of these culverts, the existing hydraulic performance of each culvert is an estimate only.

A summary of these existing culverts and initial assessment of flow capacity is presented in Table E in Appendix E. Based on the assessments presented, most of the culverts identified are undersized and are not capable of passing through a Q10 peak flow without surcharging and overtopping the road.

These undersized existing culverts are considered to be a key factor to the flooding identified in Section 1.3.1 above.

1.3.3 Primary Conveyance and Treatment

Based on the RAMM data and MSL survey provided the existing drainage consists of piped systems and swales along the corridor. This directs stormwater runoff and discharges into nearby watercourses through outlet structures.

No existing proprietary treatment devices have been identified on the RAMM data.

1.4 Reference Documents

The following reference documents have been used as the basis for design development.

- Cunningham, A., Colibaba, A., Hellberg, B., Silyn Roberts, G., Symcock, R., Vigar, N and Woortman, W (2017) Stormwater management devices in the Auckland region. Auckland Council guideline document, GD2017/001
- Auckland Council, 2016. Auckland Unitary Plan - Operative in Part - 15 November 2016, Chapter E Auckland-wide.
- Auckland Regional Council, 1999. Guidelines for stormwater runoff modelling in the Auckland Region (TP108).

1.5 Source of Existing information

The following information are used as inputs for this phase of the design for the development of concept design.

- Auckland Council GIS data:
  - Stormwater assets extracted at Business Case phase in late 2016
  - LiDAR ground contour extracted in March 2018
- NZTA RAMM data, initially provided at Business Case phase in late 2016 and again in March 2018.

Localised detailed survey has been undertaken in areas where topographic information is missing or needs to be refined. However, due to traffic management, programme and accessibility reasons, there are a large number of existing stormwater structures that cannot be surveyed. This includes most of the cross-culvert pipes.

2 BASIS OF DESIGN

The basis of design for new stormwater drainage design as follows:

- The objective for stormwater treatment is to treat all the new impervious road surface from road widening and as much as possible for existing surfaces;
- The preferred approach is to use natural stormwater systems (such as wetlands and swales) to treat the runoff from the corridor prior to discharging it to the receiving environment (where practical);
- Land take requirements are to be minimised when designing stormwater conveyance and treatment systems. To aid with this, the runoff from the corridor may also be treated by proprietary treatment devices;
- Where land take opportunities are possible and assessed to be appropriate, the use of stormwater ponds, wetlands or wetland swales will be considered and implemented where practical;
- Where the existing pipe is deemed sufficient for serviceability and capacity, no further improvements have been considered. However, if the existing pipe is deemed no longer suitable for the proposed road geometry, replacement is proposed;
- Where existing drainage systems are to be adopted/connected to, it may not be practical or feasible to upgrade/replace the existing infrastructure to meet the current standards.

In these cases, the proposed design should minimise any changes to the existing level of service; and

- Construction of any permanent assets within KiwiRail land are to be avoided.

Table 2 below sets out a summary of quantitative stormwater management design criteria applicable to the project.

Table 2: Summary of Stormwater Design Criteria

ITEM		CRITERIA
Design event allowances		
Rainfall (incl. 2.1°C climate change increase) [1]	100-year ARI (1% AEP), 24-hour	245mm
	10-year ARI (10% AEP), 24-hour	147mm
	5-year ARI (20% AEP), 24-hour	107mm
	2-year ARI (50% AEP), 24-hour	83mm
Frequent rainfall [2]	95th percentile rainfall	35mm
	90th percentile rainfall	25mm
Stormwater quality rainfall [4]	As per NZTA requirement (2 year, 1-hour, but not greater than 30mm)	28mm
Catchment characteristics		
SCS curve number	Impervious areas	98
	Pervious areas	74
Road catchment	Existing and proposed	100% impervious
Upper catchment [3]	Existing and proposed	Rural Zones: 7% impervious, 93% pervious Urban (Residential) Zones: 60% impervious, 40% pervious
Design criteria		
SMAF 1 - Retention	Impervious areas	Retention (volume reduction) of 5mm runoff depth for the impervious are for which hydrology mitigation is required
SMAF 1 - Detention	Impervious areas	Detention (temporary storage) and a drain down period of 24 hours for the difference between the pre-development and post-development runoff volumes from the 95th percentile, 24-hour rainfall event minus the 5mm retention volume, over the impervious area for which hydrology mitigation is required
Quality [4]	Road > 5000 vpd	Treatment of runoff as per the following guidelines, in order of precedence: • NZTA treatment guideline • GD01 guideline • TP10 guideline
Conveyance	Primary	10% AEP

ITEM		CRITERIA
	Secondary	1% AEP less primary capacity.
Flood risk	Carriage way	Inundation of road is kept to as per the existing condition
	Offsite properties [5]	The diversion and discharge must not result in or increase the following: • flooding of other properties in rainfall events up to the 10 per cent annual exceedance probability (AEP); • inundation of buildings on other properties in events up to the 1 per cent annual exceedance probability (AEP).

Notes:

1. Rainfall date extracted from HIRDS with allowance of 2.1°C climate change increase
2. Interpolated from Figure 13 and 14 of Auckland Council Technical Report 2013/035
3. Existing pervious area as defined from AC GIS and aerial photograph
4. Stormwater quality rainfall varies depending on the referenced guideline (other values listed below). 28mm is adopted for the project as NZTA design guideline is preferred and is greater than GD01, and not significantly different to TP10.
    a. 29mm as per TP10 (2 year, 24-hour, divide by 3)
    b. 25mm as per GD01 (90th percentile rainfall)
5. As per Section E8.6.1 (3) of the Unitary Plan.

2.1 Other Design Considerations

- New culverts, pipelines, manholes and other hydraulic structures beneath paved surfaces shall have a design and hydraulic performance life, and durability performance of not less than 100 years, considering the site ground conditions, potential settlement, and depth of cover, type of bedding and backfill and method of installation;
- Access to pipelines, hydraulic structures and treatment devices must be provided to enable safe and convenient inspection and maintenance;
- A minimum pipe diameter of 300mm is adopted across the design for reduced risk of blockage, and minimum of 375mm pipe crossing under vehicle access is required as per NZTA standards;
- Where piped networks are proposed, new inlets are spaced such that gutter flow will not encroach into the nearest traffic lane in a 10% AEP event;
- One lane must remain open for traffic each way during a 1% AEP storm event, where practical subject to existing flood conditions along SH16;
- Existing culverts are to be extended to suit the new road geometry as a minimum. Additional culverts will be provided should the extension of culvert result in an adverse effect of flooding to others on the upstream side;
- All treatment swales are to be planted to minimise footprint;
- The success of implementation new wetlands and ponds is largely dependent on the catchment areas draining to each device is larger than 4Ha;
- All discharges to sensitive receiving environments (waterways and wetlands) shall have energy dissipaters and appropriately designed permanent erosion control; and

- Clean stormwater runoff from permeable surfaces are diverted away from treatment devices where practicable.

2.2 Proposed Design

The proposed design will result in an increased impervious road area due to the widened road geometry works. The existing road is typically 11m along the corridor, whereas the new works proposed typically results in a total carriageway width range from 11.5m to 13.5m, and up to 16m in some localised sections.

Based on the existing road impervious area as defined from MLS survey and aerial photographs, the increase in impervious area of the road within Stage 1 (Section E) is 22% as per shown in Table 3.

Table 3: Existing and Proposed Impervious Area

	Existing Impervious Area (m^2)	Proposed Impervious Area (m^2)	% Increase
Stage 1 (Section E)	41100	52534	22%

The change in the overall imperviousness in catchment is tabulated in Table F in Appendix F.

2.2.1 Flood Risk

The effects of the proposed widening works are assessed in four different areas as below. It should be noted that the assessment of the effects on the various areas of flood risks are limited to desktop studies based on information gathered from AC GIS and existing RAMM data. Assumptions have been made where there are gaps in the existing information, such as stream cross-section profiles, pipe sizes and invert levels.

2.2.1.1 Flood Risk to Road

As discussed previously, most of the existing culverts are found to be under capacity under existing condition and will overtop the road under the 10% AEP design rainfall event. As there is only a minor increase in imperviousness and the road vertical geometry is not going to be changed significantly, the effects of the proposed widening works to the existing flood risk on the road are considered to be minor.

The new stormwater conveyance pipe network is proposed to capture road surface runoff, which should have a beneficial effect to the existing flooding situation on the road, as the proposed pipe network will able to provide some storage volume within the pipes.

Works to improve any existing flooding conditions to the road are currently outside the scope of the project.

2.2.1.2 Flood Risk to Others - Downstream

The cumulative effect of the proposed works for Stage 1 on downstream properties and buildings have been assessed at a discharge point on the Cane Road and Waikoukou Valley Road within the Kaipara River (refer to Figure 3).

The existing 1% AEP peak discharge to this point from a total catchment of 89.5km^2 is estimated to be 329m^3/s. The total cumulative increase in 1% AEP peak discharge from the widening works is less than 1m^3/s. Based on the existing cross section at this discharge point, an increase of 1m^3/s of peak flow will approximately increase the water level in the river at this point by about 5mm.

The effects are also reviewed at the two streams that are crossed by Stage 1 works and the results are summarised in the table below. As shown Table 4, the effects of the 1% AEP peak discharge in increase on the water level at each stream is less than 1mm. The additional discharge from the proposed works presents no increase to flood levels at these streams and the increase of flood risk and lateral loading to the bridge structure to the existing bridges are small.

Table 4: Estimated Water Level at Bridges

Stream Name	Bridge Name	Catchment area (ha)	Q100 Flow (m^3/s)			Q100 Water Level (m)		
			Pre	Post	Change	Pre	Post	Change
Coopers Creek	Kumeu #2	380.9	47.313	47.317	0.004	20.986	20.986	0.000
Ahukuramu Stream	Berrys	1295.3	115.683	115.688	0.005	16.861	16.861	0.000

Therefore, the increase in flood extent and depth to downstream buildings and properties due to the minor increase in peak flow are expected to be minimal at these key crossing points.

Figure 3: Discharge point for assessment of Stage 1 effects flood risk on downstream property (Modified, source: Auckland GIS viewer, May 2018)

2.2.1.3 Flood Risk to Others – Upstream at Culverts

Extension of existing culverts will influence the head water level (HWL) at each culvert and could therefore have an increase in potential flood risk effects to immediate upstream properties and buildings.

As discussed previously, most of the existing culverts are found to be under capacity and will overtop the road under the 10% AEP design rainfall event. Given that the road is wide, small increases in flow from the road widening will have an insignificant effect on upstream flood levels at these overflow locations. Only three culverts have been identified to have sufficient capacity for the 10% AEP design rainfall event. For these culvert locations a change of HWL has been calculated based on the additional of length of culvert required for the new road width and this is shown in Table 7 below.

Table 5: Change in HWL at culverts with capacity for 10% AEP rainfall

Catchment Name	Name (Ch)	Change in length (m)	Existing 10% AEP HWL (RL m)	10% AEP HWL after extension (RL m)	Change in HWL (m)
D	197550	0	23.024	23.024	0
H	198220	0	30.540	30.540	0
N	199580	5.99	12.559	12.563	0.005

The increases in HWL are all very small and therefore the effects of the proposed extension work on the nearby properties upstream of these culverts are insignificant.

2.2.1.4 Afflux at Bridges

The bridge widening works proposed for Berry Creek Bridge and Kumeu No.2 Bridge is limited to the extension of the bridge deck. The cross-section area defined by the stream channel and bridge structure at each stream will not be changed as the additional superstructure proposed is a replication of the existing structure.

On this basis, the effects of afflux at both streams are negligible.

2.2.2 Cross Drainage

The capacity assessment results have indicated that most of the existing culverts are potentially undersized when compared with current design standards. Increasing these culverts to accommodate a larger flow is not within the scope of works for this project.

Existing culverts that pass under SH16 will be extended to suit the new road geometry, as shown on the plans. The effect of culvert lengthening is discussed in Section 2.2.1.3 (the proposed design should be no worse than the existing level of service).

2.2.3 Stormwater Discharge and Diversion

Refer to drawings SR1003-01-CE-2101 to 2123 and Table 6 for the proposed stormwater drainage layout for primary and secondary conveyance systems. A set of detailed catchment plans are also included in Appendix D showing all the discharge points (DP)

New manholes and pipes will be typically located behind wire rope barriers in the road verge area. Catchpit spacing are placed to meet the requirement of keeping the 10% AEP stormwater runoff within shoulder.

Secondary flow from the carriageway will be typically contained within the road carriageway between kerbs or within roadside conveyance channels and/or swales.

Clean water diversion drains on either side of the road corridor have been designed to replicate the existing road side open channels. This will divert clean runoff from upstream external catchment, so no proposed treatment devices will be overloaded with clean water runoff or be unnecessarily oversized. No redirecting of catchments is proposed.

Table 6: Proposed Stormwater Discharge Points and Conveyance Systems

Discharge Point	Position	Road Catchment Chainage (m)		Receiving Environment	Capture and Conveyance Approach
		From	To		
DP 1	WB, South	196600 (Trigg Road)	169760	Artificial watercourse	Kerb and channel with pits and pipes
DP 2	EB, North	169760	196920	Artificial watercourse	Kerb and channel with pits and pipes
DP 3	WB, South	196920	197390	River or Stream (Coopers Creek)	Kerb and channel with pits and pipes and discharge into retention swale before final discharge
DP 4	EB, North	197200	197390	River or Stream (Coopers Creek)	Kerb and channel with pits and pipes
DP 5	EB, North	197390	197870	River or Stream (Coopers Creek)	Kerb and channel with pits and pipes
DP 6	EB, North	197870	198050	Artificial watercourse	Kerb and channel with pits and pipes
DP 7	EB, North	198050	198140	Artificial watercourse	Kerb and channel with pits and pipes
DP 8	WB, South	198140	198280	Artificial watercourse	Existing roadside swale
DP 9	WB, South	198280	198660	River or Stream (Ahukuramu Stream)	Existing roadside swale
DP 10	WB, South	198660	199050	River or Stream (Ahukuramu Stream)	Existing roadside swale
DP 11	EB, North	198600	198660	River or Stream (Ahukuramu Stream)	Kerb and channel with pits and pipes
DP 12A	WB, South	199050	199200	Artificial watercourse	Existing roadside swale
DP 12B	EB, North	199050	199200	Artificial watercourse	Kerb and channel with pits and pipes
DP 12	EB, North	199200	199580 (Joyce Adams Place)	River or Stream	Kerb and channel with pits and pipes
DP 13	EB, North	199580 (Joyce Adams Place)	199780	River or Stream	Kerb and channel with pits and pipes
DP 14	WB, South	199780	200020 (Wintour Road)	River or Stream	Kerb and channel with pits and pipes and discharge into swale before final discharge
DP 15	WB, South	200020 (Wintour Road)	200130	River or Stream	Kerb and channel with pits and pipes

As shown in Table 6, there are multiple discharge points directly discharging runoff into stream receiving environments. Detention and retention volumes are required to be provided

as per the AUP-OP, Rule E8.6.3. for any controlled activities when discharge to natural streams. This rule has been interpreted to require providing detention and retention volumes, to which is the requirement as the SMAF 1 overlay. The discharge points (DP) are tabulated in Table 7 below summarised with commentaries on the provision of detention and retention below.

Table 7: Discharge points within stream environments

DISCHARGE POINT	COMMENTS
DP 3	Part of the overall SMAF 1 area as detailed in Section 2.2.5.
DP 4	Part of the overall SMAF 1 area as detailed in Section 2.2.5.
DP 5	Outside of the overall SMAF 1 area as detailed in Section 2.2.5, however required retention volume are provided within the proposed retention swale design for DP 3 and DP 4.
DP 9	Heavily constrained by existing locations of utilities and power poles and land availability for provisions of any retention and/or detention devices
DP 10	Rip-rap swales are provided for conveyance and energy dissipation. Retention and/or detention are provided as per detail below.
DP 11	Heavily constrained by existing adjacent rail embankment and land availability for provisions of any retention and/or detention devices
DP 12	Heavily constrained by existing adjacent rail embankment and land availability for provisions of any retention and/or detention devices
DP 13	Heavily constrained by existing adjacent rail embankment and land availability for provisions of any retention and/or detention devices
DP 14	Discharges into an existing stormwater pond where the identified stream passes through. Provision of any retention and/or detention devices is likely to require works within this existing pond which is unlikely to provide any betterment or improvement on the existing scenario.
DP 15	Discharges into an existing stormwater pond where the identified stream passes through. Provision of any retention and/or detention devices is likely to require works within this existing pond which is unlikely to provide any betterment or improvement on the existing scenario.

Requirements of SMAF retention and detention is dealt with under Section 2.2.5. The retention and detention required under E8 of the Unitary Plan can only be provided at DP 10, for which the required hydraulic mitigation volumes are summarised in the Table 8 below. Other DPs that are not included in Table 8 will not have any detention or retention provided as it has proven to be not practical to do so as per commentaries provided in Table 7 above.

Table 8: Detention and retention volume required

Discharge point	Total Impervious Area (m^2)	Additional Impervious Area (m^2) (Note 1)	Retention Volume (m^3)	Detention Volume (m^3)	Total Detention Volume (m^3) (Note 2)
DP 10	8134	1789	40.7	0.4	41.1

Notes
1. Additional impervious areas are based the average additional impervious area of 20% as per Table 3
2. Total detention volume is calculated as per SMAF1 requirement as per the Unitary Plan, Table E10.6.3.1. SMAF1 is adopted for consistency reasons.

Under the Unitary Plan, Table E10.6.3.1, the retention volume is calculated using the impervious area of the whole site whereas detention volume is only for the difference of imperviousness between the post- and pre-development state.

The proposed road widening works means that the retention volume required also meets the requirement of provision of detention volumes (i.e. the required total detention volume is similar to the required retention volume). Therefore no specific detention volume is required to be provided.

Hydrology mitigation volumes are provided using retention storage volume under the swale (50m long) with check dams, the results are summarised in Table 9. This is the same approach adopted to meet the requirement of the SMAF overlay, per detailed in Section 2.2.5 of the report.

Table 9: Retention swales summary

Detention and retention volumes	
DP 10	
Zone 1 (Detention)	
Ponding depths (including mulch layer) (mm)	0.200
Check dam spacing (m)	16
Total ponded water volume (m^3)	12.5
Zone 2 (Retention)	
Storage layer depth (m)	1
Storage volume provided (m^3)	30

As shown in Table 9, a total of 42.5m^3 of hydrology mitigation volume is provide for DP 10, which is more than the total required.

2.2.4 Stormwater Treatment

All stormwater runoff generated from any new high use road surfaces will be treated before discharge. Not all runoff from existing road surface can be captured and treated as there sections of the westbound carriageway edge are left unchanged. Approximately 84%

(44042m^2 of treated area out of 52534m^2 total impervious area) of the total impervious area are treated.

Road surface runoff are treated through a combination of natural green infrastructure and proprietary treatment devices along the corridor (refer drawings SR1003-01-CE-2101 to 2123 and summarised in Table 10).

Wetlands were considered initially at downstream discharge points where land is not an issue or opportunity for land take is present. However, initial assessment demonstrated that it is difficult to meet the required catchment area (>4 Ha) from the road surface catchments to make the wetland ecologically viable.

Proprietary treatment devices (such as Stormwater360 Stormfilters) are proposed as the road reserve is heavily constrained by land availability, treatment swales with varying base width are used for treatment purposes elsewhere.

Table 10: Proposed Stormwater Treatment Devices

Location (Ch.)			Discharge Point (DP)	Catchment Area (m^2)		Change in Impervious Area (%)	Treatment Devices	Comments and Notes
From	To	WB or EB		Impervious	Pervious			
196600 (Trigg Road)	196700	WB	DP 1 (Ultimately)	588	0	0 %	None.	Stormwater network on WE shoulder caters for the existing runoff from upstream residential land from exiting.
196700	196730	WB (Turnaround)	DP 1	736	0	489 %	Proprietary treatment device (Stormwater360 Stormfilters, 2 No.)	See note 1
196730	196920	WB	DP 2 (Ultimately)	1043	0	0 %	None	Edge of seal remains unchanged.
196600 (Trigg Road)	196920	EB	DP 2	2705	0	45 %	Proprietary treatment device (Stormwater360 Stormfilters, 6 No.)	See note 1
196920	196950	Both	DP 2	534	0	26 %	None	Edge of seal remains unchanged.
196950	197340	Both	DP 3	4465	22184	27 %	Planted Retention Swale	See section 2.2.5 for detail
197340	197400 (Berrys Creek)	Both	DP 4	1510	0	33 %	Proprietary treatment device (Stormwater360	See note 1

Location (Ch.)			Discharge Point (DP)	Catchment area (m^2)		Change in Impervious area (%)	Treatment Devices	Comments and notes
							Stormfilters, 3 No.)	
197400 (Berrys Creek)	197880	Both	DP 5	7200	0	33 %	Proprietary treatment device (Stormwater360 Stormfilters, 15 No.)	See note 1
197880	198050	Both	DP 6	2570	0	34 %	Proprietary treatment device (Stormwater360 Stormfilters, 6 No.)	See note 1
198050	198170	Both	DP 7	1900	0	14 %	Proprietary treatment device (Stormwater360 Stormfilters, 4 No.)	See note 1
198170	198280	Both	DP 8	1235	0	15 %	None	Edge of seal remains unchanged.
198280	198420	WB	DP 9 (Ultimately)	804	0	0 %	None	Edge of seal remains unchanged.
198420	198520	WB	DP 9 (Ultimately)	500	2600	0 %	Proprietary treatment device (Stormwater360 Stormfilters, 3 No.)	See note 1
198520	198660	WB	DP 9	657	0	0 %	None	Edge of seal remains unchanged.
198280	198630	EB	DP 11	3143	921	60 %	Proprietary treatment device (Stormwater360 Stormfilters, 7 No.)	See note 1
198630	199050	EB	DP 10	5570	0	91 %	Proprietary treatment device (Stormwater360 Stormfilters, 11 No.)	Includes 1187m^2 of Froster Road catchment. See section 2.2.3 for retention and detention provision.
198660	199050	WB	DP 10	2250	0	0 %	None	Includes 470m^2 of Froster Road catchment.

Location (Ch.)			Discharge Point (DP)	Catchment Area (m^2)		Change in Impervious Area (%)	Treatment Devices	Comments and Notes
								Edge of seal remains unchanged.
199050	199200	EB	DP 12B	800	0	19 %	Proprietary treatment device (Stormwater360 Stormfilters, 2 No.)	See note 1
199050	199200	WB	DP 12A	870	0	0 %	None	Edge of seal remains unchanged.
199200	199600	Both	DP 12	5870	0	20 %	Proprietary treatment device (Stormwater360 Stormfilters, 12 No.)	See note 1
199600	199780	Both	DP 13	2260	0	24 %	Proprietary treatment device (Stormwater360 Stormfilters, 5 No.)	See note 1
199780	200020	Both	DP 14	3480	13260	17 %	Planted Treatment Swale	See note 2
200020	200020	Both	DP 15	289	0	0 %	None	Includes part of Wintour Road. Edge of seal remains unchanged.
200020	200130	Both	DP 15	1567	0	0 %	Proprietary treatment device (Stormwater360 Stormfilters, 4 No.)	See note 1 Existing stormwater pond remains.

Notes:

1. Proprietary products are to be confirmed and sized in accordance's with manufacture's guide lines and requirements. Stormwater360 Stormfilters are used for preliminary design purposes only and sizing of these are based on recommendation provided by the manufactures' web-based calculator, using a water quality rainfall intensity of 10mm/hr as per GD01.
2. Planted treatment swales are designed to NZTA's guideline to provide a residence time of 9 minutes or more.

2.2.5 SMAF Requirements- Retention and Detention

The SMAF 1 overlay mainly applies to the Kumeu Huapai township catchment and is applicable to a portion of Stage 1 of the project, for approximately 780m of SH16 measured west from Trigg Road. The required retention and detention volumes are given in Table 11 below.

Table 11: SMAF 1 volumes

Total SMAF impervious area (m^2)	Retention Volume (m^3)	Detention Volume (m^3)	Total Detention Volume (m^3)
11368	57	6	63

To cater for the required SMAF retention and detention volumes, is it proposed that the road runoff is collected by a pipe network and discharged into a retention swale. Constraints are imposed by the geographical nature of the alignment which is limited by the railway corridor to the north and private properties to the south. A typical section of retention swale is shown in Figure 4 below.

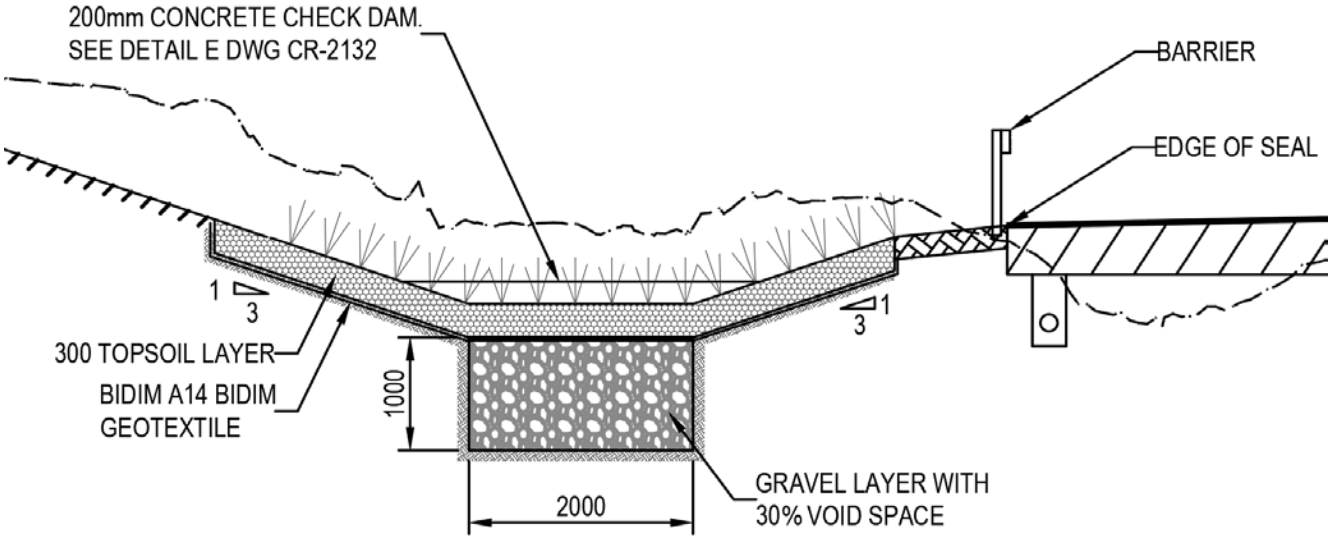

Figure 4: Typical section of retention swale

A retention swale is proposed on the westbound side of the road from approximately Ch. 197200 to 197400. Check dams are designed into this swale to encourage stormwater infiltration into the storage layer and provide detention volume within the ponded water behind check dams.

All of the required retention volume is provided by this retention swale. The proposed swale design parameters are presented in Table 12 and Figure 5.

Table 12: Retention swale result summary

ITEM	
Swale geometry and water quality (as per NZTA guideline)	
Swale base width (m)	2
Side slope (1:x)	3
Swale length (m)	180
Swale longitudinal slope (%)	1.4
WQ depth (m)	0.203
Residence time (min)	23
Detention and retention volume	
Zone 1 (Detention)	
Ponding depths (including mulch layer) (mm)	0.200
Check dam spacing (m)	30
Total ponded water volume (m^3)	20
Zone 2 (Retention)	
Storage layer depth (m)	1
Storage volume provided (m^3)	102

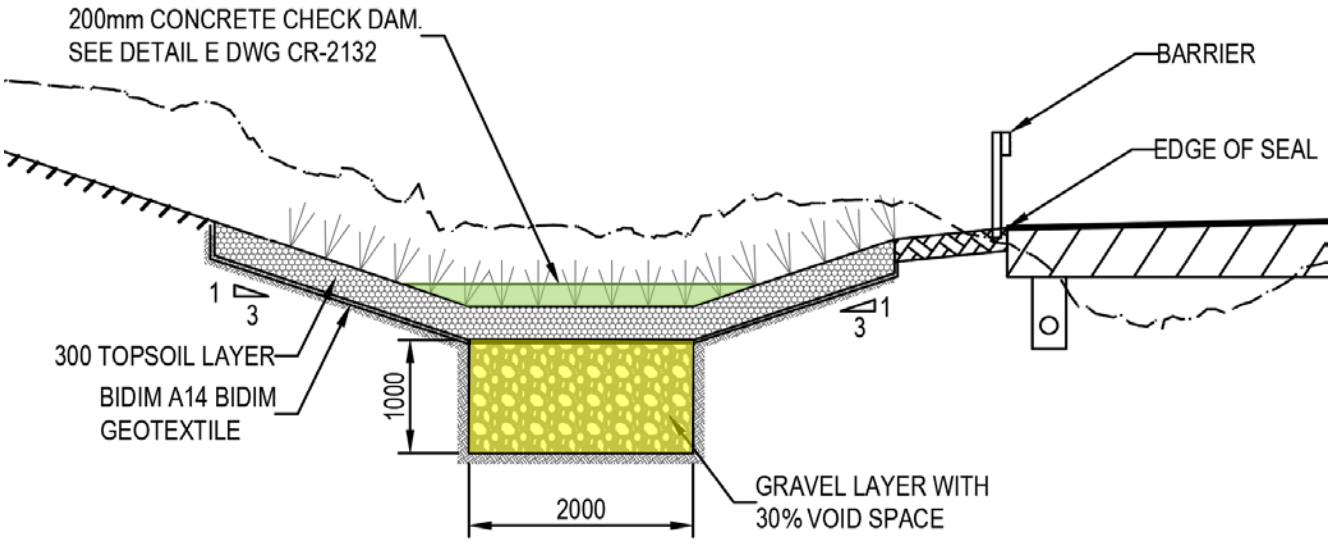

Figure 5: Proposed retention swale section

3 RESOURCE CONSENT APPLICATION SUMMARY

The State Highway 16 safety improvements project is being undertaken by the New Zealand Government to save lives on roads. The road widening works will create a small increase in runoff volume and increase pollution generating areas that flow to natural waterways in the Auckland Region. The methods of treatment, retention and detention proposed have been included within a space constrained corridor to mitigate the effects of the works before discharging runoff flows to the receiving stream.

The measures proposed in this report and as shown on the drawings in Appendix A shall adequately meet the Auckland Unitary Plan Requirements in mitigating effects arising from the works.

APPENDIX A

DRAWINGS

100mm

SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

0

GENERAL NOTES:

1. ALL MANHOLE SHALL BE 1050mm DIAMETER UNLESS NOTED OTHERWISE

2. ALL PIPES SHALL BE RCRRJ UNLESS NOTED OTHERWISE WITH MINIMUM OF:
   2.1. CLASS 6, 375mm OR LARGER FOR ALL VEHICLE CROSSING CULVERTS
   2.2. CLASS 4, 300mm OR LARGER FOR ALL OTHER STORMWATER PIPES

3. ALL FRAME AND LID SYSTEMS SHALL BE CLASS D LOAD RATING FOR TRAFFICABLE AREA

4. ALL CATCHPIT GRATES SHALL BE STANDARD 650x450 CYCLE FRIENDLY TYPE CATCHPIT GRATE & FRAME, FITTED WITH APPROVED CONCRETE BACK ENTRY LINTEL UNITS

5. ALL VEHICLE CROSSING CULVERT HEADWALLS SHALL BE EXTENDED BEYOND THE BARRIER END TERMINALS. REFER TO CE-1908 AND CE-1909 FOR DETAIL. FINAL INSTALLATION LOCATION SHALL BE CONFIRMED WITH THE ENGINEER.

6. ALL RIP-RAP SHALL BE:
   6.1. CLASS 1 (D50=100mm) FOR RIP-RAP APRONS AT ALL DOWNSTREAM CULVERT HEADWALLS, UNLESS NOTED OTHERWISE.
   6.2. CLASS 2 (D50=200mm) FOR RIP-RAP CHUTES, WITH GEOTEXTILE FABRIC AS PER SPECIFICATIONS, UNLESS NOTED OTHERWISE.

7. ALL OPEN CHANNELS (SWALES AND DIVERSION DRAINS) SHALL BE PLANTED AND HAVE A SIDE SLOPE OF 3H:1V UNLESS NOTED OTHERWISE. REFER TO LANDSCAPE DRAWINGS FOR PLANTING DETAIL.

8. ALL CULVERT HEADWALLS SHALL BE PRECAST UNITS SUITABLE FOR THE DIAMETER OF PIPE SHOWN ON THE PLANS, UNLESS OTHER WISE NOTED.
   8.1. ALL EXISTING HEADWALL INVERTS AND CROSS CULVERT SIZES AND LEVELS SHALL BE CONFIRMED AND VERIFIED ON SITE PRIOR TO UNDERTAKING ANY PERMANENT WORKS.

9. THE CONTRACTOR SHALL SETOUT ALL STORMWATER DRAINAGE ELEMENTS USING DIGITAL 3D SETOUT INFORMATION PROVIDED. SETOUT OF ALL STRUCTURES SHALL BE COORDINATED WITH ALL GEOMETRIC STRINGS AND ROADSIDE CONSTRUCTION ELEMENTS PRIOR TO UNDERTAKING ANY PERMANENT WORKS.

10. THE CONTRACTOR SHALL VERIFY ALL LEVELS AND OPERATIONAL STATUES OF EXISTING STORMWATER STRUCTURES PRIOR TO UNDERTAKING ANY PERMANENT WORKS. ANY VARIATIONS TO WHAT WERE SHOWN ON THE DRAWINGS SHALL BE NOTIFIED TO THE ENGINEER FOR REVIEW PRIOR TO PROCEEDING.

11. THE STORMFILTERS AND ASSOCIATED VAULTS AND MANHOLES ARE A PERFORMANCE BASED DESIGN COMPONENT OF THE PROJECT. THE DETAILS SHOWN ON THE PLAN ARE PRELIMINARY ONLY AND ARE BASED ON TREATMENT AREAS AS PER TABLE 1 BELOW. THE DETAILS SHOWN ON THE PLANS AND TABLE BELOW ARE BASED ON DEVICES WITH BUILT-IN PEAK FLOW DIVERSION STRUCTURES, WITH ZPG FILTER MEDIA IN 69cm TALL CARTRIDGES.
   11.1. WHERE ASTERISKS (*) ARE MARKED NEXT TO THE QUANTITY OF CARTRIDGES, IT INDICATES THAT THE LOW PROFILE (30cm TALL) CARTRIDGES ARE REQUIRED.
   11.2. THE CONTRACTOR SHALL CONFIRM FINAL PRODUCT SELECTION AND DETAILS WITH THE MANUFACTURER AND INSTALL THEM AS PER MANUFACTURERS' RECOMMENDATIONS. SUBSTITUTION FOR ALTERNATIVE PRODUCTS ARE SUBJECT TO THE APPROVAL OF THE DESIGNER.

12. THE CONTRACTOR SHALL CONSTRUCT ALL PERMANENT ASSETS AND STRUCTURES WITHIN PERMANENT LAND TAKE AREAS AS SHOWN ON THE LAND REQUIREMENT PLANS.

TABLE 1: TREAMENT DEVICE SIZING (REFER TO NOTE 11)

Treatment Devices	Catchment area (m2)		Treatment Devices
	Impervious	Pervious	
SWTD AA	736	0	Proprietary treatment device (Stormwater360 Stormfilters, 2 No.)
SWTD A	2704	0	Proprietary treatment device (Stormwater360 Stormfilters, 6 No.)
SWTD B	1510	0	Proprietary treatment device (Stormwater360 Stormfilters, 3 No.)
SWTD C	7200	0	Proprietary treatment device (Stormwater360 Stormfilters, 15 No.)
SWTD D	2570	0	Proprietary treatment device (Stormwater360 Stormfilters, * 6 No.)
SWTD E	1900	0	Proprietary treatment device (Stormwater360 Stormfilters, 4 No.)
SWTD EE	500	2600	Proprietary treatment device (Stormwater360 Stormfilters, 3 No.)
SWTD F	3140	920	Proprietary treatment device (Stormwater360 Stormfilters, 7 No.)
SWTD FF	5570	0	Proprietary treatment device (Stormwater360 Stormfilters, 11 No.)
SWTD G	5870	0	Proprietary treatment device (Stormwater360 Stormfilters, * 12 No.)
SWTD GG	800	0	Proprietary treatment device (Stormwater360 Stormfilters, * 2 No.)
SWTD H	2260	0	Proprietary treatment device (Stormwater360 Stormfilters, 5 No.)
SWTD I	1567	0	Proprietary treatment device (Stormwater360 Stormfilters, 4 No.)

GENERAL LEGEND

- PROPERTY BOUNDARY
- ROAD / RAIL DESIGNATION
- 196700 CHAINAGE
- BRIDGE WIDENING
- 016-0019-B/6.5 ROUTE POSITION (RP)

NEW MAJOR AND MINOR CONTOURS
- 17.00 MAJOR CONTOURS
- 17.00 MINOR CONTOURS

STORMWATER LEGEND

EXISTING	NEW
STORMWATER PIPE	STORMWATER PIPE
STORMWATER MANHOLE	STORMWATER MANHOLE
STORMWATER CATCHPIT	STORMWATER CATCHPIT
STORMWATER OUTLET	SCRUFFY DOME / GRATED INLET
SYSTEM TO BE ABANDONED	HEADWALL WITH RIP RAP APRON
CATCHPIT MANHOLE	STORMWATER TREATMENT DEVICE (SWTD) (SEE NOTE 11)
OPEN CHANNEL / SWALE	RIP-RAP FLUME/CHUTE/APRON

NEW CHANNEL AND ARROW
- PLANTED TREATMENT SWALE
- RETENTION SWALE
- CONVEYANCE AND DIVERSION CHANNEL

1. ALL SWALES AND OPEN CHANNELS SHALL BE CONSTRUCTED AS PER DIMENSIONED ON THE PLANS AND DETAILS.
2. THE CONTRACTOR SHALL ALLOW FOR LOCALISED EARTHWORK AND GRADING IN AREAS WITH UNDULATING TERRAINS SUCH THAT THE CHANNELS ARE FLOWING AS INTENDED BY THE PLANS.

NEW EXTENT OF KERBS AND CHANNELS
- K1 SM1 - SEMI MOUNTABLE KERB ONLY
- K2 SM2 - SEMI MOUNTABLE KERB AND CHANNEL
- KV 600mm WIDE V-SHAPED DISH CHANNEL
- KB BRIDGE EDGE TREATMENT

1. THE FINAL EXTENT OF DIFFERENT KERB VARIATIONS SHALL BE CONFIRMED WITH THE ENGINEER ON SITE.
2. REFER TO CIVIL DRAWINGS CE-2135 FOR KERB DETAILS.
3. REFER STRUCTURAL DRAWINGS FOR BRIDGE EDGE TREATMENTS AND DETAILS.

ORIGINAL DRAWING IN COLOUR

No.	Revision	By	Chk	Appd	Date
0	FOR TENDER	JL	RS	LBD	14.06.19

Original Scale (A3) NTS

Design	JL	25.06.18	Approved For Construction*
Drawn	KA	16.02.18	-
Dsg Verifier	RS	07.06.18	
Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER LEGEND AND GENERAL NOTES

Status: FOR TENDER

Drawing No. SR1003 - 01 - VE - 2100

Rev. 0

Document No. P:\341341\1907-Shared\Auckland-Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\8 Pre-implementation\CAD - VE\SR1003-01-VE-2100.dwg

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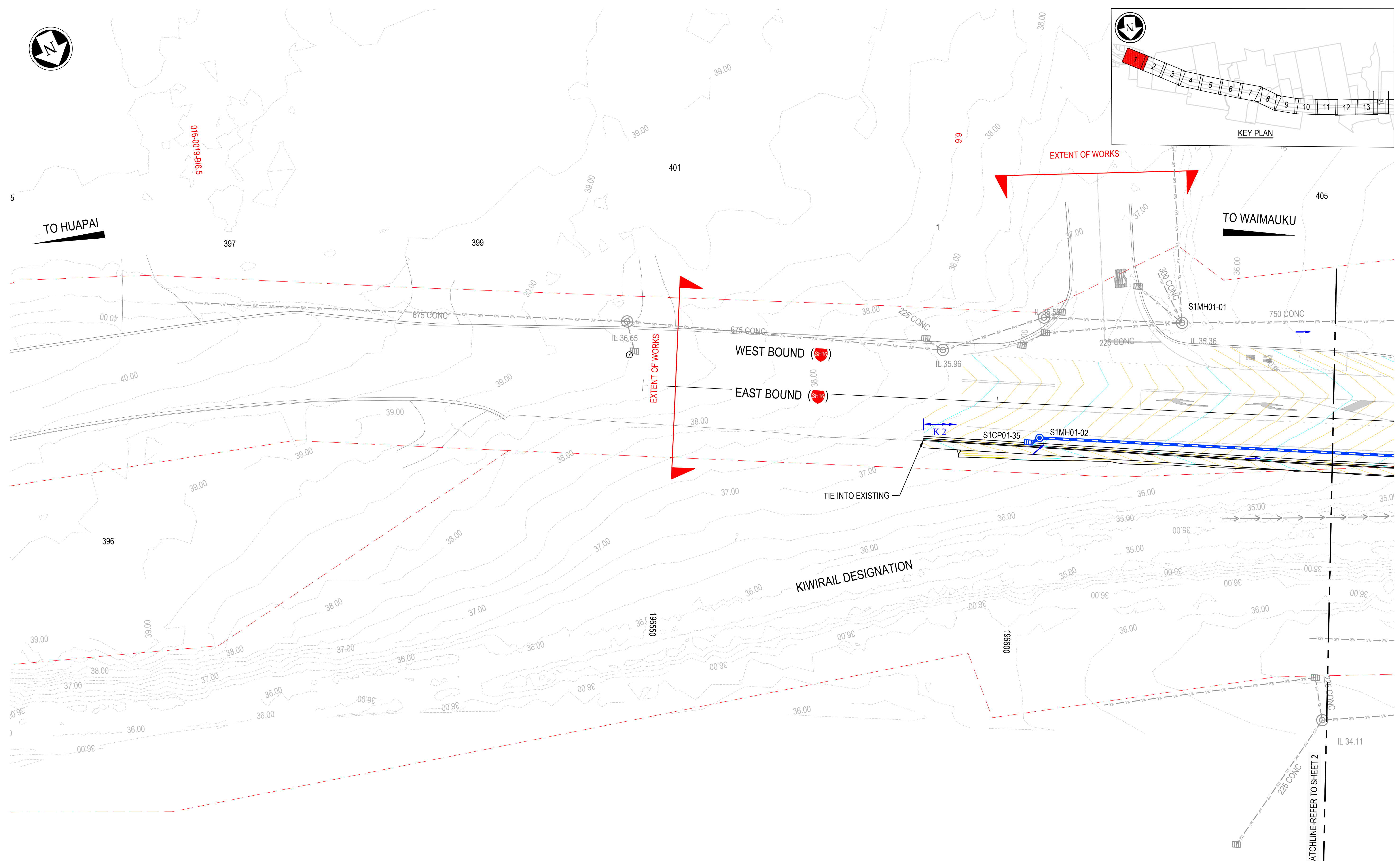

SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

DISCLAIMER

THE LOCATIONS OF UNDERGROUND SERVICES HAVE BEEN DIGITISED FROM EXISTING RECORDS PROVIDED BY LOCAL AUTHORITIES AND SERVICE PROVIDERS. THE SAFE ROADS ALLIANCE DOES NOT ACCEPT ANY RESPONSIBILITY FOR THE ACCURACY OR COMPLETENESS OF THIS INFORMATION. THE LOCATION OF ALL UNDERGROUND SERVICES AND ALL DIMENSIONS SHALL BE VERIFIED ON SITE PRIOR TO THE COMMENCEMENT OF ANY WORKS.

NOTES:

1. REFER TO SR1003-01-VE-2100 FOR LEGEND AND GENERAL NOTES.
2. REFER TO SR1003-01-VE-2140 TO VE-2141 FOR STANDARD DETAILS.
3. REFER TO SR1003-01-VE-2180 TO VE-2176 FOR STORM WATER LONGITUDINAL SECTIONS.

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Drawn	KA	16.02.18
Dsg Verifier	RS	25.06.18
Dwg Check	JL	07.06.18

Approved For Construction* -

Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI — Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER PLAN SHEET 1 OF 23

Status: FOR TENDER

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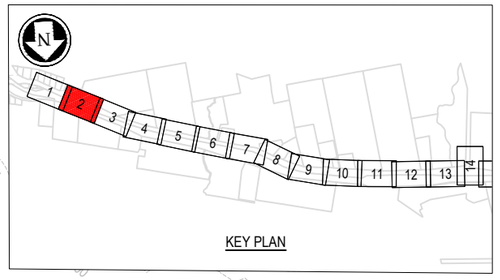

405
TO HUAPAI
407
TO WAIMAUKU
LOCALISED EARTHWORKS AROUND NEW SCRUFFY DOME SUCH THAT ALL RUNOFF IS CAPTURED
EXTENSION OF EXISTING STORMWATER LINE.
TIE INTO EXISTING KERB AND CHANNEL
SWTD AA
REFER TO NOTE 11 ON VE-2100
TYPE 3A DIVERSION DRAIN
LOCALLY SHAPE TO ALLOW FALL FROM S1HW01-01 TO S1HW01-EX196750. PLACE CLASS 2 RIP-RAP APRON AROUND NEW HEADWALLS. RIP RAP LENGTH = 6D
TYPE 3B DIVERSION DRAIN
S1CP01-125 DOUBLE
S1MH01-125 Ø1200mm
S1MH02-01
S1MH03-01
S1MH04-01 Ø1350mm
S1MH05-01 Ø1350mm
S1MH06-01 Ø1800mm
S1HW01-01
S1HW01-EX196750
S1PC01-EX196750
S1CP01-04
DN 750
DN 375
DN 825
525 RCP
750 CONC
IL 33.30
IL 33.61
WEST BOUND (SH16)
EAST BOUND (SH16)
S1MH02-02
S1CP01-136
S1MH03-02
S1CP01-137
S1MH04-02
S1CP01-138
S1MH01-EX196750
IL 33.97
CULVERT EX196750
EXISTING MANHOLE TO BE RAISED TO SUIT NEW FINISHED LEVEL
KIWIRAIL DESIGNATION
EXISTING SWALE
225 CONC
196700
300 CONC
IL 32.2
IL 28.78
IL 28.05
450 CONC
525 CONC
196800
MATCHLINE-REFER TO SHEET 1
MATCHLINE-REFER TO SHEET 3
34.11
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DISCLAIMER

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3. REFER TO SR1003-01-VE-2180 TO VE-2176 FOR STORM WATER LONGITUDINAL SECTIONS.

ORIGINAL DRAWING IN COLOUR

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-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

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Drawn	KA	16.02.18	-
Dsg Verifier	RS	25.06.18	
Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER PLAN SHEET 2 OF 23

Status. FOR TENDER

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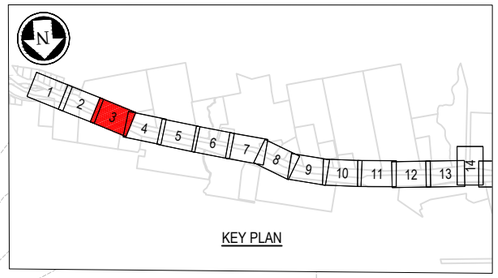

TO HUAPAI

TO WAIMAUKU

016-0019-B7

LOCATION OF CULVERTS UNKNOWN BASED ON EXISTING INFORMATION. LOCATION TO BE CONFIRMED ONSITE AND NOTIFIED TO THE ENGINEER, PRIOR TO UNDERTAKING ANY PERMANENT WORKS.

S1MH01-EX196910

WEST BOUND (SH16)

EAST BOUND (SH16)

CULVERT-EX196920

375 DIA

DN 375

S1MH05-02

S1MH06-02

S1MH07-02
Ø2100mm

S1MH01-EX197760

S1MH02-EX197760

S1CP01-139

S1CP01-140

SWTD A
REFER TO NOTE
11 ON VE-2100

EXISTING SWALE

450 CONC

KIWIRAIL DESIGNATION

S1HW02-EX196910

196900

MATCHLINE-REFER TO SHEET 2

MATCHLINE-REFER TO SHEET 4

IL 27.5

225 CONC

525 CONC

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2. REFER TO SR1003-01-VE-2140 TO VE-2141 FOR STANDARD DETAILS.
3. REFER TO SR1003-01-VE-2180 TO VE-2176 FOR STORM WATER LONGITUDINAL SECTIONS.

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ORIGINAL DRAWING IN COLOUR

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-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

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Drawn	KA	16.02.18	-
Dsg Verifier	RS	25.06.18	-
Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER PLAN SHEET 3 OF 23

Status. FOR TENDER

Drawing No. SR1003 - 01 - VE - 2103

Rev. 0

Document No. P:\341\341 1907\Shared\Auckland-Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\B Preimplementation\CAD - VE\SR1003-01-VE-2101-2123.dwg

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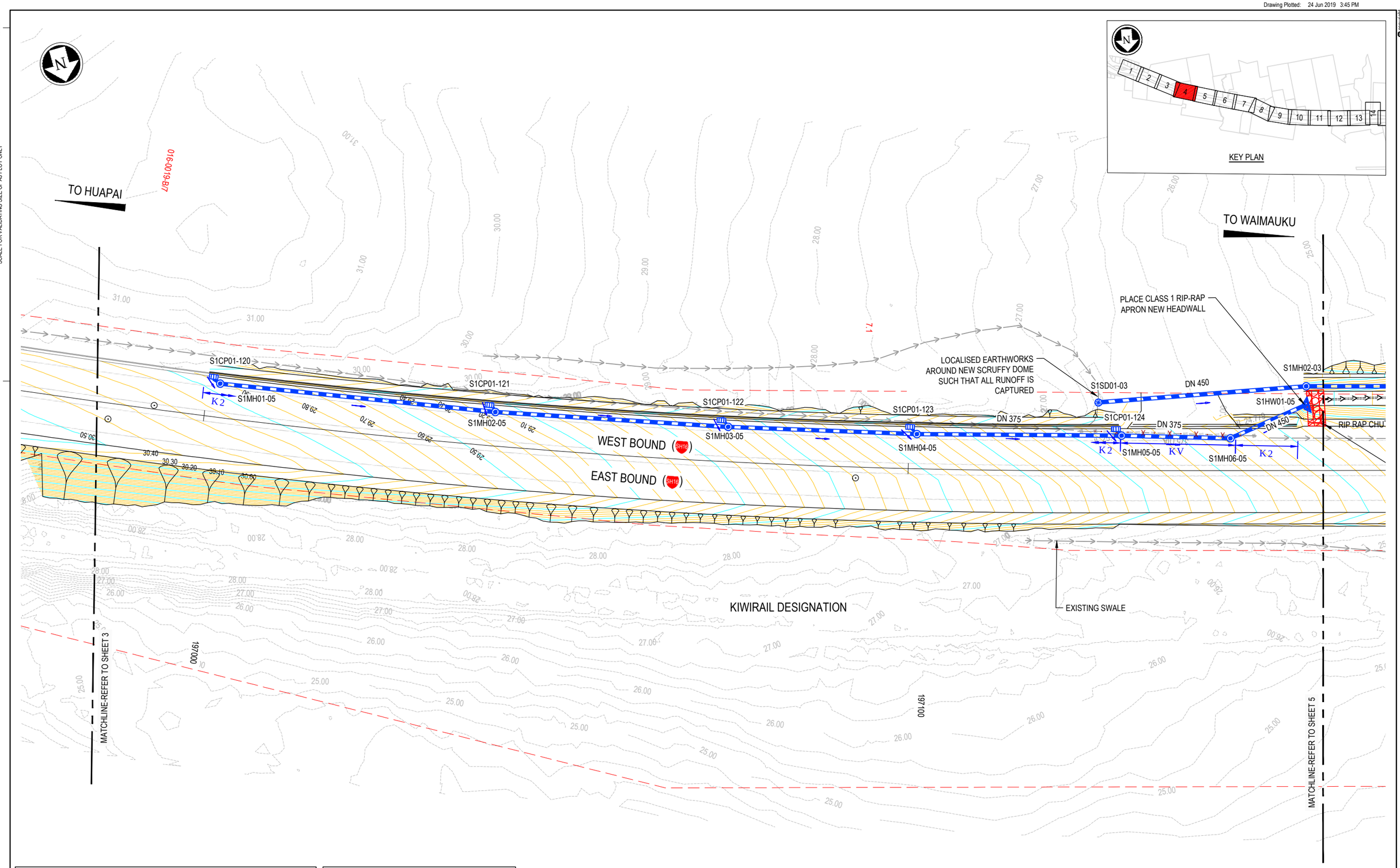

DISCLAIMER

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2. REFER TO SR1003-01-VE-2140 TO VE-2141 FOR STANDARD DETAILS.
3. REFER TO SR1003-01-VE-2180 TO VE-2176 FOR STORM WATER LONGITUDINAL SECTIONS.

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Original Scale (A3) 1:500

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Drawn	KA	16.02.18	-
Dsg Verifier	RS	25.06.18	
Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI — Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER PLAN SHEET 4 OF 23

Status. FOR TENDER

Drawing No. SR1003 - 01 - VE - 2104

Rev. 0

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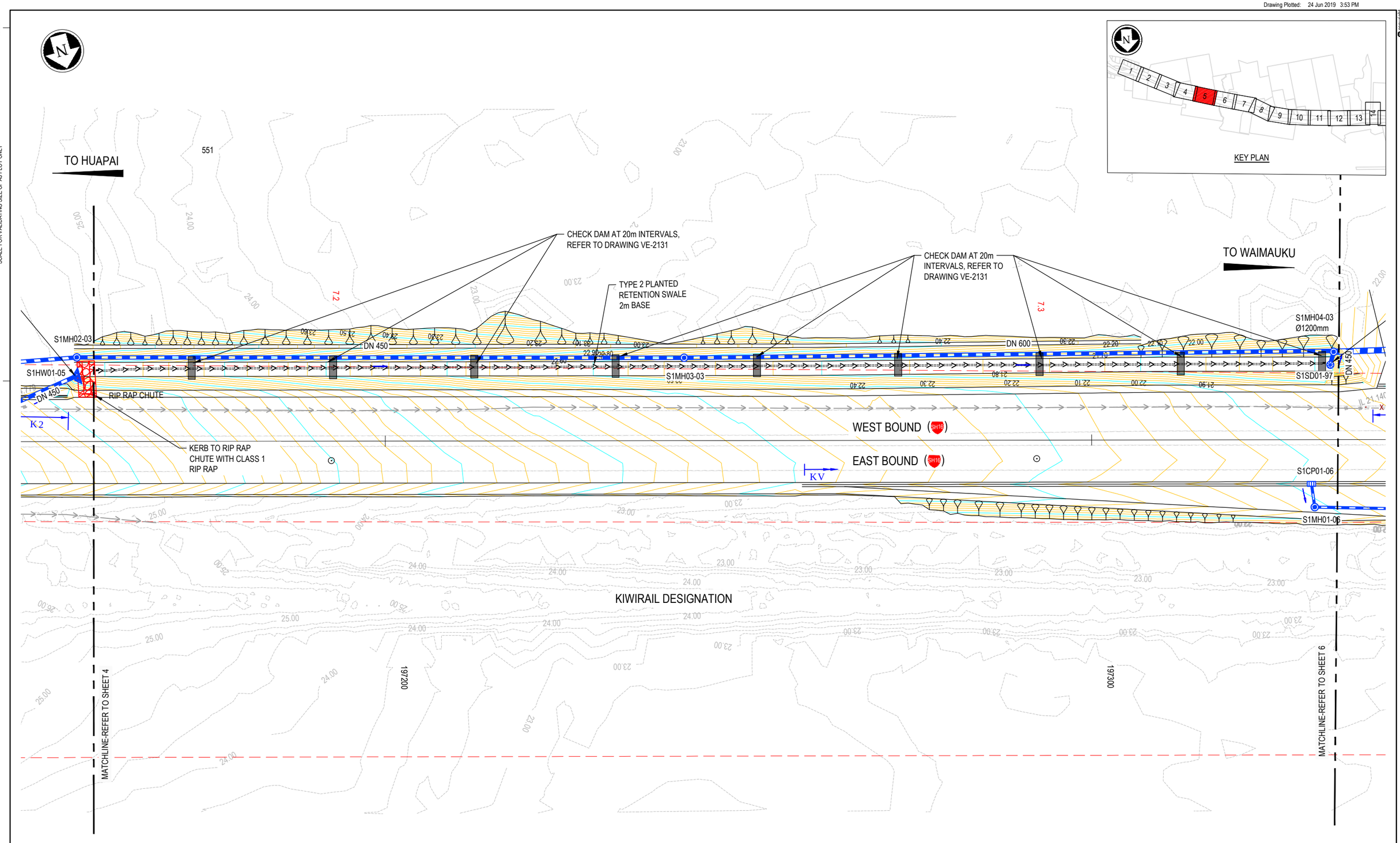

DISCLAIMER

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NOTES:

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2. REFER TO SR1003-01-VE-2140 TO VE-2141 FOR STANDARD DETAILS.
3. REFER TO SR1003-01-VE-2180 TO VE-2176 FOR STORM WATER LONGITUDINAL SECTIONS.

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Drawn	KA	16.02.18	-
Dsg Verifier	RS	25.06.18	-
Dwg Check	JL	07.06.18	Date -

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NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER PLAN SHEET 5 OF 23

Status: FOR TENDER

Drawing No. SR1003 - 01 - VE - 2105

Rev. 0

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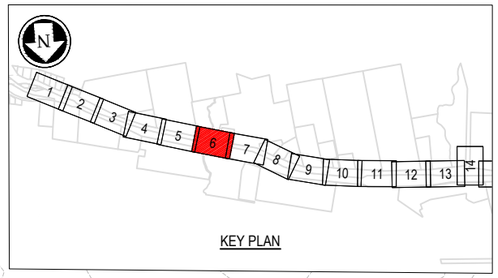

KEY PLAN

TO HUAPAI

TO WAIMAUKU

583

016-0019-B7:5

PLACE CLASS 2 RIP-RAP APRON WITH MIN LENGTH OF 6D FROM NEW HEADWALL AND CONTINUE RIP-RAP DOWN THE STREAM BANK.

BRIDGE SUMP AND PIPE. REFER TO BRIDGE DRAWINGS FOR DETAILS

NEW SCRUFFY DOME TO BE LOCATED AT THE END OF THE SWALE. FINAL LOCATION OF OUTLET STRUCTURE TO BE CONFIRMED ON SITE.

TYPE 3A DIVERSION DRAIN WITH ROCK LINED 1m WIDE CHANNEL WITH CLASS 2 RIP-RAP

PLACE CLASS 2 RIP-RAP APRON AT NEW HEADWALL AND TRANSITION TO ROCK LINE CHANNEL

TYPE 4B RETAINING WALL CHANNEL

S1MH04-03
Ø1200mm

DN 450

S1SD01-97

DN 750

S1HW01-03

S1HW01-101

DN 375

S1SD01-101

S1MH01-07

S1CP01-07

S1CP01-85

S1CP01-25

S1CP01-28

S1CP01-30

WEST BOUND (SH16)

EAST BOUND (SH16)

S1MH01-25

S1MH12-08
Ø1350mm

S1MH11-08
Ø1350mm

DN 375

S1CP01-06

S1CP01-132

S1CP01-26

S1CP01-27

S1CP01-31

S1MH01-06

S1MH02-07

S1MH02-06

S1MH03-07
Ø1500mm

S1HW01-07

DN 375

DN 600

DN 525

S1MH02-25

S1TA01-25

S1HW01-25

SWTD B
REFER TO NOTE 11
ON VE-2100

SWTD C
REFER TO NOTE 11
ON VE-2100

PIPE DAYLIGHT AT STREAM BANK. PROPOSED CONCRETE CHUTE ON BANK OF SLOPE WITH CLASS 3 RIP-RAP CHUTE AT BASED OF STREAM. MINIMUM 2m WIDTH ACROSS THE STREAM BED AND BANK. RIP-RAP TO EXTEND 1m BEHIND THE DISCHARGE POINT.

DETAILS OF EXISTING OUTLET PIPE TO BE CONFIRMED

ALLOW POLYSTYRENE PACKING ADJACENT TO EXISTING BRIDGE ABUTMENT FOR INSTALLATION OF NEW STORMWATER PIPE.

EXISTING KUMEU NO.2 (COOPERS CREEK) BRIDGE

KIWIRAIL DESIGNATION

197400

197500

MATCHLINE-REFER TO SHEET 5

MATCHLINE-REFER TO SHEET 7

DISCLAIMER

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NOTES:

1. REFER TO SR1003-01-VE-2100 FOR LEGEND AND GENERAL NOTES.
2. REFER TO SR1003-01-VE-2140 TO VE-2141 FOR STANDARD DETAILS.
3. REFER TO SR1003-01-VE-2180 TO VE-2176 FOR STORM WATER LONGITUDINAL SECTIONS.

1:500 (A3) 0 10 20 30m

ORIGINAL DRAWING IN COLOUR

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3) 1:500

Design	JL	25.06.18	Approved For Construction*
Drawn	KA	16.02.18	-
Dsg Verifier	RS	25.06.18	-
Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER PLAN SHEET 6 OF 23

Status. FOR TENDER

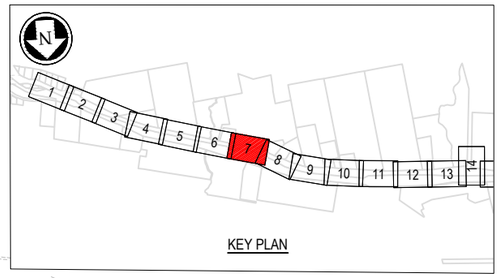
Drawing No. SR1003 - 01 - VE - 2106

Rev. 0

Document No. P:\341041907\Shared\Auckland-Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\B Pre-implementation\CAD - VE\SR1003-01-VE-2101-2123.dwg

DO NOT SCALE

IF IN DOUBT ASK.



587

TO HUAPAI

LOCATION, SIZE AND INVERT LEVELS OF CULVERT TO BE CONFIRMED ON SITE. EXISTING CULVERT AND HEADWALL STRUCTURES TO REMAIN AND BE PROTECTED DURING RETAINING WALL CONSTRUCTION. REFER TO RETAINING WALL DRAWINGS FOR BRIDGING DETAILS OVER THE EXISTING PIPE.

CHANNEL DRAINS BEHIND RETAINING WALL TO BE DRAINED TO EXISTING CULVERT INLET. CHANNEL INVERT TO TIE INTO EXISTING INLET INVERT.

TYPE 4A RETAINING WALL CHANNEL

TYPE 3A DIVERSION DRAIN

CLASS 2 RIP-RAP APRON WITH 6D LENGTH AT HEADWALL

TYPE 3B DIVERSION DRAIN

TO WAIMAUKU

S1HW01-102

S1HW01-EX197550

S1SD01-102

DN 600

K2

CULVERT EX197550

700 DIA

WEST BOUND (SH16)

EAST BOUND (SH16)

DN 375

S1MH10-08

S1CP01-32

S1MH09-08

S1CP01-33

S1MH08-08

S1CP01-34

EXISTING HEADWALL TO BE REMOVED

S1MH07-08

S1CP01-36

S1HW02-EX197550

KIWIRAIL DESIGNATION

MATCHLINE-REFER TO SHEET 6

MATCHLINE-REFER TO SHEET 8

197500

197600

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3. REFER TO SR1003-01-VE-2180 TO VE-2176 FOR STORM WATER LONGITUDINAL SECTIONS.

1:500 (A3) 0 10 20 30m

ORIGINAL DRAWING IN COLOUR

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3) 1:500

Design	JL	25.06.18	Approved For Construction*
Drawn	KA	16.02.18	-
Dsg Verifier	RS	25.06.18	
Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER PLAN SHEET 7 OF 23

Status. FOR TENDER

Drawing No. SR1003 - 01 - VE - 2107

Rev. 0

Document No. S:\Auckland-Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\B Pre-implementation\CAD - VE\SR1003-01-VE-2101-2123.dwg

DO NOT SCALE

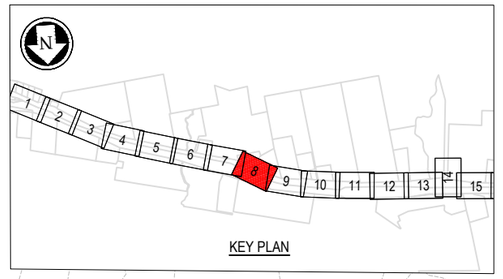
IF IN DOUBT ASK

Drawing Plotted: 27 Nov 2019 12:50 p.m.

100mm

SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

0



KEY PLAN

TO HUAPAI

TO WAIMAUKU

1m WIDE BY 0.5m DEEP CHANNEL TRANSITIONS TO STANDARD TYPE 3C DIVERSION DRAIN

DIVERTED CLEAN WATER TO DISCHARGE TO EXTENDED CULVERT CROSSING. NEW CULVERT HEADWALL UNIT SHALL BE HYND'S MOUNTABLE WING WALL WITH SAFETY GRILLE OR SIMILAR APPROVED PRODUCT. LOCATION, SIZE AND INVERT LEVELS OF CULVERT TO BE CONFIRMED ON SITE.

TYPE 3A DIVERSION DRAIN

INSTALL NEW MANHOLE ON TOP OF EXISTING 375Ø CULVERT WITH NEW HEADWALL. LOCATION, SIZE AND INVERT LEVELS OF CULVERT TO BE CONFIRMED ON SITE.

TYPE 3A DIVERSION DRAIN

TYPE 3B DIVERSION DRAIN

EXISTING HEADWALL TO BE REMOVED

TYPE 3B D
AT HIGH F
TY
TY
0

609

619

S1HW01-EX197760

S1CP01-39

S1MH03-08

S1SD02-131

S1SD01-131

S1CP01-09

DN 375

S1MH02-08

S1MH01-08

K2

KV

WEST BOUND (SH16)

EAST BOUND (SH16)

S1CP01-37

S1CP01-38

S1MH04-08

S1MH07-08

S1MH06-08

S1MH05-08

S1CP01-36

CULVERT EX197760

TYPE 3B DIVERSION DRAIN WITH 0.25m BASE

EARTHWORKS TO STAY CLEAR OVER EXISTING CULVERT AND HEADWALL STRUCTURES WHICH TO REMAIN AND BE PROTECTED. LOCATION AND IL OF EXISTING CULVERT OUTLET TO BE CONFIRMED ON SITE. ALLOWANCE TO BE MADE FOR INSTALLATION OF NEW SCRUFFY DOME ON TOP OF EXISTING CULVERT.

TYPE 3A DIVERSION DRAIN TO DIVERTED CLEAN WATER TO DISCHARGE TO CULVERT.

KIWIRAIL DESIGNATION

S1HW02-EX197760

197700

197800

MATCHLINE-REFER TO SHEET 7

MATCHLINE-REFER TO SHEET 9

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NOTES:

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2. REFER TO SR1003-01-VE-2140 TO VE-2141 FOR STANDARD DETAILS.
3. REFER TO SR1003-01-VE-2180 TO VE-2176 FOR STORM WATER LONGITUDINAL SECTIONS.

1:500 (A3) 0 10 20 30m

ORIGINAL DRAWING IN COLOUR

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
0A	FOR TENDER	JL	RS	LDB	26.09.19
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3) 1:500

Design	JL	25.06.18	Approved For Construction*
Drawn	KA	16.02.18	-
Dsg Verifier	RS	25.06.18	Date -
Dwg Check	JL	07.06.18	

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER PLAN SHEET 8 OF 23

Status: FOR TENDER

Drawing No. SR1003 - 01 - VE - 2108

Rev. 0A

Document No. S:\Auckland-Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\B Pre-implementation\CAD - VE\SR1003-01-VE-2101-2123.dwg

DO NOT SCALE

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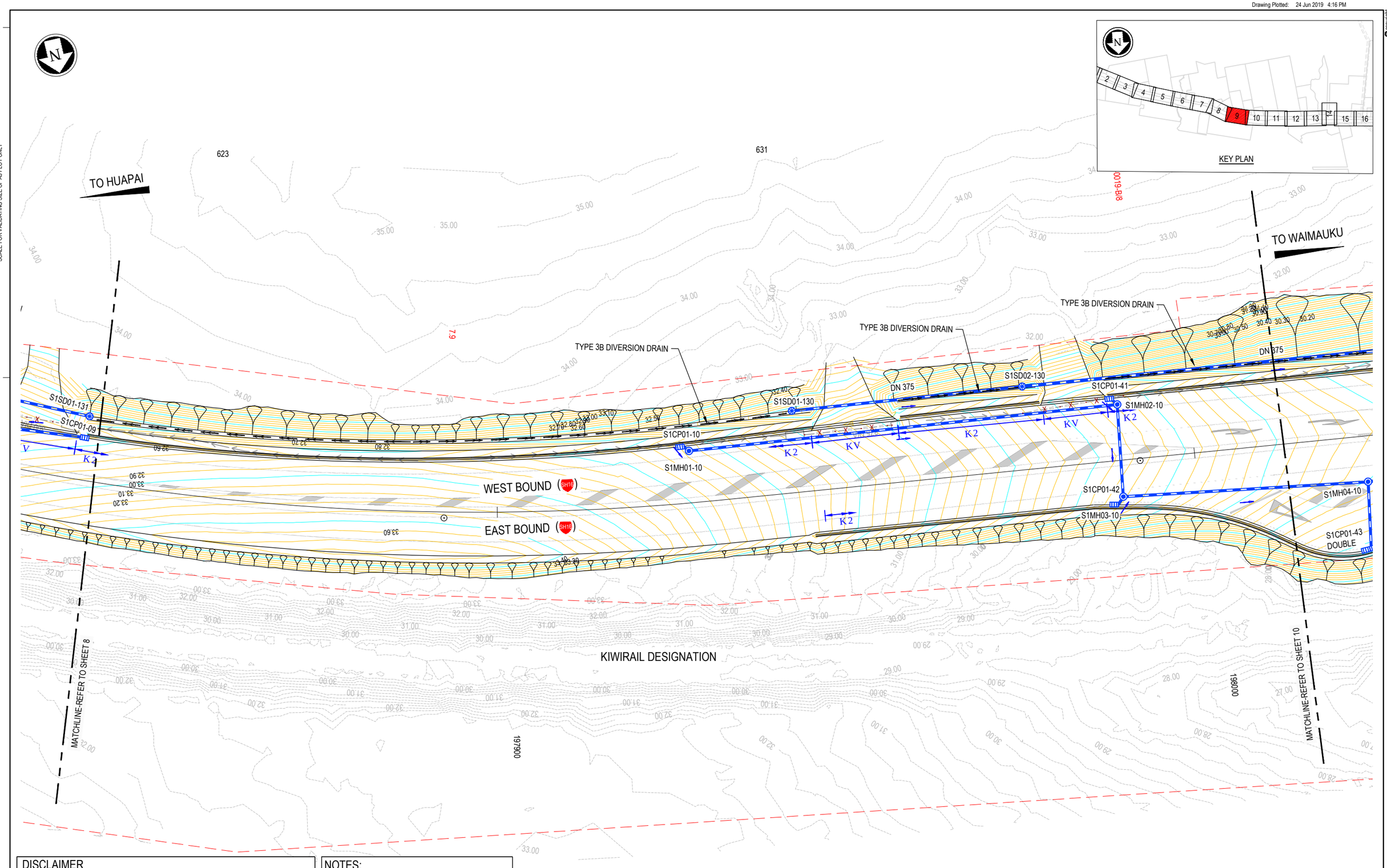

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2. REFER TO SR1003-01-VE-2140 TO VE-2141 FOR STANDARD DETAILS.
3. REFER TO SR1003-01-VE-2180 TO VE-2176 FOR STORM WATER LONGITUDINAL SECTIONS.

1:500 (A3) 0 10 20 30m

ORIGINAL DRAWING IN COLOUR

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3) 1:500

Design	JL	25.06.18	Approved For Construction*
Drawn	KA	16.02.18	-
Dsg Verifier	RS	25.06.18	
Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

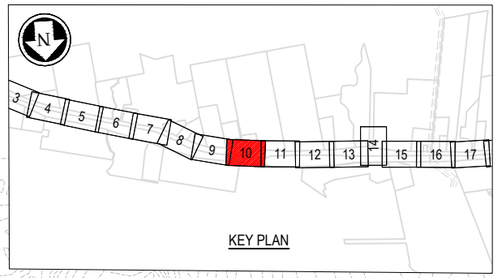
Title: STORMWATER PLAN SHEET 9 OF 23

Status: FOR TENDER

Drawing No. SR1003 - 01 - VE - 2109

Rev. 0

Document No. P:\341341\1907-Shared\Auckland-Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\B Pre-implementation\CAD - VE\SR1003-01-VE-2101-2123.dwg



KEY PLAN

TO HUAPAI

TO WAIMAUKU

641

643

653

TYPE 3B DIVERSION DRAIN

NEW MANHOLE TO BE CONSTRUCTED ON EXISTING CULVERT CROSSING. EXISTING INVERT LEVELS OF CULVERT TO BE VERIFIED ON SITE.

DIVERTED CLEAN WATER TO DISCHARGE TO NEW SCRUFFY DOME

EXISTING INVERT LEVELS OF CULVERT UNKNOWN. INVERT LEVELS TO BE CONFIRMED ONSITE AND NOTIFIED TO THE ENGINEER, PRIOR TO UNDERTAKING ANY PERMANENT WORKS.

S1HW01-EX198140

DN 375

S1SD03-130

S1CP01-44

S1MH01-EX198050

CULVERT EX198050

S1CP01-11
DOUBLE
IL 26.949

S1CP01-46

WEST BOUND (SH16)

EAST BOUND (SH16)

CULVERT EX198140

S1MH05-10

S1MH04-10

S1MH06-10
Ø1800mm

S1CP01-43
DOUBLE

S1PC01-EX198050

S1HW01-EX198050

S1HW01-10

S1MH01-11
Ø1350mm

S1CP01-47
DOUBLE

S1MH02-11
Ø1350mm

DN 600

S1MH03-11
Ø1500mm

S1CP01-48

S1HW01-11

S1HW02-EX198140

EXISTING INVERT LEVELS OF CULVERT UNKNOWN. INVERT LEVELS TO BE CONFIRMED ONSITE AND NOTIFIED TO THE ENGINEER, PRIOR TO UNDERTAKING ANY PERMANENT WORKS.

IF EXISTING UPSTREAM IL LEVEL IS FOUND TO BE HIGHER THAN RL 26.40, THEN THE EXISTING PIPE SHALL BE REPLACED WITH A NEW 700 DIA RCRRJ PIPE AND DAYLIGHTING AT S1HW01-10.

NEW 600 DIA PIPE TO CONNECT TO WING WALL OF NEW HEADWALL

SWTD D
REFER TO NOTE
11 ON VE-2100

SWTD E
REFER TO NOTE 11
ON VE-2100

EXISTING CULVERT TO BE EXTENDED TO SUIT NEW BATTER. PLACE CLASS 1 RIP RAP APRON AROUND HEADWALL.

PLACE CLASS 1 RIP-RAP APRON NEW HEADWALL

KIWIRAIL DESIGNATION

EARTHWORKS TO STAY CLEAR OVER EXISTING CULVERT AND HEADWALL STRUCTURES TO REMAIN AND BE PROTECTED. NEW CULVERT HEADWALL UNIT SHALL BE HUMES 1800 SERIES WING WALL (00538) OR SIMILAR APPROVED. PLACE CLASS 2 RIP-RAP APRON BEYOND NEW HEADWALL WITH A MIN LENGTH OF 3.6m LONG

198100

MATCHLINE-REFER TO SHEET 9

MATCHLINE-REFER TO SHEET 11

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NOTES:

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2. REFER TO SR1003-01-VE-2140 TO VE-2141 FOR STANDARD DETAILS.
3. REFER TO SR1003-01-VE-2180 TO VE-2176 FOR STORM WATER LONGITUDINAL SECTIONS.

1:500 (A3) 0 10 20 30m

ORIGINAL DRAWING IN COLOUR

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3) 1:500

Design	JL	25.06.18	Approved For Construction*
Drawn	KA	16.02.18	-
Dsg Verifier	RS	25.06.18	-
Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER PLAN SHEET 10 OF 23

Status: FOR TENDER

Drawing No. SR1003 - 01 - VE - 2110

Rev. 0

Document No. P:\341341\1907\Shared\Auckland-Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\8 Pre-implementation\CAD - VE\SR1003-01-VE-2101-2123.dwg

DO NOT SCALE

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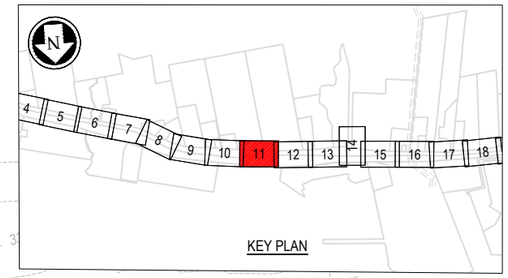

TO HUAPAI

TO WAIMAUKU

S1HW01-EX198220

S1HW01-EX198330

S1HW02-EX198220

S1HW02-EX198330

S1MH01-12

S1CP01-12

CULVERT EX198220

CULVERT EX198330

WEST BOUND (SH16)

EAST BOUND (SH16)

K2

KIWIRAIL DESIGNATION

EARTHWORKS TO STAY CLEAR OVER EXISTING CULVERT AND HEADWALL STRUCTURES TO REMAIN AND BE PROTECTED. PROVISION FOR NEW CULVERT HEADWALL UNIT SHALL BE ALLOWED AND SHALL BE HUMES 1800 SERIES WING WALL (00538) OR SIMILAR APPROVED, FOR NEW HEAD WALL IF REQUIRED.

MATCHLINE-REFER TO SHEET 10

MATCHLINE-REFER TO SHEET 12

198200

198300

1:500 (A3) 0 10 20 30m

ORIGINAL DRAWING IN COLOUR

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No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3) 1:500

Design	JL	25.06.18	Approved For Construction*
Drawn	KA	16.02.18	-
Dsg Verifier	RS	25.06.18	-
Dwg Check	JL	07.06.18	Date -

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NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

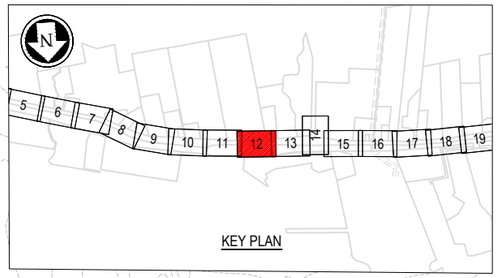
Title: STORMWATER PLAN SHEET 11 OF 23

Status. FOR TENDER

Drawing No. SR1003 - 01 - VE - 2111

Rev. 0

Document No. P:\341341907\Shared\Auckland-Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\8 Pre-implementation\CAD - VE\SR1003-01-VE-2101-2123.dwg



TO HUAPAI

TO WAIMAUKU

016-0019-B18.5

8.4

EXISTING CATCHPIT AND DRIVEWAY CULVERT TO BE MAINTAINED

WEST BOUND (SH16)

EAST BOUND (SH16)

S1MH01-12

S1CP01-12

S1MH02-12

S1CP01-54

S1MH03-12

S1CP01-51

DN 375

S1MH04-12
Ø1500mm

S1CP01-50

S1CP01-53

DN 375

300 DIA

K2

KV

V-SHAPED CHANNEL AT THE BACK EDGE OF MAINTENANCE BAY

EXTENT OF WORKS

198400

198500

KIWIRAIL DESIGNATION

MATCHLINE-REFER TO SHEET 11

MATCHLINE-REFER TO SHEET 13

MATUA RD

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3. REFER TO SR1003-01-VE-2180 TO VE-2176 FOR STORM WATER LONGITUDINAL SECTIONS.

1:500 (A3) 0 10 20 30m

ORIGINAL DRAWING IN COLOUR

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3) 1:500

Design	JL	25.06.18	Approved For Construction*
Drawn	KA	16.02.18	-
Dsg Verifier	RS	25.06.18	
Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER PLAN SHEET 12 OF 23

Status. FOR TENDER

Drawing No. SR1003 - 01 - VE - 2112

Rev. 0

Document No. P:\341\341907\Stares\Auckland\NorthlandSH16 - Brigham Creek to Waimauku\00\Drawings\B Pre-implementation\CAD - VE\SR1003-01-VE-2101-2123.dwg

DO NOT SCALE

IF IN DOUBT ASK.

Drawing Plotted: 27 Nov 2019 12:59 p.m.

100mm

SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

0

N

TO HUAPAI

NEW MANHOLE CONNECTING TO EXISTING VEHICLE ACCESS CULVERT AT EXISTING LEVEL. NEW OUTLET PIPE DOWNSTREAM SHALL ACHIEVE MIN 600 COVER.

SWTD EE
REFER TO NOTE 11 ON VE-2100

PROVIDE 740mm LEVEL DIFFERENCE BETWEEN INLET AND OUTLET INVERT LEVELS

FORM CLASS 1 RIP RAP AROUND NEW HEADWALL AND LOCALISED EARTHWORK MAYBE REQUIRED TO FORMALISED CHANNELS TO TIE INTO EXISTING.

NEW SWALE TO DISCHARGE INTO EXISTING STREAM OVER RIPRAP CHANNEL.

CATCHPIT TO BE DEMOLISHED AND REMOVED

WEST BOUND (SH16)

EAST BOUND (SH16)

K2 KV DN 375 S1CP01-52 S1MH05-12

S1MH01-13 Ø1200mm S1CP01-56 S1CP01-57

DN 375

S1CP01-58 V K2 KB

S1MH02-13 DN 375 S1MH03-13 Ø2400mm KV

KB K2 S1CP01-14 S1MH01-14

KB KB

SWTD FF
REFER TO NOTE 11 ON VE-2100

S1CP01-60 DOUBLE

V-SHAPED CHANNEL AT THE TOE OF BATTER

SWTD F
REFER TO NOTE 11 ON VE-2100

FORM CLASS 1 RIP RAP AROUND NEW HEADWALL DOWN THE STREAM BANK

EXISTING BERRY'S BRIDGE

TO WAIMAUKU

DN 450

KEY PLAN

6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

KIWIRAIL DESIGNATION

MATCHLINE-REFER TO SHEET 12

MATCHLINE-REFER TO SHEET 14

1968000

1968700

EXISTING BRIDGE AND GROUND LEVEL

EXISTING STREAM

NEW RIP RAP CHANNEL

SECTION 1 (1) SCALE 1:500

DISCLAIMER

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2. REFER TO SR1003-01-VE-2140 TO VE-2141 FOR STANDARD DETAILS.
3. REFER TO SR1003-01-VE-2180 TO VE-2176 FOR STORM WATER LONGITUDINAL SECTIONS.

1:500 (A3) 0 10 20 30m

ORIGINAL DRAWING IN COLOUR

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3) 1:500

Design	JL	25.06.18	Approved For Construction* -
Drawn	KA	16.02.18	
Dsg Verifier	RS	25.06.18	
Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

DO NOT SCALE

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER PLAN SHEET 13 OF 23

Status: FOR TENDER

Drawing No. SR1003 - 01 - VE - 2113

Rev. 0

IF IN DOUBT ASK.

Document No. S:\Auckland-Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\B Pre-implementation\CAD - VE\SR1003-01-VE-2101-2123.dwg

Drawing Plotted: 27 Nov 2019 1:06 p.m.

100mm

SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

0

N

MATCHLINE-REFER TO SHEET 13

198700

KIWIRAIL DESIGNATION

S1MH01-14

S1CP01-14

S1MH02-14
Ø1350mm

S1CP01-60
DOUBLE

DN 375

EAST BOUND (SH16)

WEST BOUND (SH16)

DN 375

EXISTING SWALE

S1MH05-16

S1CP01-71

DN 375

TYPE 3B CONVEYANCE CHANNEL 2m WIDE WITH ROCK LINED CHANNEL WITH CLASS 2 RIP-RAP TO FULL CHANNEL PERIMETER. 1m DEPTH STORAGE DEPTH AS PER VE-2131

CHECK DAM AT 16m INTERVALS, REFER TO DRAWING VE-2131

TO HUAPAI

NEW HEADWALL TO BE SIZED FOR BOTH INLET PIPES

PLACE CLASS 2 RIP-RAP APRON NEW HEADWALL

SWTD FF
REFER TO NOTE
11 ON VE-2100

S1HW01-14

S1HW02-EX198760

DN 450

DN 450

S1TA01-14

S1MH03-14

S1MH01-15

S1PC01-EX198760

S1CP01-15
DOUBLE

S1CP01-134

FOSTER RD

K2

K2

450 DIA CULVERT EX198760

EXTEND EXISTING 450Ø CULVERT PIPE TO BEYOND PROPOSED VERGE LINE

S1HW01-EX198760

EXTENT OF WORKS

TO WAIMAUKU

MATCHLINE-REFER TO SHEET 15

KEY PLAN

7 8 9 10 11 12 13 14 15 16 17 18 19 20 21

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3. REFER TO SR1003-01-VE-2180 TO VE-2176 FOR STORM WATER LONGITUDINAL SECTIONS.

1:500 (A3) 0 10 20 30m

ORIGINAL DRAWING IN COLOUR

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3) 1:500

Design	JL	25.06.18	Approved For Construction*
Drawn	KA	16.02.18	-
Dsg Verifier	RS	25.06.18	
Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER PLAN SHEET 14 OF 23

Status: FOR TENDER

Drawing No. SR1003 - 01 - VE - 2114

Rev. 0

Document No. S:\Auckland-Northland\SH16 - Bingham Creek to Waimauku\00 Drawings\B Pre-implementation\CAD - VE\SR1003-01-VE-2101-2123.dwg

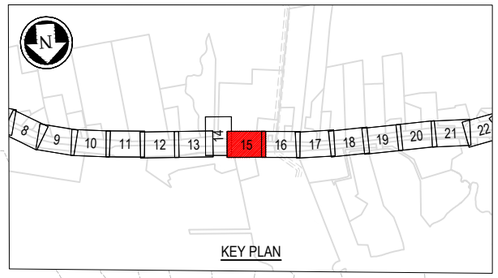
DO NOT SCALE

IF IN DOUBT ASK.

100mm

SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

0



TO HUAPAI

TO WAIMAUKU

727

733

89

88

IL 17.063

IL 18.140

300 DIA

WEST BOUND (SH16)

EAST BOUND (SH16)

K2

KV

K2

IL 18.297

S1CP01-69

IL 17.193

300 DIA

S1CP01-67

S1CP01-65

S1MH04-16
Ø1350mm

S1MH03-16

S1MH02-16

S1MH

ON 375

16.70

V-SHAPED CHANNEL AT
THE TOE OF CUT BATTER

KV

REFORM EXISTING DRAIN,
TYPE 3A DIVERSION DRAIN

KIWIRAIL DESIGNATION

MATCHLINE-REFER TO SHEET 14

MATCHLINE-REFER TO SHEET 16

6988000

6989000

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1:500 (A3) 0 10 20 30m

ORIGINAL DRAWING IN COLOUR

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3) 1:500

Design	JL	25.06.18	Approved For Construction*
Drawn	KA	16.02.18	-
Dsg Verifier	RS	25.06.18	-
Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS
STAGE 1
HUAPAI TO WAIMAUKU

Title: STORMWATER PLAN
SHEET 15 OF 23

Status. FOR TENDER

Drawing No. SR1003 - 01 - VE - 2115

Rev. 0

Document No. P:\341041907\Shared\Auckland-Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\B Pre-implementation\CAD - VE\SR1003-01-VE-2101-2123.dwg

DO NOT SCALE

IF IN DOUBT ASK.

100mm

SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

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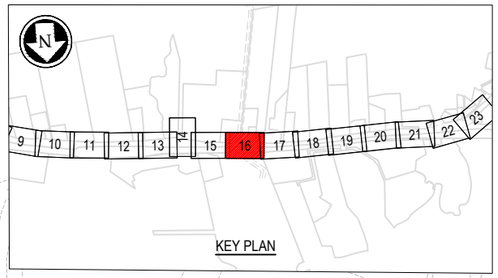

TO HUAPAI

TO WAIMAUKU

016-0019-B/9

9.1

741

745A

751

375 DIA

300 DIA

300 DIA

IL 20.897

IL 20.575

IL 20.202

IL 18.593

WEST BOUND (SH16)

EAST BOUND (SH16)

22.20

22.10

S1CP01-63

S1MH01-16

S1MH01-21

S1CP01-73

KIWIRAIL DESIGNATION

MATCHLINE-REFER TO SHEET 15

MATCHLINE-REFER TO SHEET 17

199000

199100

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1:500 (A3) 0 10 20 30m

ORIGINAL DRAWING IN COLOUR

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3) 1:500

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Dsg Verifier	RS	25.06.18	
Dwg Check	JL	07.06.18	Date -

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NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER PLAN SHEET 16 OF 23

Status. FOR TENDER

Drawing No. SR1003 - 01 - VE - 2116

Rev. 0

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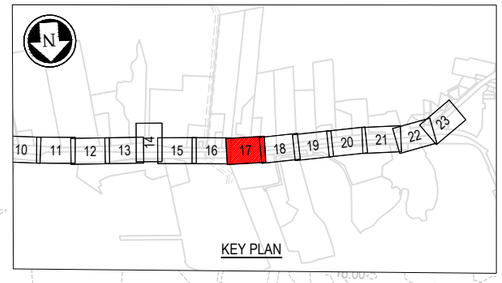

TO HUAPAI

TO WAIMAUKU

LOCALISED CHANNEL REINSTATEMENT WORKS SUCH THAT CONTINUITY OF FLOW IS PROVIDED FROM EXISTING ROAD SIDE CHANNEL TO EXISTING INLET STRUCTURE TO CULVERT. LOCALLY SHAPE EARTH WORKS AROUND STRUCTURE TO FORMALISE LOW POINT.

TYPE 3B DIVERSION DRAIN 1m BASE WIDTH

CONFIRM STATUS OF CATCHPIT PRIOR TO DEMOLITION AND REMOVAL. IF IN USE CATCHPIT TO BE RELOCATED AND CONNECTION TO BE REINSTATED

TYPE 3B DIVERSION DRAIN 1m BASE WIDTH

PLACE CLASS 3 RIP-RAP APRON AT MIN LENGTH = 8D AROUND NEW HEADWALL

S1HW01-EX199220
IL 17.00
S1PC01-EX199220
S1SD01-133
S1CP01-76
S1MH01-17
DN 375
S1HW01-133
S1CP01-77
S1MH02-17
WEST BOUND (SH16)
EAST BOUND (SH16)
S1MH02-21
S1MH03-21
Ø1200mm
S1MH04-21
IL 16.851
S1CP01-74
S1SD05-21
Ø1200mm
S1CP01-21
CULVERT EX199220
450 DIA
K2
KV

SWTD GG
REFER TO NOTE 11
ON VE-2100

NEW SCRUFFY DOME OUTLET WITH 450 DIA STUB OUTLET, PLACE CLASS 2 RIP-RAP AROUND THE SCRUFFY DOME AND CONTINUES FOR MIN 4m LONG DOWN STREAM IN THE EXISTING CHANNEL WITHIN THE BOUNDARY.

KIWIRAIL DESIGNATION

199200

199300

MATCHLINE-REFER TO SHEET 16

MATCHLINE-REFER TO SHEET 18

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1:500 (A3) 0 10 20 30m

ORIGINAL DRAWING IN COLOUR

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3) 1:500

Design	JL	25.06.18	Approved For Construction*
Drawn	KA	16.02.18	-
Dsg Verifier	RS	25.06.18	-
Dwg Check	JL	07.06.18	Date -

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NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

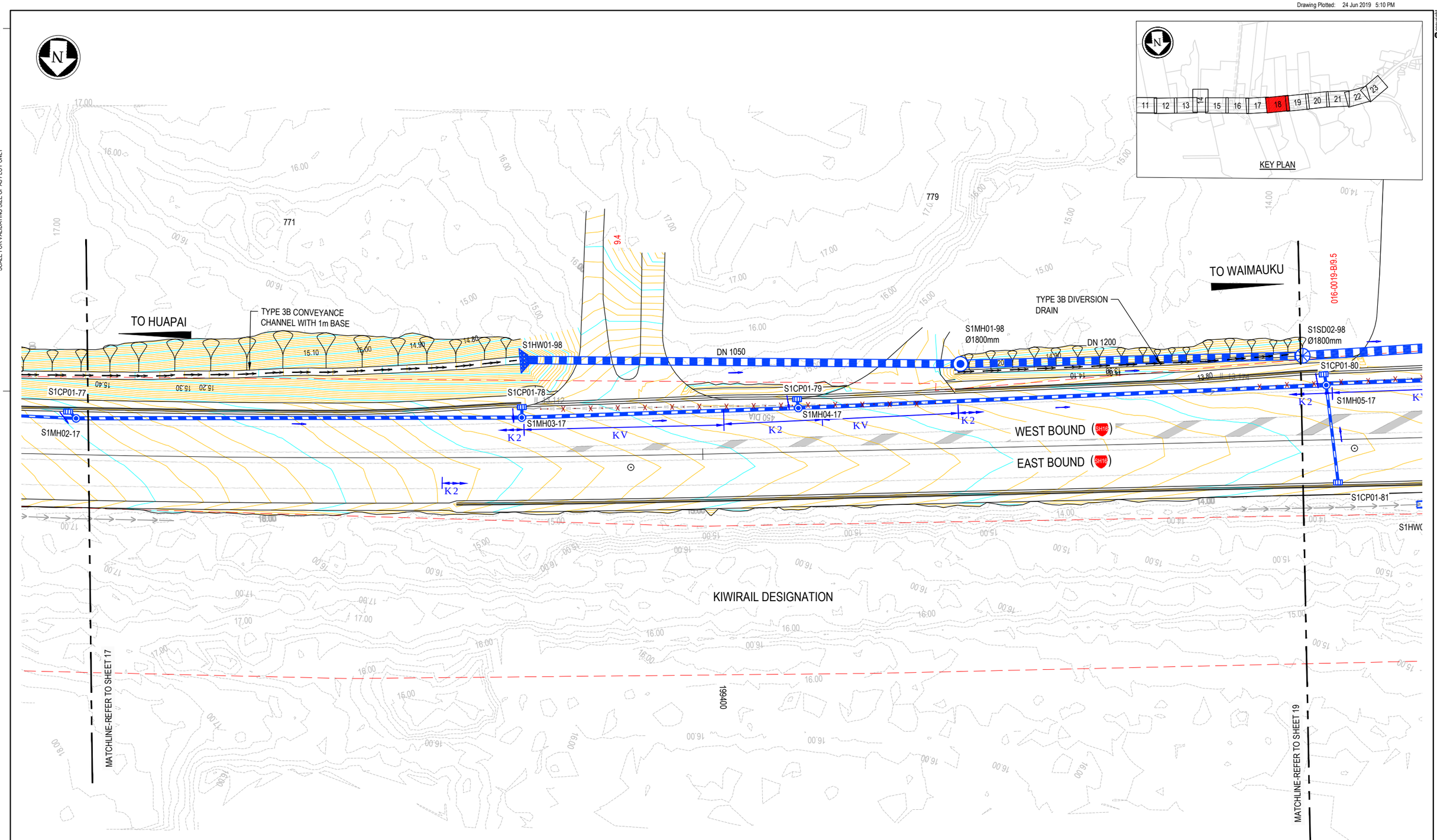
Title: STORMWATER PLAN SHEET 17 OF 23

Status: FOR TENDER

Drawing No. SR1003 - 01 - VE - 2117

Rev. 0

Document No. P:\341041\1907-Shared\Auckland-Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\B Pre-implementation\CAD - VE\SR1003-01-VE-2101-2123.dwg



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1:500 (A3) 0 10 20 30m

ORIGINAL DRAWING IN COLOUR

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3) 1:500

Design	JL	25.06.18	Approved For Construction*
Drawn	KA	16.02.18	-
Dsg Verifier	RS	25.06.18	-
Dwg Check	JL	07.06.18	Date -

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NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER PLAN SHEET 18 OF 23

Status. FOR TENDER

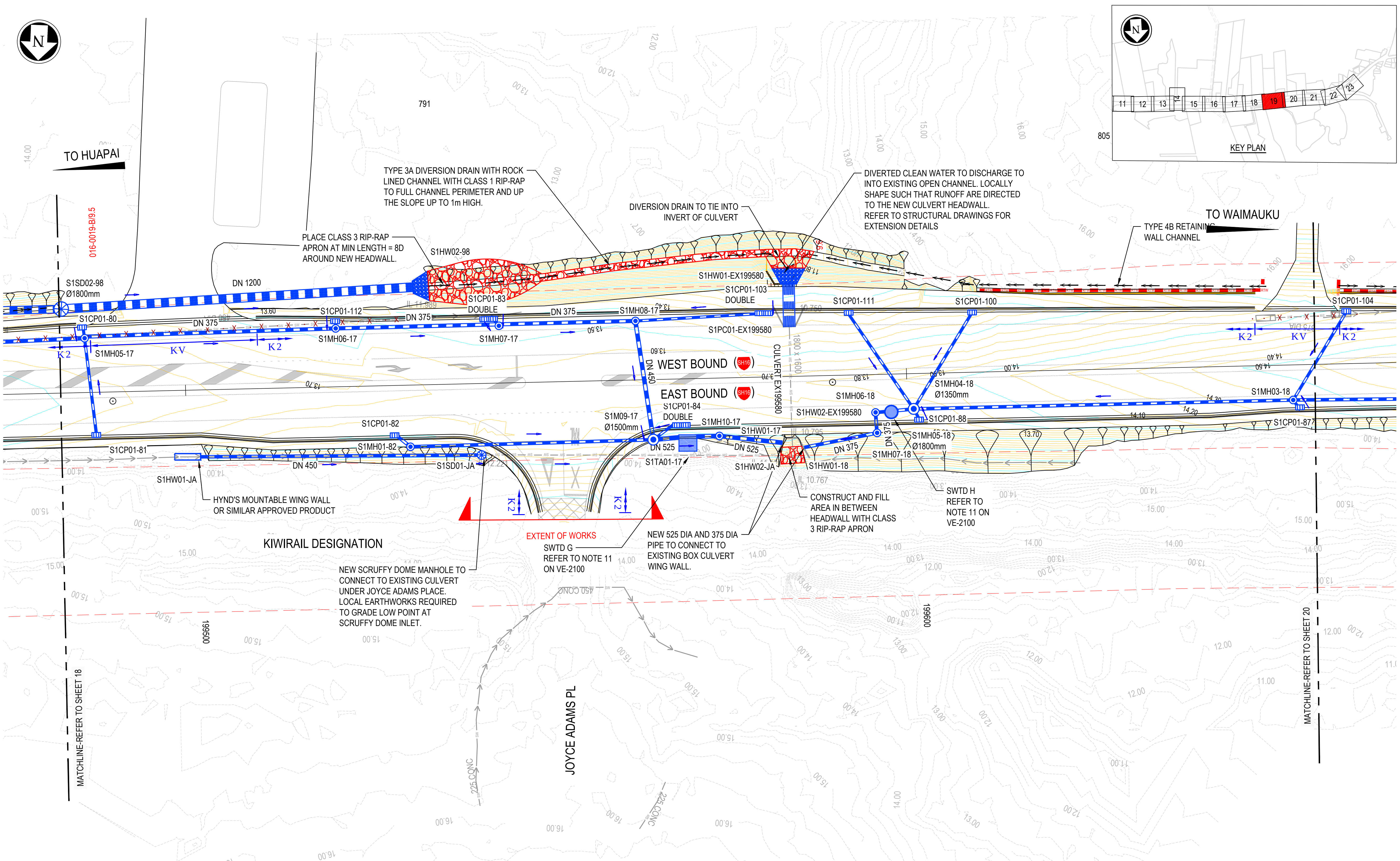
Drawing No. SR1003 - 01 - VE - 2118

Rev. 0

DO NOT SCALE

IF IN DOUBT ASK.

Drawing Plotted: 24 Jun 2019 5:16 PM



TO HUAPAI
TO WAIMAUKU
KEY PLAN
791
805
016-0019-B/9.5
TYPE 3A DIVERSION DRAIN WITH ROCK LINED CHANNEL WITH CLASS 1 RIP-RAP TO FULL CHANNEL PERIMETER AND UP THE SLOPE UP TO 1m HIGH.
DIVERSION DRAIN TO TIE INTO INVERT OF CULVERT
DIVERTED CLEAN WATER TO DISCHARGE TO INTO EXISTING OPEN CHANNEL. LOCALLY SHAPE SUCH THAT RUNOFF ARE DIRECTED TO THE NEW CULVERT HEADWALL. REFER TO STRUCTURAL DRAWINGS FOR EXTENSION DETAILS
TYPE 4B RETAINING WALL CHANNEL
PLACE CLASS 3 RIP-RAP APRON AT MIN LENGTH = 8D AROUND NEW HEADWALL.
S1HW02-98
S1SD02-98
Ø1800mm
DN 1200
S1CP01-80
S1CP01-112
S1CP01-83
DOUBLE
DN 375
S1MH08-17
S1HW01-EX199580
S1CP01-103
DOUBLE
S1CP01-111
S1CP01-100
S1CP01-104
S1MH05-17
S1MH06-17
S1MH07-17
S1PC01-EX199580
WEST BOUND
EAST BOUND
DN 450
CULVERT EX199580
1800 x 1800
S1MH04-18
Ø1350mm
S1MH06-18
S1MH03-18
S1HW02-EX199580
S1CP01-88
S1CP01-87
S1CP01-84
DOUBLE
S1M09-17
Ø1500mm
S1HW10-17
S1HW01-17
S1CP01-82
S1MH01-82
S1CP01-81
DN 450
S1SD01-JA
S1HW01-JA
DN 525
S1TA01-17
S1HW02-JA
DN 375
S1MH05-18
Ø1800mm
S1MH07-18
S1HW01-18
HYND'S MOUNTABLE WING WALL OR SIMILAR APPROVED PRODUCT
CONSTRUCT AND FILL AREA IN BETWEEN HEADWALL WITH CLASS 3 RIP-RAP APRON
SWTD H
REFER TO NOTE 11 ON VE-2100
EXTENT OF WORKS
SWTD G
REFER TO NOTE 11 ON VE-2100
NEW 525 DIA AND 375 DIA PIPE TO CONNECT TO EXISTING BOX CULVERT WING WALL.
KIWIRAIL DESIGNATION
NEW SCRUFFY DOME MANHOLE TO CONNECT TO EXISTING CULVERT UNDER JOYCE ADAMS PLACE. LOCAL EARTHWORKS REQUIRED TO GRADE LOW POINT AT SCRUFFY DOME INLET.
JOYCE ADAMS PL
225 CONC
450 CONC
MATCHLINE-REFER TO SHEET 18
MATCHLINE-REFER TO SHEET 20
199500
199600

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1:500 (A3) 0 10 20 30m

ORIGINAL DRAWING IN COLOUR

No	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3) 1:500

Design	JL	25.06.18	Approved For Construction*
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Dsg Verifier	RS	25.06.18	-
Dwg Check	JL	07.06.18	Date -

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NZ TRANSPORT AGENCY WAKA KOTAHI — Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER PLAN SHEET 19 OF 23

Status: FOR TENDER

Drawing No. SR1003 - 01 - VE - 2119 Rev. 0

DO NOT SCALE

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SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

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100mm

SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

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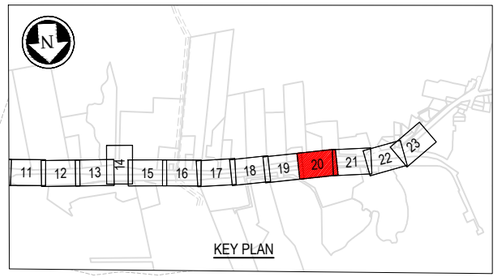

TO HUAPAI

TO WAIMAUKU

TYPE 3A DIVERSION DRAIN

TYPE 4B RETAINING WALL CHANNEL

DIVERTED CLEAN WATER TO DISCHARGE TO EXTENDED CULVERT CROSSING. NEW CULVERT HEADWALL UNIT SHALL BE HUMES 1800 SERIES WING WALL (00538) OR SIMILAR APPROVED.

EXISTING CULVERT UNDER DRIVEWAY TO REMAIN AND BE EXTENDED BEYOND THE NEW BARRIER TERMINAL. CLASS 1 RIP RAP APRON AT NEW HEADWALL OUTLET.

815

S1HW02-99

S1HW01-EX199710

S1CP01-104

S1CP01-105

S1MH01-99

DN 375

S1HW01-99

K2

KV

CULVERT EX199710

WEST BOUND (SH16)

EAST BOUND (SH16)

S1MH03-18

S1MH02-18

S1MH01-18

S1CP01-87

S1CP01-86

S1CP01-18

S1HW02-EX199710

KIWIRAIL DESIGNATION

EARTHWORKS TO STAY CLEAR OVER EXISTING CULVERT AND HEADWALL. STRUCTURES TO REMAIN AND BE PROTECTED.

199700

199800

MATCHLINE-REFER TO SHEET 19

MATCHLINE-REFER TO SHEET 21

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1:500 (A3) 0 10 20 30m

ORIGINAL DRAWING IN COLOUR

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NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER PLAN SHEET 20 OF 23

Status: FOR TENDER

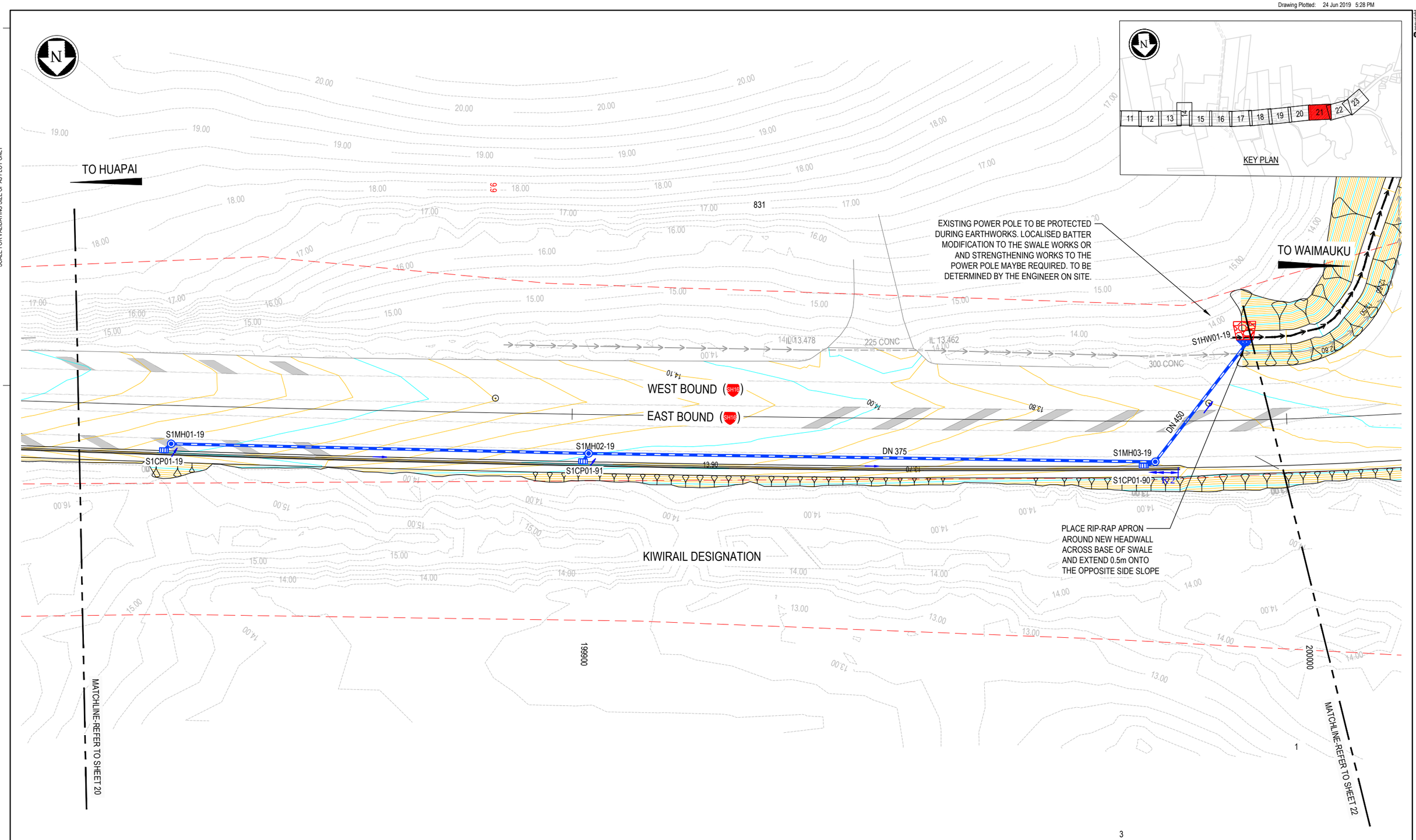
Drawing No. SR1003 - 01 - VE - 2120

Rev. 0

Document No. P:\341341907\Shared\Auckland-Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\8 Pre-implementation\CAD - VE\SR1003-01-VE-2101-2123.dwg

DO NOT SCALE

IF IN DOUBT ASK.



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1:500 (A3) 0 10 20 30m

ORIGINAL DRAWING IN COLOUR

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3) 1:500

Design	JL	25.06.18	Approved For Construction*
Drawn	KA	16.02.18	-
Dsg Verifier	RS	25.06.18	
Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER PLAN SHEET 21 OF 23

Status: FOR TENDER

Drawing No. SR1003 - 01 - VE - 2121

Rev. 0

DO NOT SCALE

IF IN DOUBT ASK.

EXISTING OPEN CHANNEL TO BE RESHAPED INTO TYPE 1 TREATMENT SWALE 2m BASE. MINIMUM OF 60m SWALE LENGTH NEEDS TO BE ARCHIVED.

016-0019-B/10

WINTOUR RD

TO HUAPAI

TO WAIMAUKU

KEY PLAN

HEADWALL TO BE LOCATED AT BASE OF BANK WITH ALLOWANCE FOR PLACEMENT OF RIP-RAP APRON AROUND NEW HEADWALL DOWN THE BANK.

EXISTING FLOOD STORAGE AREA

S1HW01-19

S1HW01-20

S1MH01-EX200080

SWTD I
REFER TO NOTE 11
ON VE-2100

S1MH01-20

S1MH03-20
Ø1800mm

S1CP01-20

S1MH02-20
Ø1350mm

S1CP01-92

WEST BOUND (SH16)

EAST BOUND (SH16)

CULVERT EX200080

TIE INTO EXISTING KERB

K1

K2

225 CONC

300 CONC

IL 12.2

IL 12.81

S1MH02-EX200080

200100

675 CONC

200000

KIWIRAIL DESIGNATION

MATCHLINE-REFER TO SHEET 21

MATCHLINE-REFER TO SHEET 23

1:500 (A3) 0 10 20 30m

ORIGINAL DRAWING IN COLOUR

DISCLAIMER

THE LOCATIONS OF UNDERGROUND SERVICES HAVE BEEN DIGITISED FROM EXISTING RECORDS PROVIDED BY LOCAL AUTHORITIES AND SERVICE PROVIDERS. THE SAFE ROADS ALLIANCE DOES NOT ACCEPT ANY RESPONSIBILITY FOR THE ACCURACY OR COMPLETENESS OF THIS INFORMATION. THE LOCATION OF ALL UNDERGROUND SERVICES AND ALL DIMENSIONS SHALL BE VERIFIED ON SITE PRIOR TO THE COMMENCEMENT OF ANY WORKS.

NOTES:

1. REFER TO SR1003-01-VE-2100 FOR LEGEND AND GENERAL NOTES.
2. REFER TO SR1003-01-VE-2140 TO VE-2141 FOR STANDARD DETAILS.
3. REFER TO SR1003-01-VE-2180 TO VE-2176 FOR STORM WATER LONGITUDINAL SECTIONS.

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3) 1:500

Design	JL	25.06.18	Approved For Construction*
Drawn	KA	16.02.18	-
Dsg Verifier	RS	25.06.18	
Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER PLAN SHEET 22 OF 23

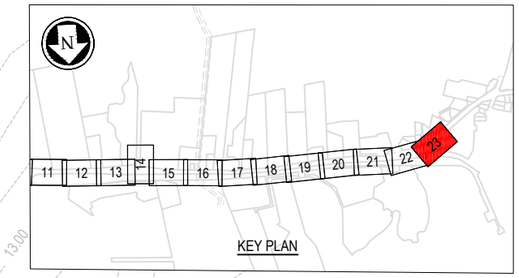
Status: FOR TENDER

Drawing No. SR1003 - 01 - VE - 2122

Rev. 0

DO NOT SCALE

IF IN DOUBT ASK.



TO HUAPAI

TO WAIMAUKU

WEST BOUND (SH16)

EAST BOUND (SH16)

EXTENT OF WORKS

EXTENT OF WORKS

FACTORY RD

THE TRIANGLE

MATCHLINE-REFER TO SHEET 22

IL 12.2

IL 12.81

IL 12.79

IL 12.03

IL 10.63

IL 1

Abandoned

225 CONC

300 CONC

600 CONC

150 PVVN

853

4

1

5

7F

7H

202200

202300

10.2

10.3

1:500 (A3) 0 10 20 30m

ORIGINAL DRAWING IN COLOUR

DISCLAIMER

THE LOCATIONS OF UNDERGROUND SERVICES HAVE BEEN DIGITISED FROM EXISTING RECORDS PROVIDED BY LOCAL AUTHORITIES AND SERVICE PROVIDERS. THE SAFE ROADS ALLIANCE DOES NOT ACCEPT ANY RESPONSIBILITY FOR THE ACCURACY OR COMPLETENESS OF THIS INFORMATION. THE LOCATION OF ALL UNDERGROUND SERVICES AND ALL DIMENSIONS SHALL BE VERIFIED ON SITE PRIOR TO THE COMMENCEMENT OF ANY WORKS.

NOTES:

1. REFER TO SR1003-01-VE-2100 FOR LEGEND AND GENERAL NOTES.
2. REFER TO SR1003-01-VE-2140 TO VE-2141 FOR STANDARD DETAILS.
3. REFER TO SR1003-01-VE-2180 TO VE-2176 FOR STORM WATER LONGITUDINAL SECTIONS.

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3) 1:500

Design	JL	25.06.18	Approved For Construction*
Drawn	KA	16.02.18	-
Dsg Verifier	RS	25.06.18	
Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER PLAN SHEET 23 OF 23

Status. FOR TENDER

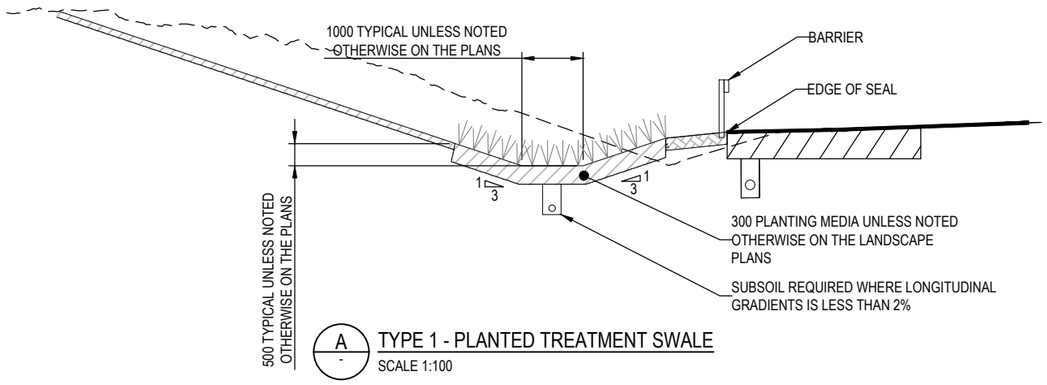
Drawing No. SR1003 - 01 - VE - 2123

Rev. 0

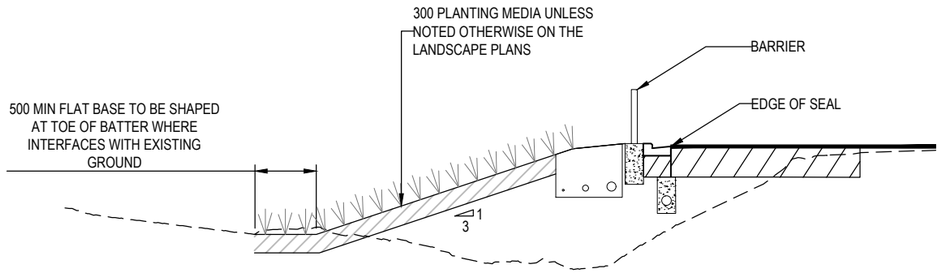
Document No. P:\341041907-Shared\Auckland-Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\B Pre-implementation\CAD - VE\SR1003-01-VE-2101-2123.dwg

DO NOT SCALE

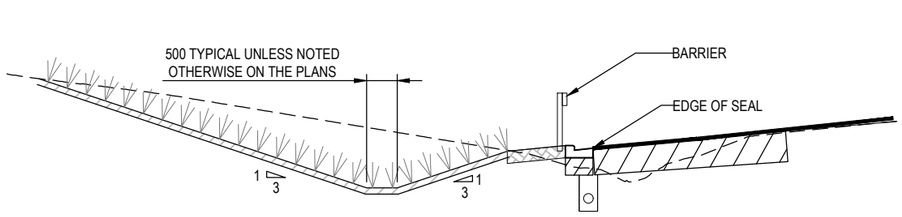
IF IN DOUBT ASK.



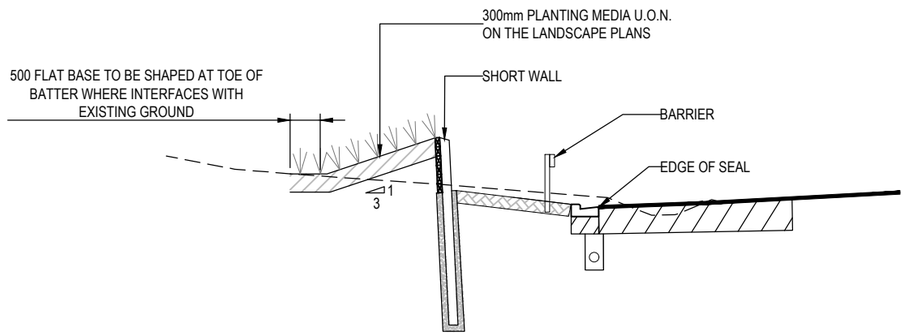
A - TYPE 1 - PLANTED TREATMENT SWALE
SCALE 1:100



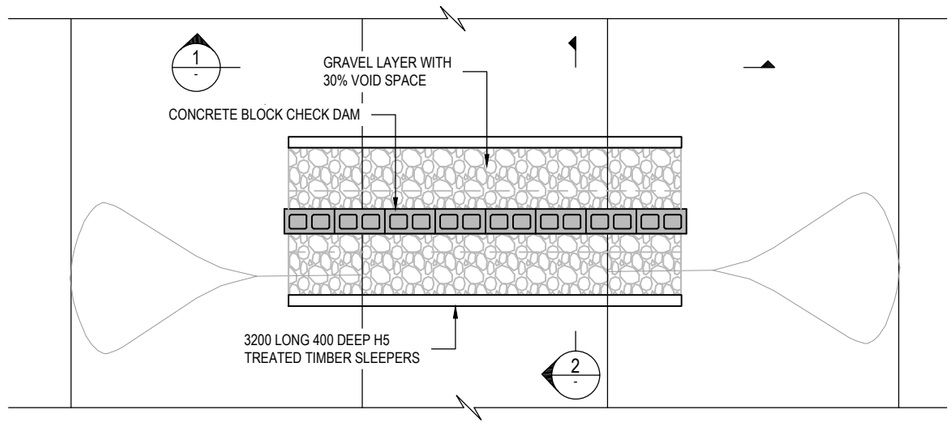
B - TYPE 3A - DIVERSION DRAIN (FILL)
SCALE 1:100



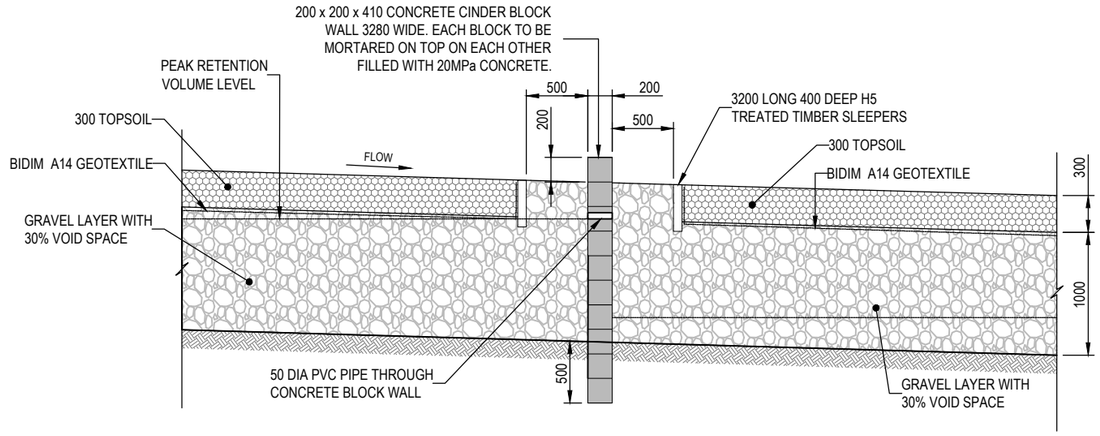
C - TYPE 3B - CONVEYANCE CHANNEL OR DIVERSION DRAIN (CUT)
SCALE 1:100



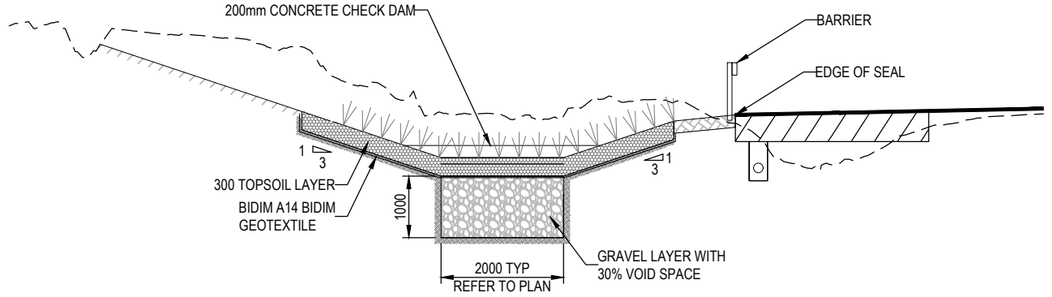
D - TYPE 3C - DIVERSION DRAIN (SHORT WALL)
SCALE 1:100



E - TYPICAL PLAN - RETENTION SWALE CHECK DAM
SCALE 1:50



2 - SECTION TO CONCRETE BLOCK CHECK DAM
SCALE 1:50



1 - TYPE 2 - PLANTED RETENTION SWALE
SCALE 1:100

NOTES:

1. REFER TO LANDSCAPE DRAWINGS FOR PLANTING DETAILS.
2. ALL CHANNELS SHALL HAVE A MAXIMUM 5% LONGITUDINAL SLOPE. UNLESS OTHERWISE SHOWN ON THE PLANS, CHANNELS EXCEEDING THE MAXIMUM ALLOWABLE SLOPE SHALL BE LINED WITH RIP RAP DETAIL AS PER DETAIL 1 ON VE-2133.

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3) AS SHOWN

Design	JL	25.06.18	Approved For Construction*
Drawn	AA	05.06.18	-
Dsg Verifier	RS	25.06.18	
Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER TYPICAL DETAILS SHEET 1 OF 10

Status: FOR TENDER

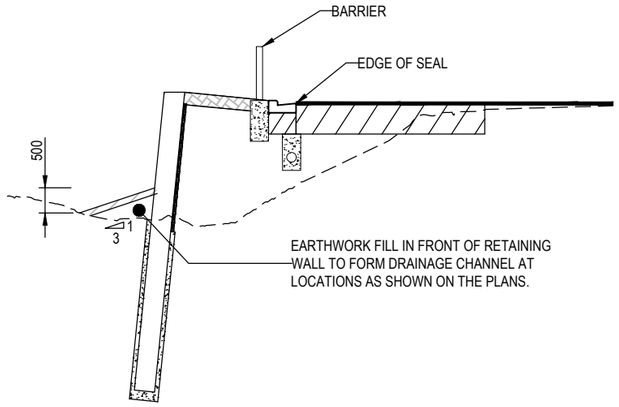
Drawing No. SR1003 - 01 - VE - 2131

Rev. 0

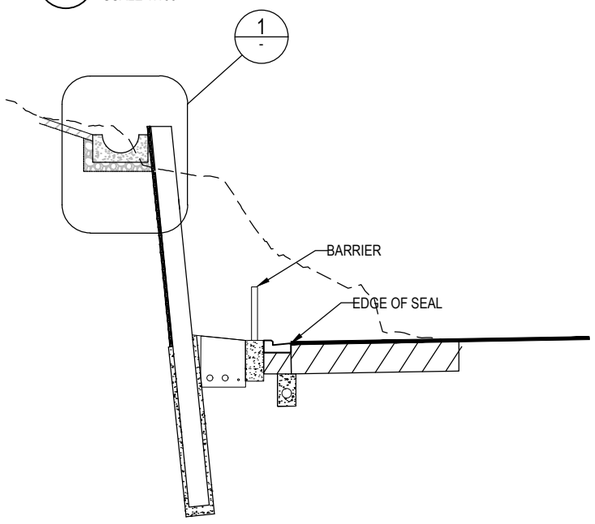
Document No. P:\341341907\Shared\Auckland-Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\B Pre-implementation\CAD - VE\SR1003-01-VE-2131-2140.dwg

NOTES:

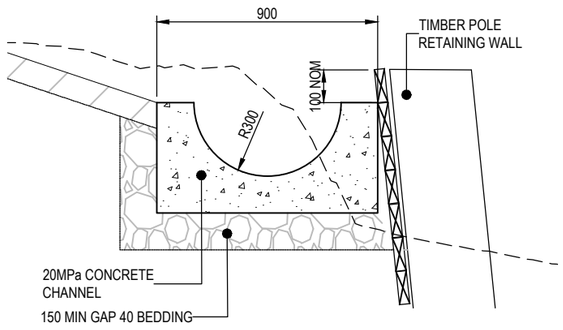
1. REFER TO LANDSCAPE DRAWINGS FOR PLANTING DETAILS.



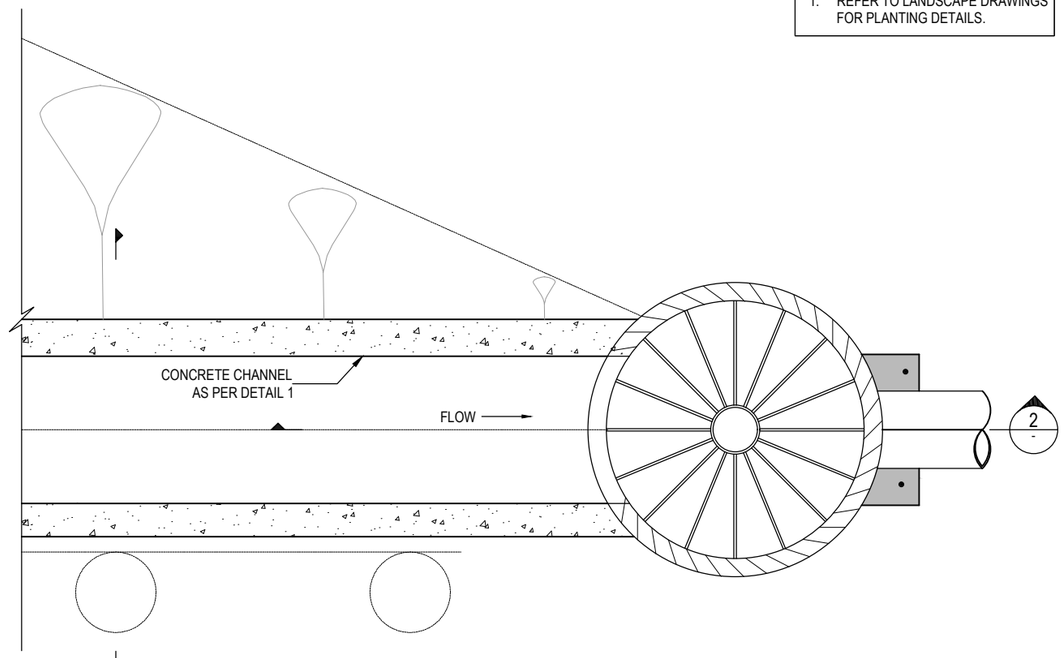
A - TYPE 4A - RETAINING WALL CHANNEL (FILL)
SCALE 1:100



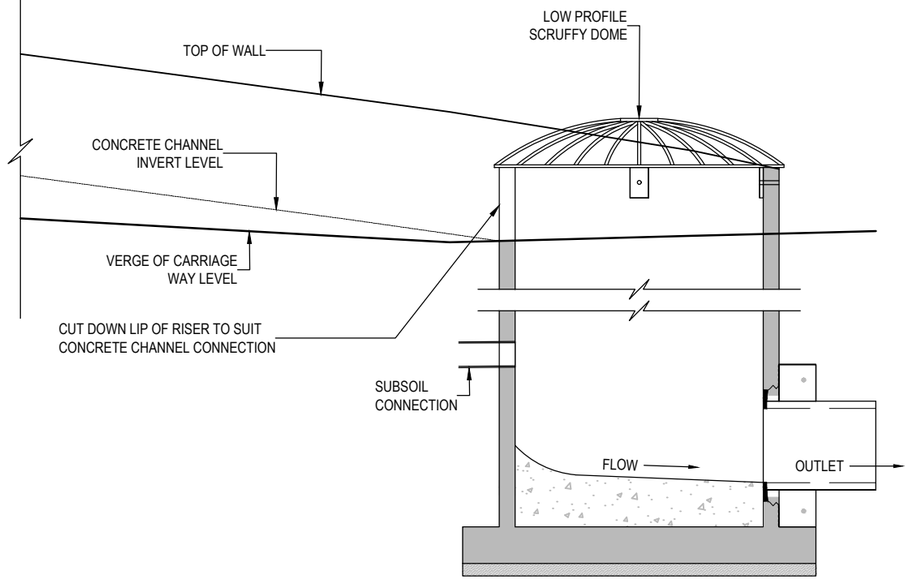
B - TYPE 4B - RETAINING WALL CHANNEL (CUT)
SCALE 1:100



1 - DETAIL - RETAINING WALL CONCRETE CHANNEL
1:25



1 C - TYPICAL PLAN - CONCRETE CHANNEL BEHIND RETAINING WALLS
SCALE 1:50



2 - SECTION - CONCRETE CHANNEL BEHIND RETAINING WALLS
SCALE 1:50

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3)				
AS SHOWN	Design	JL	25.06.18	Approved For Construction*
	Drawn	AA	05.06.18	-
	Dsg Verifier	RS	25.06.18	
	Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI — Safe Roads

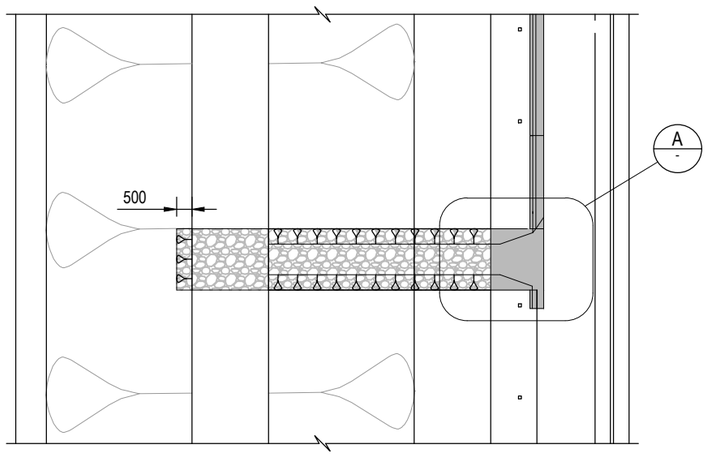
Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER TYPICAL DETAILS SHEET 2 OF 10

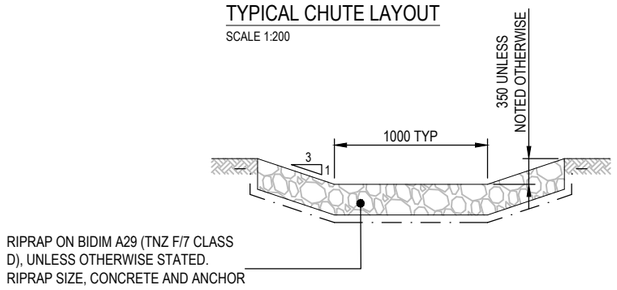
Status: FOR TENDER

Drawing No.: SR1003 - 01 - VE - 2132

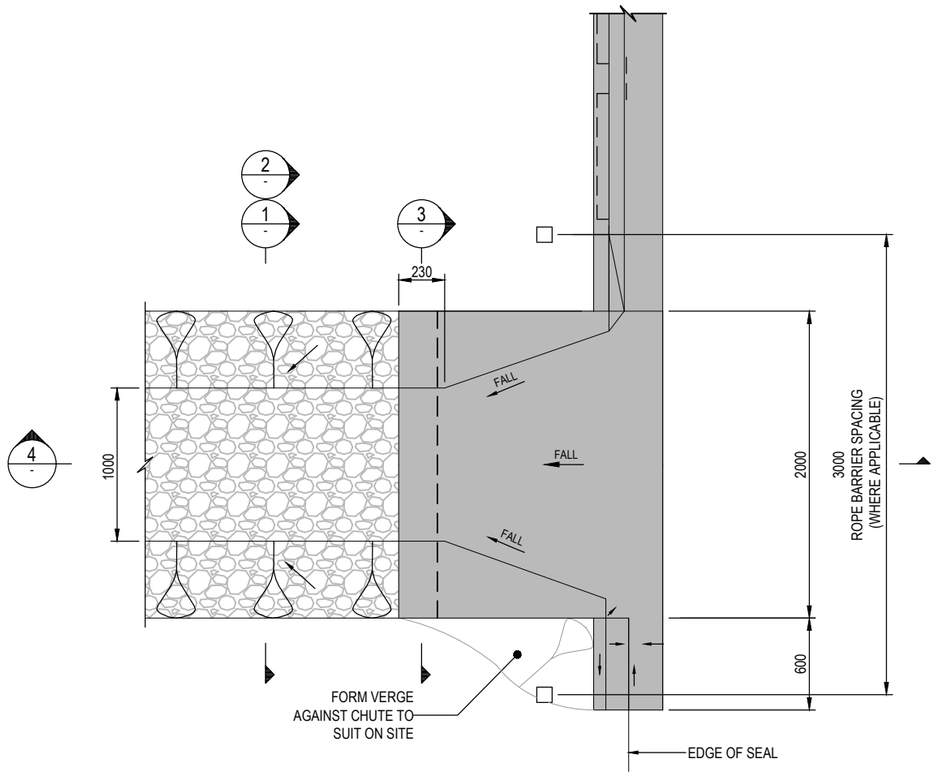
Rev.: 0



TYPICAL CHUTE LAYOUT
SCALE 1:200



1 - RIPRAP CHUTE (ON SLOPE FLATTER THAN 3H:1V) - TYPICAL
SCALE 1:40

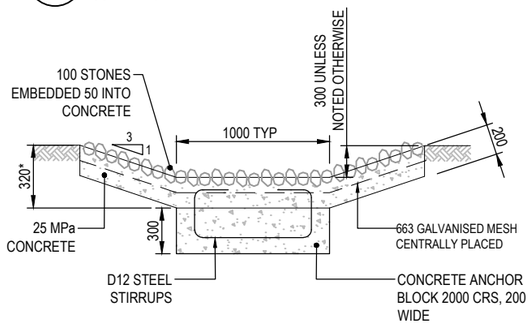


A - KERB TO CHUTE LAYOUT
SCALE 1:40

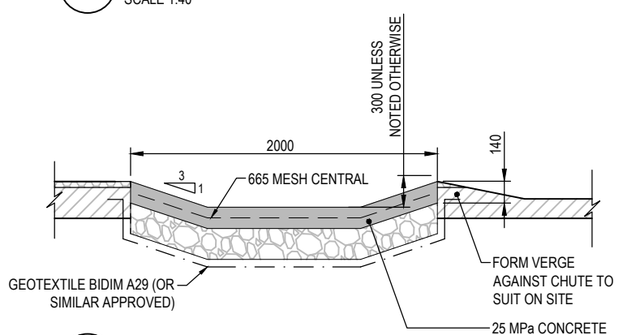
NOTES:

1. AMEND TO SUIT ON SITE FOR DIFFERENT BARRIER / KERB ARRANGEMENTS.
2. ALLOW ADDITIONAL BARRIER POSTS TO BE CAST IN TO CONCRETE CHUTE WHERE REQUIRED.
3. SETOUT SUMP CHUTE AND BARRIER ON SITE AND COORDINATE LAYOUT. CONSULT DESIGNER FOR ANY NECESSARY CLARIFICATION.

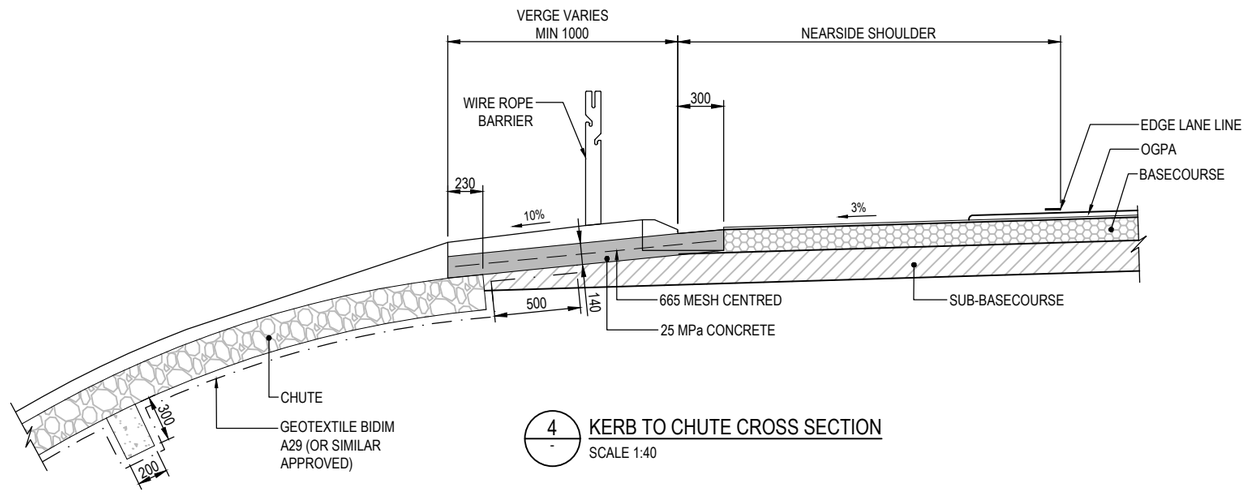
* MAY BE WIDER OR DEEPER AS INDICATED ON PLANS



2 - CONCRETE CHUTE (ON SLOPE STEEPER THAN 3H:1V) - TYPICAL
SCALE 1:40



3 - CHUTE CROSS SECTION
SCALE 1:40



4 - KERB TO CHUTE CROSS SECTION
SCALE 1:40

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
-	-	-	-	-	-
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Original Scale (A3) AS SHOWN	Design	JL	25.06.18	Approved For Construction*
	Drawn	AA	05.06.18	-
	Dsg Verifier	RS	25.06.18	-
	Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI — Safe Roads

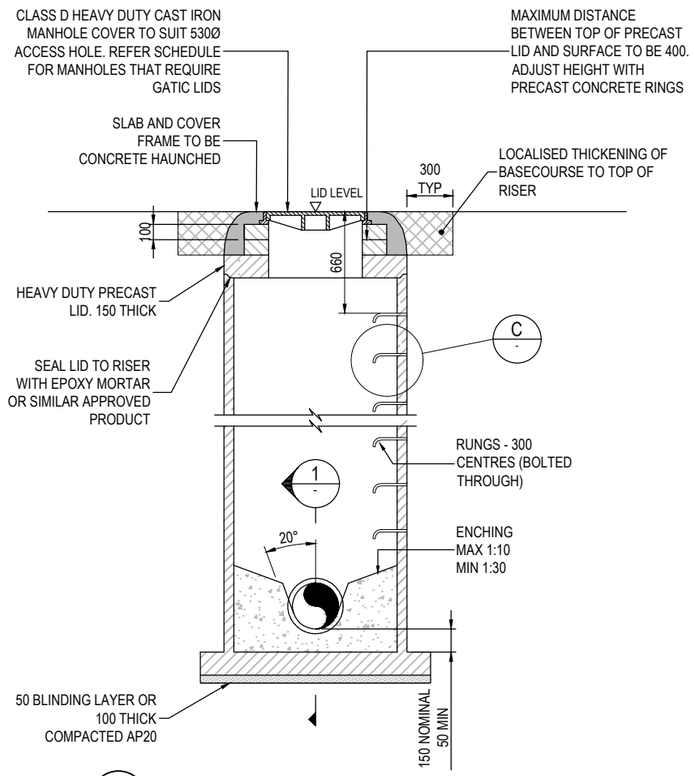
Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER TYPICAL DETAILS SHEET 3 OF 10

Status: FOR TENDER

Drawing No.: SR1003 - 01 - VE - 2133

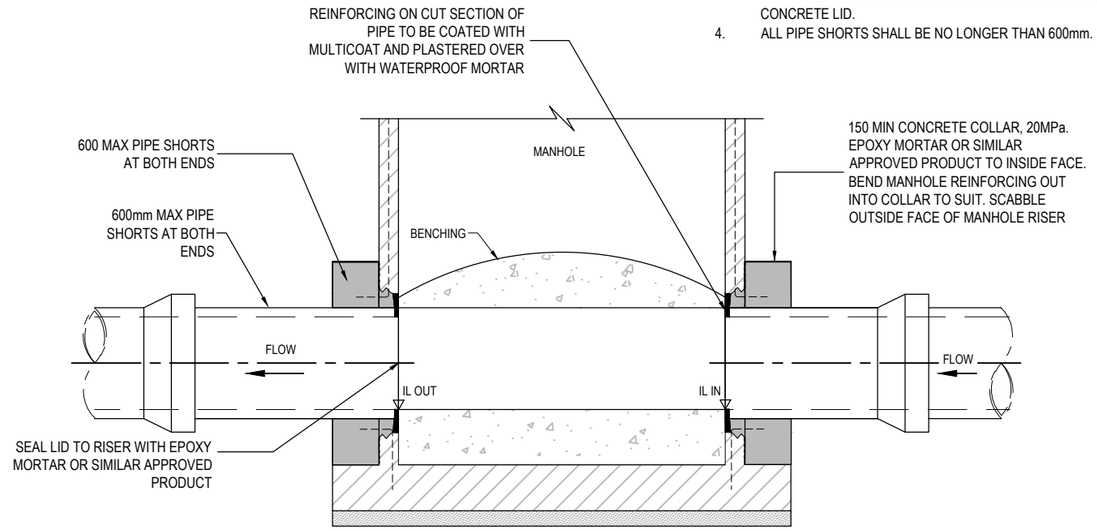
Rev.: 0



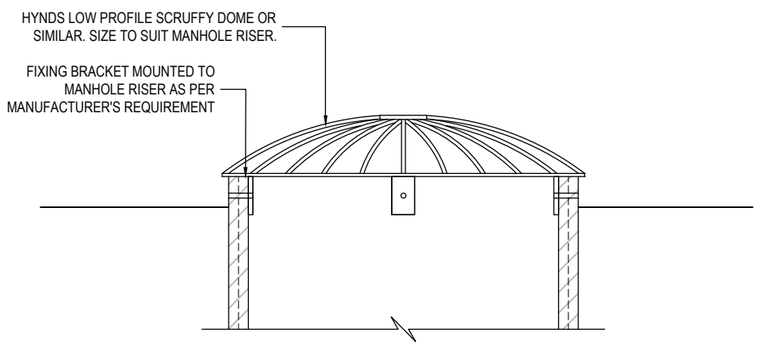
A - STANDARD PRECAST CONCRETE MANHOLE
SCALE 1:40

NOTES:

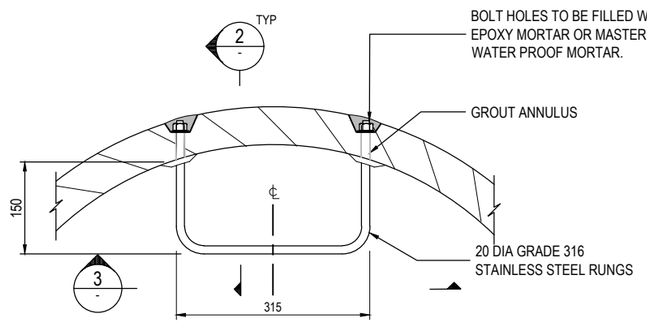
1. REFER TO LONG SECTIONS FOR DEPTHS AND INVERT LEVELS. REFER TO 3D MODEL FOR SETOUT.
2. MANHOLE LIDS ARE TO BE HINGED AND SELF-RESEATING, ORIENTED TO CLOSE IN THE DIRECTION OF TRAFFIC
3. CAST LID ON MANHOLES TO BE APPLIED WITH EPOXY MORTAR OR SIMILAR APPROVED PRODUCT OR ALTERNATIVELY BOLTING THE FRAME TO THE CONCRETE LID.
4. ALL PIPE SHORTS SHALL BE NO LONGER THAN 600mm.



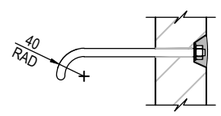
1 - CONCRETE PIPE TO MANHOLE CONNECTION
SCALE 1:20



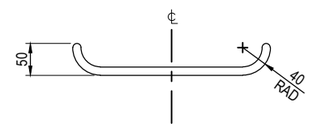
B - TYPICAL DETAIL - SCRUFFY DOME
SCALE 1:20



C - PLAN - STEP IRON
SCALE 1:10



2 - SECTION - STEP IRON
SCALE 1:10



3 - ELEVATION - STEP IRON
SCALE 1:10

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3)				
AS SHOWN	Design	JL	25.06.18	Approved For Construction*
	Drawn	AA	05.06.18	-
	Dsg Verifier	RS	25.06.18	
	Dwg Check	JL	07.06.18	Date -
	* Refer to Revision 1 for Original Signature			

NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER TYPICAL DETAILS SHEET 4 OF 10

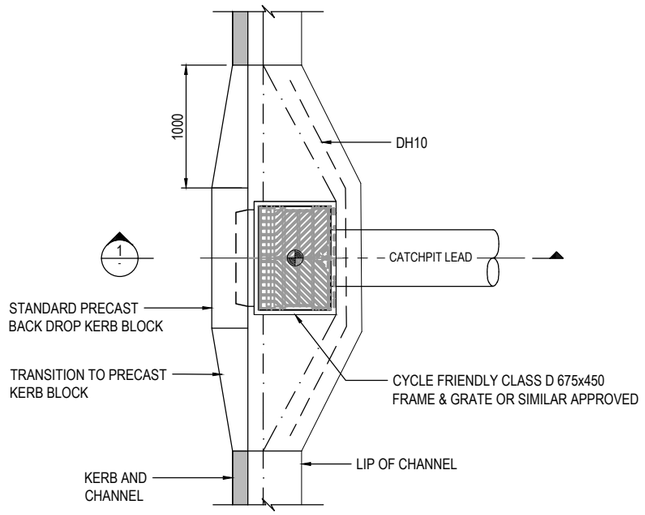
Status: FOR TENDER

Drawing No.: SR1003 - 01 - VE - 2134

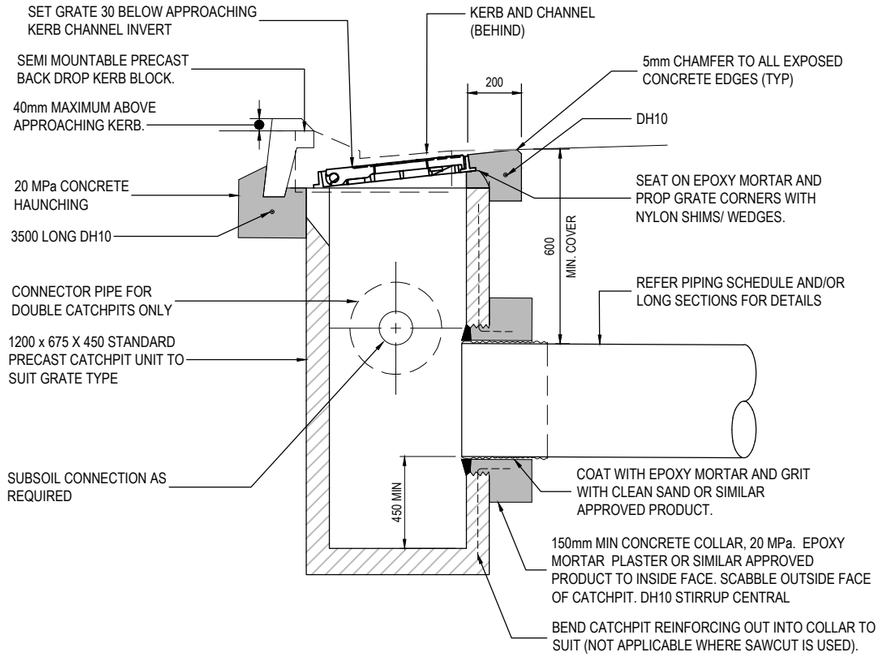
Rev.: 0

DO NOT SCALE

IF IN DOUBT ASK.



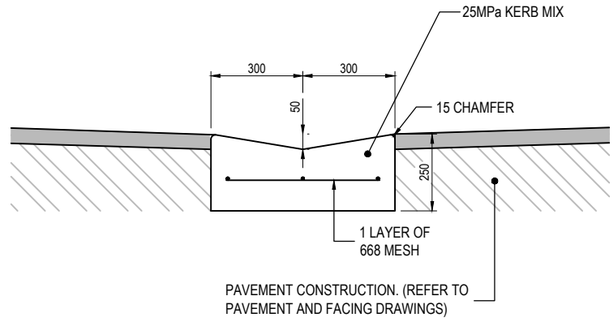
A - STANDARD SINGLE CATCHPIT
SCALE 1:40



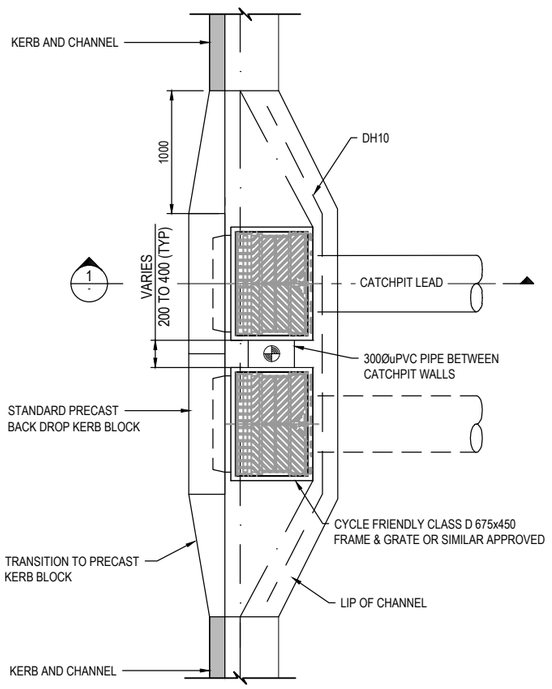
1 - TYPICAL CATCHPIT SECTION
SCALE 1:20

NOTES:

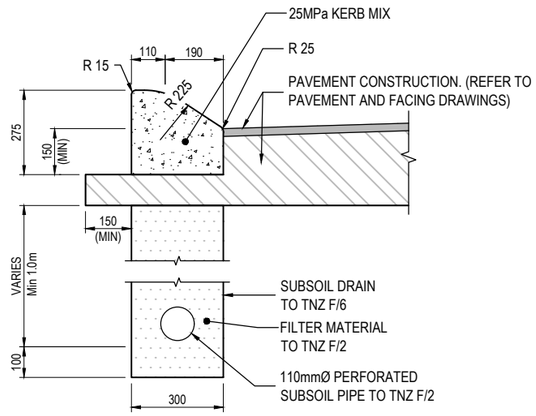
1. FOR DIFFERENT KERB AND CHANNEL TYPES, AMEND SUMP GRATE SETTING DETAIL TO SUIT ON SITE. IN ALL CASES, THE SUMP GRATE IS TO BE BELOW APPROACHING CHANNEL INVERT. NO BACK ENTRY REQUIRED FOR VEE CHANNELS.
2. SINGLE SUMPS IN FRONT OF CONCRETE BARRIER ARE SIMILAR TO DOUBLE SUMP.
3. REFER TO SCHEDULES IN EACH SECTOR FOR DETAIL ON CORRECT SUMP TYPE.



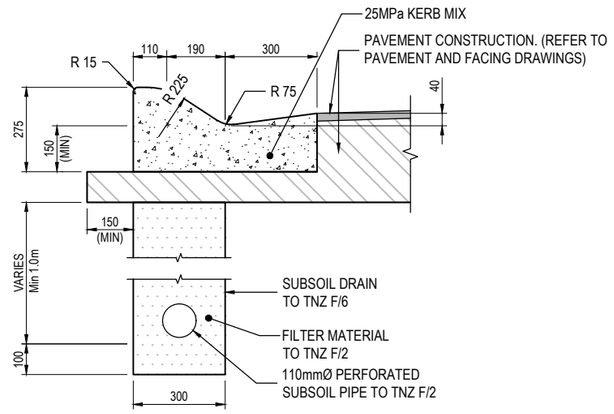
KV - TYPE KV KERB - 600mm WIDE V-SHAPED DISH CHANNEL
SCALE 1:10 (A3)



B - STANDARD DOUBLE CATCHPIT
SCALE 1:40



K1 - TYPE K1 KERB - SM1 SEMI MOUNTABLE KERB ONLY
SCALE 1:10 (A3)



K2 - TYPE K2 - SM2 SEMI MOUNTABLE KERB & CHANNEL
SCALE 1:10 (A3)

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3) AS SHOWN

Design	JL	25.06.18	Approved For Construction*
Drawn	AA	05.06.18	-
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Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

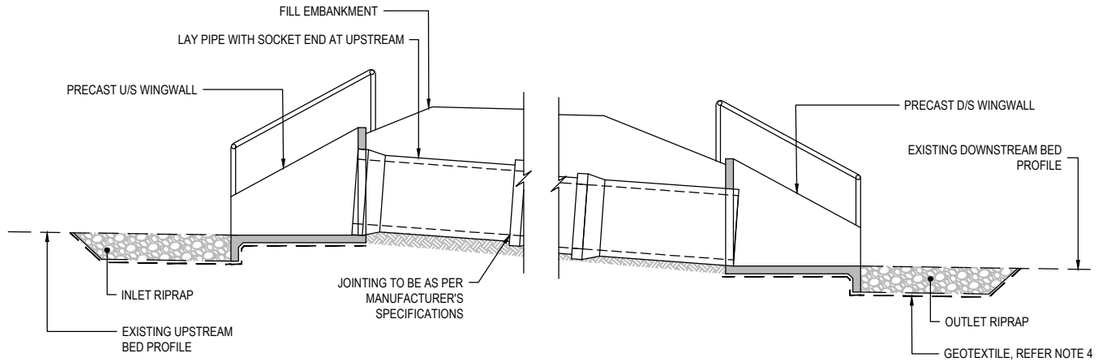
Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER TYPICAL DETAILS SHEET 5 OF 10

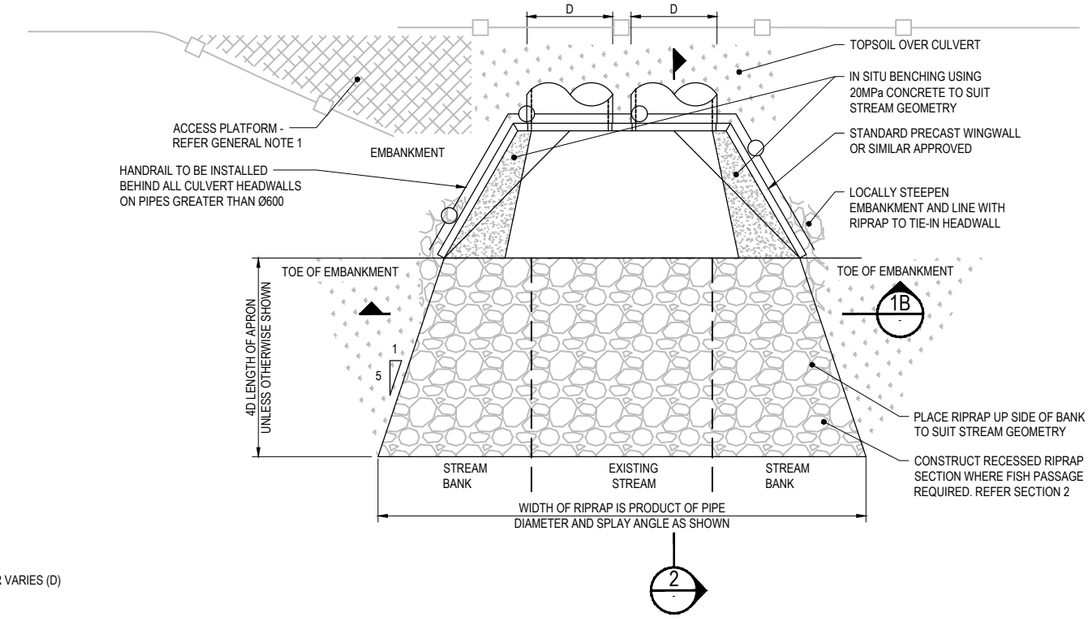
Status: FOR TENDER

Drawing No. SR1003 - 01 - VE - 2135

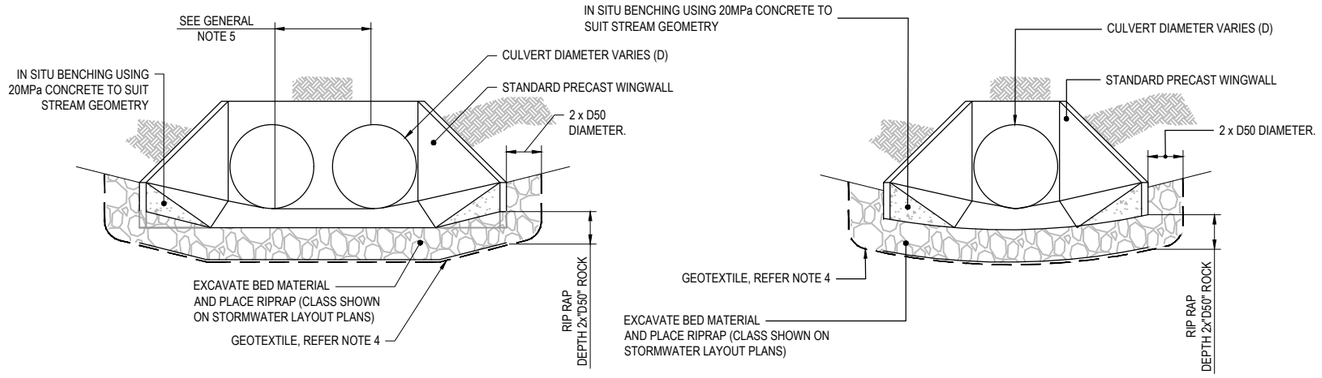
Rev. 0



A - CULVERT PIPE - TYPICAL DETAIL
SCALE 1:100

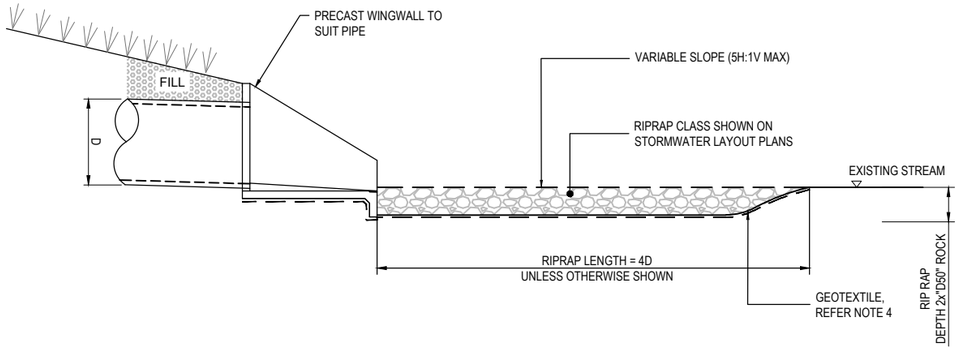


C - MULTIPLE BARREL PIPE - TYPICAL RIPRAP APRON
SCALE 1:100

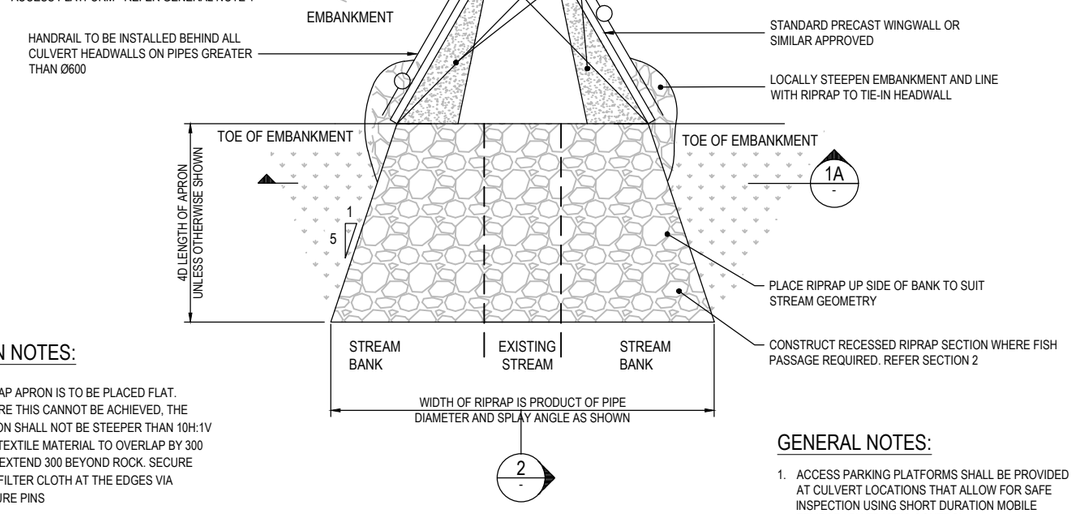


1A - MULTIPLE BARREL PIPE - TYPICAL RIPRAP APRON
SCALE 1:100

1B - SINGLE BARREL PIPE - TYPICAL RIPRAP APRON
SCALE 1:100



2 - TYPICAL RIRAP SCOUR PROTECTION
SCALE 1:100



APRON NOTES:

1. RIPRAP APRON IS TO BE PLACED FLAT. WHERE THIS CANNOT BE ACHIEVED, THE APRON SHALL NOT BE STEEPER THAN 10H:1V
2. GEOTEXTILE MATERIAL TO OVERLAP BY 300 AND EXTEND 300 BEYOND ROCK. SECURE THE FILTER CLOTH AT THE EDGES VIA SECURE PINS

B - TYPICAL BARREL - TYPICAL RIPRAP APRON
SCALE 1:100

GENERAL NOTES:

1. ACCESS PARKING PLATFORMS SHALL BE PROVIDED AT CULVERT LOCATIONS THAT ALLOW FOR SAFE INSPECTION USING SHORT DURATION MOBILE TEMPORARY TRAFFIC CONTROL.
2. PIPE INSTALLATION AS PER SPECIFICATIONS AND AS/NZS 3725:2007.
3. FOR RIPRAP CLASS SPECIFICATION, REFER SPECIFICATION
4. GEOTEXTILE TO BE BIDIM A29 UNLESS NOTED OTHERWISE.
5. FOR BARREL SPACING, REFER DRAWING VE-2139.

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3) AS SHOWN				
Design	JL	25.06.18	Approved For Construction*	
Drawn	AA	05.06.18	-	
Dsg Verifier	RS	25.06.18		
Dwg Check	JL	07.06.18	Date	-

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI — Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER TYPICAL DETAILS SHEET 6 OF 10

Status: FOR TENDER

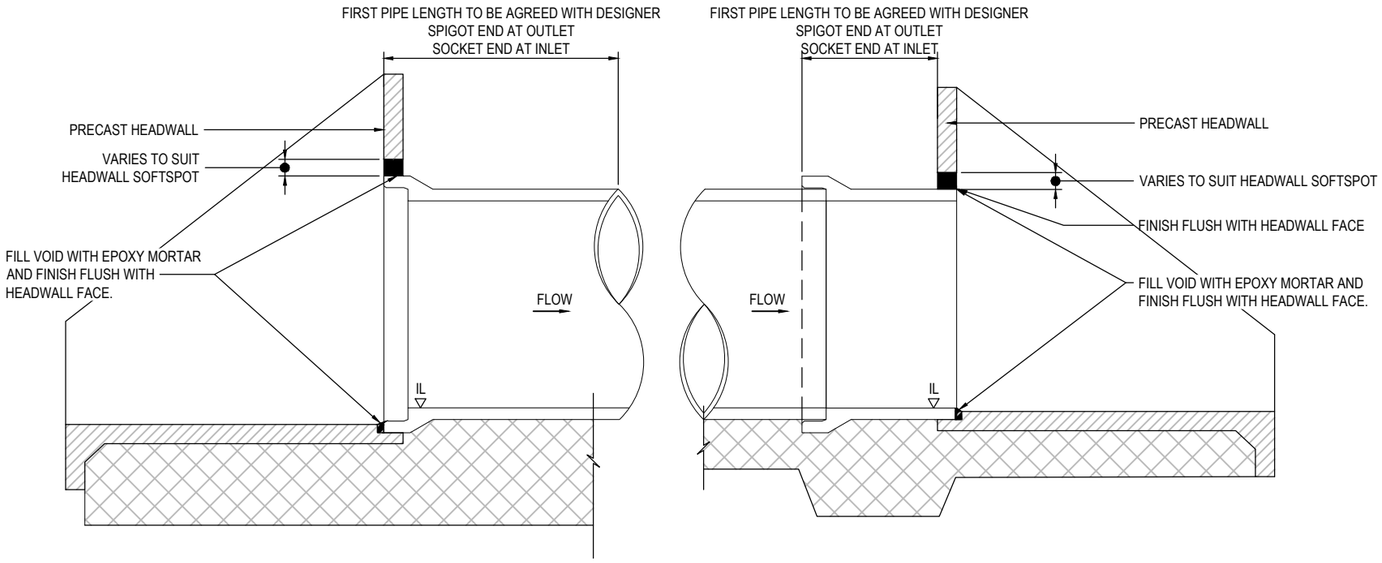
Drawing No.: SR1003 - 01 - VE - 2136

Rev.: 0

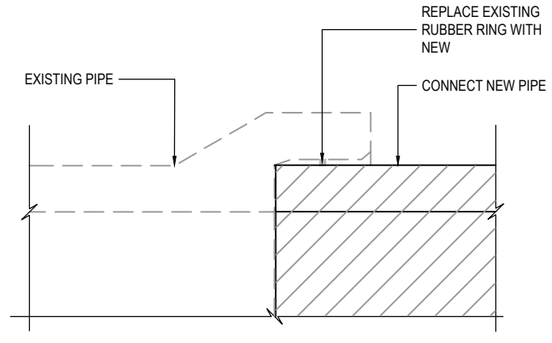
Document No.: P:\341341\1907\Shared\Auckland-Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\B Pre-implementation\CAD - VE\SR1003-01-VE-2131-2140.dwg

NOTE:

1. FOR PIPE DIAMETER, INVERT LEVELS, MATERIAL AND CLASS REFER PIT TO SCHEDULE AND / OR LONG SECTION DRAWINGS.



A - CONCRETE CULVERT TO HEADWALL CONNECTION
SCALE 1:40



B - TYPICAL DETAIL - CULVERT EXTENSION FROM EXISTING
SCALE 1:10

CULVERT EXTENSION CONSTRUCTION NOTES:

THE CONSTRUCTION OF ANY PROPOSED CULVERT EXTENSION NEED TO BE CARRIED IN THE FOLLOWING:

1. SITE CLEARANCE AROUND THE INLET AND OUTLET OF THE EXISTING CULVERT
2. INVESTIGATION OF EXISTING CULVERTS AS PER PROJECT SPECIFICATION
3. CONFIRM UPSTREAM WORKS AND EXTENT
4. REMOVE THE FIRST LENGTH OF EXISTING PIPE
5. PROTECT EXISTING COLLAR AND DOWNSTREAM PIPE
6. CLEAN EXISTING JOINT
7. BEDDING, NEW PIPE INSERTION, PIPE SURROUND AND BACKFILL OF PIPE TRENCH AS PER SPECIFICATION

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

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Design	JL	25.06.18	Approved For Construction*
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Dsg Verifier	RS	25.06.18	
Dwg Check	JL	07.06.18	Date -

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NZ TRANSPORT AGENCY WAKA KOTAHI Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER TYPICAL DETAILS SHEET 7 OF 10

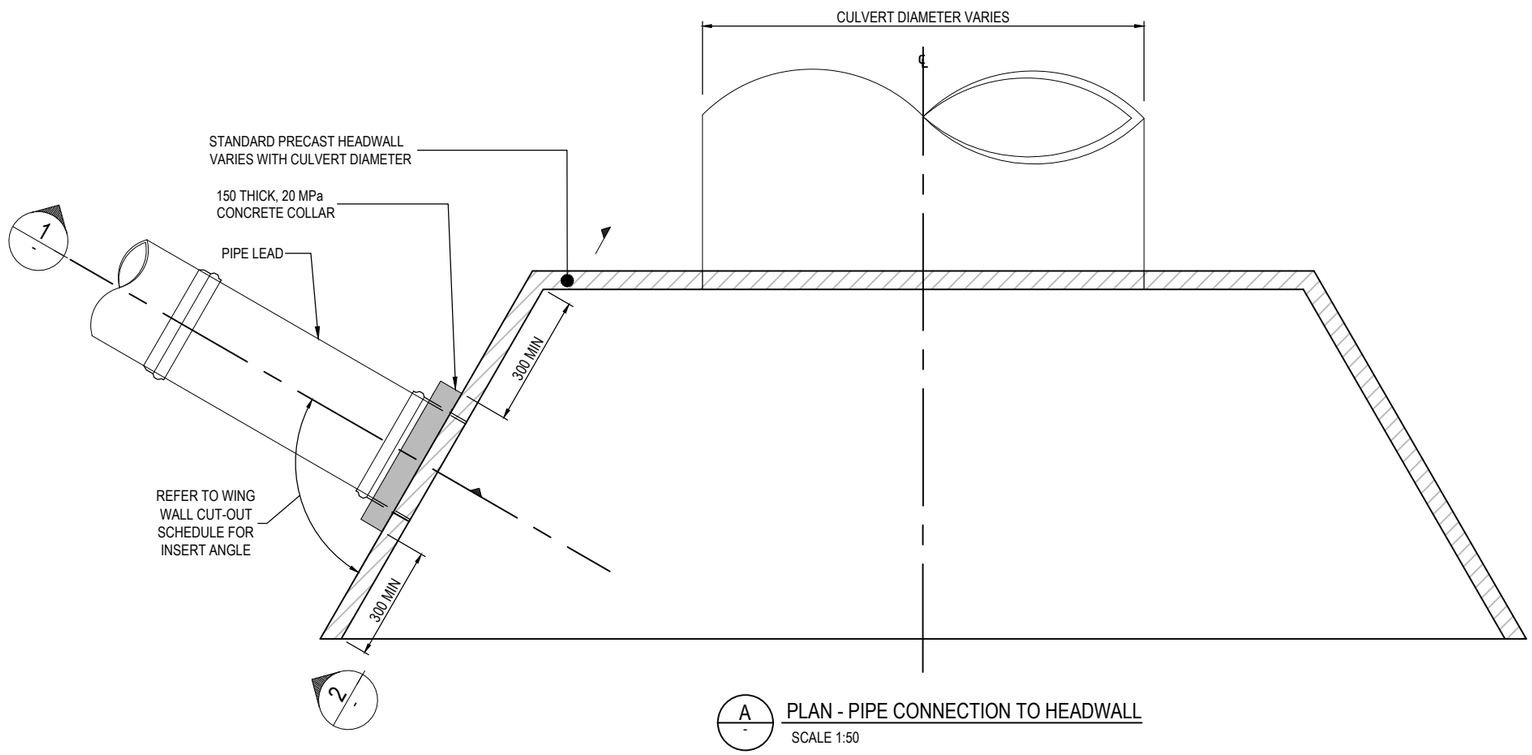
Status: FOR TENDER

Drawing No.: SR1003 - 01 - VE - 2137

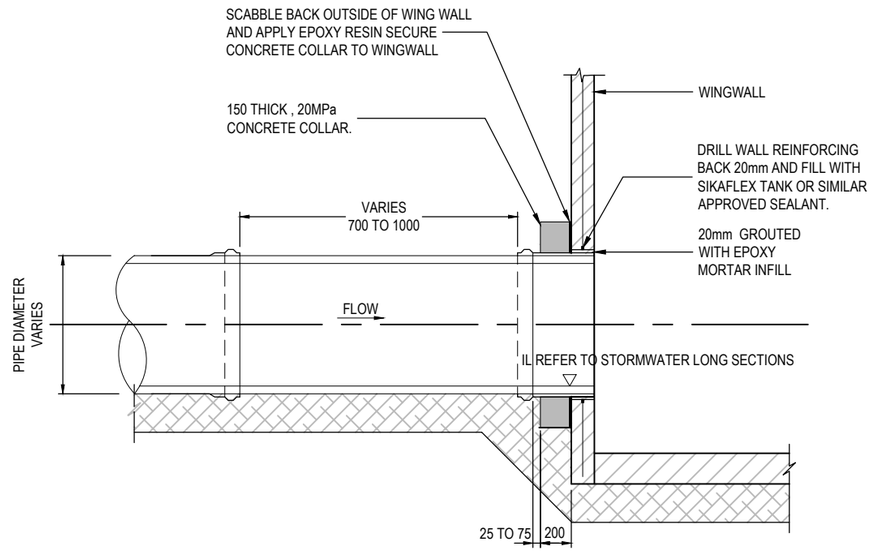
Rev.: 0

Document No. P:\341341\907-Shared\Auckland-Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\B Pre-implementation\CAD - \VE\SR1003-01-VE-2131-2140.dwg

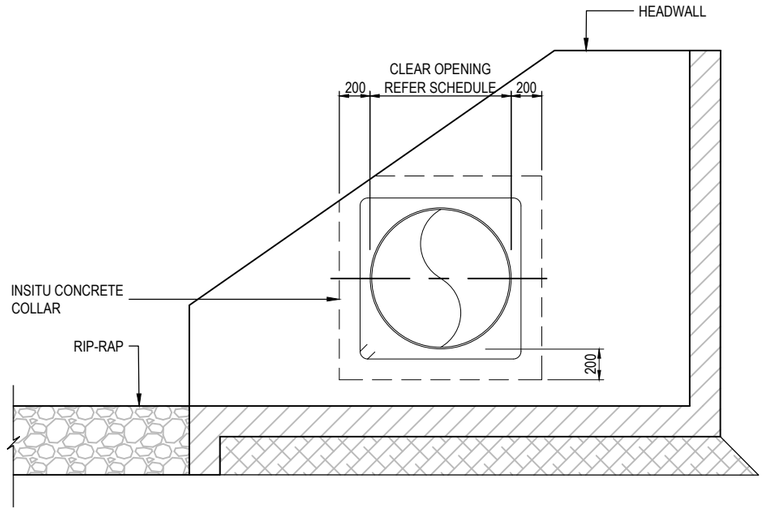
WING WALL CUT-OUT SCHEDULE	
INSERT ANGLE TO WALL	CLEAR OPENING
90 ° - 100 °	1.0 x PIPE OD + 20mm
100 ° - 110 °	1.1 x PIPE OD + 20mm
110 ° - 120 °	1.2 x PIPE OD + 20mm
120 ° - 130 °	1.3 x PIPE OD + 20mm



A - PLAN - PIPE CONNECTION TO HEADWALL
SCALE 1:50



1 - SECTION THROUGH PIPE LEAD
SCALE 1:40



2 - ELEVATION
SCALE 1:40

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3) AS SHOWN

Design	JL	25.06.18	Approved For Construction*
Drawn	AA	05.06.18	-
Dsg Verifier	RS	25.06.18	
Dwg Check	JL	07.06.18	Date -

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NZ TRANSPORT AGENCY WAKA KOTAHI — Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER TYPICAL DETAILS SHEET 8 OF 10

Status: FOR TENDER

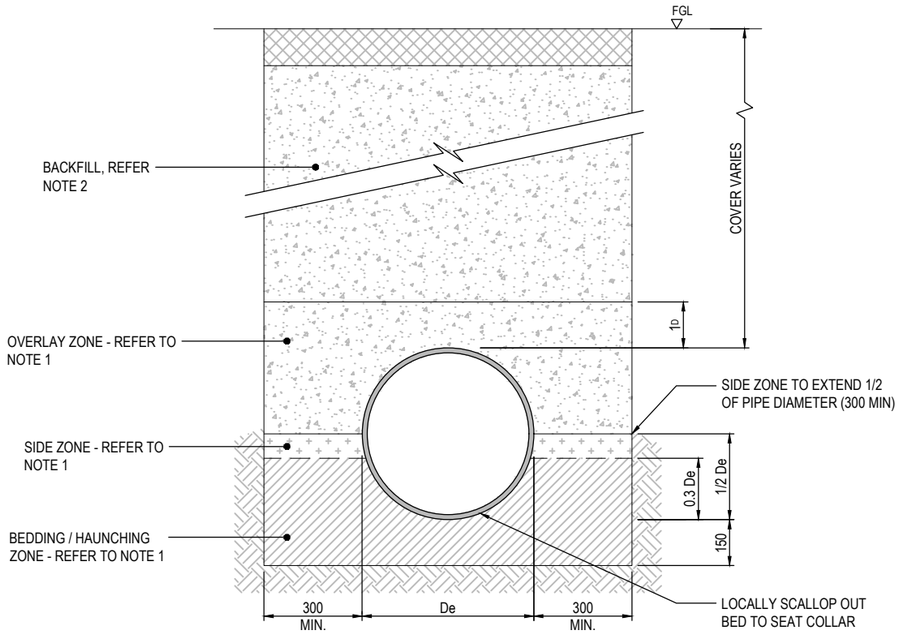
Drawing No.: SR1003 - 01 - VE - 2138

Rev.: 0

Document No. P:\341341\1907\Shared\Auckland-Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\B Pre-implementation\CAD - VE\SR1003-01-VE-2131-2140.dwg

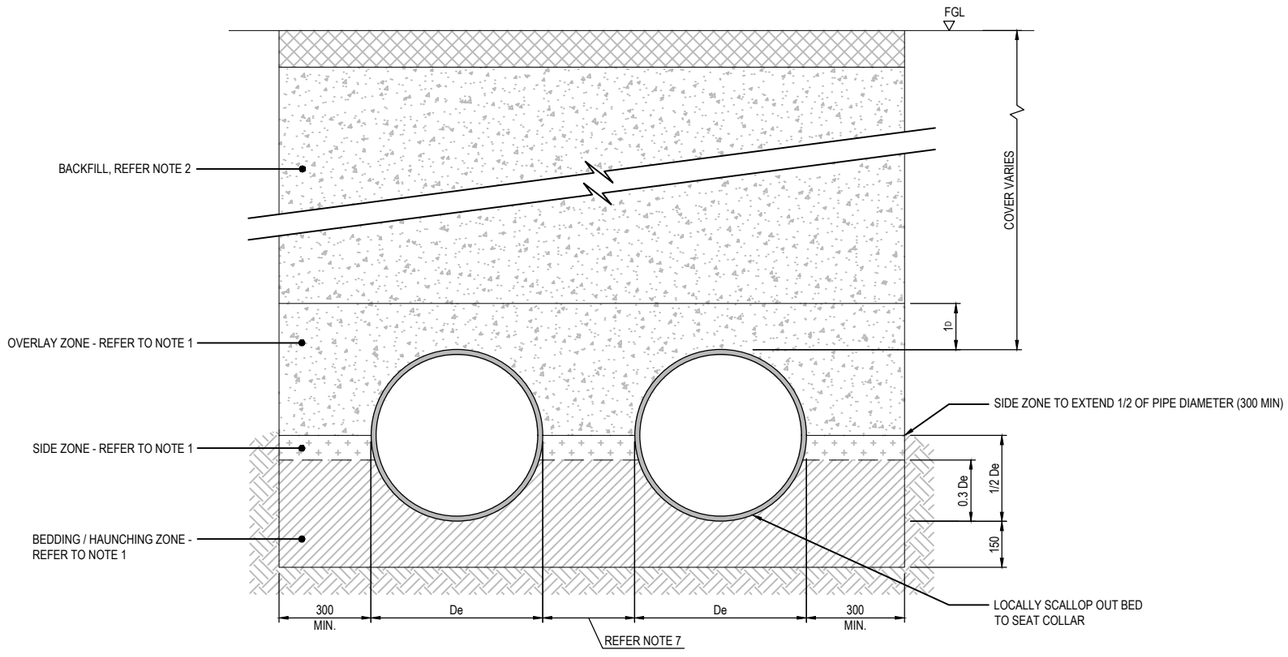
DO NOT SCALE

IF IN DOUBT ASK.



HS2 TRENCH / BEDDING FOR SINGLE BARREL CONCRETE PIPES

SCALE 1:20



HS2 TRENCH / BEDDING FOR MULTIPLE BARREL CONCRETE PIPES

SCALE 1:10

NOTES:

1. BEDDING / HAUNCHING / SIDE / EMBEDMENT MATERIAL TO BE IN ACCORDANCE WITH THE TABLES BELOW. THESE ZONES TO BE COMPACTED IN 150mm MAX. LAYERS TO MIN. 90% OF MDD. TESTING SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION C0204. OVERLAY ZONE TO BE COMPACTED TO MIN. 90% OF MDD AND SHALL ALSO BE FREE OF STONES > 150mm AND CONTAIN LESS THAN 20% OF MATERIAL WITH A SIZE BETWEEN 75mm AND 150mm.

   GRADING REQUIREMENTS

BEDDING / HAUNCHING / EMBEDMENT / ZONE						
SIEVE SIZE (mm)	19	2.36	0.6	0.3	0.15	0.075
% MASS PASSING	100	100-50	90-20	60-10	25-0	10-0

SIDE ZONE					
SIEVE SIZE (mm)	75	9.5	2.36	0.6	0.075
% MASS PASSING	100	100-50	100-30	50-15	25-0

2. BACKFILL TO BE FREE FROM LUMPS > 150mm AND STONES > 65mm. REFER TO SPECIFICATIONS. REFER TO PAVEMENT PLANS AND DETAILS WHERE UNDER ROAD. REFER TO EARTHWORKS PLANS AND DETAILS ELSEWHERE.

3. FORMATION LAYER TO BE TESTED WITH SCALA PENETROMETER EVERY 10m AND SHALL HAVE MINIMUM 2 BLOWS / 100mm.

4. EMBEDMENT MINIMUM VALUES

D_e	MINIMUM VALUES	
	1_C	1_D
>300 ≤450	200	150
>450 ≤900	300	150
>900 ≤1500	350	200
>1500 ≤4000	$0.25D_e$	300

5. FOR EMBANKMENT INSTALLATION, THE SAME EMBEDMENT REQUIREMENTS SHALL BE MET. THE POSITIVE PROJECTION SHALL BE LESS THAN 0.5 TIMES THE PIPE DIAMETER.

6. FOR PIPE CLASS AND MATERIAL REFER STORMWATER LONGITUDINAL SECTION DRAWINGS.

7. BARREL SPACING SHOWN IN TABLE BELOW IS BASED ON AS/NZS 3725:2007. THESE VALUES ARE MINIMUMS TO BE ADOPTED WHERE PIPE MANUFACTURER HAS NOT SPECIFIED OTHERWISE. FOR CROSS CULVERTS ALL BARREL SPACING WILL BE GOVERNED BY THE HEADWALL PENETRATION SPACING.

BARREL SPACING	
PIPE INTERNAL DIAMETER (mm)	SEPARATION
<= 600mm	150mm
600 TO 1200mm	200mm
>= 1200mm	D/6 WHERE D IS OUTSIDE DIAMETER OF THE BARREL (NOT THE SOCKET)

8. MINIMUM COVER OF 600mm SHALL BE PROVIDED TO ALL NEW STORMWATER PIPES UNDER THE ROAD CARRIAGEWAY. WHERE MINIMUM COVER CAN NOT BE ACHIEVED, ALTERNATIVE BEDDING TYPE, BEDDING MATERIAL OR PIPE CLASS MAY NEED TO BE ADOPTED UPON THE INSTRUCTION OF THE ENGINEER.

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
-	-	-	-	-	-
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Original Scale (A3) AS SHOWN

Design	JL	25.06.18	Approved For Construction*
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Dsg Verifier	RS	25.06.18	
Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER TYPICAL DETAILS SHEET 9 OF 10

Status. FOR TENDER

Drawing No. SR1003 - 01 - VE - 2139

Rev. 0

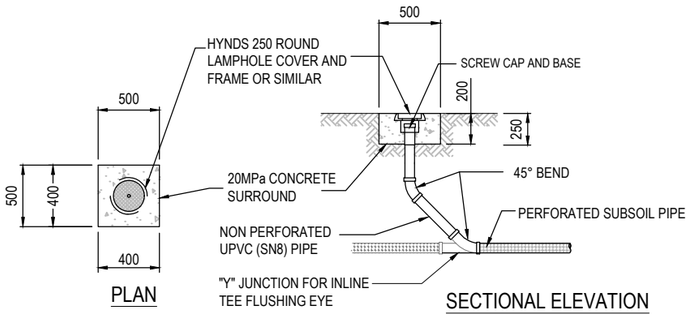
100mm

0

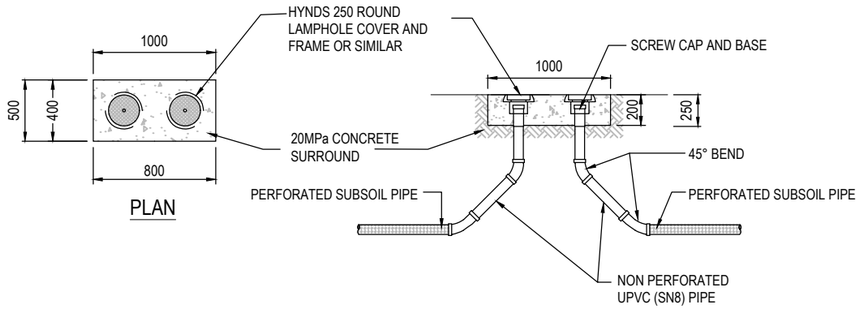
SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

NOTES:

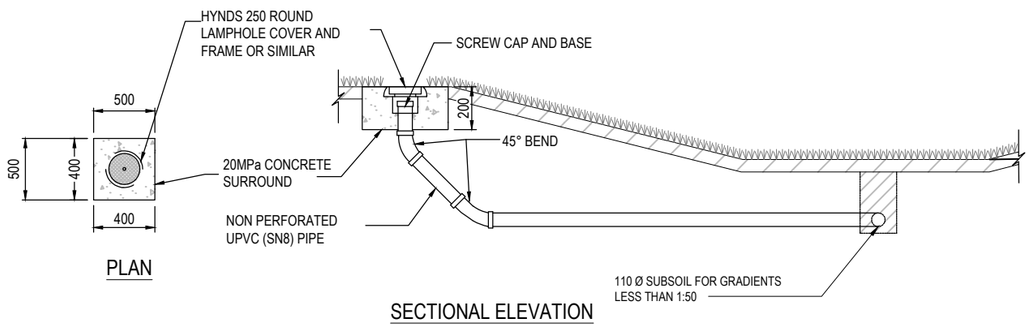
1. MAX SUBSOIL RUN = 90m BEFORE CONNECTION TO DRAINAGE STRUCTURE (CATCHPIT, SCRUFFY DOME ETC.) OR SUBSOIL DAYLIGHTED. IF NOT POSSIBLE, FLUSHING EYE REQUIRED.
2. SUBSOIL PIPES TO BE NZTA F/2 SMOOTH BORED PIPE.
3. UPSTREAM END OF SUBSOILS REQUIRE FLUSHING ACCESS. E.G. FLUSHING EYE OR START IN DRAINAGE STRUCTURE.
4. PVC JOINTING AS PER THREADED FITTING STANDARD FOR PLUMBING APPLICATIONS.
5. INVERT TO BE MIN 210mm FOR PAVEMENT SUBSOIL DRAINS OR TO INVERT LEVEL INDICATED ON THE SUBSOIL DRAWINGS. WHERE DISCHARGE LEVEL CANNOT BE ACHIEVED, THE SUBSOIL DRAIN MAY BE PLACED WITH INVERT THE INVERT LEVEL AT THE BASE OF THE SUBGRADE IMPROVEMENT LAYER WITH WRITTEN APPROVAL FROM THE ENGINEER.
6. DISCHARGE IL OF SUBSOIL DRAIN TO BE ABOVE CATCHPIT / MANHOLE OUTLET LEAD.
7. TOP OF SUBSOIL DRAIN TO CONNECT TO UNDERSIDE OF SIL LAYER
8. LONGITUDINAL SUBSOIL DRAINS AT 1% GRADE (MIN 0.5%) OR STEEPER AS INDICATED ON THE SUBSOIL DRAWINGS.
9. FLUSHING EYES AT 90m MAX INTERVALS AND AS INDICATED ON THE SUBSOIL DRAWINGS.
10. SUBSOIL DISCHARGING DOWNSTREAM TO CONCRETE OUTLET, LATERAL PAVEMENT SUBSOIL OR DRAINAGE STRUCTURE AS INDICATED ON THE SUBSOIL DRAWINGS.
11. SECTION OF UPVC PIPE REQUIRED IN LATERAL DRAINS AND ELSEWHERE AS INDICATED ON THE SUBSOIL DRAWINGS.
12. A BLUE COLOURED MARKER POST (GUIDELITE TYPE OR EQUAL APPROVED) SHALL BE INSTALLED AT EACH SUBSOIL DRAIN FIELD OUTLET (CONCRETE OUTLET).



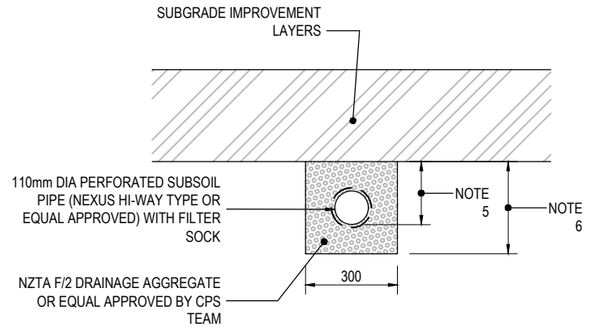
A - PAVEMENT SUBSOIL 'SINGLE END' FLUSHING EYE DETAIL
SCALE 1:50



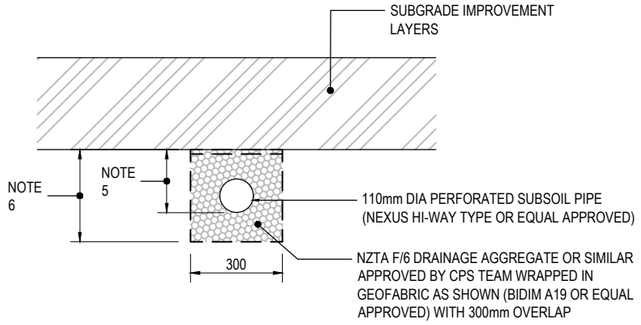
B - PAVEMENT SUBSOIL 'DOUBLE END' FLUSHING EYE DETAIL
SCALE 1:50



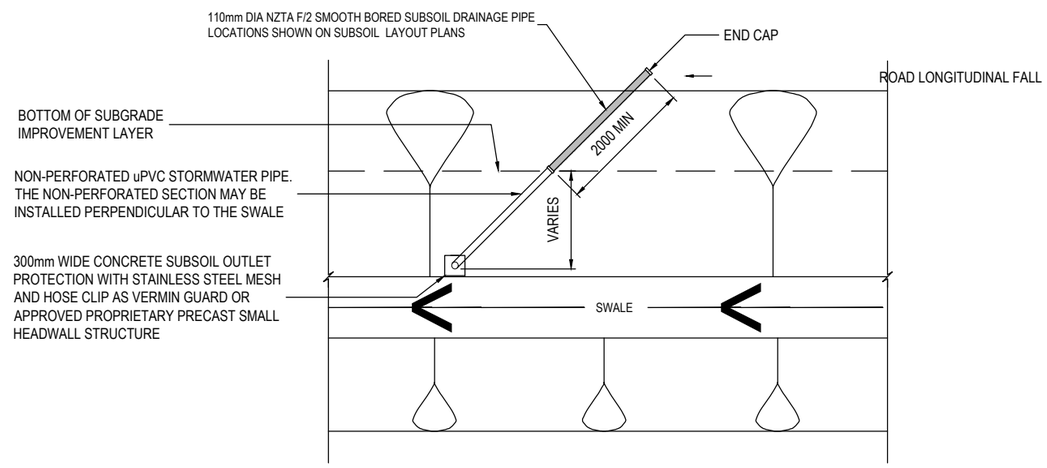
C - SWALE SUBSOIL FLUSHING EYE DETAIL
SCALE 1:50



D - F/2 SUBSOIL DRAIN DETAIL
SCALE 1:20



D - F/6 SUBSOIL DRAIN DETAIL
SCALE 1:20



F - LATERAL PAVEMENT SUBSOIL DRAIN OUTLET - PLAN
SCALE 1:100

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
-	-	-	-	-	-
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Original Scale (A3) AS SHOWN

Design	SB	25.06.18	Approved For Construction*
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* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER TYPICAL DETAILS SHEET 10 OF 10

Status. **FOR TENDER**

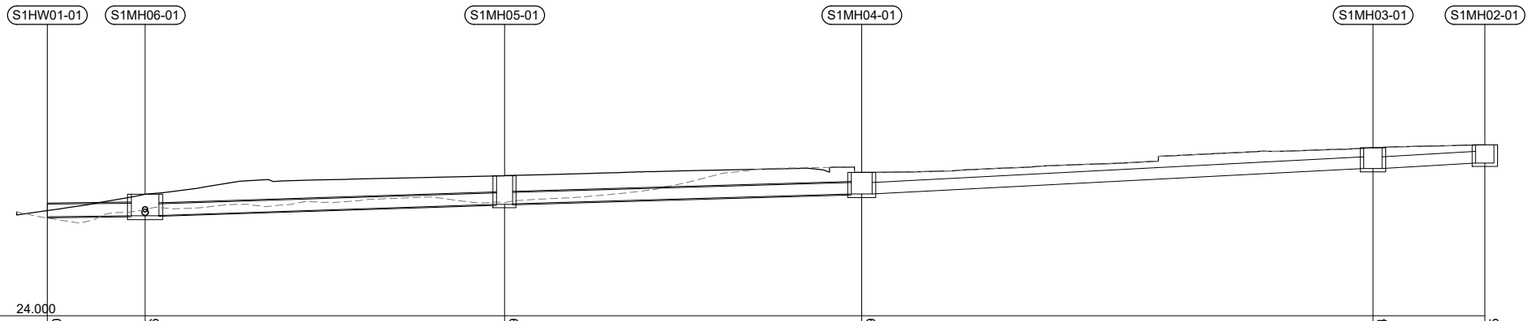
Drawing No. SR1003 - 01 - VE - 2140

Rev. 0

Document No. P:\341\341\1907-Stores\Auckland-Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\B Pre-implementation\CAD - VE\SR1003-01-VE-2131-2140.dwg

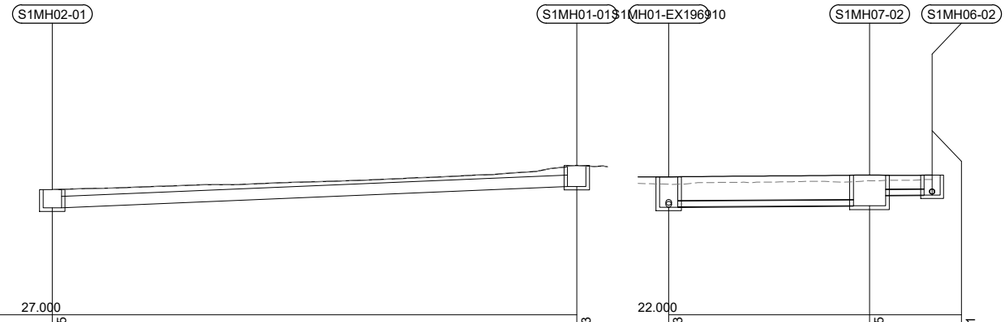
DO NOT SCALE

IF IN DOUBT ASK.



DATUM R.L. (m)	24.000											
FINISHED SURFACE (RL)	30.860		31.926		33.139		33.349		34.954		35.155	
EXISTING SURFACE (RL)	30.376	30.376	30.930	30.930	31.394	31.394	33.349	33.349	34.954	34.954	35.155	35.155
INVERT LEVEL	30.460	30.460	30.520	30.550	31.270	31.300	31.950	31.950	33.610	33.610	33.970	
DEPTH TO INVERT	0.825		1.406	1.376	1.869	1.839	1.399		1.344		1.185	
PIPE SIZE	Ø825mm		Ø750mm		Ø750mm		Ø750mm		Ø750mm			
PIPE CLASS	RCRRJ Class 4		RCRRJ Class 4		RCRRJ Class 4		EXISTING		EXISTING			
PIPE LENGTH	5.47m		22.02m		22.11m		32.08m		6.10m			
PIPE GRADE	1.10%		3.27%		2.94%		5.18%		5.90%			

SW LINE 01



DATUM R.L. (m)	27.000				22.000			
FINISHED SURFACE (RL)	35.155		36.733		30.993		31.105	31.101
EXISTING SURFACE (RL)	35.155		36.733		30.504		30.738	30.814
INVERT LEVEL	33.970	33.970	35.360		29.010	29.030	29.100	29.780	29.800
DEPTH TO INVERT	1.185		1.373		1.983	1.963	2.005	1.325	1.301
PIPE SIZE	Ø750mm				Ø375mm		Ø375mm	
PIPE CLASS	EXISTING				RCRRJ Class 4		RCRRJ Class 4	
PIPE LENGTH	33.01m				11.45m		2.50m	
PIPE GRADE	4.21%				0.61%		0.80%	

SW LINE 01

SW LINE 02

BEDDING NOTE:

- ALL BEDDING SHALL BE HS2 AS PER DRAWING VE-2139.

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

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Dwg Check	JL	07.06.18	Date -

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DO NOT SCALE

NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER LONGITUDINAL SECTIONS SHEET 1 OF 30

Status: FOR TENDER

Drawing No.: SR1003 - 01 - VE - 2151

Rev.: 0

IF IN DOUBT ASK.

DATUM R.L. (m)	23.000	
FINISHED SURFACE (RL)	31.101	31.693
EXISTING SURFACE (RL)	30.814	31.667
INVERT LEVEL	29.800 / 29.830	30.350
DEPTH TO INVERT	1.301 / 1.271	1.343
PIPE SIZE	Ø375mm	
PIPE CLASS	RCRRJ Class 4	
PIPE LENGTH	55.85m	
PIPE GRADE	0.93%	

SW LINE 02

DATUM R.L. (m)	23.000	
FINISHED SURFACE (RL)	31.693	32.322
EXISTING SURFACE (RL)	31.667	32.214
INVERT LEVEL	30.350 / 30.380	30.950 / 29.800
DEPTH TO INVERT	1.343 / 1.313	1.372 / 2.522
PIPE SIZE	Ø375mm	
PIPE CLASS	RCRRJ Class 4	
PIPE LENGTH	58.85m	
PIPE GRADE	0.97%	

SW LINE 02

BEDDING NOTE:

- ALL BEDDING SHALL BE HS2 AS PER DRAWING VE-2139.

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

DO NOT SCALE

Original Scale (A3) 1:400 (H) 1:200 (V)

Design	JL	25.06.18	Approved For Construction*
Drawn	KA	05.06.18	-
Dsg Verifier	RS	25.06.18	
Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER LONGITUDINAL SECTIONS SHEET 2 OF 30

Status. FOR TENDER

Drawing No. SR1003 - 01 - VE - 2152

Rev. 0

IF IN DOUBT ASK.

100mm

SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

0

S1MH04-02 S1MH03-02

DATUM R.L. (m)	24.000		
FINISHED SURFACE (RL)	32.322		33.095
EXISTING SURFACE (RL)	32.214		33.200
INVERT LEVEL	30.950 29.800		30.800
DEPTH TO INVERT	1.372 2.522		2.295
PIPE SIZE	Ø375mm		
PIPE CLASS	RCRRJ Class 4		
PIPE LENGTH	58.69m		
PIPE GRADE	1.70%		

SW LINE 02

S1MH03-02 S1MH02-02

DATUM R.L. (m)	25.000		
FINISHED SURFACE (RL)	33.095		34.646
EXISTING SURFACE (RL)	33.200		34.817
INVERT LEVEL	30.800 31.400		33.340
DEPTH TO INVERT	2.295 1.695		1.306
PIPE SIZE	Ø300mm		
PIPE CLASS	RCRRJ Class 4		
PIPE LENGTH	58.73m		
PIPE GRADE	3.30%		

SW LINE 02

BEDDING NOTE:

- ALL BEDDING SHALL BE HS2 AS PER DRAWING VE-2139.

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3) 1:400 (H) 1:200 (V)

Design	JL	25.06.18	Approved For Construction*
Drawn	KA	05.06.18	-
Dsg Verifier	RS	25.06.18	-
Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER LONGITUDINAL SECTIONS SHEET 3 OF 30

Status. FOR TENDER

Drawing No. SR1003 - 01 - VE - 2153

Rev. 0

Document No. P:\341\341907\Shared\Auckland-Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\B Pre-implementation\CAD - VE\SR1003-01-VE-2151-2180.dwg

DO NOT SCALE

IF IN DOUBT ASK.

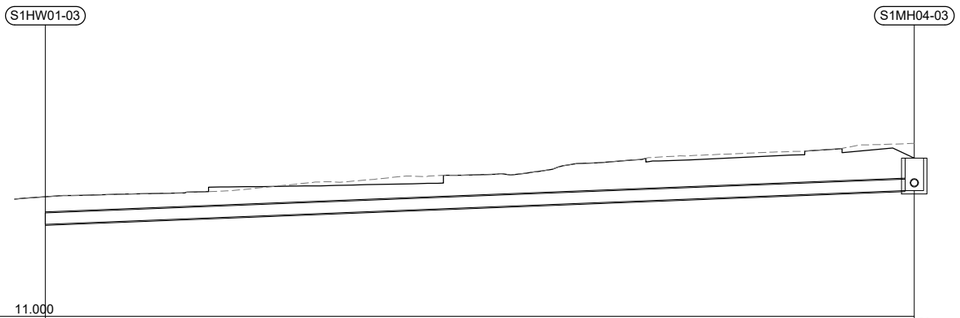
100mm

SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

0

DATUM R.L. (m)	27.000		
FINISHED SURFACE (RL)	34.646		36.534
EXISTING SURFACE (RL)	34.817		36.787
INVERT LEVEL	33.340 / 33.430		35.200
DEPTH TO INVERT	1.306 / 1.216		1.334
PIPE SIZE	Ø300mm		
PIPE CLASS	RCRRJ Class 4		
PIPE LENGTH	59.04m		
PIPE GRADE	3.00%		

SW LINE 02



DATUM R.L. (m)	11.000		
FINISHED SURFACE (RL)	18.798		21.312
EXISTING SURFACE (RL)	18.798		22.276
INVERT LEVEL	17.000 / 17.000		19.200
DEPTH TO INVERT	0.750		2.112
PIPE SIZE	Ø750mm		
PIPE CLASS	RCRRJ Class 4		
PIPE LENGTH	56.10m		
PIPE GRADE	3.92%		

SW LINE 03

BEDDING NOTE:

- ALL BEDDING SHALL BE HS2 AS PER DRAWING VE-2139.

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

DO NOT SCALE

Original Scale (A3)				
1:400 (H) 1:200 (V)	Design	JL	25.06.18	Approved For Construction*
	Drawn	KA	05.06.18	-
	Dsg Verifier	RS	25.06.18	-
	Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI — Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER LONGITUDINAL SECTIONS SHEET 4 OF 30

Status: FOR TENDER

Drawing No.: SR1003 - 01 - VE - 2154

Rev.: 0

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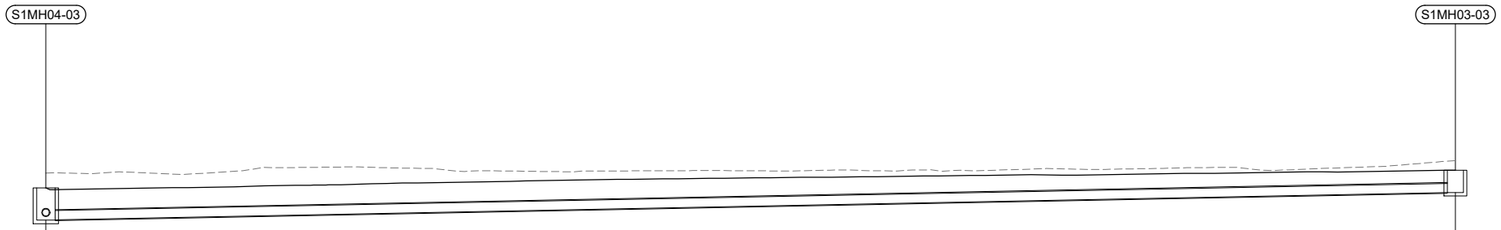
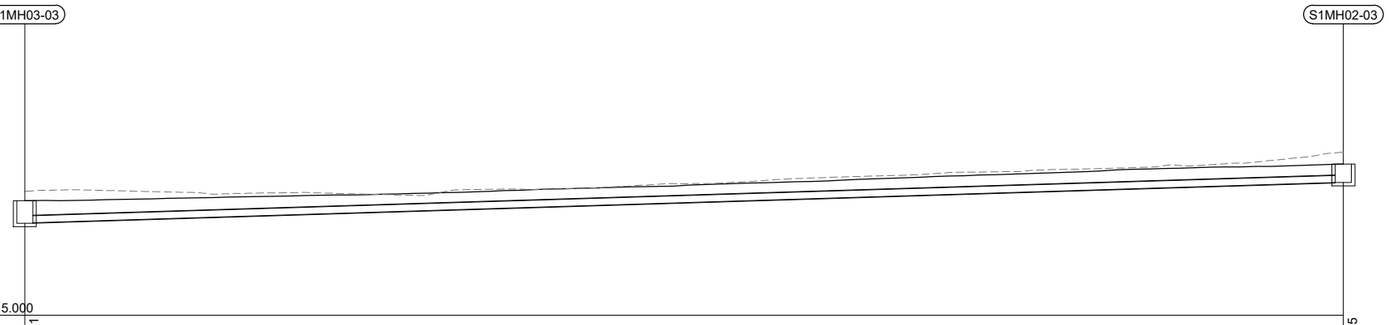


DATUM R.L. (m)	13.000	
FINISHED SURFACE (RL)	21.312	22.461
EXISTING SURFACE (RL)	22.276	23.078
INVERT LEVEL	19.200 / 19.230	21.000
DEPTH TO INVERT	2.112 / 2.082	1.461
PIPE SIZE	Ø600mm	
PIPE CLASS	RCRRJ Class 4	
PIPE LENGTH	90.83m	
PIPE GRADE	1.95%	

SW LINE 03



DATUM R.L. (m)	15.000	
FINISHED SURFACE (RL)	22.461	24.855
EXISTING SURFACE (RL)	23.078	25.623
INVERT LEVEL	21.000 / 21.030	23.650
DEPTH TO INVERT	1.461 / 1.431	1.205
PIPE SIZE	Ø450mm	
PIPE CLASS	RCRRJ Class 4	
PIPE LENGTH	84.97m	
PIPE GRADE	3.08%	

SW LINE 03

BEDDING NOTE:

- ALL BEDDING SHALL BE HS2 AS PER DRAWING VE-2139.

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3) 1:400 (H) 1:200 (V)

Design	JL	25.06.18	Approved For Construction* -
Drawn	KA	05.06.18	
Dsg Verifier	RS	25.06.18	
Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI — Safe Roads

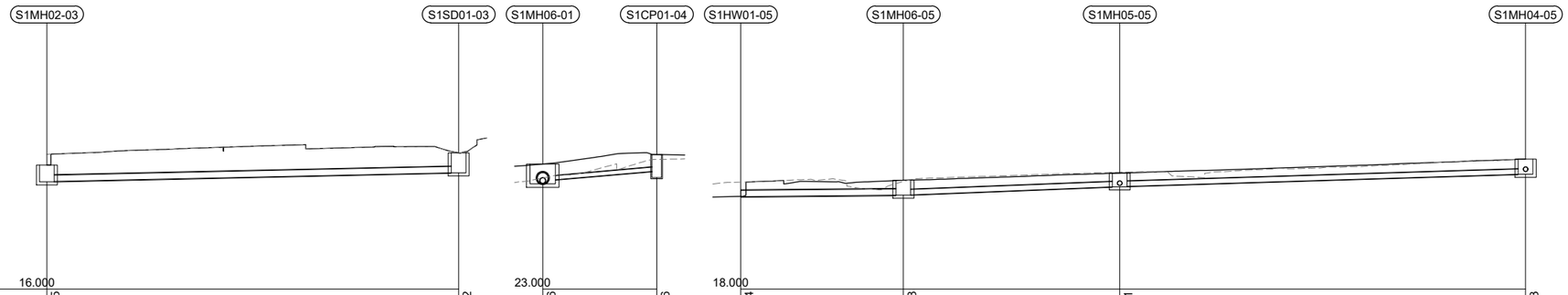
Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER LONGITUDINAL SECTIONS SHEET 4 OF 30

Status: FOR TENDER

Drawing No.: SR1003 - 01 - VE - 2155

Rev.: 0

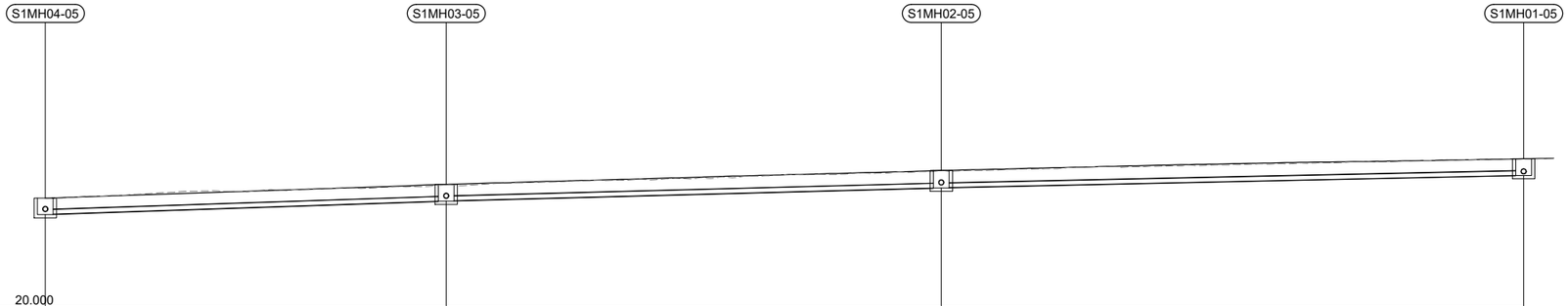


DATUM R.L. (m)	16.000			23.000			18.000				
FINISHED SURFACE (RL)	24.855		25.722	31.926		32.606	24.624	25.768	26.281		27.283
EXISTING SURFACE (RL)	25.623		25.722	30.930		32.255	25.632	25.692	26.336		27.294
INVERT LEVEL	23.650	23.680	24.300	30.520	30.800	31.400	24.600	24.700	25.300	25.330	26.190
DEPTH TO INVERT	1.205	1.175	1.422	1.406	1.126	1.206	0.450	1.068	0.981	0.951	1.093
PIPE SIZE	Ø450mm			Ø300mm			Ø450mm	Ø375mm		Ø375mm	
PIPE CLASS	RCRRJ Class 4			RCRRJ Class 4			RCRRJ Class 4	RCRRJ Class 4		RCRRJ Class 4	
PIPE LENGTH	28.33m			6.89m			11.08m	14.38m		27.92m	
PIPE GRADE	2.19%			8.71%			0.90%	3.96%		3.08%	

SW LINE 03 SW LINE 04 SW LINE 05

BEDDING NOTE:

- ALL BEDDING SHALL BE HS2 AS PER DRAWING VE-2139.



DATUM R.L. (m)	20.000			
FINISHED SURFACE (RL)	27.283	28.205	29.124	29.911
EXISTING SURFACE (RL)	27.294	28.171	29.121	29.897
INVERT LEVEL	26.190	26.220	27.080	27.120	27.960	27.990	28.800
DEPTH TO INVERT	1.093	1.063	1.125	1.085	1.164	1.134	1.111
PIPE SIZE	Ø300mm		Ø300mm		Ø300mm	
PIPE CLASS	RCRRJ Class 4		RCRRJ Class 4		RCRRJ Class 4	
PIPE LENGTH	25.69m		31.97m		37.79m	
PIPE GRADE	3.35%		2.63%		2.14%	

SW LINE 05

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3) 1:400 (H) 1:200 (V)

Design	JL	25.06.18	Approved For Construction*
Drawn	KA	05.06.18	-
Dsg Verifier	RS	25.06.18	
Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

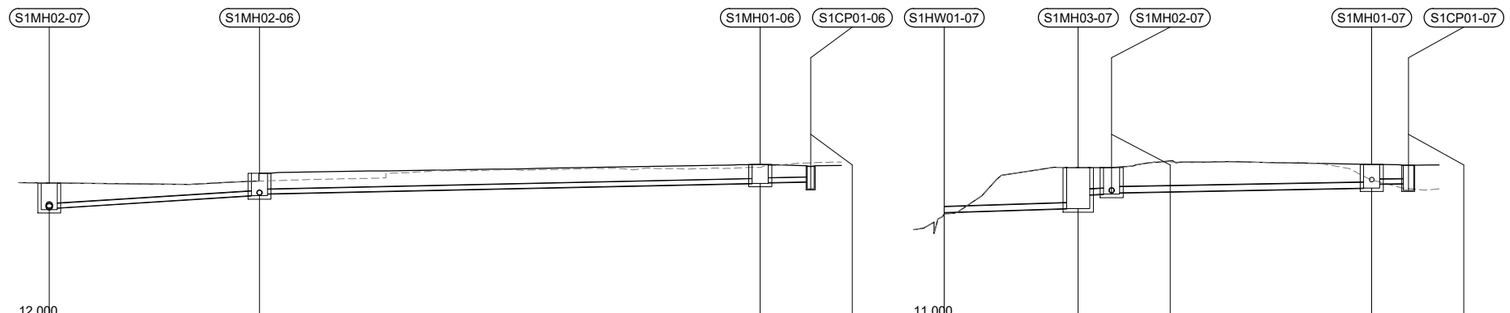
Title: STORMWATER LONGITUDINAL SECTIONS SHEET 6 OF 30

Status. FOR TENDER

Drawing No. SR1003 - 01 - VE - 2156

Rev. 0

Document No. P:\341\341\1907\Shared\Auckland-Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\8 Pre-implementation\CAD - VE\SR1003-01-VE-2151-2180.dwg

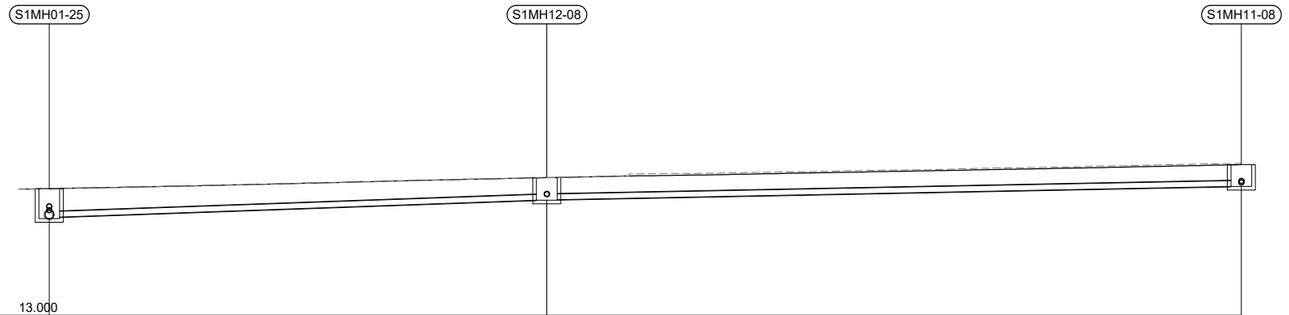


DATUM R.L. (m)	12.000					
FINISHED SURFACE (RL)	20.826	20.826	21.455		22.041	21.910
EXISTING SURFACE (RL)	20.826	20.826	20.954		21.843	22.141
INVERT LEVEL	19.100	19.200	20.000	20.120	20.800	20.850	20.900	20.450
DEPTH TO INVERT	1.726	1.626	1.455	1.335	1.241	1.191	1.010	1.460
PIPE SIZE	Ø300mm		Ø300mm			Ø300mm		
PIPE CLASS	RCRRJ Class 4		RCRRJ Class 4			RCRRJ Class 4		
PIPE LENGTH	12.67m		31.62m			2.54m		
PIPE GRADE	6.31%		2.15%			1.97%		

SW LINE 06

DATUM R.L. (m)	11.000								
FINISHED SURFACE (RL)	17.823	17.823	20.838		20.826		21.038		20.984
EXISTING SURFACE (RL)	17.823	17.823	20.838		20.826		20.003		19.479
INVERT LEVEL	17.900	17.900	18.160	19.050	19.100	19.200	19.500	19.772	19.789	19.339
DEPTH TO INVERT	0.375		2.678	1.788	1.726	1.626	1.538	1.266	1.195	1.645
PIPE SIZE	Ø375mm		Ø375mm		Ø375mm		Ø300mm			
PIPE CLASS	RCRRJ Class 4		RCRRJ Class 4		RCRRJ Class 4		RCRRJ Class 4			
PIPE LENGTH	7.99m		0.91m		15.92m		1.53m			
PIPE GRADE	3.25%		5.51%		1.88%		1.12%			

SW LINE 07



DATUM R.L. (m)	13.000		
FINISHED SURFACE (RL)	21.256	21.974	22.819
EXISTING SURFACE (RL)	21.255	21.972	22.903
INVERT LEVEL	19.300	19.400	20.500	20.530	21.400
DEPTH TO INVERT	1.956	1.856	1.474	1.444	1.419
PIPE SIZE	Ø375mm		Ø375mm	
PIPE CLASS	RCRRJ Class 4		RCRRJ Class 4	
PIPE LENGTH	31.11m		43.96m	
PIPE GRADE	3.54%		1.98%	

SW LINE 08

BEDDING NOTE:

- ALL BEDDING SHALL BE HS2 AS PER DRAWING VE-2139.

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3) 1:400 (H) 1:200 (V)

Design	JL	25.06.18	Approved For Construction*
Drawn	KA	05.06.18	-
Dsg Verifier	RS	25.06.18	-
Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER LONGITUDINAL SECTIONS SHEET 7 OF 30

Status. FOR TENDER

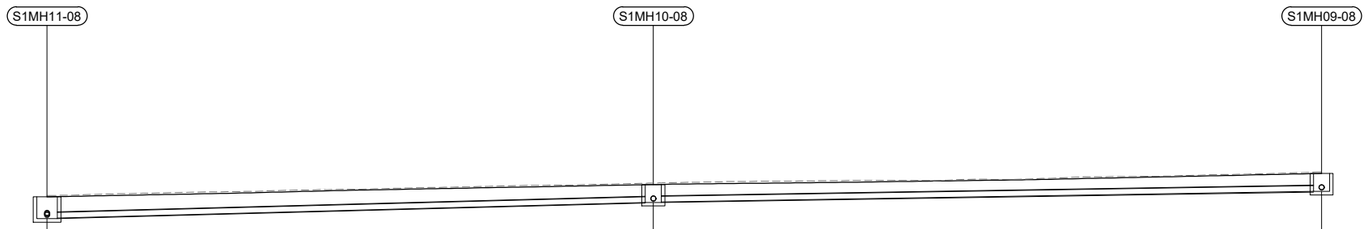
Drawing No. SR1003 - 01 - VE - 2157

Rev. 0

Document No. P:\341\341190\Shared\Auckland-Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\B Pre-implementation\CAD - VE\SR1003-01-VE-2151-2180.dwg

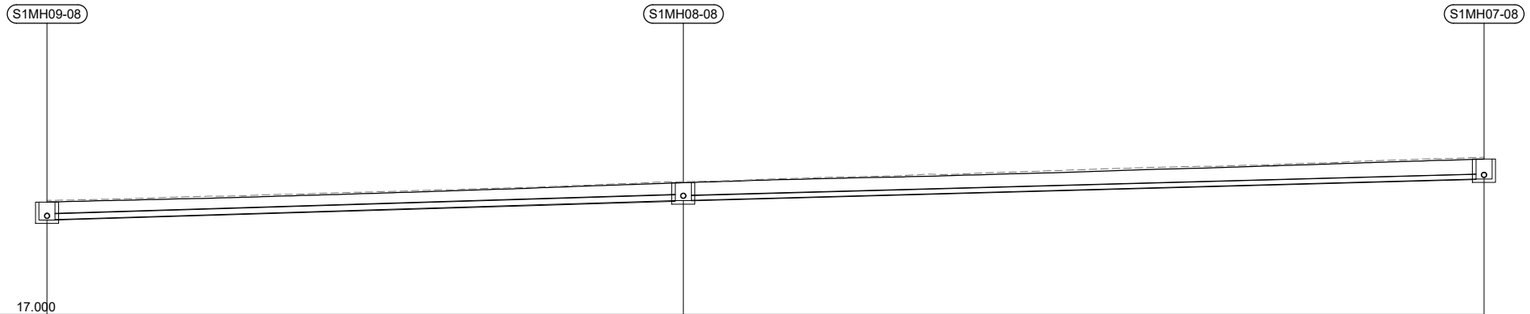
DO NOT SCALE

IF IN DOUBT ASK.



DATUM R.L. (m)	15.000		
FINISHED SURFACE (RL)	22.819	23.620	24.342
EXISTING SURFACE (RL)	22.903	23.721	24.447
INVERT LEVEL	21.400 / 21.430	22.450 / 22.480	23.170
DEPTH TO INVERT	1.419 / 1.389	1.170 / 1.140	1.172
PIPE SIZE	Ø375mm	Ø375mm	
PIPE CLASS	RCRRJ Class 4	RCRRJ Class 4	
PIPE LENGTH	38.36m	42.55m	
PIPE GRADE	2.66%	1.62%	

SW LINE 08



DATUM R.L. (m)	17.000		
FINISHED SURFACE (RL)	24.342	25.601	27.139
EXISTING SURFACE (RL)	24.447	25.674	27.263
INVERT LEVEL	23.170 / 23.200	24.430 / 24.460	25.840
DEPTH TO INVERT	1.172 / 1.142	1.171 / 1.141	1.299
PIPE SIZE	Ø375mm	Ø300mm	
PIPE CLASS	RCRRJ Class 4	RCRRJ Class 4	
PIPE LENGTH	40.46m	51.19m	
PIPE GRADE	3.04%	2.70%	

SW LINE 08

BEDDING NOTE:

- ALL BEDDING SHALL BE HS2 AS PER DRAWING VE-2139.

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3) 1:400 (H) 1:200 (V)

Design	JL	25.06.18	Approved For Construction*
Drawn	KA	05.06.18	-
Dsg Verifier	RS	25.06.18	
Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER LONGITUDINAL SECTIONS SHEET 8 OF 30

Status: FOR TENDER

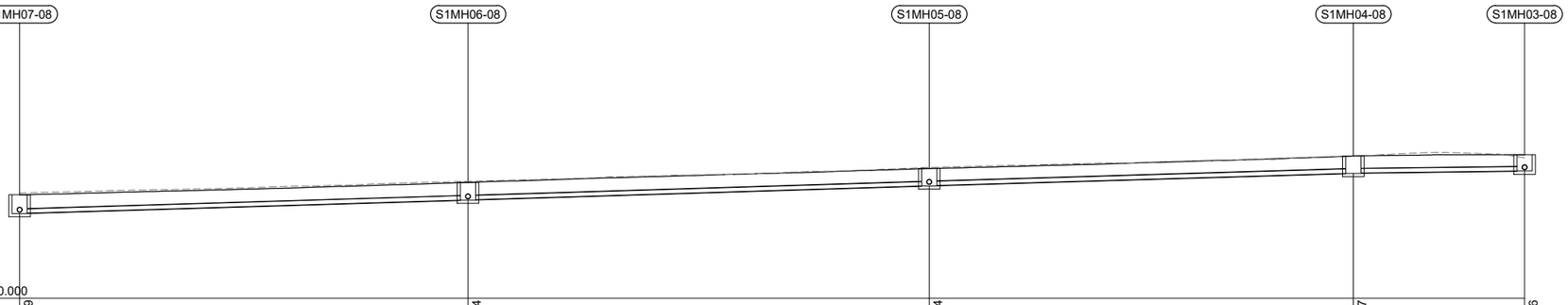
Drawing No.: SR1003 - 01 - VE - 2158

Rev.: 0

100mm

0

SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

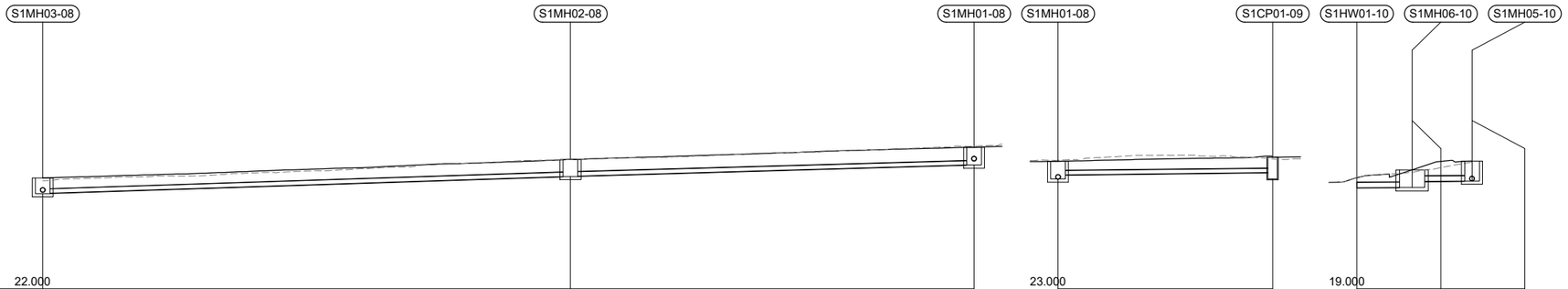


DATUM R.L. (m)	20.000									
FINISHED SURFACE (RL)	27.139		27.994		28.954		29.817		29.896	
EXISTING SURFACE (RL)	27.263		28.083		29.037		29.796		29.692	
INVERT LEVEL	25.840	25.870	26.770	26.800	27.750	27.780	28.620	28.650	28.780	
DEPTH TO INVERT	1.299	1.269	1.224	1.194	1.204	1.174	1.197	1.167	1.116	
PIPE SIZE	Ø300mm		Ø300mm		Ø300mm		Ø300mm			
PIPE CLASS	RCRRJ Class 4		RCRRJ Class 4		RCRRJ Class 4		RCRRJ Class 4			
PIPE LENGTH	29.90m		30.79m		28.23m		10.77m			
PIPE GRADE	3.01%		3.09%		2.98%		1.21%			

BEDDING NOTE:

- ALL BEDDING SHALL BE HS2 AS PER DRAWING VE-2139.

SW LINE 08



DATUM R.L. (m)	22.000						
FINISHED SURFACE (RL)	29.896		31.207		32.085		
EXISTING SURFACE (RL)	29.692		31.215		32.164		
INVERT LEVEL	28.780	28.810	30.000	30.030	30.820		
DEPTH TO INVERT	1.116	1.086	1.207	1.177	1.265		
PIPE SIZE	Ø300mm		Ø300mm				
PIPE CLASS	RCRRJ Class 4		RCRRJ Class 4				
PIPE LENGTH	36.63m		27.76m				
PIPE GRADE	3.25%		2.85%				

SW LINE 09

DATUM R.L. (m)	23.000		
FINISHED SURFACE (RL)	32.085		32.367
EXISTING SURFACE (RL)	32.164		32.256
INVERT LEVEL	30.820	31.120	31.280
DEPTH TO INVERT	1.265	0.965	1.087
PIPE SIZE	Ø300mm		
PIPE CLASS	RCRRJ Class 4		
PIPE LENGTH	14.47m		
PIPE GRADE	1.11%		

SW LINE 10

DATUM R.L. (m)	19.000		
FINISHED SURFACE (RL)	26.907	27.472	28.094
EXISTING SURFACE (RL)	26.907	27.307	28.025
INVERT LEVEL	26.200	26.220	26.650	26.670
DEPTH TO INVERT	0.375	1.252	0.822	1.424
PIPE SIZE	Ø375mm	Ø375mm	
PIPE CLASS	RCRRJ Class 4	RCRRJ Class 4	
PIPE LENGTH	3.04m	2.86m	
PIPE GRADE	0.66%	0.70%	

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3) 1:400 (H) 1:200 (V)

Design	JL	25.06.18	Approved For Construction*
Drawn	KA	05.06.18	-
Dsg Verifier	RS	25.06.18	
Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER LONGITUDINAL SECTIONS SHEET 9 OF 30

Status: FOR TENDER

Drawing No.: SR1003 - 01 - VE - 2159

Rev.: 0

Document No.: P:\341\341\1907\Shared\Auckland\Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\8 Pre-implementation\CAD - \VE\SR1003-01-VE-2151-2160.dwg

DO NOT SCALE

IF IN DOUBT ASK.

100mm

SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

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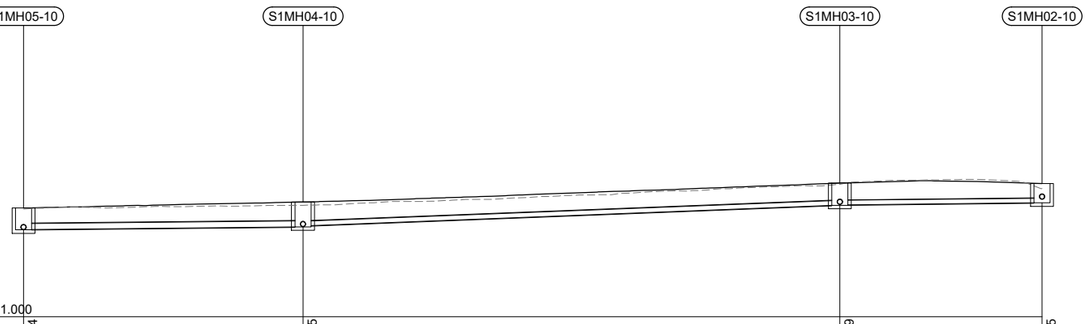
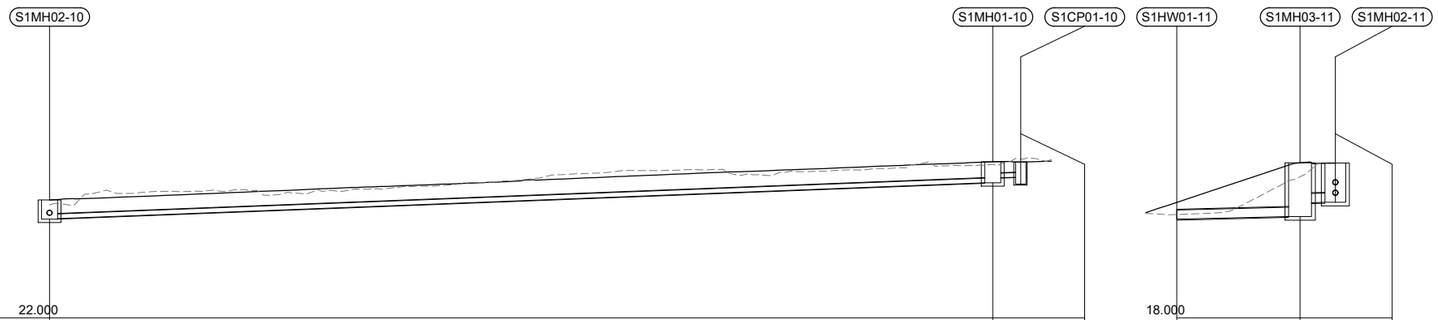


DATUM R.L. (m)	21.000								
FINISHED SURFACE (RL)	28.094		28.485		29.719		29.685		
EXISTING SURFACE (RL)	28.025		28.274		29.647		29.365		
INVERT LEVEL	26.670	26.700	26.870	26.950	28.270	28.300	28.430		
DEPTH TO INVERT	1.424	1.394	1.615	1.535	1.449	1.419	1.255		
PIPE SIZE	Ø375mm		Ø300mm		Ø300mm				
PIPE CLASS	RCRRJ Class 4		RCRRJ Class 4		RCRRJ Class 4				
PIPE LENGTH	17.18m		33.98m		12.14m				
PIPE GRADE	0.99%		3.88%		1.07%				

BEDDING NOTE:

- ALL BEDDING SHALL BE HS2 AS PER DRAWING VE-2139.

SW LINE 10



DATUM R.L. (m)	22.000								
FINISHED SURFACE (RL)	29.685						32.174		32.153
EXISTING SURFACE (RL)	29.365						31.991		32.339
INVERT LEVEL	28.430	28.460				30.800	31.130	31.160	30.710
DEPTH TO INVERT	1.255	1.225				1.374	1.044	0.993	1.443
PIPE SIZE	Ø300mm						Ø300mm		
PIPE CLASS	RCRRJ Class 4						RCRRJ Class 4		
PIPE LENGTH	60.48m						0.97m		
PIPE GRADE	3.87%						3.09%		

SW LINE 10

DATUM R.L. (m)	18.000			
FINISHED SURFACE (RL)	25.520		28.101	28.090
EXISTING SURFACE (RL)	24.730		27.192	28.059
INVERT LEVEL	24.420	24.420	24.600	25.500	25.520
DEPTH TO INVERT	0.600		3.501	2.601	2.570
PIPE SIZE	Ø600mm		Ø600mm	
PIPE CLASS	RCRRJ Class 4		RCRRJ Class 4	
PIPE LENGTH	7.30m		0.88m	
PIPE GRADE	2.47%		2.28%	

SW LINE 11

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3) 1:400 (H) 1:200 (V)

Design	JL	25.06.18	Approved For Construction*
Drawn	KA	05.06.18	-
Dsg Verifier	RS	25.06.18	
Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER LONGITUDINAL SECTIONS SHEET 10 OF 30

Status: **FOR TENDER**

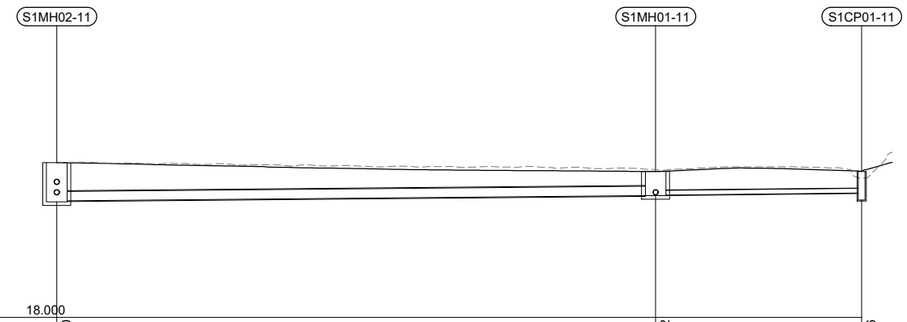
Drawing No.: SR1003 - 01 - VE - 2160

Rev.: 0

Document No.: P:\341341907\Shared\Auckland-Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\8 Pre-implementation\CAD - VE\SR1003-01-VE-2151-2180.dwg

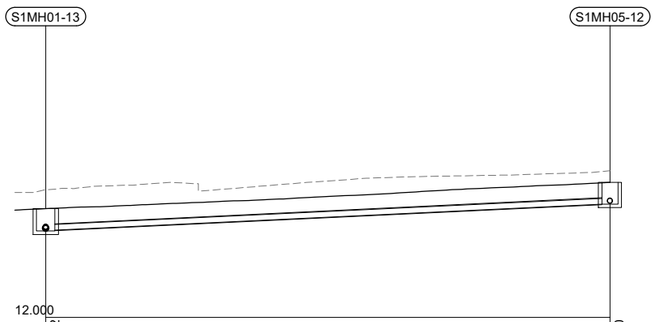
DO NOT SCALE

IF IN DOUBT ASK.



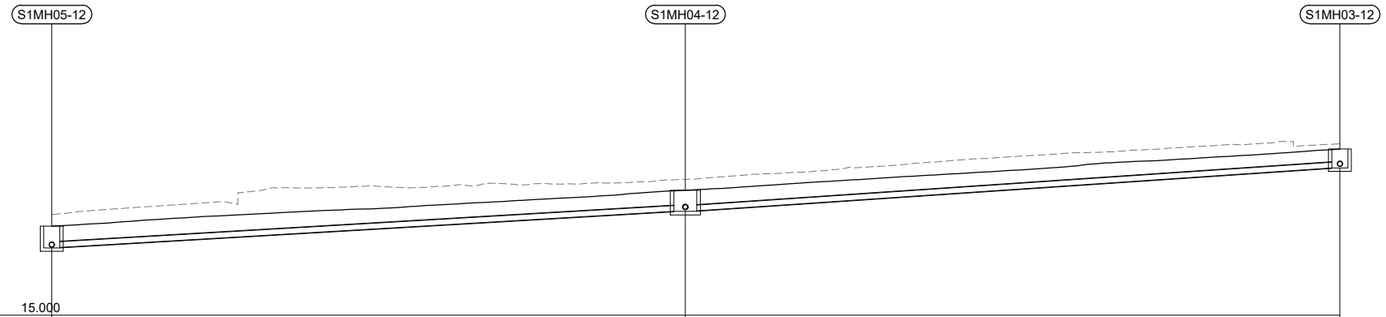
DATUM R.L. (m)	18.000		
FINISHED SURFACE (RL)	28.090	27.502	27.506
EXISTING SURFACE (RL)	28.059	27.649	27.051
INVERT LEVEL	25.520 / 25.600	25.940 / 25.970	26.100 / 25.650
DEPTH TO INVERT	2.570 / 2.490	1.562 / 1.532	1.406 / 1.856
PIPE SIZE	Ø600mm	Ø300mm	
PIPE CLASS	RCRRJ Class 4	RCRRJ Class 4	
PIPE LENGTH	37.72m	12.54m	
PIPE GRADE	0.90%	1.04%	

SW LINE 11



DATUM R.L. (m)	12.000	
FINISHED SURFACE (RL)	19.082	20.800
EXISTING SURFACE (RL)	20.317	21.554
INVERT LEVEL	17.630 / 17.680	19.380
DEPTH TO INVERT	1.452 / 1.402	1.420
PIPE SIZE	Ø375mm	
PIPE CLASS	RCRRJ Class 4	
PIPE LENGTH	35.69m	
PIPE GRADE	4.76%	

SW LINE 12



DATUM R.L. (m)	15.000		
FINISHED SURFACE (RL)	20.800	23.146	25.839
EXISTING SURFACE (RL)	21.554	23.854	26.176
INVERT LEVEL	19.380 / 19.410	21.770 / 21.800	24.600
DEPTH TO INVERT	1.420 / 1.390	1.376 / 1.346	1.239
PIPE SIZE	Ø375mm	Ø375mm	
PIPE CLASS	RCRRJ Class 4	RCRRJ Class 4	
PIPE LENGTH	40.06m	41.43m	
PIPE GRADE	5.89%	6.76%	

SW LINE 12

BEDDING NOTE:

- ALL BEDDING SHALL BE HS2 AS PER DRAWING VE-2139.

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3) 1:400 (H) 1:200 (V)

Design	JL	25.06.18	Approved For Construction*
Drawn	KA	05.06.18	-
Dsg Verifier	RS	25.06.18	
Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER LONGITUDINAL SECTIONS SHEET 11 OF 30

Status: FOR TENDER

Drawing No. SR1003 - 01 - VE - 2161

Rev. 0

Document No. P:\341341190\Shared\Auckland-Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\B Pre-implementation\CAD - VE\SR1003-01-VE-2151-2180.dwg

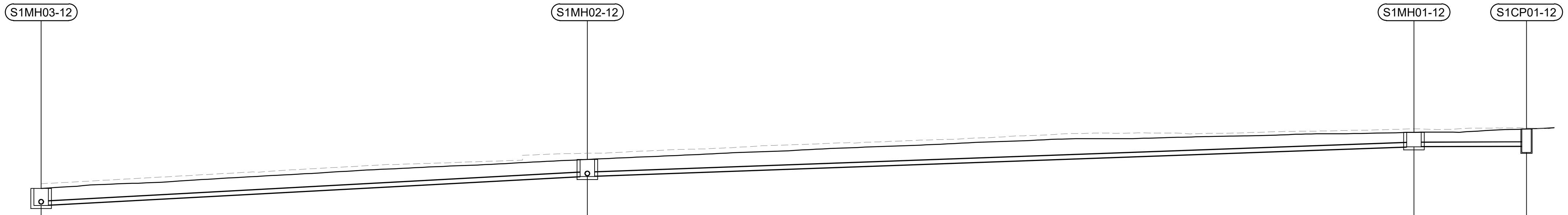
DO NOT SCALE

IF IN DOUBT ASK.

100mm

SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

0

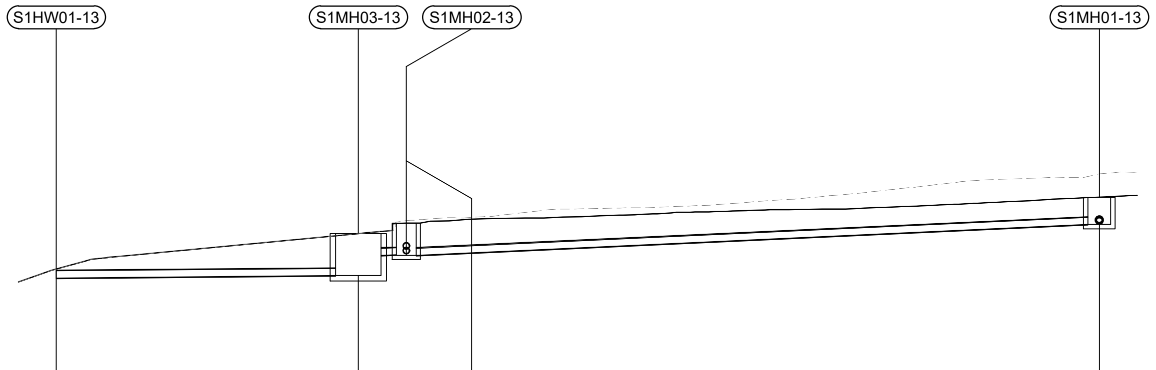


DATUM R.L. (m) 19.000

	S1MH03-12	S1MH02-12	S1MH01-12	S1CP01-12
FINISHED SURFACE (RL)	25.839	27.934	29.908	30.144
EXISTING SURFACE (RL)	26.176	28.387	30.155	30.222
INVERT LEVEL	24.600 / 24.630	26.700 / 26.730	28.850 / 28.880	28.900 / 28.450
DEPTH TO INVERT	1.239 / 1.209	1.234 / 1.204	1.058 / 1.028	1.244 / 1.694

	S1MH03-12 to S1MH02-12	S1MH02-12 to S1MH01-12	S1MH01-12 to S1CP01-12
PIPE SIZE	Ø300mm	Ø300mm	Ø300mm
PIPE CLASS	RCRRJ Class 4	RCRRJ Class 4	RCRRJ Class 4
PIPE LENGTH	38.47m	58.75m	7.29m
PIPE GRADE	5.38%	3.61%	0.27%

SW LINE 12

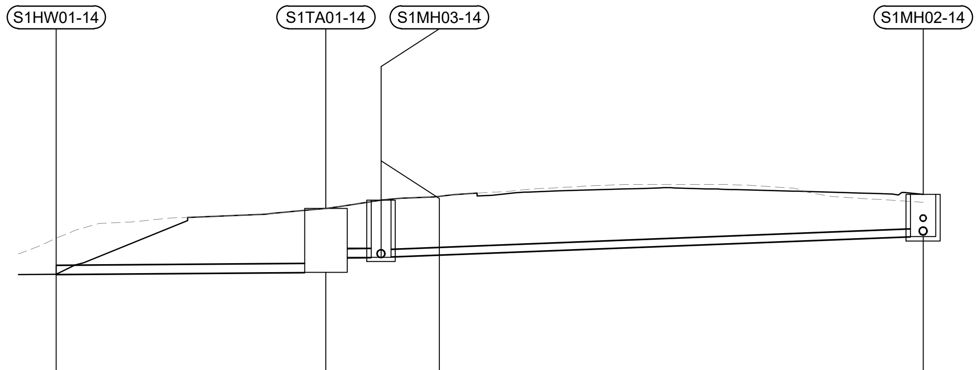


DATUM R.L. (m) 9.000

	S1HW01-13	S1MH03-13	S1MH02-13	S1MH01-13
FINISHED SURFACE (RL)	15.268	17.148	17.696	19.082
EXISTING SURFACE (RL)	15.268	17.148	17.832	20.317
INVERT LEVEL	14.800 / 14.800	14.930 / 16.000	16.030 / 16.000 / 16.000	17.630
DEPTH TO INVERT	0.375	2.218 / 1.148	1.666 / 1.696 / 1.696	1.452

	S1HW01-13 to S1MH03-13	S1MH03-13 to S1MH02-13	S1MH02-13 to S1MH01-13
PIPE SIZE	Ø375mm	Ø375mm	Ø375mm
PIPE CLASS	RCRRJ Class 4	RCRRJ Class 4	RCRRJ Class 4
PIPE LENGTH	14.78m	0.81m	35.54m
PIPE GRADE	0.88%	3.69%	4.59%

SW LINE 13



6.000

	S1HW01-14	S1TA01-14	S1MH03-14	S1MH02-14
FINISHED SURFACE (RL)	12.000	15.487	15.921	16.221
EXISTING SURFACE (RL)	13.901	15.487	15.921	15.799
INVERT LEVEL	12.000 / 12.000	12.100 / 12.890	12.900 / 12.930	14.000
DEPTH TO INVERT	0.450	3.387 / 2.597	3.021 / 2.991	2.221

	S1HW01-14 to S1TA01-14	S1TA01-14 to S1MH03-14	S1MH03-14 to S1MH02-14
PIPE SIZE	Ø450mm	Ø450mm	Ø375mm
PIPE CLASS	RCRRJ Class 4	RCRRJ Class 4	RCRRJ Class 4
PIPE LENGTH	13.15m	1.27m	27.50m
PIPE GRADE	0.76%	0.79%	3.89%

SW LINE 14

BEDDING NOTE:

- ALL BEDDING SHALL BE HS2 AS PER DRAWING VE-2139.

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3) 1:400 (H) 1:200 (V)			
Design	JL	25.06.18	Approved For Construction* -
Drawn	KA	05.06.18	
Dsg Verifier	RS	25.06.18	
Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI — Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER LONGITUDINAL SECTIONS SHEET 12 OF 30

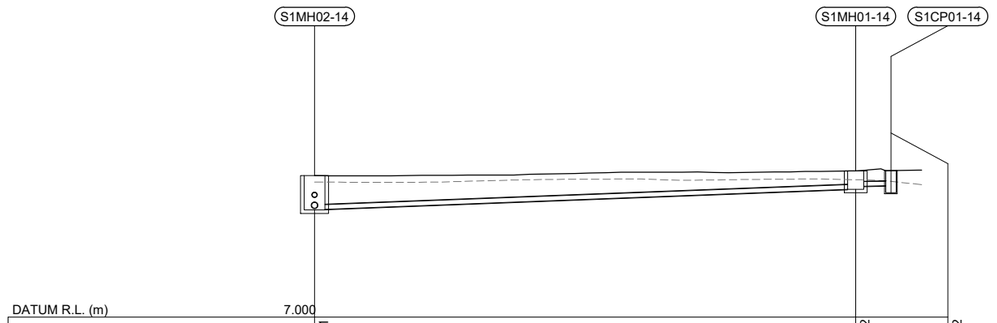
Status. FOR TENDER

Drawing No. SR1003 - 01 - VE - 2162 Rev. 0

Document No. P:\341\3411907-Shared\Auckland-Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\B Pre-implementation\CAD - VE\SR1003-01-VE-2151-2180.dwg

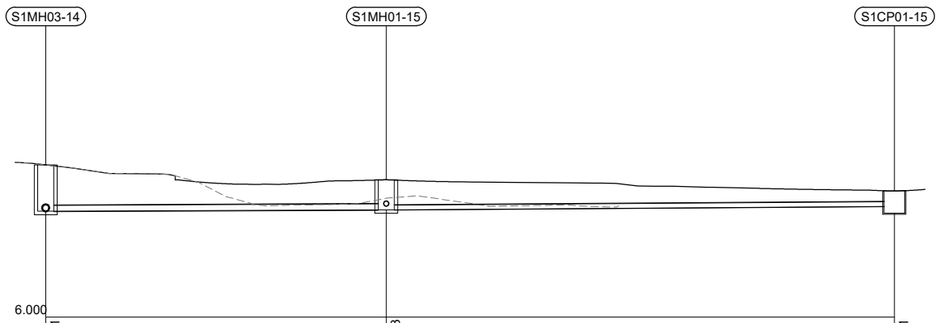
DO NOT SCALE

IF IN DOUBT ASK.



DATUM R.L. (m)	7.000					
FINISHED SURFACE (RL)	16.221		16.532		16.552	
EXISTING SURFACE (RL)	15.799		15.955		15.851	
INVERT LEVEL	14.000	14.030	15.330	15.530	15.560	15.110
DEPTH TO INVERT	2.221	2.191	1.202	1.002	0.992	1.442
PIPE SIZE	Ø300mm		Ø300mm			
PIPE CLASS	RCRRJ Class 4		RCRRJ Class 4			
PIPE LENGTH	34.11m		1.43m			
PIPE GRADE	3.81%		2.09%			

SW LINE 14

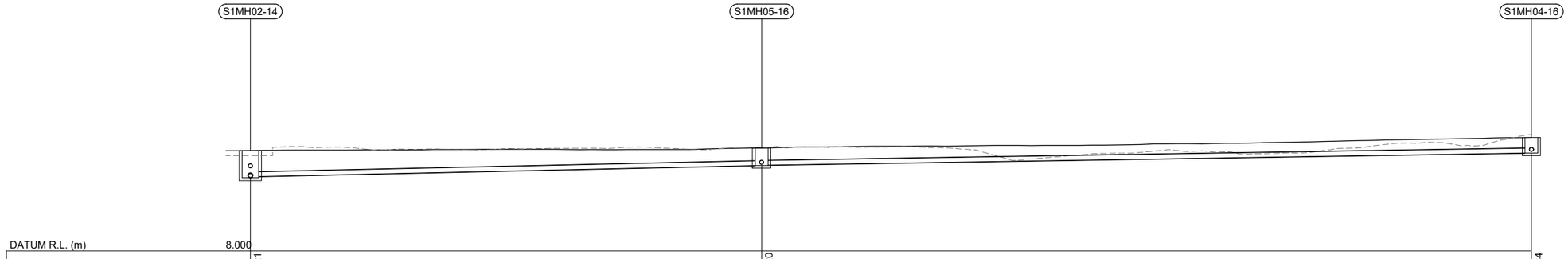


DATUM R.L. (m)	6.000					
FINISHED SURFACE (RL)	15.921		14.953		14.231	
EXISTING SURFACE (RL)	15.921		13.758		14.231	
INVERT LEVEL	12.900	12.900	13.000	13.000	13.220	12.770
DEPTH TO INVERT	3.021		1.953		1.011	1.461
PIPE SIZE	Ø375mm		Ø300mm			
PIPE CLASS	RCRRJ Class 4		RCRRJ Class 4			
PIPE LENGTH	21.17m		31.95m			
PIPE GRADE	0.47%		0.69%			

SW LINE 15

BEDDING NOTE:

- ALL BEDDING SHALL BE HS2 AS PER DRAWING VE-2139.



DATUM R.L. (m)	8.000				
FINISHED SURFACE (RL)	16.221		16.420		17.284
EXISTING SURFACE (RL)	15.799		16.480		17.537
INVERT LEVEL	14.000	14.100	15.000	15.030	16.020
DEPTH TO INVERT	2.221	2.121	1.420	1.390	1.264
PIPE SIZE	Ø375mm		Ø375mm		
PIPE CLASS	RCRRJ Class 4		RCRRJ Class 4		
PIPE LENGTH	40.70m		62.05m		
PIPE GRADE	2.21%		1.60%		

SW LINE 16

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3) 1:400 (H) 1:200 (V)

Design	JL	25.06.18	Approved For Construction*
Drawn	KA	05.06.18	-
Dsg Verifier	RS	25.06.18	
Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI — Safe Roads

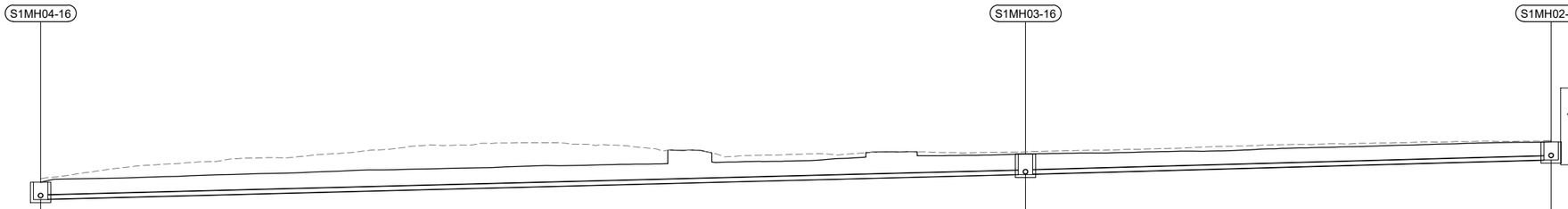
Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER LONGITUDINAL SECTIONS SHEET 13 OF 30

Status: FOR TENDER

Drawing No.: SR1003 - 01 - VE - 2163

Rev.: 0

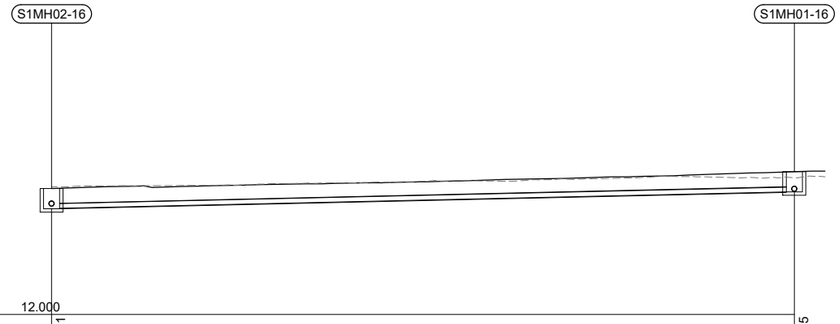


BEDDING NOTE:

- ALL BEDDING SHALL BE HS2 AS PER DRAWING VE-2139.

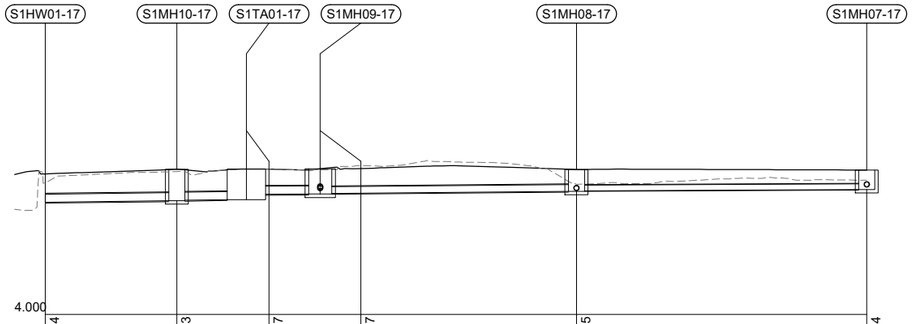
DATUM R.L. (m)	10.000		
FINISHED SURFACE (RL)	17.284	19.343	20.221
EXISTING SURFACE (RL)	17.537	19.498	20.331
INVERT LEVEL	16.020 / 16.050	17.850 / 17.880	18.900
DEPTH TO INVERT	1.264 / 1.234	1.493 / 1.463	1.321
PIPE SIZE	Ø300mm	Ø300mm	
PIPE CLASS	RCRRJ Class 4	RCRRJ Class 4	
PIPE LENGTH	71.03m	37.42m	
PIPE GRADE	2.53%	2.73%	

SW LINE 16



DATUM R.L. (m)	12.000	
FINISHED SURFACE (RL)	20.221	21.315
EXISTING SURFACE (RL)	20.331	20.922
INVERT LEVEL	18.900 / 18.930	20.000
DEPTH TO INVERT	1.321 / 1.291	1.315
PIPE SIZE	Ø300mm	
PIPE CLASS	RCRRJ Class 4	
PIPE LENGTH	47.41m	
PIPE GRADE	2.26%	

SW LINE 16



DATUM R.L. (m)	4.000				
FINISHED SURFACE (RL)	13.174	13.473	13.487	13.507 / 13.455	13.424
EXISTING SURFACE (RL)	12.592	13.322	13.487	13.442 / 12.492	12.764
INVERT LEVEL	11.330 / 11.330	11.420 / 11.450	11.490 / 11.840	11.860 / 11.890 / 12.030 / 12.060	12.150
DEPTH TO INVERT	0.525 / 2.053	2.023 / 1.997	1.647 / 1.647	1.617 / 1.425 / 1.395	1.274
PIPE SIZE	Ø525mm	Ø525mm	Ø525mm	Ø450mm	Ø375mm
PIPE CLASS	RCRRJ Class 4	RCRRJ Class 4	RCRRJ Class 4	RCRRJ Class 4	RCRRJ Class 4
PIPE LENGTH	8.06m	2.76m	2.81m	15.44m	17.89m
PIPE GRADE	1.12%	1.45%	0.71%	0.91%	0.50%

SW LINE 17

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3) 1:400 (H) 1:200 (V)	Design	JL	25.06.18	Approved For Construction*
	Drawn	KA	05.06.18	-
	Dsg Verifier	RS	25.06.18	
	Dwg Check	JL	07.06.18	Date -
	* Refer to Revision 1 for Original Signature			

NZ TRANSPORT AGENCY WAKA KOTAHI — Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER LONGITUDINAL SECTIONS SHEET 14 OF 30

Status: FOR TENDER

Drawing No.: SR1003 - 01 - VE - 2164

Rev.: 0

100mm

SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

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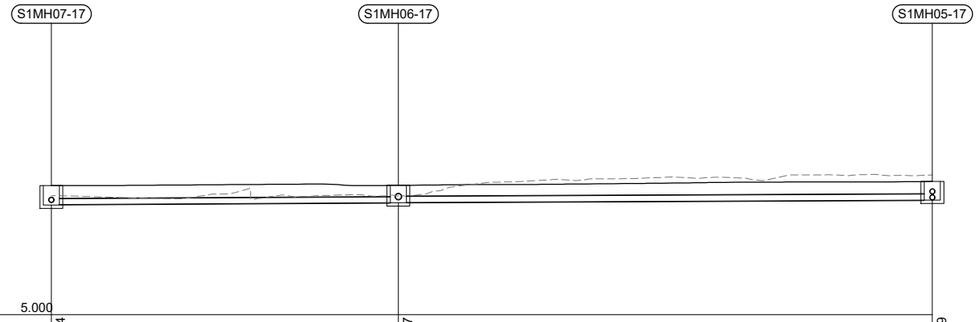
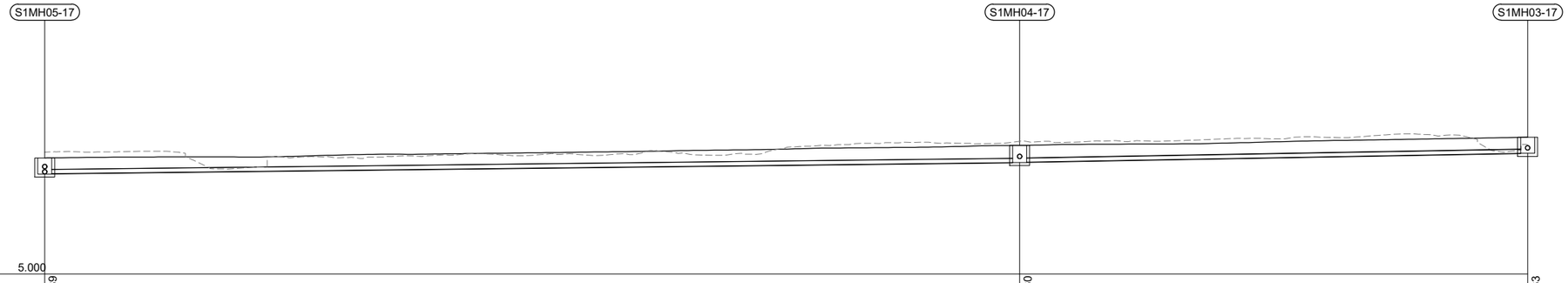


DATUM R.L. (m) 5.000						
FINISHED SURFACE (RL)	13.424			13.437		13.689
EXISTING SURFACE (RL)	12.764			12.756		14.116
INVERT LEVEL	12.150	12.180		12.300	12.330	12.480
DEPTH TO INVERT	1.274	1.244		1.137	1.107	1.209
PIPE SIZE	Ø375mm			Ø375mm		
PIPE CLASS	RCRRJ Class 4			RCRRJ Class 4		
PIPE LENGTH	21.59m			33.79m		
PIPE GRADE	0.56%			0.44%		

SW LINE 17



DATUM R.L. (m) 5.000						
FINISHED SURFACE (RL)	13.689			14.630		15.233
EXISTING SURFACE (RL)	14.116			14.933		14.668
INVERT LEVEL	12.480	12.510		13.340	13.370	14.030
DEPTH TO INVERT	1.209	1.179		1.290	1.260	1.203
PIPE SIZE	Ø300mm			Ø300mm		
PIPE CLASS	RCRRJ Class 4			RCRRJ Class 4		
PIPE LENGTH	71.96m			36.99m		
PIPE GRADE	1.15%			1.78%		

SW LINE 17

BEDDING NOTE:

- ALL BEDDING SHALL BE HS2 AS PER DRAWING VE-2139.

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3) 1:400 (H) 1:200 (V)

Design	JL	25.06.18	Approved For Construction*
Drawn	KA	05.06.18	-
Dsg Verifier	RS	25.06.18	
Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER LONGITUDINAL SECTIONS SHEET 15 OF 30

Status: FOR TENDER

Drawing No.: SR1003 - 01 - VE - 2165

Rev.: 0

Document No. P:\341341907\Shared\Auckland-Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\B Pre-implementation\CAD - \VE\SR1003-01-VE-2151-2180.dwg

DO NOT SCALE

IF IN DOUBT ASK.

100mm

SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

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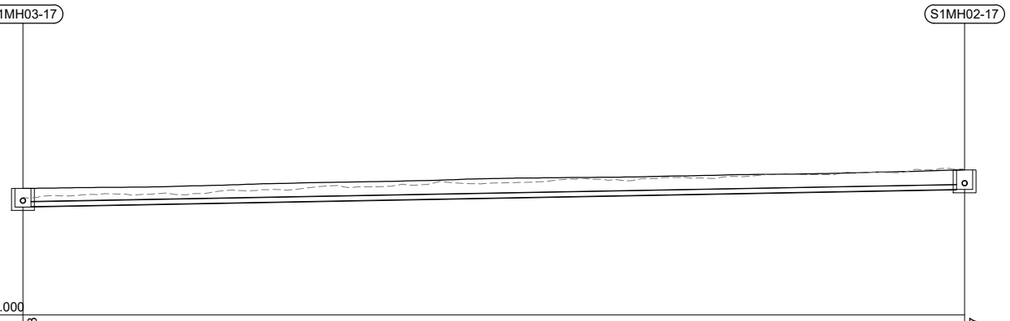
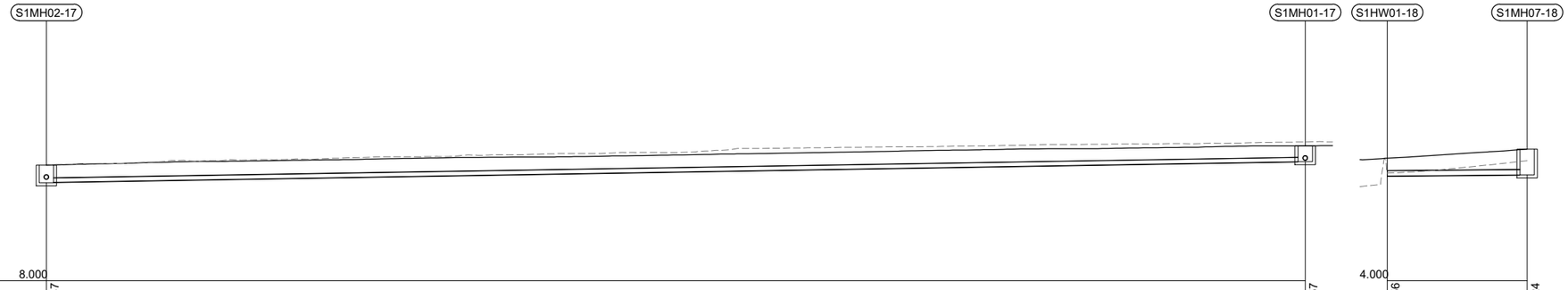


DATUM R.L. (m)	7.000		
FINISHED SURFACE (RL)	15.233		16.447
EXISTING SURFACE (RL)	14.668		16.497
INVERT LEVEL	14.030 / 14.060		15.170
DEPTH TO INVERT	1.203 / 1.173		1.277
PIPE SIZE	Ø300mm		
PIPE CLASS	RCRRJ Class 4		
PIPE LENGTH	60.39m		
PIPE GRADE	1.84%		

SW LINE 17



DATUM R.L. (m)	8.000			4.000	
FINISHED SURFACE (RL)	16.447		17.857	12.956	13.624
EXISTING SURFACE (RL)	16.497		18.147	11.865	12.768
INVERT LEVEL	15.170 / 15.200		16.700	11.650 / 11.650	11.740
DEPTH TO INVERT	1.277 / 1.247		1.157	0.375	1.884
PIPE SIZE	Ø300mm			Ø375mm	
PIPE CLASS	RCRRJ Class 4			RCRRJ Class 4	
PIPE LENGTH	90.98m			9.70m	
PIPE GRADE	1.65%			0.93%	

SW LINE 17

SW LINE 18

BEDDING NOTE:

- ALL BEDDING SHALL BE HS2 AS PER DRAWING VE-2139.

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3) 1:400 (H) 1:200 (V)

Design	JL	25.06.18	Approved For Construction*
Drawn	KA	05.06.18	-
Dsg Verifier	RS	25.06.18	
Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI — Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER LONGITUDINAL SECTIONS SHEET 16 OF 30

Status: FOR TENDER

Drawing No.: SR1003 - 01 - VE - 2166

Rev.: 0

DO NOT SCALE

IF IN DOUBT ASK.

Document No. P:\341\341190\Shared\Auckland\Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\8 Pre-implementation\CAD - VE\SR1003-01-VE-2151-2180.dwg

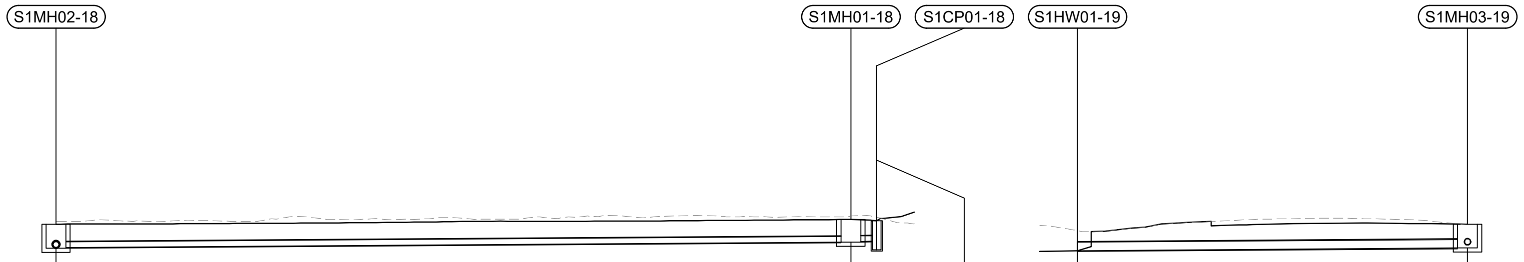
Drawing Plotted: 24 Jun 2019 5:47 PM

DATUM R.L. (m) 5.000

	S1MH07-18	S1MH06-18	S1MH05-18	S1MH04-18	S1MH03-18	S1MH02-18
FINISHED SURFACE (RL)	13.624	13.678	13.730	13.731	14.388	14.612
EXISTING SURFACE (RL)	12.768	13.944	13.853	14.040	14.588	14.764
INVERT LEVEL	11.740 / 11.770	11.800 / 11.830	11.840 / 12.170	12.180 / 12.210	13.000 / 13.030	13.340
DEPTH TO INVERT	1.884 / 1.854	1.878 / 1.848	1.890 / 1.560	1.551 / 1.521	1.388 / 1.358	1.272

	S1MH07-18 – S1MH06-18	S1MH06-18 – S1MH05-18	S1MH05-18 – S1MH04-18	S1MH04-18 – S1MH03-18	S1MH03-18 – S1MH02-18
PIPE SIZE	Ø375mm	Ø375mm	Ø375mm	Ø300mm	Ø300mm
PIPE CLASS	RCRRJ Class 4	RCRRJ Class 4	RCRRJ Class 4	RCRRJ Class 4	RCRRJ Class 4
PIPE LENGTH	1.69m	0.77m	1.55m	51.44m	39.74m
PIPE GRADE	1.78%	1.30%	0.65%	1.54%	0.78%

SW LINE 18



DATUM R.L. (m) 6.000

	S1MH02-18	S1MH01-18	S1CP01-18
FINISHED SURFACE (RL)	14.612	14.859	14.785
EXISTING SURFACE (RL)	14.764	15.048	14.985
INVERT LEVEL	13.340 / 13.370	13.660 / 13.690	13.700 / 13.250
DEPTH TO INVERT	1.272 / 1.242	1.199 / 1.169	1.085 / 1.535

	S1MH02-18 – S1MH01-18	S1MH01-18 – S1CP01-18
PIPE SIZE	Ø300mm	Ø300mm
PIPE CLASS	RCRRJ Class 4	RCRRJ Class 4
PIPE LENGTH	41.02m	0.62m
PIPE GRADE	0.71%	1.62%

SW LINE 18

5.000

	S1HW01-19	S1MH03-19
FINISHED SURFACE (RL)	12.193	13.604
EXISTING SURFACE (RL)	13.265	13.577
INVERT LEVEL	12.200 / 12.200	12.350
DEPTH TO INVERT	0.450	1.254

	S1HW01-19 – S1MH03-19
PIPE SIZE	Ø450mm
PIPE CLASS	RCRRJ Class 4
PIPE LENGTH	20.12m
PIPE GRADE	0.75%

SW LINE 19

BEDDING NOTE:

- ALL BEDDING SHALL BE HS2 AS PER DRAWING VE-2139.

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3) 1:400 (H) 1:200 (V)

Design	JL	25.06.18	Approved For Construction*
Drawn	KA	05.06.18	-
Dsg Verifier	RS	25.06.18	
Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI — Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER LONGITUDINAL SECTIONS SHEET 17 OF 30

Status. FOR TENDER

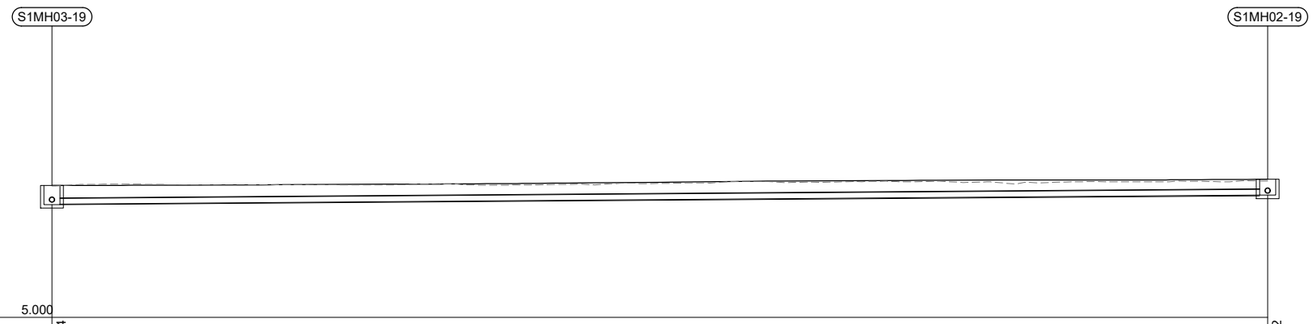
Drawing No. SR1003 - 01 - VE - 2167 Rev. 0

DO NOT SCALE

IF IN DOUBT ASK.

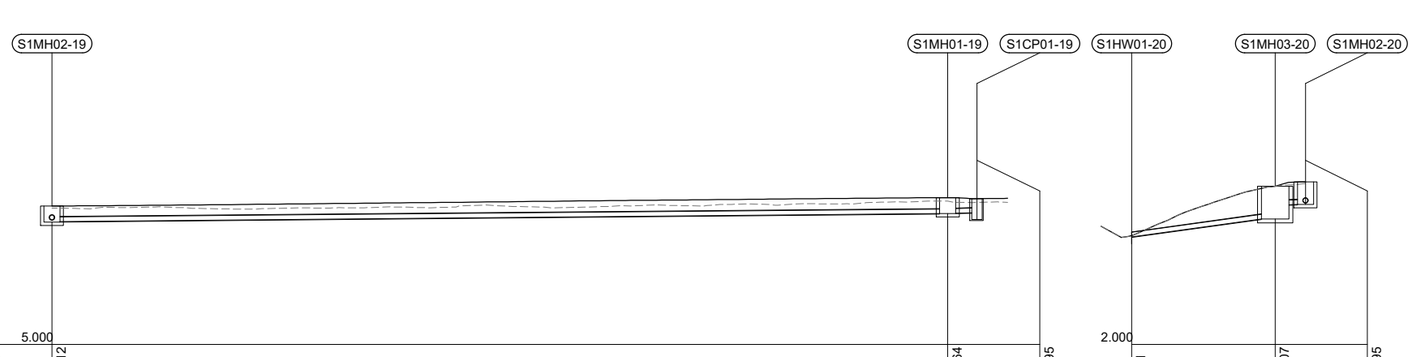
Document No. P:\341\3411907-Shared\Auckland-Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\B Pre-implementation\CAD - VE\SR1003-01-VE-2151-2180.dwg

SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY 100mm 0



DATUM R.L. (m)	5.000		
FINISHED SURFACE (RL)	13.604		14.012
EXISTING SURFACE (RL)	13.577		13.889
INVERT LEVEL	12.350 / 12.380		12.970
DEPTH TO INVERT	1.254 / 1.224		1.042
PIPE SIZE	Ø375mm		
PIPE CLASS	RCRRJ Class 4		
PIPE LENGTH	78.26m		
PIPE GRADE	0.75%		

SW LINE 19



DATUM R.L. (m)	5.000		
FINISHED SURFACE (RL)	14.012	14.564	14.495
EXISTING SURFACE (RL)	13.889	14.329	14.249
INVERT LEVEL	12.970 / 13.000	13.520 / 13.550	13.580 / 13.130
DEPTH TO INVERT	1.042 / 1.012	1.044 / 1.014	0.915 / 1.365
PIPE SIZE	Ø300mm	Ø300mm	
PIPE CLASS	RCRRJ Class 4	RCRRJ Class 4	
PIPE LENGTH	57.39m	1.05m	
PIPE GRADE	0.91%	2.86%	

SW LINE 19

DATUM R.L. (m)	2.000		
FINISHED SURFACE (RL)	9.091	12.307	12.595
EXISTING SURFACE (RL)	9.091	12.310	12.487
INVERT LEVEL	8.550 / 9.000	10.170 / 11.100	11.120
DEPTH TO INVERT	0.750 / 0.300	2.137 / 1.207	1.475
PIPE SIZE	Ø300mm	Ø300mm	
PIPE CLASS	RCRRJ Class 4	RCRRJ Class 4	
PIPE LENGTH	8.46m	0.54m	
PIPE GRADE	13.82%	3.67%	

SW LINE 20

BEDDING NOTE:

- ALL BEDDING SHALL BE HS2 AS PER DRAWING VE-2139.

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3) 1:400 (H) 1:200 (V)

Design	JL	25.06.18	Approved For Construction*
Drawn	KA	05.06.18	-
Dsg Verifier	RS	25.06.18	
Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI — Safe Roads

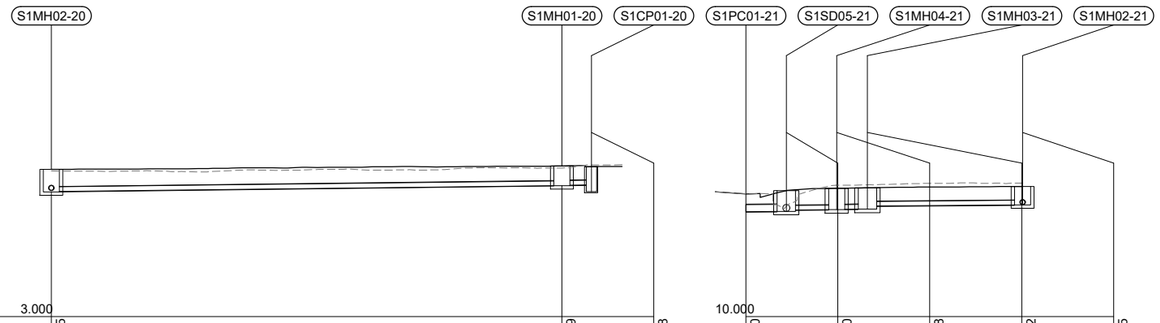
Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER LONGITUDINAL SECTIONS SHEET 18 OF 30

Status: FOR TENDER

Drawing No.: SR1003 - 01 - VE - 2168

Rev.: 0



DATUM R.L. (m)	3.000			
FINISHED SURFACE (RL)	12.595		12.809	12.768
EXISTING SURFACE (RL)	12.487		12.677	12.876
INVERT LEVEL	11.120 / 11.150		11.530 / 11.560	11.580 / 11.130
DEPTH TO INVERT	1.475 / 1.445		1.279 / 1.249	1.188 / 1.638
PIPE SIZE		Ø300mm		Ø300mm
PIPE CLASS		RCRRJ Class 4		RCRRJ Class 4
PIPE LENGTH		32.26m		1.06m
PIPE GRADE		1.18%		1.88%

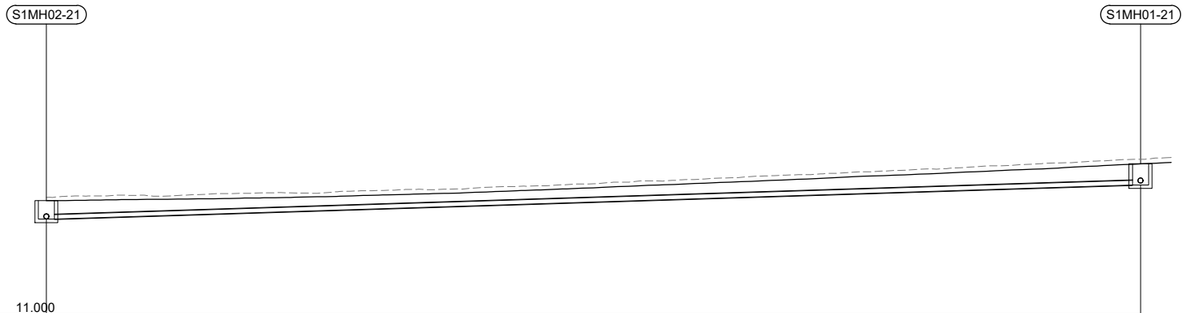
SW LINE 20

DATUM R.L. (m)	10.000				
FINISHED SURFACE (RL)	17.990	18.210	18.348	18.382	18.475
EXISTING SURFACE (RL)	17.990	17.184	18.553	18.582	18.691
INVERT LEVEL	16.835 / 16.835	16.851 / 16.940	16.960 / 16.990	17.000 / 17.200	17.270
DEPTH TO INVERT	0.450	1.359 / 1.270	1.388 / 1.358	1.382 / 1.182	1.205
PIPE SIZE	Ø450mm	Ø300mm	Ø300mm	Ø300mm	
PIPE CLASS	RCRRJ Class 4	RCRRJ Class 4	RCRRJ Class 4	RCRRJ Class 4	
PIPE LENGTH	2.04m	2.16m	0.89m	9.00m	
PIPE GRADE	0.78%	0.93%	1.13%	0.78%	

SW LINE 21

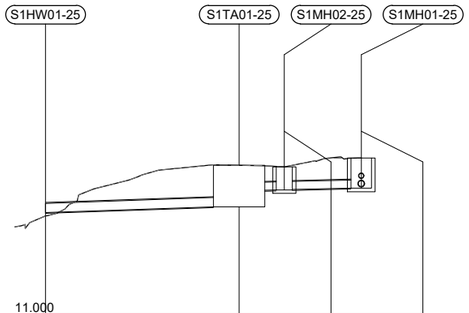
BEDDING NOTE:

- ALL BEDDING SHALL BE HS2 AS PER DRAWING VE-2139.



DATUM R.L. (m)	11.000		
FINISHED SURFACE (RL)	18.475		20.876
EXISTING SURFACE (RL)	18.691		21.173
INVERT LEVEL	17.270 / 17.270		19.500
DEPTH TO INVERT	1.205		1.376
PIPE SIZE		Ø300mm	
PIPE CLASS		RCRRJ Class 4	
PIPE LENGTH		70.33m	
PIPE GRADE		3.17%	

SW LINE 21



DATUM R.L. (m)	11.000			
FINISHED SURFACE (RL)	17.480	20.781	20.689	21.256
EXISTING SURFACE (RL)	17.480	20.781	20.689	21.255
INVERT LEVEL	17.700 / 17.700	18.080 / 19.150	19.170 / 19.200	19.300
DEPTH TO INVERT	0.600	2.701 / 1.631	1.519 / 1.489	1.956
PIPE SIZE	Ø600mm	Ø525mm	Ø525mm	
PIPE CLASS	RCRRJ Class 4	RCRRJ Class 4	RCRRJ Class 4	
PIPE LENGTH	10.95m	0.76m	3.81m	
PIPE GRADE	3.47%	2.64%	2.62%	

SW LINE 25

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3)				
1:400 (H) 1:200 (V)	Design	JL	25.06.18	Approved For Construction*
	Drawn	KA	05.06.18	-
	Dsg Verifier	RS	25.06.18	-
	Dwg Check	JL	07.06.18	Date -
	* Refer to Revision 1 for Original Signature			

NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

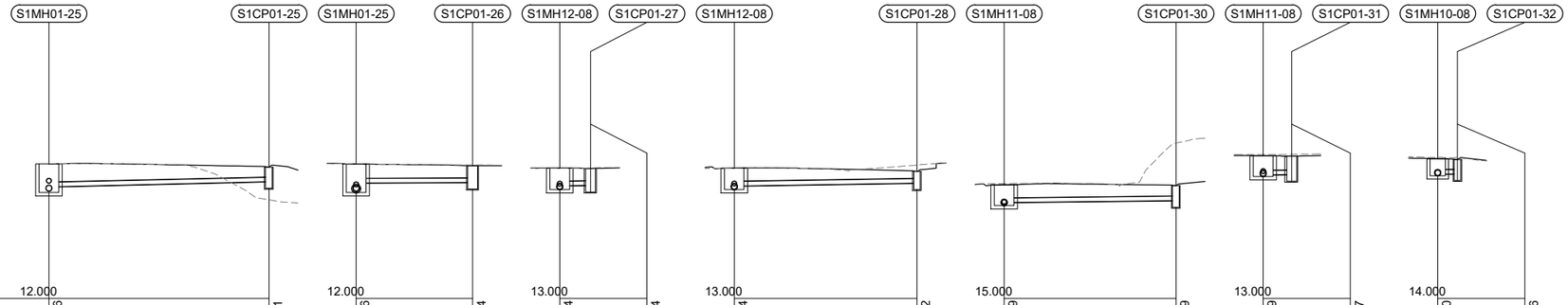
Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER LONGITUDINAL SECTIONS SHEET 19 OF 30

Status: **FOR TENDER**

Drawing No.: SR1003 - 01 - VE - 2169

Rev.: 0

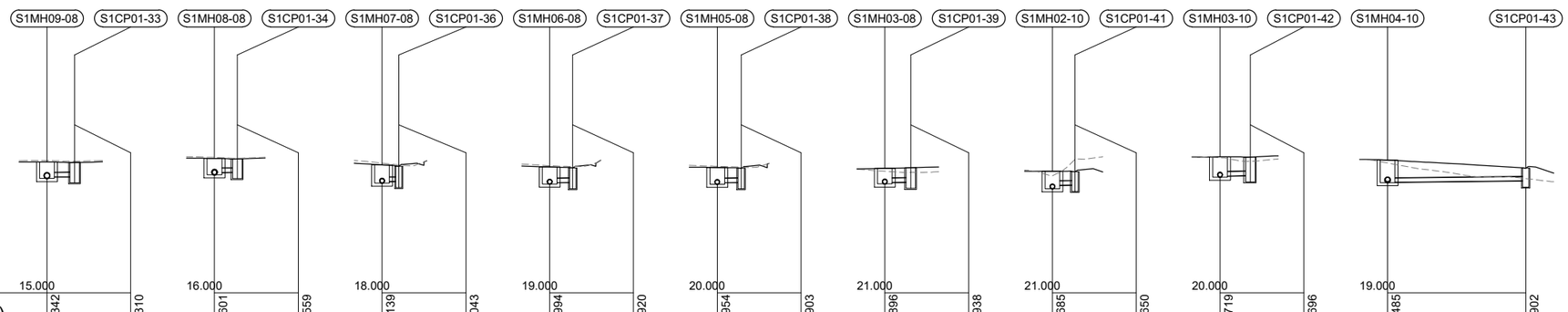


DATUM R.L. (m)	12.000				12.000				13.000				13.000				15.000				13.000				14.000			
FINISHED SURFACE (RL)		21.256		21.041		21.256		21.144		21.974		21.944		21.974		21.742		22.819		22.759		22.819		22.797		23.620		23.556
EXISTING SURFACE (RL)		21.255		18.790		21.255		21.185		21.972		21.979		21.972		22.183		22.903		25.693		22.903		22.912		23.721		23.713
INVERT LEVEL	19.300	19.700	20.030	19.580	19.300	19.950	19.980	19.530	20.500	20.760	20.780	20.330	20.500	20.750	20.940	20.490	21.400	21.610	21.730	21.280	21.400	21.510	21.520	21.070	22.450	22.560	22.570	22.120
DEPTH TO INVERT	1.956	1.556	1.011	1.461	1.956	1.306	1.164	1.614	1.474	1.214	1.164	1.614	1.474	1.224	0.802	1.252	1.419	1.209	1.029	1.479	1.419	1.309	1.277	1.727	1.170	1.060	0.986	1.436
PIPE SIZE	Ø300mm				Ø300mm				Ø300mm				Ø300mm				Ø300mm				Ø300mm				Ø300mm			
PIPE CLASS	RCRRJ Class 4				RCRRJ Class 4				RCRRJ Class 4				RCRRJ Class 4				RCRRJ Class 4				RCRRJ Class 4				RCRRJ Class 4			
PIPE LENGTH	14.24m				6.99m				1.11m				11.67m				10.91m				0.95m				0.61m			
PIPE GRADE	2.32%				0.43%				1.81%				1.63%				1.10%				1.06%				1.63%			

SW LINE 25 | SW LINE 26 | SW LINE 27 | SW LINE 28 | SW LINE 30 | SW LINE 31 | SW LINE 32

BEDDING NOTE:

- ALL BEDDING SHALL BE HS2 AS PER DRAWING VE-2139.



DATUM R.L. (m)	15.000				16.000				18.000				19.000				20.000				21.000				21.000				20.000				19.000			
FINISHED SURFACE (RL)		24.342		24.310		25.601		25.559		27.139		27.043		27.994		27.920		28.954		28.903		29.896		29.938		29.685		29.650		29.719		29.696		28.485		27.902
EXISTING SURFACE (RL)		24.447		24.401		25.674		25.617		27.263		27.143		28.083		28.027		29.037		28.978		29.692		29.604		29.365		30.522		29.647		29.390		28.274		27.161
INVERT LEVEL	23.170	23.290	23.300	22.850	24.430	24.600	24.610	24.160	25.840	25.960	25.970	25.520	26.770	26.880	26.890	26.440	27.750	27.880	27.890	27.440	28.780	28.890	28.910	28.460	28.430	28.690	28.700	28.250	28.270	28.350	28.380	27.930	26.870	26.900	27.000	26.550
DEPTH TO INVERT	1.172	1.052	1.010	1.460	1.171	1.001	0.949	1.399	1.299	1.179	1.073	1.523	1.224	1.114	1.030	1.480	1.204	1.074	1.013	1.463	1.116	1.006	1.028	1.478	1.255	0.995	0.950	1.400	1.449	1.369	1.316	1.766	1.615	1.585	0.902	1.352
PIPE SIZE	Ø300mm				Ø300mm				Ø300mm				Ø300mm				Ø300mm				Ø300mm				Ø300mm				Ø300mm				Ø300mm			
PIPE CLASS	RCRRJ Class 4				RCRRJ Class 4				RCRRJ Class 4				RCRRJ Class 4				RCRRJ Class 4				RCRRJ Class 4				RCRRJ Class 4				RCRRJ Class 4				RCRRJ Class 4			
PIPE LENGTH	1.12m				0.78m				0.45m				0.90m				0.96m				0.99m				0.87m				1.31m				9.15m			
PIPE GRADE	0.89%				1.29%				2.23%				1.11%				1.04%				2.02%				1.16%				2.29%				1.09%			

SW LINE 33 | SW LINE 34 | SW LINE 36 | SW LINE 37 | SW LINE 38 | SW LINE 39 | SW LINE 41 | SW LINE 42 | SW LINE 43

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3) 1:400 (H) 1:200 (V)

Design	JL	25.06.18	Approved For Construction*
Drawn	KA	05.06.18	-
Dsg Verifier	RS	25.06.18	
Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER LONGITUDINAL SECTIONS SHEET 20 OF 30

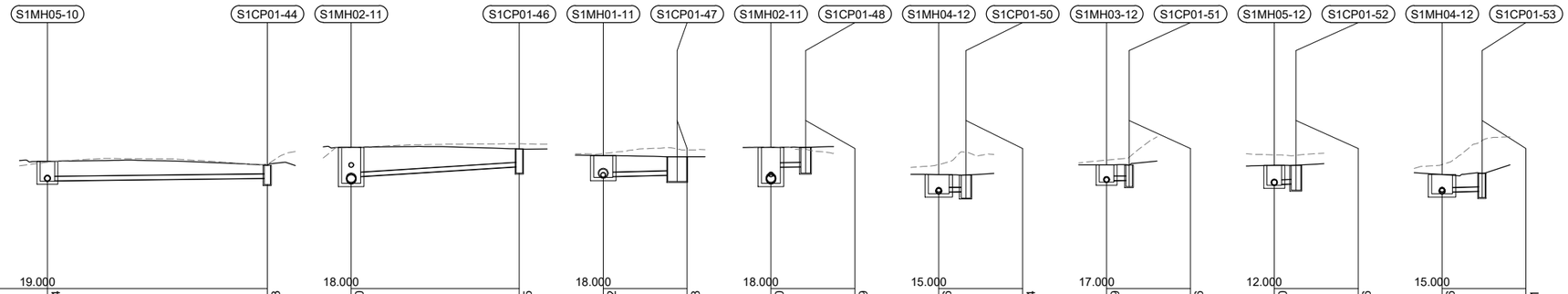
Status: **FOR TENDER**

Drawing No.: SR1003 - 01 - VE - 2170

Rev.: 0

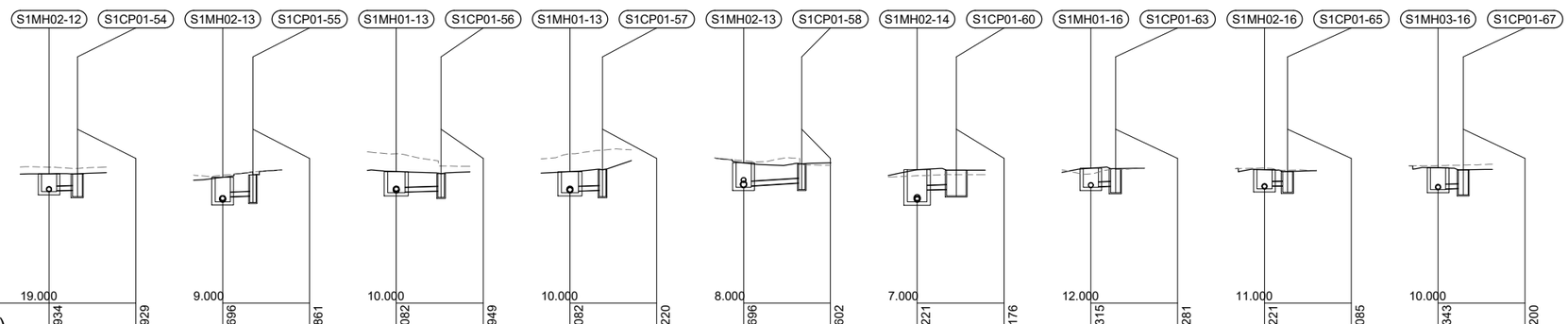
BEDDING NOTE:

- ALL BEDDING SHALL BE HS2 AS PER DRAWING VE-2139.



DATUM R.L. (m)	19.000			18.000			18.000			18.000			15.000			17.000			12.000			15.000		
FINISHED SURFACE (RL)	28.094		27.803	28.090		27.975	27.502		27.408	28.090		28.089	23.146		23.104	25.839		25.816	20.800		20.806	23.146		23.231
EXISTING SURFACE (RL)	28.025		27.915	28.059		28.343	27.649		27.975	28.059		27.949	23.854		24.749	26.176		26.374	21.554		21.516	23.854		25.566
INVERT LEVEL	26.670	26.700	26.880	25.520	26.000	26.700	25.940	26.000	26.100	25.520	26.680	26.700	21.770	21.910	21.920	24.600	24.720	24.730	19.380	19.450	19.480	21.770	21.900	21.950
	26.700		26.430	26.059		26.250	27.649		25.650	28.059		26.250	23.854		21.470	26.176		24.280	21.554		19.030	23.854		21.500
DEPTH TO INVERT	1.424	1.394	0.923	2.570	2.090	1.275	1.562	1.502	1.308	2.570	1.410	1.389	1.376	1.236	1.184	1.239	1.119	1.086	1.420	1.350	1.326	1.376	1.246	1.281
	1.394		1.373	2.059		1.725	1.502		1.758	1.410		1.839	1.236		1.634	1.119		1.536	1.350		1.776	1.246		1.731
PIPE SIZE	Ø300mm			Ø300mm			Ø300mm			Ø300mm			Ø300mm			Ø300mm			Ø300mm			Ø300mm		
PIPE CLASS	RCRRJ Class 4			RCRRJ Class 4			RCRRJ Class 4			RCRRJ Class 4			RCRRJ Class 4			RCRRJ Class 4			RCRRJ Class 4			RCRRJ Class 4		
PIPE LENGTH	14.98m			11.12m			3.94m			1.46m			0.86m			0.87m			0.69m			1.88m		
PIPE GRADE	1.20%			6.29%			2.54%			1.37%			1.16%			1.15%			4.35%			2.66%		

SW LINE 44 | SW LINE 46 | SW LINE 47 | SW LINE 48 | SW LINE 50 | SW LINE 51 | SW LINE 52 | SW LINE 53



DATUM R.L. (m)	19.000			9.000			10.000			10.000			8.000			7.000			12.000			11.000			10.000		
FINISHED SURFACE (RL)	27.934		27.929	17.696		17.861	19.082		18.949	19.082		19.220	17.696		17.602	16.221		16.176	21.315		21.281	20.221		20.085	19.343		19.200
EXISTING SURFACE (RL)	28.387		28.306	17.832		18.067	20.317		19.472	20.317		20.569	17.832		17.539	15.799		15.882	20.922		21.230	20.331		20.185	19.498		19.531
INVERT LEVEL	26.700	26.770	26.800	16.030	16.000	16.400	17.630	17.680	17.750	17.630	17.750	17.800	16.030	16.000	16.300	14.000	14.820	14.860	20.000	20.050	20.080	18.900	19.090	19.100	17.850	17.900	17.920
	26.770		26.350	16.350		15.950	17.680		17.300	17.750		17.350	16.100		15.850	14.820		14.410	20.050		19.630	19.090		18.650	17.900		17.470
DEPTH TO INVERT	1.234	1.164	1.129	1.666	1.696	1.461	1.452	1.402	1.199	1.452	1.332	1.420	1.666	1.696	1.302	2.221	1.401	1.316	1.315	1.265	1.201	1.321	1.131	0.985	1.493	1.443	1.280
	1.164		1.579	1.346		1.911	1.402		1.649	1.332		1.870	1.596		1.752	1.401		1.766	1.265		1.651	1.131		1.435	1.443		1.730
PIPE SIZE	Ø300mm			Ø300mm			Ø300mm			Ø300mm			Ø300mm			Ø300mm			Ø300mm			Ø300mm			Ø300mm		
PIPE CLASS	RCRRJ Class 4			RCRRJ Class 4			RCRRJ Class 4			RCRRJ Class 4			RCRRJ Class 4			RCRRJ Class 4			RCRRJ Class 4			RCRRJ Class 4			RCRRJ Class 4		
PIPE LENGTH	1.11m			1.34m			2.27m			1.43m			3.28m			1.36m			0.85m			0.74m			0.88m		
PIPE GRADE	2.71%			3.73%			3.08%			3.49%			6.10%			2.95%			3.54%			1.35%			2.27%		

SW LINE 54 | SW LINE 55 | SW LINE 56 | SW LINE 57 | SW LINE 58 | SW LINE 60 | SW LINE 63 | SW LINE 65 | SW LINE 67

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3) 1:400 (H) 1:200 (V)

Design	JL	25.06.18	Approved For Construction*
Drawn	KA	05.06.18	-
Dsg Verifier	RS	25.06.18	
Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER LONGITUDINAL SECTIONS SHEET 21 OF 30

Status: FOR TENDER

Drawing No.: SR1003 - 01 - VE - 2171 | Rev.: 0

Document No. P:\341341\907\Shared\Auckland\Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\8 Pre-implementation\CAD - VE\SR1003-01-VE-2151-2180.dwg

DO NOT SCALE

IF IN DOUBT ASK.

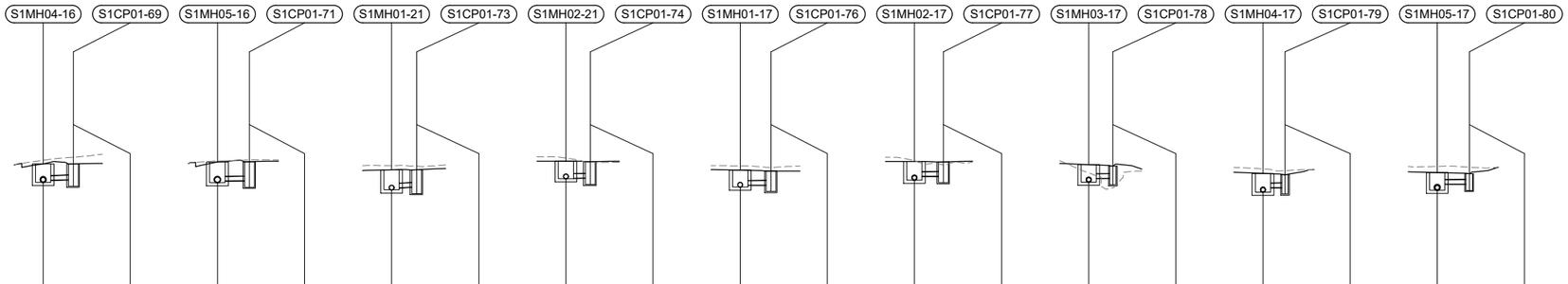
100mm

SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

0

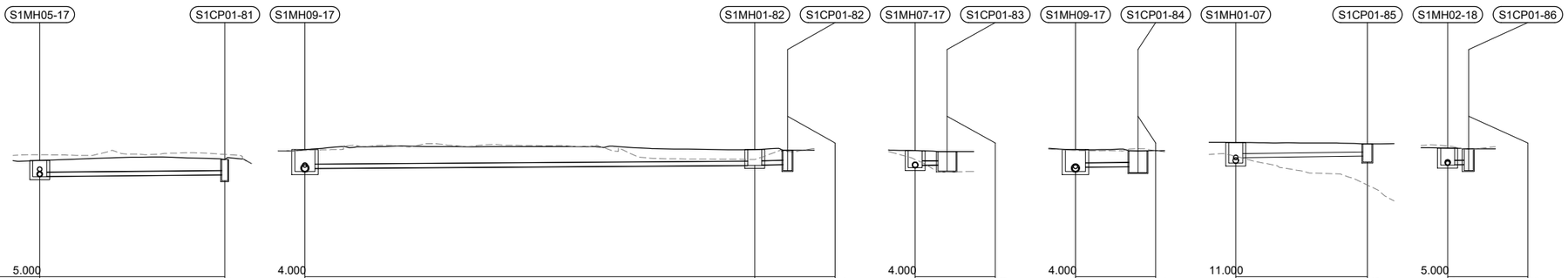
BEDDING NOTE:

- ALL BEDDING SHALL BE HS2 AS PER DRAWING VE-2139.



DATUM R.L. (m)	8.000			7.000			12.000			9.000			9.000			7.000			6.000			6.000			5.000		
FINISHED SURFACE (RL)		17.284			16.420			20.876			18.475			17.857			16.447			15.233			14.630			13.689	
EXISTING SURFACE (RL)		17.537			16.480			21.173			18.691			18.147			16.497			14.668			14.933			14.116	
INVERT LEVEL	16.020	16.160	16.200	15.000	15.110	15.130	19.500	19.640	19.690	17.270	17.300	17.310	16.700	16.820	16.830	15.170	15.430	15.440	14.030	14.290	14.300	13.340	13.650	13.660	12.480	12.890	12.900
DEPTH TO INVERT	1.264	1.124	1.089	1.420	1.310	1.303	1.376	1.236	1.191	1.205	1.175	1.131	1.157	1.037	0.960	1.277	1.017	0.976	1.203	0.943	0.839	1.290	0.980	0.881	1.209	0.799	0.702
PIPE SIZE		Ø300mm			Ø300mm			Ø300mm			Ø300mm			Ø300mm			Ø300mm			Ø300mm			Ø300mm			Ø300mm	
PIPE CLASS		RCRRJ Class 4			RCRRJ Class 4			RCRRJ Class 4			RCRRJ Class 4			RCRRJ Class 4			RCRRJ Class 4			RCRRJ Class 4			RCRRJ Class 4			RCRRJ Class 4	
PIPE LENGTH		1.22m			1.35m			0.86m			0.80m			1.26m			1.14m			0.91m			0.77m			1.46m	
PIPE GRADE		3.29%			1.48%			5.85%			1.25%			0.80%			0.88%			1.10%			1.30%			0.69%	

SW LINE 69 | SW LINE 71 | SW LINE 73 | SW LINE 74 | SW LINE 76 | SW LINE 77 | SW LINE 78 | SW LINE 79 | SW LINE 80



DATUM R.L. (m)	5.000			4.000			4.000			4.000			11.000			5.000		
FINISHED SURFACE (RL)		13.689			13.507			13.424			13.507			21.038			14.612	
EXISTING SURFACE (RL)		14.116			13.442			12.764			13.442			20.003			14.764	
INVERT LEVEL	12.480	12.500	12.620	11.860	12.100	12.320	12.150	12.340	12.350	11.860	12.200	12.230	19.500	19.900	20.020	13.340	13.380	13.390
DEPTH TO INVERT	1.209	1.189	1.147	1.647	1.407	1.184	1.274	1.084	1.000	1.647	1.307	1.184	1.538	1.138	0.913	1.272	1.232	1.165
PIPE SIZE		Ø300mm			Ø300mm			Ø300mm			Ø300mm			Ø300mm			Ø300mm	
PIPE CLASS		RCRRJ Class 4			RCRRJ Class 4			RCRRJ Class 4			RCRRJ Class 4			uPVC			RCRRJ Class 4	
PIPE LENGTH		13.10m			32.40m			1.19m			3.26m			8.99m			0.72m	
PIPE GRADE		0.92%			0.68%			0.84%			0.92%			1.33%			1.39%	

SW LINE 81 | SW LINE 82 | SW LINE 83 | SW LINE 84 | SW LINE 85 | SW LINE 86

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3)				
1:400 (H) 1:200 (V)	Design	JL	25.06.18	Approved For Construction*
	Drawn	KA	05.06.18	-
	Dsg Verifier	RS	25.06.18	-
	Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER LONGITUDINAL SECTIONS SHEET 22 OF 30

Status: FOR TENDER

Drawing No.: SR1003 - 01 - VE - 2172

Rev.: 0

Document No. P:\3411\3411907\Shared\Auckland-Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\8 Pre-implementation\CAD - VE\SR1003-01-VE-2151-2180.dwg

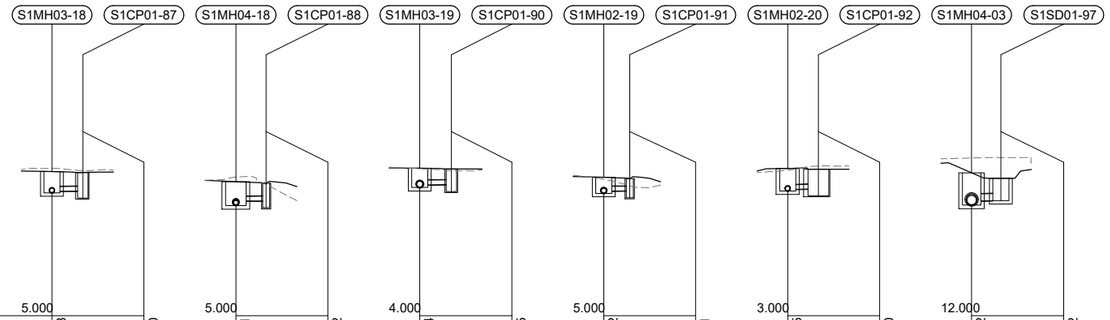
DO NOT SCALE

IF IN DOUBT ASK.

100mm

SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

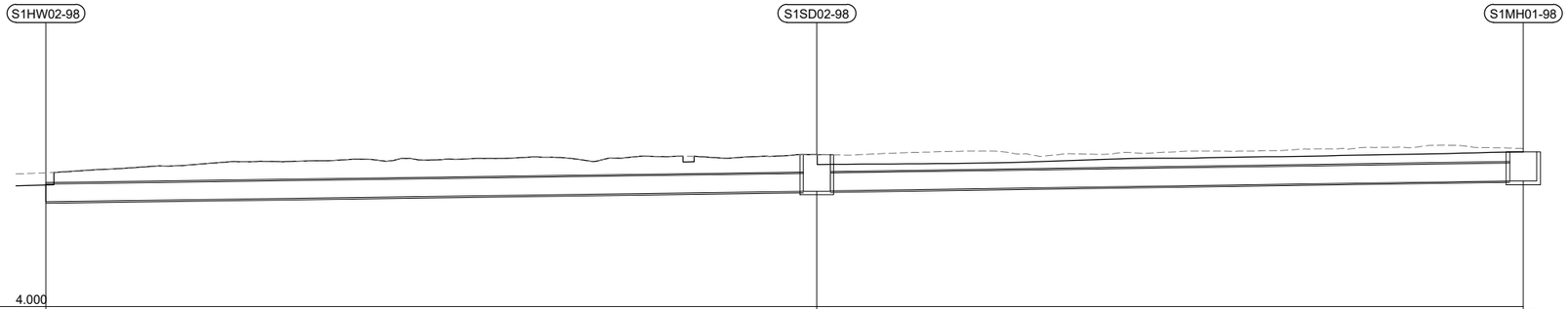
0



DATUM R.L. (m)	5.000			5.000			4.000			5.000	
FINISHED SURFACE (RL)	14.388		14.330	13.731		13.622	13.604		13.555	14.012	
EXISTING SURFACE (RL)	14.588		14.456	14.040		13.554	13.577		13.455	13.889	
INVERT LEVEL	13.000	13.110	13.120	12.180	12.470	12.480	12.030	12.350	12.530	12.540	12.090
DEPTH TO INVERT	1.388	1.278	1.210	1.660	1.551	1.261	1.142	1.592	1.254	1.074	1.015
PIPE SIZE	Ø300mm			Ø300mm			Ø300mm			Ø300mm	
PIPE CLASS	RCRRJ Class 4			RCRRJ Class 4			RCRRJ Class 4			RCRRJ Class 4	
PIPE LENGTH	1.15m			1.08m			1.20m			0.95m	
PIPE GRADE	0.87%			0.93%			0.83%			1.05%	

DATUM R.L. (m)	3.000			12.000							
FINISHED SURFACE (RL)	12.595		12.540	21.312		20.952					
EXISTING SURFACE (RL)	12.487		12.749	22.276		22.303					
INVERT LEVEL	11.120	11.230	11.260	10.810	19.200	19.480	19.500				
DEPTH TO INVERT	1.475	1.365	1.280	1.730	2.112	1.832	1.452				
PIPE SIZE	Ø300mm			Ø450mm							
PIPE CLASS	RCRRJ Class 4			RCRRJ Class 4							
PIPE LENGTH	0.81m			0.78m							
PIPE GRADE	3.71%			2.56%							

SW LINE 87 | SW LINE 88 | SW LINE 90 | SW LINE 91 | SW LINE 92 | SW LINE 97



DATUM R.L. (m)	4.000		
FINISHED SURFACE (RL)	12.134	14.153	14.338
EXISTING SURFACE (RL)	12.943	14.153	14.565
INVERT LEVEL	11.000	11.700	12.400
	11.000	11.730	
DEPTH TO INVERT	1.200	2.453	1.938
		2.423	
PIPE SIZE	Ø1200mm		Ø1200mm
PIPE CLASS	RCRRJ Class 4		RCRRJ Class 4
PIPE LENGTH	50.65m		45.44m
PIPE GRADE	1.38%		1.47%

SW LINE 98

BEDDING NOTE:

- ALL BEDDING SHALL BE HS2 AS PER DRAWING VE-2139.

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

DO NOT SCALE

Original Scale (A3) 1:400 (H) 1:200 (V)

Design	JL	25.06.18	Approved For Construction*
Drawn	KA	05.06.18	-
Dsg Verifier	RS	25.06.18	
Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER LONGITUDINAL SECTIONS SHEET 23 OF 30

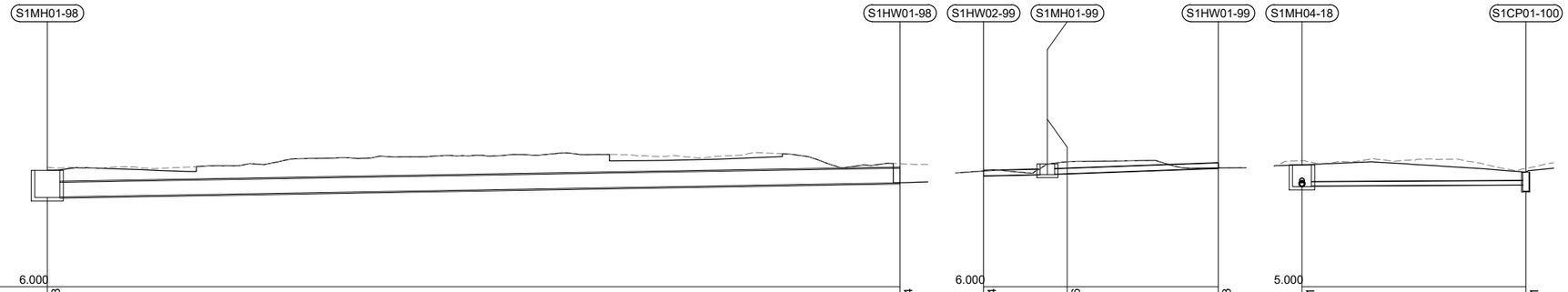
Status: FOR TENDER

Drawing No. SR1003 - 01 - VE - 2173

Rev. 0

Document No. P:\341341907\Shared\Auckland-Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\8 Pre-implementation\CAD - VE\SR1003-01-VE-2151-2180.dwg

IF IN DOUBT ASK.



DATUM R.L. (m)	6.000				6.000			5.000		
FINISHED SURFACE (RL)	14.338			13.454	14.294		14.806	13.731		13.201
EXISTING SURFACE (RL)	14.565			14.816	14.294		14.806	14.040		13.481
INVERT LEVEL	12.400	12.430	13.440		13.950	14.040	14.500	12.180	12.301	
					13.950	14.070	14.513	12.221	11.851	
DEPTH TO INVERT	1.938	1.908	1.050		0.375	0.766	0.375	1.551	0.900	
						0.736		1.510	1.350	
PIPE SIZE	Ø1050mm				Ø375mm		Ø375mm	Ø300mm		
PIPE CLASS	RCRRJ Class 4				RCRRJ Class 4		RCRRJ Class 4	RCRRJ Class 4		
PIPE LENGTH	60.22m				4.05m		11.72m	15.15m		
PIPE GRADE	1.68%				2.22%		3.67%	0.53%		

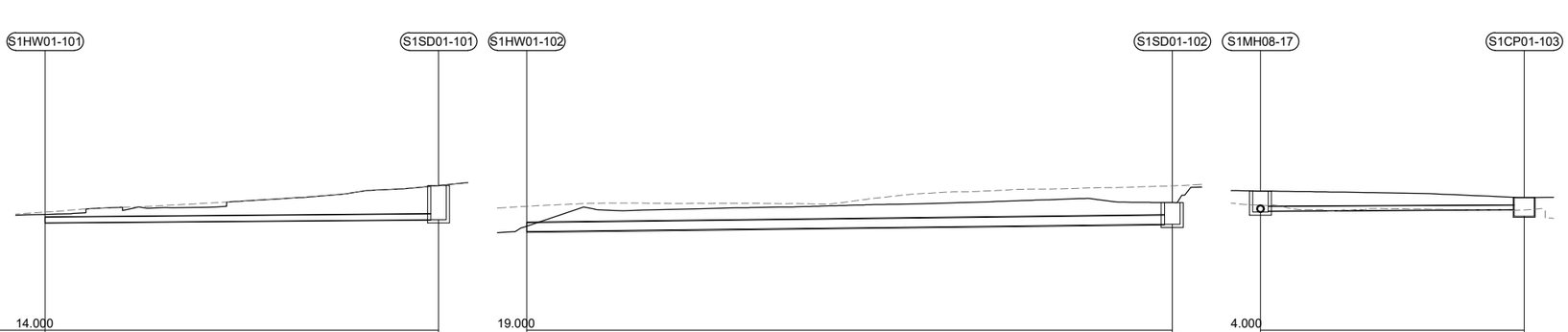
SW LINE 98

SW LINE 99

SW LINE 100

BEDDING NOTE:

- ALL BEDDING SHALL BE HS2 AS PER DRAWING VE-2139.



DATUM R.L. (m)	14.000			19.000			4.000		
FINISHED SURFACE (RL)	21.857		23.828	26.056		27.664	13.455		13.015
EXISTING SURFACE (RL)	22.020		23.828	27.418		28.802	12.492		12.168
INVERT LEVEL	21.300	21.509		25.700	26.200		12.030	12.190	
	21.300			25.700			12.100	11.740	
DEPTH TO INVERT	0.375	2.319		0.600	1.464		1.425	0.825	
							1.355	1.275	
PIPE SIZE	Ø375mm			Ø600mm			Ø300mm		
PIPE CLASS	RCRRJ Class 4			RCRRJ Class 4			RCRRJ Class 4		
PIPE LENGTH	26.22m			43.36m			16.73m		
PIPE GRADE	0.80%			1.15%			0.54%		

SW LINE 101

SW LINE 102

SW LINE 103

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

DO NOT SCALE

Original Scale (A3)				
1:400 (H) 1:200 (V)	Design	JL	25.06.18	Approved For Construction*
	Drawn	KA	05.06.18	-
	Dsg Verifier	RS	25.06.18	-
	Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

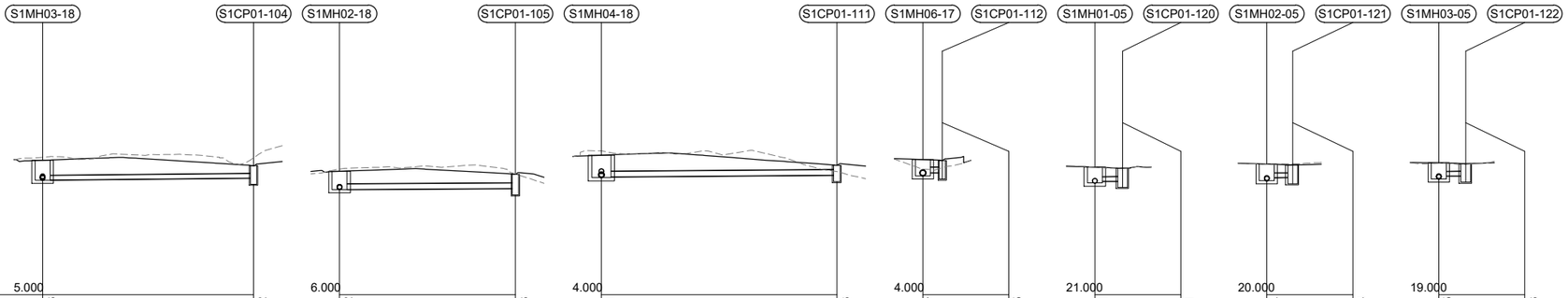
Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER LONGITUDINAL SECTIONS SHEET 24 OF 30

Status: FOR TENDER

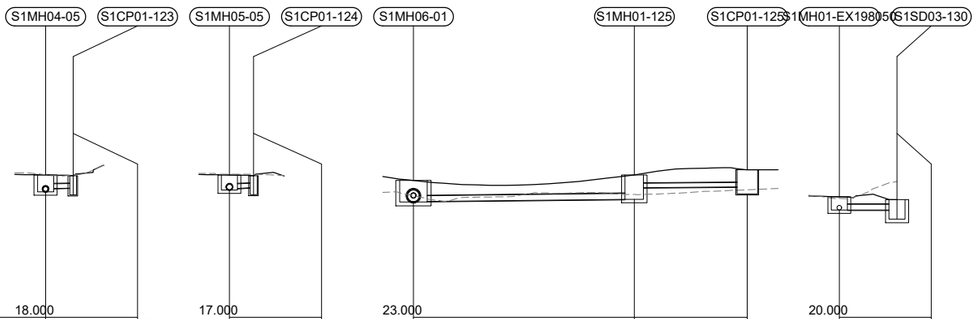
Drawing No.: SR1003 - 01 - VE - 2174

Rev.: 0



DATUM R.L. (m)	5.000			6.000			4.000			4.000			21.000			20.000			19.000		
FINISHED SURFACE (RL)		14.388			14.612			13.731			13.437			29.911			29.124			28.205	
EXISTING SURFACE (RL)		14.588			14.764			14.040			12.756			29.897			29.121			28.171	
INVERT LEVEL	13.000	13.010	13.150	13.340	13.354	13.412	12.180	12.230	12.350	12.300	12.515	12.520	28.800	28.920	28.930	27.960	28.180	28.190	27.080	27.290	27.300
DEPTH TO INVERT	1.388	1.378	0.852	1.272	1.258	0.986	1.551	1.501	0.673	1.137	0.922	0.845	1.111	0.991	0.901	1.164	0.944	0.864	1.125	0.915	0.848
PIPE SIZE		Ø300mm			Ø375mm			Ø375mm			Ø375mm			Ø300mm			Ø300mm			Ø300mm	
PIPE CLASS		RCRRJ Class 4			RCRRJ Class 4			RCRRJ Class 4			RCRRJ Class 4			RCRRJ Class 4			RCRRJ Class 4			RCRRJ Class 4	
PIPE LENGTH		13.97m			11.52m			15.53m			0.61m			1.07m			0.94m			1.02m	
PIPE GRADE		1.00%			0.51%			0.77%			0.83%			0.93%			1.06%			0.98%	

SW LINE 104 | SW LINE 105 | SW LINE 111 | SW LINE 112 | SW LINE 120 | SW LINE 121 | SW LINE 122



DATUM R.L. (m)	18.000			17.000			23.000				20.000		
FINISHED SURFACE (RL)		27.283			26.281			31.926		32.292		27.860	
EXISTING SURFACE (RL)		27.294			26.336			30.930		31.008		27.758	
INVERT LEVEL	26.190	26.410	26.430	25.300	25.410	25.450	30.520	30.560	30.700	31.450	31.500	27.000	27.000
DEPTH TO INVERT	1.093	0.873	0.800	0.981	0.871	0.778	1.406	1.366	1.592	0.842	1.123	0.860	0.677
PIPE SIZE		Ø300mm			Ø300mm			Ø375mm		Ø300mm			Ø375mm
PIPE CLASS		RCRRJ Class 4			RCRRJ Class 4			RCRRJ Class 4		RCRRJ Class 4			RCRRJ Class 4
PIPE LENGTH		1.05m			0.82m			12.90m		6.10m			2.72m
PIPE GRADE		1.91%			4.85%			1.08%		0.82%			0.00%

SW LINE 123 | SW LINE 124 | SW LINE 125 | SW LINE 130

BEDDING NOTE:

- ALL BEDDING SHALL BE HS2 AS PER DRAWING VE-2139.

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3) 1:400 (H) 1:200 (V)

Design	JL	25.06.18	Approved For Construction*
Drawn	KA	05.06.18	-
Dsg Verifier	RS	25.06.18	-
Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER LONGITUDINAL SECTIONS SHEET 25 OF 30

Status: FOR TENDER

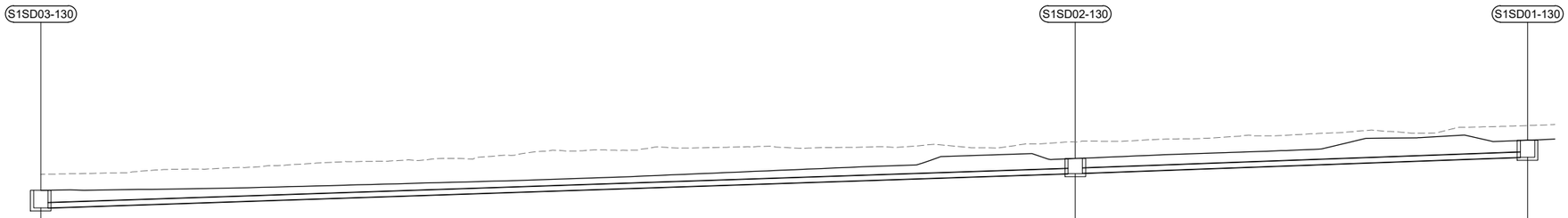
Drawing No.: SR1003 - 01 - VE - 2175

Rev.: 0

100mm

SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

0

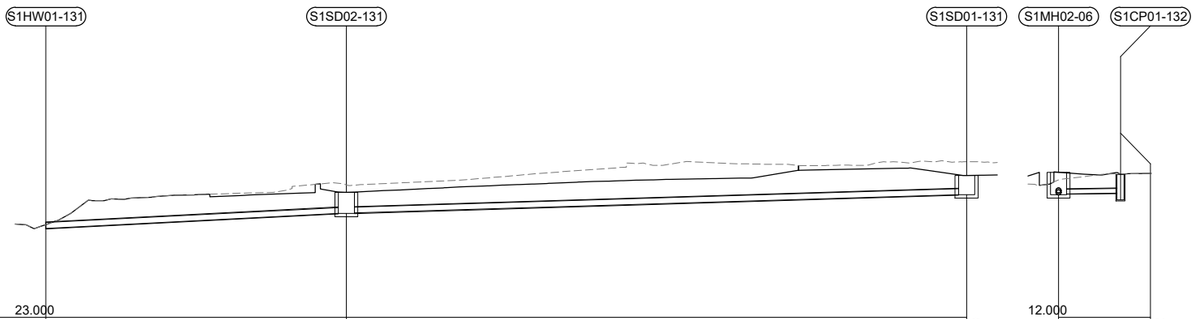


DATUM R.L. (m)	21.000		
FINISHED SURFACE (RL)	27.677	30.014	31.352
EXISTING SURFACE (RL)	28.857	31.228	32.433
INVERT LEVEL	27.000 / 26.400 / 26.400	28.900 / 28.930	30.100
DEPTH TO INVERT	0.677 / 1.277 / 1.277	1.114 / 1.084	1.252
PIPE SIZE	Ø375mm		Ø375mm
PIPE CLASS	RCRRJ Class 4		RCRRJ Class 4
PIPE LENGTH	74.67m		32.04m
PIPE GRADE	3.35%		3.65%

SW LINE 130

BEDDING NOTE:

- ALL BEDDING SHALL BE HS2 AS PER DRAWING VE-2139.



DATUM R.L. (m)	23.000			12.000
FINISHED SURFACE (RL)	29.044	31.141	32.239	21.455 / 21.312
EXISTING SURFACE (RL)	29.044	31.616	33.139	20.954 / 21.348
INVERT LEVEL	28.800 / 28.800	29.780 / 29.800	31.000	20.000 / 20.050 / 20.100 / 19.650
DEPTH TO INVERT	0.375	1.361 / 1.341	1.239	1.455 / 1.405 / 1.212 / 1.662
PIPE SIZE	Ø375mm	Ø375mm		Ø300mm
PIPE CLASS	RCRRJ Class 4	RCRRJ Class 4		RCRRJ Class 4
PIPE LENGTH	19.09m	39.41m		3.29m
PIPE GRADE	5.13%	3.05%		1.52%

SW LINE 131

SW LINE 132

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3) 1:400 (H) 1:200 (V)

Design	JL	25.06.18	Approved For Construction*
Drawn	KA	05.06.18	-
Dsg Verifier	RS	25.06.18	
Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI — Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER LONGITUDINAL SECTIONS SHEET 26 OF 30

Status: FOR TENDER

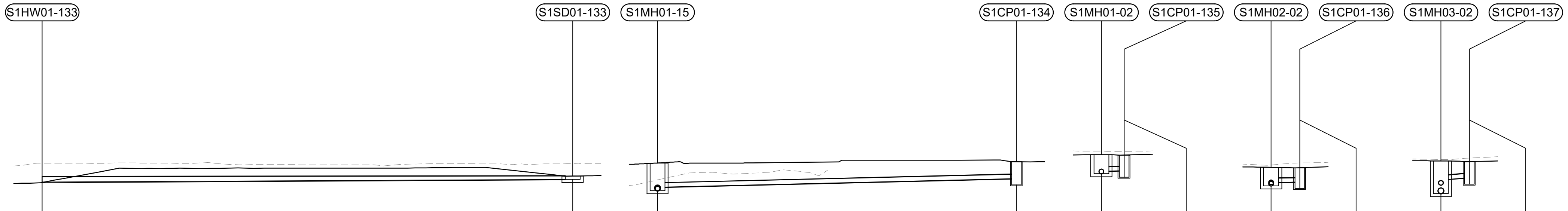
Drawing No. SR1003 - 01 - VE - 2176

Rev. 0

Document No. P:\341341907\Shared\Auckland-Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\8 Pre-implementation\CAD - VE\SR1003-01-VE-2151-2180.dwg

DO NOT SCALE

IF IN DOUBT ASK.



DATUM R.L. (m)

	9.000	S1HW01-133	S1SD01-133
FINISHED SURFACE (RL)		16.569	17.023
EXISTING SURFACE (RL)		17.896	17.905
INVERT LEVEL	16.600	16.600	16.800
DEPTH TO INVERT	0.375		0.223
PIPE SIZE		Ø375mm	
PIPE CLASS		RCRRJ Class 4	
PIPE LENGTH		36.98m	
PIPE GRADE		0.54%	

SW LINE 133

	6.000	S1MH01-15		S1CP01-134
FINISHED SURFACE (RL)		14.953		15.040
EXISTING SURFACE (RL)		13.758		15.040
INVERT LEVEL	13.000	13.250	13.850	13.400
DEPTH TO INVERT	1.953	1.703	1.190	1.640
PIPE SIZE		Ø300mm		
PIPE CLASS		RCRRJ Class 4		
PIPE LENGTH		24.51m		
PIPE GRADE		2.45%		

SW LINE 134

	27.000	S1MH01-02		S1CP01-135
FINISHED SURFACE (RL)		36.534		36.511
EXISTING SURFACE (RL)		36.787		36.773
INVERT LEVEL	35.200	35.380	35.400	34.950
DEPTH TO INVERT	1.334	1.154	1.111	1.561
PIPE SIZE		Ø300mm		
PIPE CLASS		RCRRJ Class 4		
PIPE LENGTH		0.74m		
PIPE GRADE		2.69%		

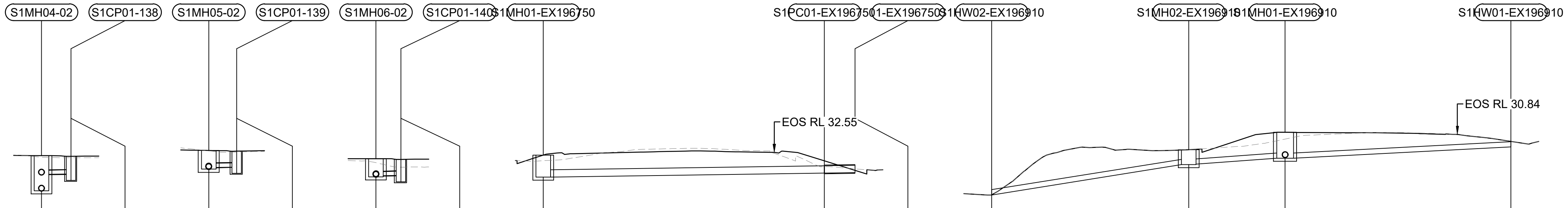
SW LINE 135

	26.000	S1MH02-02		S1CP01-136
FINISHED SURFACE (RL)		34.646		34.613
EXISTING SURFACE (RL)		34.817		34.956
INVERT LEVEL	33.340	33.580	33.600	33.150
DEPTH TO INVERT	1.306	1.066	1.013	1.463
PIPE SIZE		Ø300mm		
PIPE CLASS		RCRRJ Class 4		
PIPE LENGTH		1.16m		
PIPE GRADE		1.73%		

SW LINE 136

	24.000	S1MH03-02		S1CP01-137
FINISHED SURFACE (RL)		33.095		33.052
EXISTING SURFACE (RL)		33.200		33.306
INVERT LEVEL	30.800	31.800	31.900	31.450
DEPTH TO INVERT	2.295	1.295	1.152	1.602
PIPE SIZE		Ø300mm		
PIPE CLASS		RCRRJ Class 4		
PIPE LENGTH		1.16m		
PIPE GRADE		8.64%		

SW LINE 137



DATUM R.L. (m)

	23.000	S1MH04-02		S1CP01-138
FINISHED SURFACE (RL)		32.322		32.279
EXISTING SURFACE (RL)		32.214		32.175
INVERT LEVEL	30.950	29.800 / 30.980	31.000	30.550
DEPTH TO INVERT	1.372	2.522 / 1.342	1.279	1.729
PIPE SIZE		Ø300mm		
PIPE CLASS		RCRRJ Class 4		
PIPE LENGTH		1.25m		
PIPE GRADE		1.60%		

SW LINE 138

	22.000	S1MH05-02		S1CP01-139
FINISHED SURFACE (RL)		31.693		31.640
EXISTING SURFACE (RL)		31.667		31.582
INVERT LEVEL	30.350	30.480	30.500	30.050
DEPTH TO INVERT	1.343	1.213	1.140	1.590
PIPE SIZE		Ø300mm		
PIPE CLASS		RCRRJ Class 4		
PIPE LENGTH		1.14m		
PIPE GRADE		1.76%		

SW LINE 139

	22.000	S1MH06-02		S1CP01-140
FINISHED SURFACE (RL)		31.101		31.060
EXISTING SURFACE (RL)		30.814		30.500
INVERT LEVEL	29.800	29.880	29.900	29.450
DEPTH TO INVERT	1.301	1.221	1.160	1.610
PIPE SIZE		Ø300mm		
PIPE CLASS		RCRRJ Class 4		
PIPE LENGTH		0.93m		
PIPE GRADE		2.16%		

SW LINE 140

	23.000	S1MH01-EX196750		S1PC01-EX196750		S1-EX196750
FINISHED SURFACE (RL)		32.363		31.947		31.265
EXISTING SURFACE (RL)		31.962		31.521		31.375
INVERT LEVEL	30.785	30.785 (EST.)	31.071	31.071 (EST.)	31.102	
DEPTH TO INVERT	1.577		0.525		0.525	
PIPE SIZE		Ø525mm (GIS)		Ø525mm		
PIPE CLASS		EXISTING		RCRRJ Class 4		
PIPE LENGTH		19.64m (EST.)		2.19m		
PIPE GRADE		1.46%		1.42%		

SW LINE EX196750

	20.000	S1HW02-EX196910		S1MH02-EX196910		S1MH01-EX196910		S1HW01-EX196910
FINISHED SURFACE (RL)		26.509		29.747		30.993		30.343
EXISTING SURFACE (RL)		26.509		29.747		30.504		30.343
INVERT LEVEL	26.503	26.503 (EST.)	28.676	28.700 (EST.)	29.010	29.140 (EST.)	29.955	(EST.)
DEPTH TO INVERT	0.375		1.071	1.047	1.983		0.375	
PIPE SIZE		Ø375mm (EST.)		Ø375mm (RAMM)		Ø375mm (RAMM)		
PIPE CLASS		EXISTING		EXISTING		EXISTING		
PIPE LENGTH		13.62m (EST.)		5.79m (EST.)		15.59m (EST.)		
PIPE GRADE		15.95%		5.36%		5.22%		

SW LINE EX196910

BEDDING NOTE:

- ALL BEDDING SHALL BE HS2 AS PER DRAWING VE-2139.

NOTES:

FOR EXISTING CROSS CULVERT DRAINAGE:

- EOS = EDGE OF SEAL LEVEL, INDICATIVELY ONLY. REFER TO GEOMETRIC DRAWINGS FOR CONFIRMATION.
- EST. = DATA BASED ON ESTIMATION ONLY. TO BE VERIFIED ON SITE
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- SUR. = DATA BASED ON SURVEY INFORMATION

No	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3)			
1:400 (H) 1:200 (V)	Design	JL	25.06.18
	Drawn	KA	05.06.18
	Dsg Verifier	RS	25.06.18
	Dwg Check	JL	07.06.18

Approved For Construction* -
Date -
* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI — Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

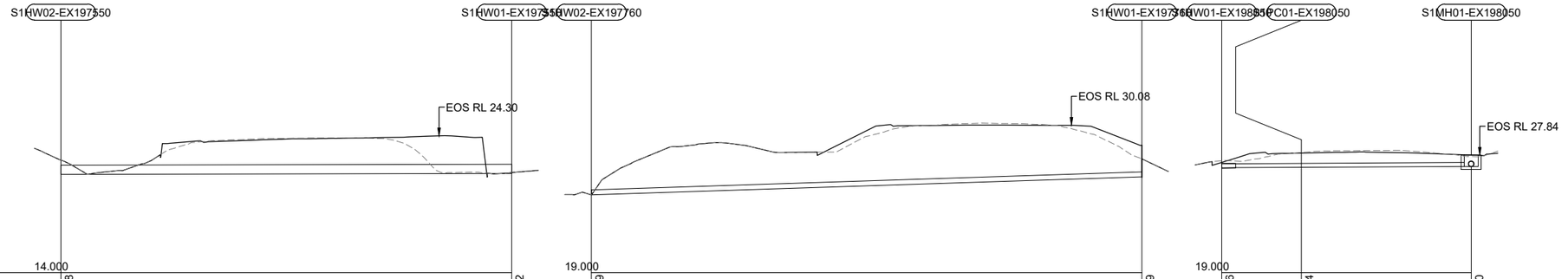
Title: STORMWATER LONGITUDINAL SECTIONS SHEET 27 OF 30

Status: FOR TENDER

Drawing No. SR1003 - 01 - VE - 2177 Rev. 0

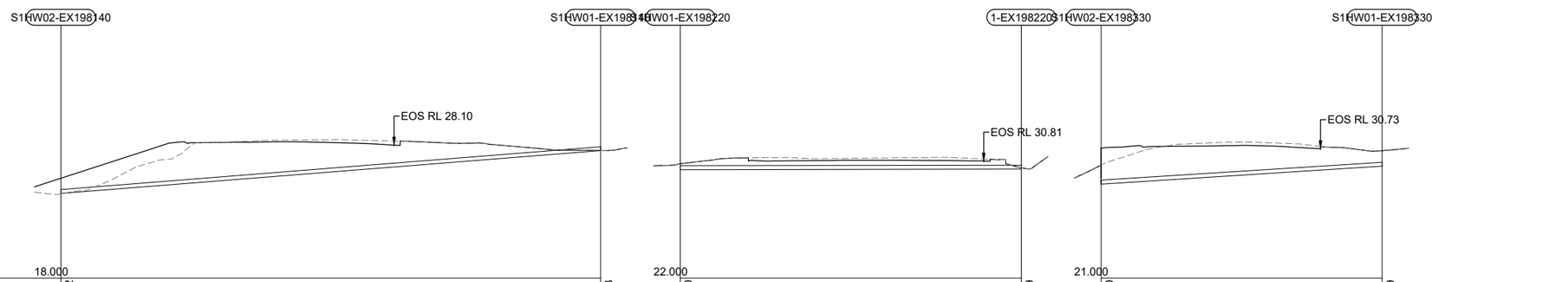
DO NOT SCALE

IF IN DOUBT ASK



DATUM R.L. (m)	14.000			19.000			19.000		
FINISHED SURFACE (RL)	22.478		21.532	24.859		27.569	27.296	27.624	27.860
EXISTING SURFACE (RL)	22.478		21.532	24.859		27.569	27.424	27.398	27.758
INVERT LEVEL	21.400	21.400 (EST.)	21.460 (EST.)	24.851	24.851 (EST.)	26.209 (EST.)	26.890	26.890 (EST.)	26.900 (EST.)	26.900 (EST.)	27.000 (EST.)
DEPTH TO INVERT	0.700		0.700	0.375		0.375	0.300		0.300		0.860
PIPE SIZE	Ø700mm (EST.)			Ø375mm (RAMM)			Ø300mm	Ø300mm (RAMM)	
PIPE CLASS	EXISTING			EXISTING			RCRRJ Class 4	EXISTING	
PIPE LENGTH	33.93m (EST.)			41.43m (EST.)			1.05m	17.20m (EST.)	
PIPE GRADE	0.18%			3.28%			0.95%	0.58%	

SW LINE EX197550 | SW LINE EX197760 | SW LINE EX198050



DATUM R.L. (m)	18.000			22.000			21.000		
FINISHED SURFACE (RL)	25.512		27.593	30.600		30.289	30.800		30.589
EXISTING SURFACE (RL)	24.325		27.593	30.600		30.289	29.488		30.589
INVERT LEVEL	24.366	24.366 (EST.)	27.584 (EST.)	30.150	30.150 (EST.)	30.193 (EST.)	28.073	28.073 (SUR.)	29.415 (SUR.)
DEPTH TO INVERT	0.300		0.300	0.300		0.300	0.300		0.300
PIPE SIZE	Ø300mm (RAMM)			Ø300mm (RAMM)			Ø300mm		
PIPE CLASS	EXISTING			EXISTING			EXISTING		
PIPE LENGTH	40.61m (EST.)			25.67m (EST.)			21.16m		
PIPE GRADE	7.93%			0.17%			6.34%		

SW LINE EX198140 | SW LINE EX198220 | SW LINE EX198330

BEDDING NOTE:

- ALL BEDDING SHALL BE HS2 AS PER DRAWING VE-2139.

NOTES:

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No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3) 1:400 (H) 1:200 (V)

Design	JL	25.06.18	Approved For Construction*
Drawn	KA	05.06.18	-
Dsg Verifier	RS	25.06.18	-
Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

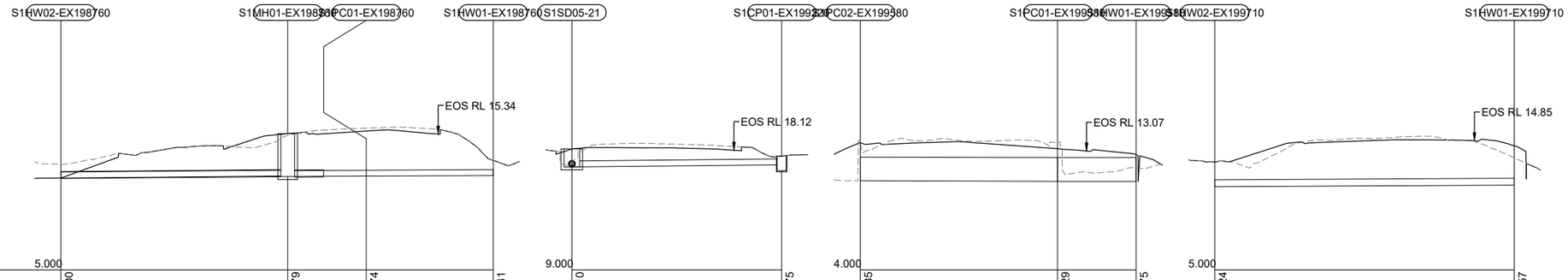
Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER LONGITUDINAL SECTIONS SHEET 28 OF 30

Status: FOR TENDER

Drawing No.: SR1003 - 01 - VE - 2178

Rev.: 0



DATUM R.L. (m)	5.000						
FINISHED SURFACE (RL)	12.000		15.379		15.374		13.341
EXISTING SURFACE (RL)	13.019		15.246		15.652		13.341
INVERT LEVEL	12.000	12.000	12.150	12.120	12.130	12.130 (EST.)	12.190 (SUR.)
DEPTH TO INVERT	0.450		3.229	3.269	0.450		0.450
PIPE SIZE	Ø450mm		Ø450mm		Ø450mm		
PIPE CLASS	RCRRJ Class 4		RCRRJ Class 4		EXISTING		
PIPE LENGTH	16.78m		2.21m		12.94m		
PIPE GRADE	0.89%		0.90%		0.46%		

SW LINE EX198760

DATUM R.L. (m)	9.000		
FINISHED SURFACE (RL)	18.210		17.675
EXISTING SURFACE (RL)	17.184		17.675
INVERT LEVEL	16.851	16.851 (SUR.)	17.000 (SUR.)
DEPTH TO INVERT	1.359		0.675
PIPE SIZE	Ø450mm		
PIPE CLASS	EXISTING		
PIPE LENGTH	15.67m		
PIPE GRADE	0.95%		

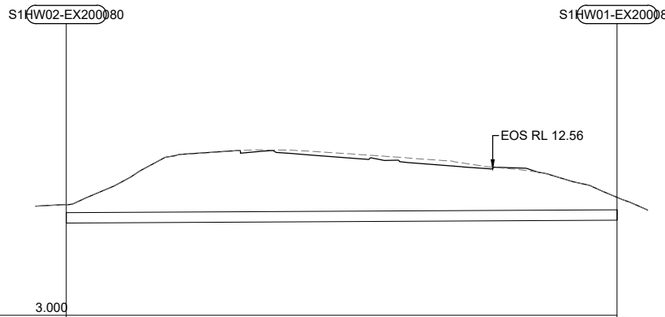
SW LINE EX199220

DATUM R.L. (m)	4.000			
FINISHED SURFACE (RL)	13.685		13.229	12.775
EXISTING SURFACE (RL)	13.758		13.734	11.760
INVERT LEVEL	10.795	10.795 (SUR.)	10.750 (SUR.)	10.750
DEPTH TO INVERT	1.800		1.800	1.800
PIPE SIZE	Ø1600x1800mm		Ø1600x1800mm	
PIPE CLASS	EXISTING		BOX	
PIPE LENGTH	15.04m		5.99m	
PIPE GRADE	-0.30%		0.00%	

SW LINE EX199580

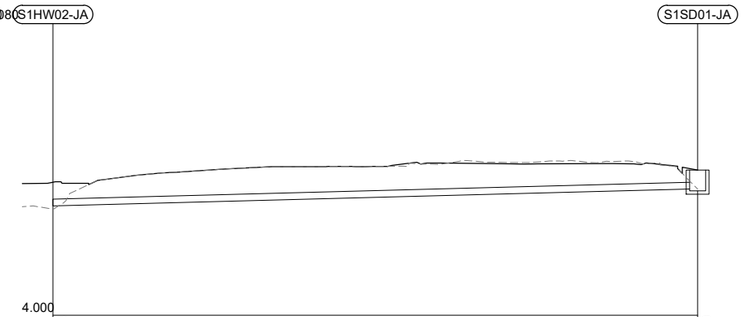
DATUM R.L. (m)	5.000		
FINISHED SURFACE (RL)	13.224		14.457
EXISTING SURFACE (RL)	13.224		13.535
INVERT LEVEL	11.340	11.340 (EST.)	11.460 (EST.)
DEPTH TO INVERT	0.525		0.525
PIPE SIZE	Ø525mm		
PIPE CLASS	EXISTING		
PIPE LENGTH	22.85m (EST.)		
PIPE GRADE	0.53%		

SW LINE EX199710



DATUM R.L. (m)	3.000		
FINISHED SURFACE (RL)	10.207		10.684
EXISTING SURFACE (RL)	10.207		10.684
INVERT LEVEL	9.000	9.000 (EST.)	9.200 (EST.)
DEPTH TO INVERT	0.675		0.675
PIPE SIZE	Ø675mm (GIS)		
PIPE CLASS	EXISTING		
PIPE LENGTH	35.93m (EST.)		
PIPE GRADE	0.56%		

SW LINE EX200080



DATUM R.L. (m)	4.000		
FINISHED SURFACE (RL)	12.664		13.460
EXISTING SURFACE (RL)	10.921		12.221
INVERT LEVEL	11.120	11.120 (SUR.)	12.220 12.100
DEPTH TO INVERT	0.450		1.240 1.360
PIPE SIZE	Ø450mm		
PIPE CLASS	EXISTING		
PIPE LENGTH	41.53m		
PIPE GRADE	2.65%		

SW LINE JA

BEDDING NOTE:

- ALL BEDDING SHALL BE HS2 AS PER DRAWING VE-2139.

NOTES:

FOR EXISTING CROSS CULVERT DRAINAGE:

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No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3) 1:400 (H) 1:200 (V)

Design	JL	25.06.18	Approved For Construction*
Drawn	KA	05.06.18	-
Dsg Verifier	RS	25.06.18	
Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER LONGITUDINAL SECTIONS SHEET 29 OF 30

Status: FOR TENDER

Drawing No. SR1003 - 01 - VE - 2179

Rev. 0

Document No. P:\341341\1907\Shared\Auckland-Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\B Pre-implementation\CAD - VE\SR1003-01-VE-2151-2180.dwg

DATUM R.L. (m)	4.000		
FINISHED SURFACE (RL)	13.460		12.812
EXISTING SURFACE (RL)	12.221		12.812
INVERT LEVEL	12.220	12.220	12.600
DEPTH TO INVERT	1.240	1.240	0.450
PIPE SIZE	Ø450mm		
PIPE CLASS	RCRRJ Class 4		
PIPE LENGTH	38.37m		
PIPE GRADE	0.99%		

SW LINE JA

BEDDING NOTE:

- ALL BEDDING SHALL BE HS2 AS PER DRAWING VE-2139.

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-
0	FOR TENDER	JL	RS	LDB	14.06.19

Original Scale (A3) 1:400 (H) 1:200 (V)

Design	JL	25.06.18	Approved For Construction*
Drawn	KA	05.06.18	-
Dsg Verifier	RS	25.06.18	
Dwg Check	JL	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI — Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: STORMWATER LONGITUDINAL SECTIONS SHEET 30 OF 30

Status. **FOR TENDER**

Drawing No. SR1003 - 01 - VE - 2180

Rev. 0

APPENDIX B

1% AEP FLOOD MAP

Stage 1 Flood map

0 160 320 480
Meters

Scale @ A3
= 1:15,000

Date Printed:
22/03/2018

Auckland Council
Te Kaunihera o Tāmaki Makaurau

Flood Prone Areas

Flood Prone Areas

Flood Sensitive Area

Flood Sensitive Area

Flood Plains

Flood Plains

Stormwater Catchments

Stormwater Catchments

Place Name (25,000)

Place Name (25,000)

Hydrographic Place Name (25,000)

Hydrographic Place Name (25,000)

Rail Stations (25,000)

Rail Stations (25,000)

Railway (25,000)

Railway (25,000)

Auckland Council Boundary

Auckland Council Boundary

Roads (15,000)

CLASSIFICATION

Motorway

Major Road

Arterial Road

Medium Road

Minor Road

Parcels

Parcels

Lakes

Lakes

Base Region (CRS)

Land Outside

Water

Region Cache Public Open Space Extent

Region Cache Public Open Space Extent

Legend

Date Printed:
22/03/2018

Auckland Council
Te Kaunihera o Tāmaki Makaurau

APPENDIX C

CULVERT CATCHMENT SUMMARY

Drawing Plotted: 20 Jun 2019 10:28 AM

Stage 1		Existing Areas (ha)			Existing Flow, Q (m3/s)		Proposed Areas (ha)			Proposed Flow, Q (m3/s)		Note
Catchment Name	Culvert Location (CH)	Impervious	Pervious	Total	Q10	Q100	Impervious	Pervious	Total	Q10	Q100	Change in Imperviousness
A	196750	3.56	2.20	5.76	1.01	1.85	3.68	2.09	5.76	1.01	1.86	2.01%
B	196910	0.34	1.74	2.08	0.36	0.73	0.38	1.69	2.08	0.36	0.73	2.18%
C	197400	27.18	353.75	380.92	22.76	47.31	27.30	353.63	380.92	22.76	47.32	0.03% Kumeu No 2 Bridge
D	197550	0.67	5.52	6.19	1.07	2.19	0.76	5.44	6.19	1.08	2.20	1.43%
E	197780	0.75	7.45	8.20	1.08	2.23	0.79	7.41	8.20	1.08	2.23	0.50%
F	198050	0.35	1.52	1.88	0.34	0.68	0.43	1.45	1.88	0.34	0.68	4.23%
G	198140	1.06	12.63	13.69	1.76	3.65	1.09	12.60	13.69	1.76	3.65	0.18%
H	198220	0.07	0.19	0.26	0.05	0.10	0.09	0.18	0.26	0.05	0.10	4.88%
I	198330	0.33	2.36	2.69	0.47	0.96	0.36	2.33	2.69	0.47	0.96	1.21%
J	198660	89.46	1183.60	1273.06	54.62	113.69	89.63	1183.43	1273.06	54.62	113.69	0.01% Berrys Creek Bridge
K	198760	1.85	20.41	22.25	2.60	5.39	1.92	20.34	22.25	2.61	5.40	0.31% Existing cross culvert under Froster Road
L	199220	0.42	2.42	2.84	0.50	1.02	0.46	2.37	2.84	0.50	1.02	1.79%
M	199360*	0.67	6.62	7.30	0.99	2.03	0.72	6.59	7.30	0.99	2.04	0.53% No cross culvert identified currently.
N	199580	2.92	35.63	38.54	4.03	8.36	2.96	35.58	38.54	4.04	8.36	0.13% Box culvert, 1.6m W x 1.8m H
O	199710	0.76	8.08	8.84	1.08	2.24	0.79	8.05	8.84	1.08	2.24	0.38%
P	200080	10.00	52.80	62.80	6.28	12.76	10.09	52.71	62.80	6.28	12.77	0.13%

CATCHMENT A
CATCHMENT B
CATCHMENT C
(KUMEU No. 2 BRIDGE)
CATCHMENT D
CATCHMENT E
CATCHMENT F
CATCHMENT G
CATCHMENT H
CATCHMENT I
CATCHMENT J
(BERRYS CREEK BRIDGE)
CATCHMENT K
CATCHMENT L
CATCHMENT M*
CATCHMENT N
CATCHMENT O
CATCHMENT P

LEGEND

- BRIDGE STRUCTURE
- CULVERT CROSSING
- EXISITNG CONTOUR (5m INTERVAL)
- CATCHMENT BOUNDARY

ORIGINAL DRAWING IN COLOUR

100mm
SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY
0

No.	Revision	By	Chk	Appd	Date
-	-	-	-	-	-

Original Scale (A3) 1:20000

Design	JL	01.06.18	Approved For Construction* -
Drawn	MC	01.06.18	
Dsg Verifier	-	-	
Dwg Check	-	-	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMUKU

Title: STORMWATER CULVERT CROSSING CATCHMENT PLAN

Status. FOR INFORMATION

Drawing No. SR1003 - 01 - SK - 9004

Rev. A

Document No. P:\341\341\1907-Shared\Auckland-Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\B Pre-implementation\CAD - VE\Sketches\SR1003-01-SK-9004 CATCHMENT AREAS.dwg

DO NOT SCALE

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APPENDIX D

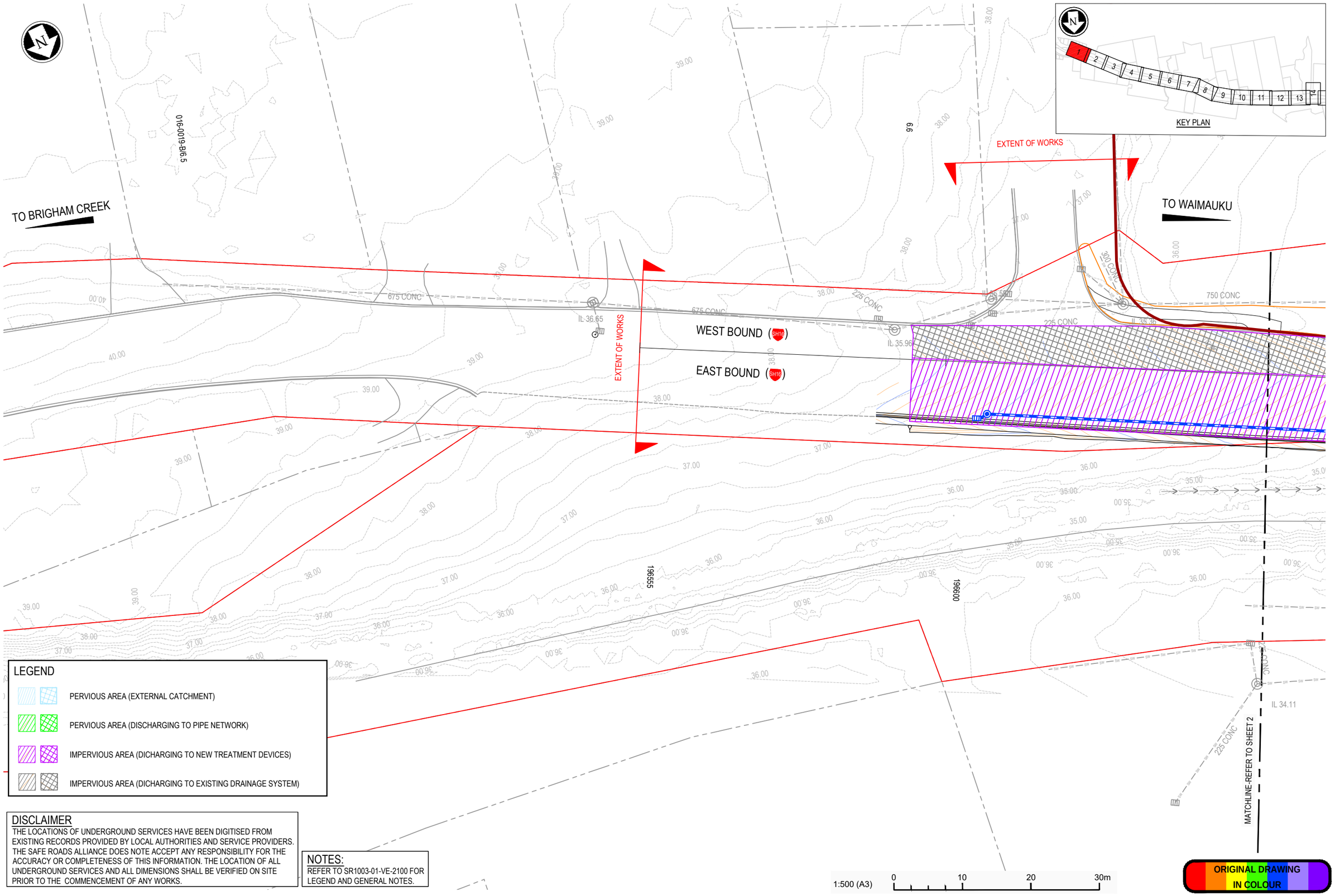
DISCHARGE POINT CATCHMENT PLAN

Drawing Plotted: 14 Jun 2019 11:28 AM

100mm

SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

0



DISCLAIMER

THE LOCATIONS OF UNDERGROUND SERVICES HAVE BEEN DIGITISED FROM EXISTING RECORDS PROVIDED BY LOCAL AUTHORITIES AND SERVICE PROVIDERS. THE SAFE ROADS ALLIANCE DOES NOTE ACCEPT ANY RESPONSIBILITY FOR THE ACCURACY OR COMPLETENESS OF THIS INFORMATION. THE LOCATION OF ALL UNDERGROUND SERVICES AND ALL DIMENSIONS SHALL BE VERIFIED ON SITE PRIOR TO THE COMMENCEMENT OF ANY WORKS.

NOTES:

REFER TO SR1003-01-VE-2100 FOR LEGEND AND GENERAL NOTES.

Original Scale (A3) 1:500				
	Design	JL	25.06.18	Approved For Construction*
	Drawn	AA	16.02.18	-
	Dsg Verifier	RJM	25.06.18	
	Dwg Check	SS	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: CATCHMENT PLAN SHEET 1 OF 23

Document No. P:\341\341\1907-Shared\Auckland-Northland\SH16 - Bingham Creek to Waimauku\00 Drawings\B Pre-implementation\CAD - VE\Sketches\SR1003-01-SK-2101-2124 CATCHMENT PLAN.dwg

DO NOT SCALE

IF IN DOUBT ASK.

100mm

SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

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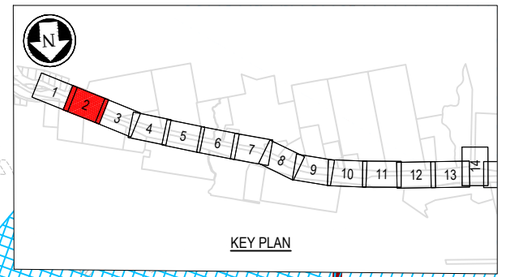

TO BRIGHAM CREEK

TO WAIMAUKU

BATTER 2

BATTER 3

CULVERT CATCHMENT A

DP 1

ROAD 1

ROAD 1A

WEST BOUND (SH16)

EAST BOUND (SH16)

MATCHLINE-REFER TO SHEET 3

750 CONC

300 CONC

525 CONC

450 CONC

225 CONC

IL 33.97

IL 32.2

IL 28.78

IL 28.05

LEGEND

- PERVIOUS AREA (EXTERNAL CATCHMENT)
- PERVIOUS AREA (DISCHARGING TO PIPE NETWORK)
- IMPERVIOUS AREA (DICHARGING TO NEW TREATMENT DEVICES)
- IMPERVIOUS AREA (DICHARGING TO EXISTING DRAINAGE SYSTEM)

DISCLAIMER

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NOTES:

REFER TO SR1003-01-VE-2100 FOR LEGEND AND GENERAL NOTES.

1:500 (A3) 0 10 20 30m

ORIGINAL DRAWING IN COLOUR

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	Drawn	AA	16.02.18	-
	Dsg Verifier	RJM	25.06.18	
	Dwg Check	SS	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: CATCHMENT PLAN SHEET 2 OF 23

DO NOT SCALE

IF IN DOUBT ASK.

Document No. P:\341\31411907.Shared\Auckland-Northland\SH16 - Brigham Creek to Waimauku\000 Drawings\6B Pre-implementation\CAD - VE\Sketches\SR1003-01-SK-2101-2124 CATCHMENT PLAN.dwg

Drawing Plotted: 14 Jun 2019 11:45 AM

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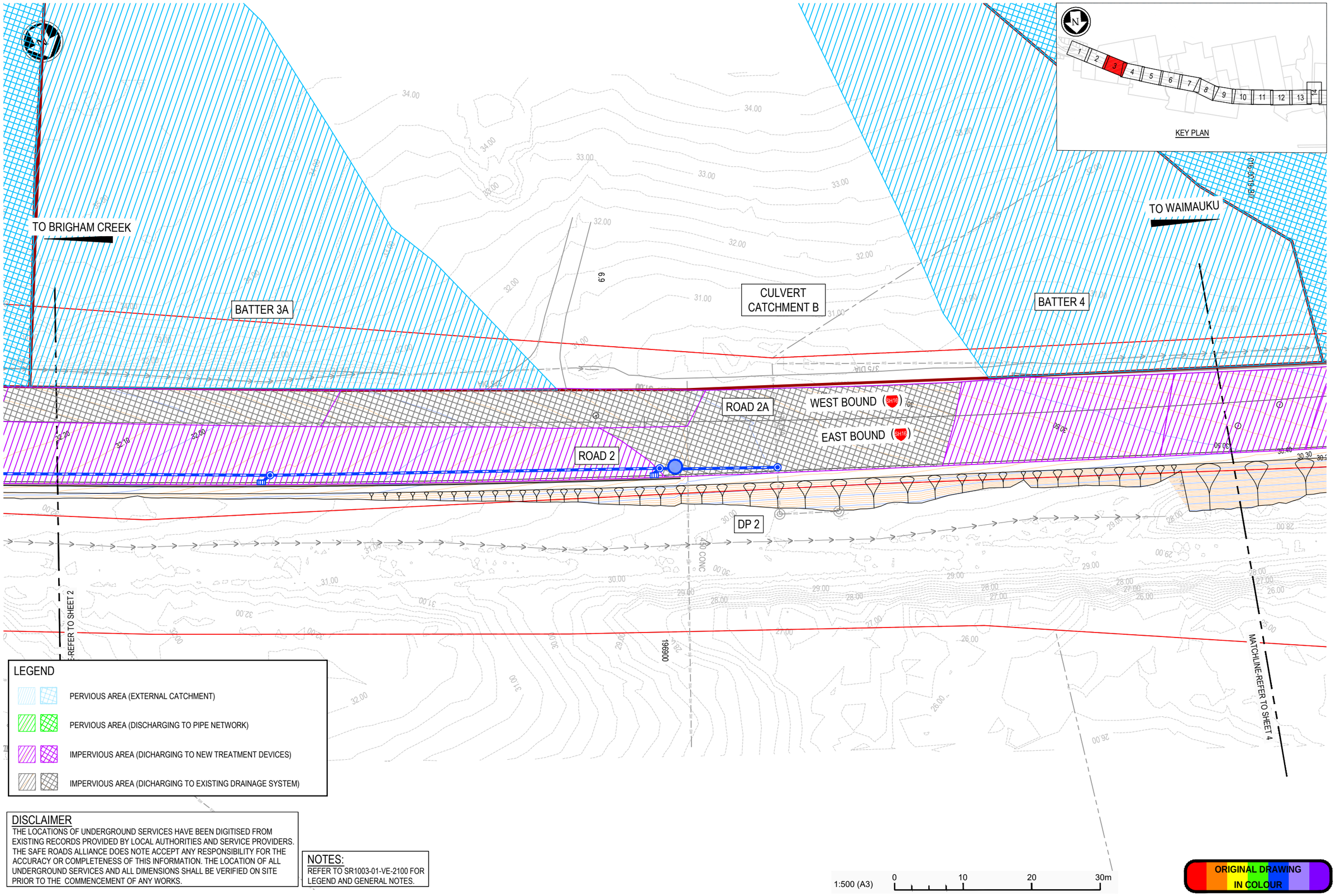
SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY



LEGEND

- PERVIOUS AREA (EXTERNAL CATCHMENT)
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ORIGINAL DRAWING IN COLOUR

Original Scale (A3) 1:500				
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Dsg Verifier	RJM	25.06.18		
Dwg Check	SS	07.06.18	Date	-

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: CATCHMENT PLAN SHEET 3 OF 23

DO NOT SCALE

IF IN DOUBT ASK.

Document No. P:\341\341411907-Shared\Auckland-NorthlandSH16 - Brigham Creek to Waimauku\00 Drawings\B Pre-implementation\CAD - VE\Sketches\SR1003-01-SK-2101-2124 CATCHMENT PLAN.dwg

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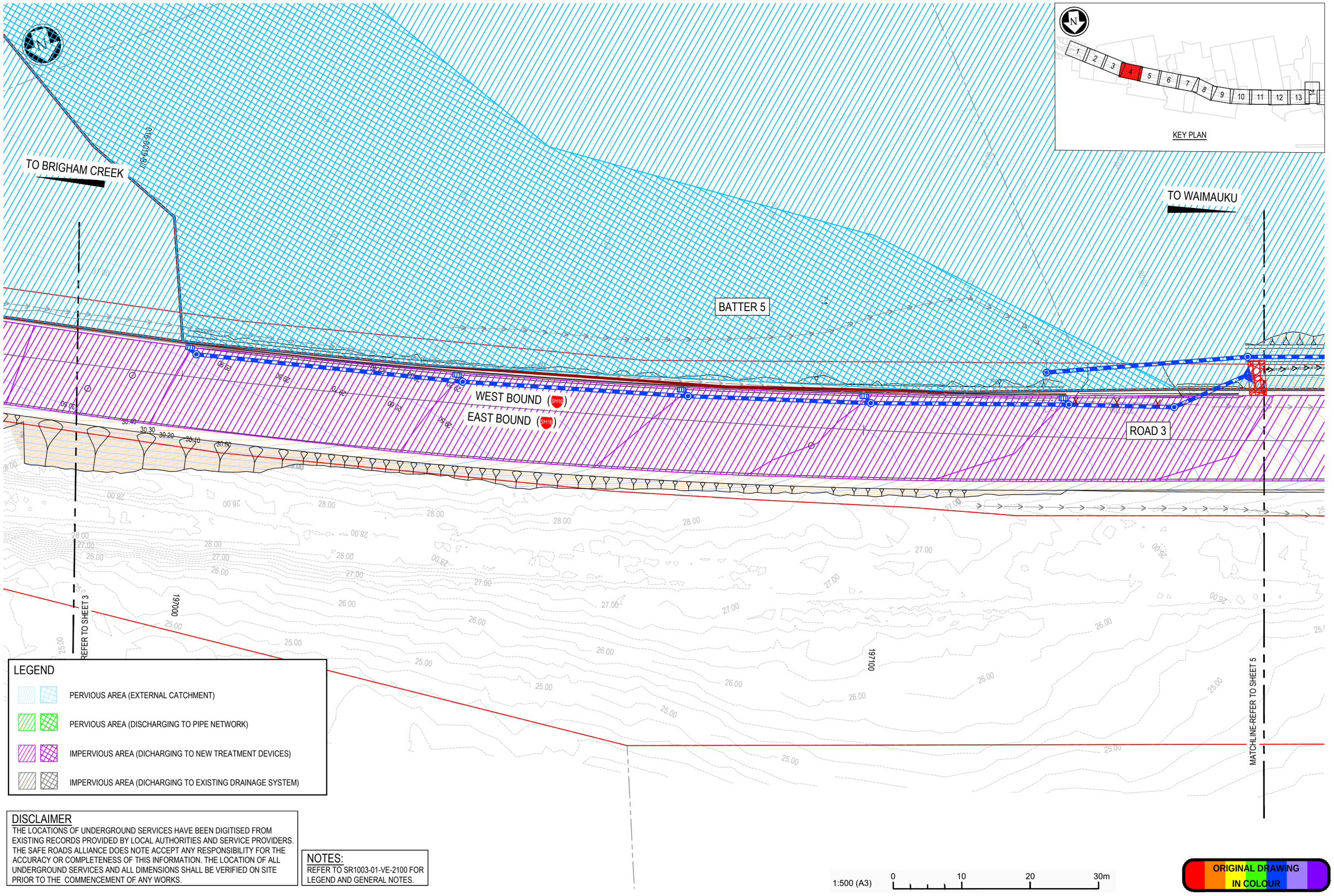

LEGEND

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Dsg Verifier	RJM	25.06.18		
Dwg Check	SS	07.06.18	Date	-

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: CATCHMENT PLAN SHEET 4 OF 23

Document No. P:\341134119\07-Shared\Auckland-Northland\SH16 - Brigham Creek to Waimauku\00 Drawing\8 Pre-implementation\CAD - VE\Sketches\SR1003-01-SK-2101-2124 CATCHMENT PLAN.dwg

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IF IN DOUBT ASK.

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SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

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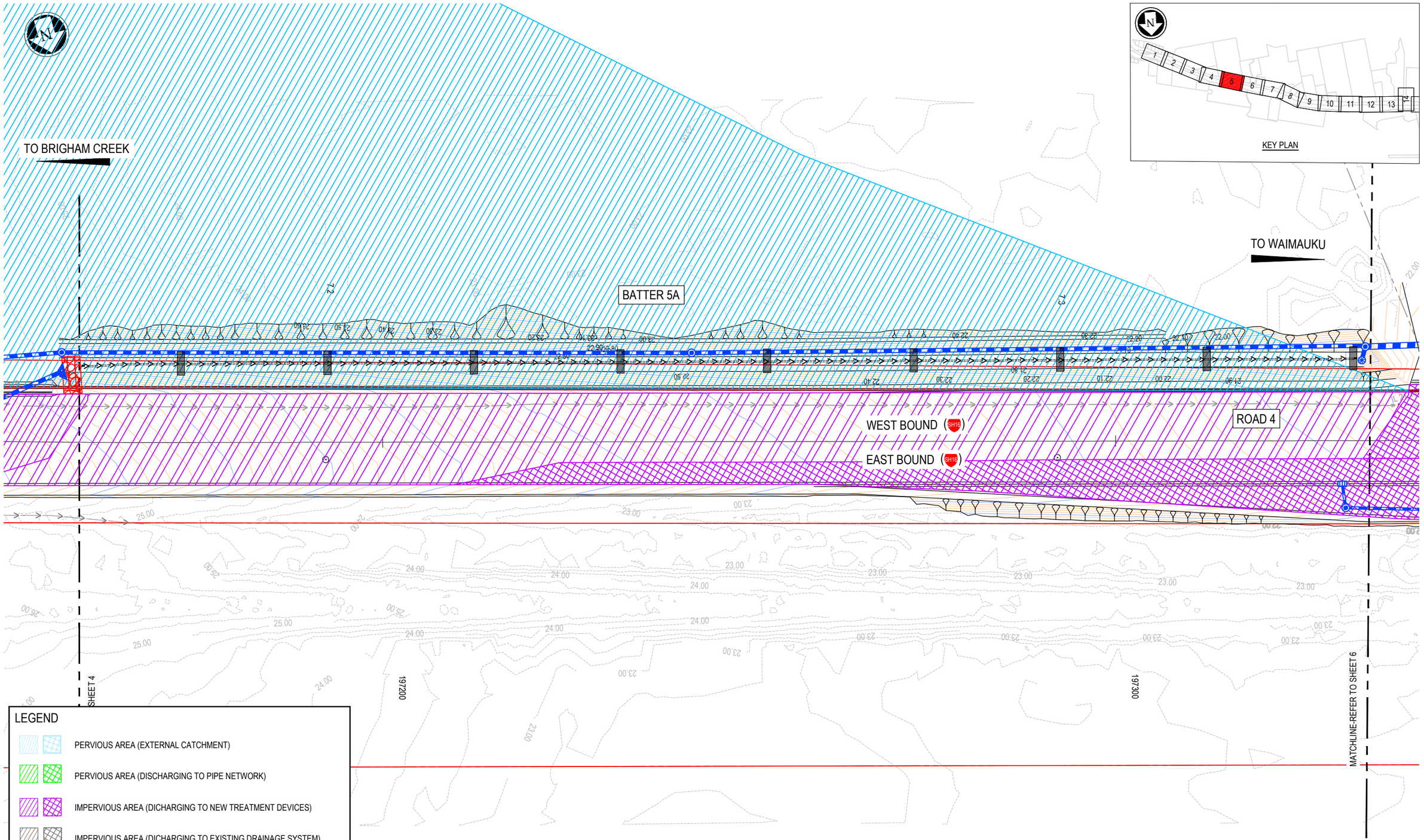

LEGEND

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Dsg Verifier	RJM	25.06.18		
Dwg Check	SS	07.06.18	Date	-

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NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

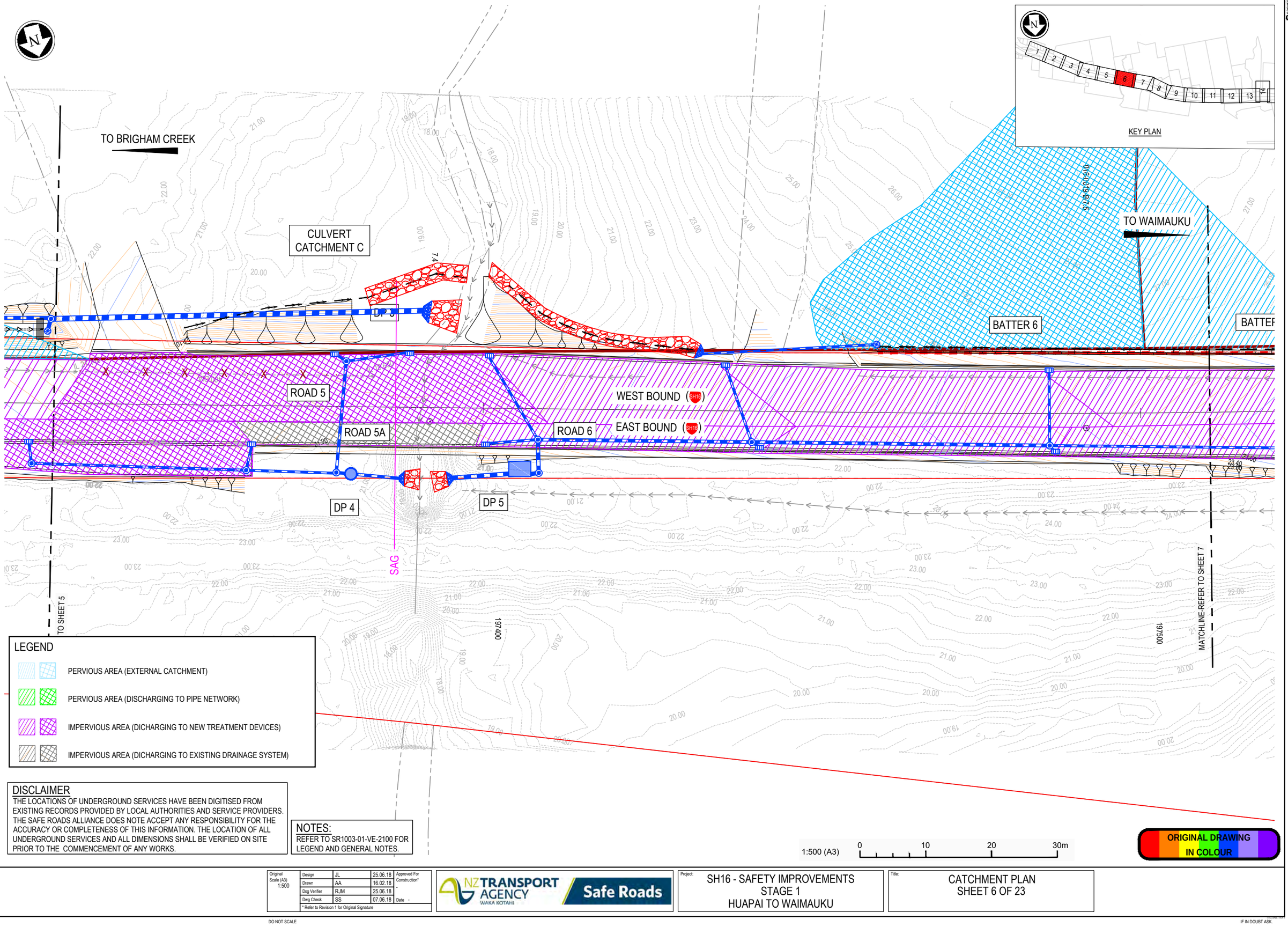
Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: CATCHMENT PLAN SHEET 5 OF 23

DO NOT SCALE

IF IN DOUBT ASK.

Document No. P:\341\3411907-Shared\Auckland-Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\IB Pre-implementation\CAD - VE\Sketches\SR1003-01-SK-2101-2124 CATCHMENT PLAN.dwg



LEGEND

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Dwg Check	SS	07.06.18	Date -	

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NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: CATCHMENT PLAN SHEET 6 OF 23

DO NOT SCALE

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Document No. P:\341\341907-Shared\Auckland-North\land\SH16 - Brigham Creek to Waimauku\00 Drawings\8 Pre-implementation\CAD - VE\Sketches\SR1003-01-SK-2101-2124 CATCHMENT PLAN.dwg

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SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

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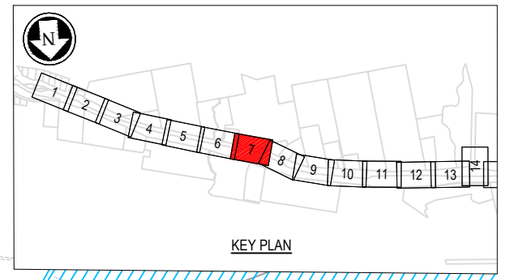

KEY PLAN

TO BRIGHAM CREEK

TO WAIMAUKU

BATTER 6A

BATTER 7A

CULVERT CATCHMENT D

WEST BOUND (SH16)

EAST BOUND (SH16)

MATCHLINE-REFER TO SHEET 6

MATCHLINE-REFER TO SHEET 8

19700

LEGEND

- PERVIOUS AREA (EXTERNAL CATCHMENT)
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	Dwg Check	SS	07.06.18	Date -

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NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: CATCHMENT PLAN SHEET 7 OF 23

DO NOT SCALE

IF IN DOUBT ASK.

Document No. P:\341\13411907.Shared\Auckland-Northland\SH16 - Brigham Creek to Waimauku\000 Drawings\6B Pre-implementation\CAD - VE\Sketches\SR1003-01-SK-2101-2124 CATCHMENT PLAN.dwg

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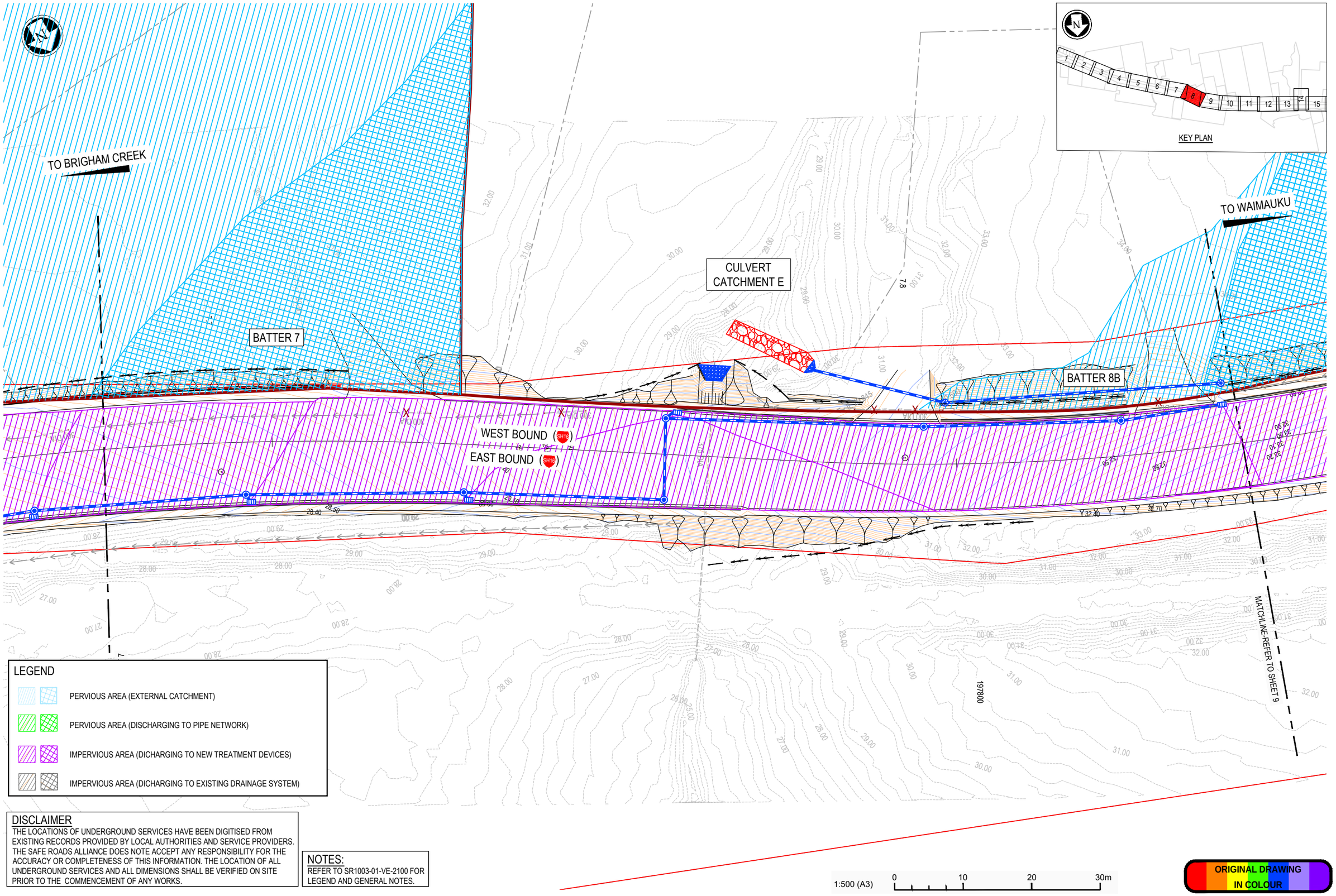

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	Dwg Check	SS	07.06.18	Date -

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NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: CATCHMENT PLAN SHEET 8 OF 23

DO NOT SCALE

IF IN DOUBT ASK.

Document No. P:\341\341907\Shared\Auckland-Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\IB Pre-implementation\CAD - VE\Sketches\SR1003-01-SK-2101-2124 CATCHMENT PLAN.dwg

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SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

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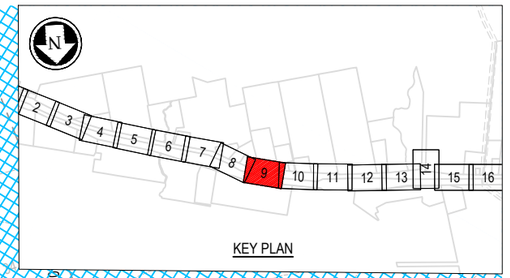

KEY PLAN

TO BRIGHAM CREEK

TO WAIMAUKU

BATTER 8

BATTER 8A

BATTER 9

WEST BOUND (SH16)

EAST BOUND (SH16)

ROAD 7

CREST

198000

197900

MATCHLINE-REFER TO SHEET 10

ER TO SHEET 8

LEGEND

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NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: CATCHMENT PLAN SHEET 9 OF 23

DO NOT SCALE

IF IN DOUBT ASK.

Document No. P:\341341907-Shared\Auckland-Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\B Pre-implementation\CAD - VE\Sketches\SR1003-01-SK-2101-2124 CATCHMENT PLAN.dwg

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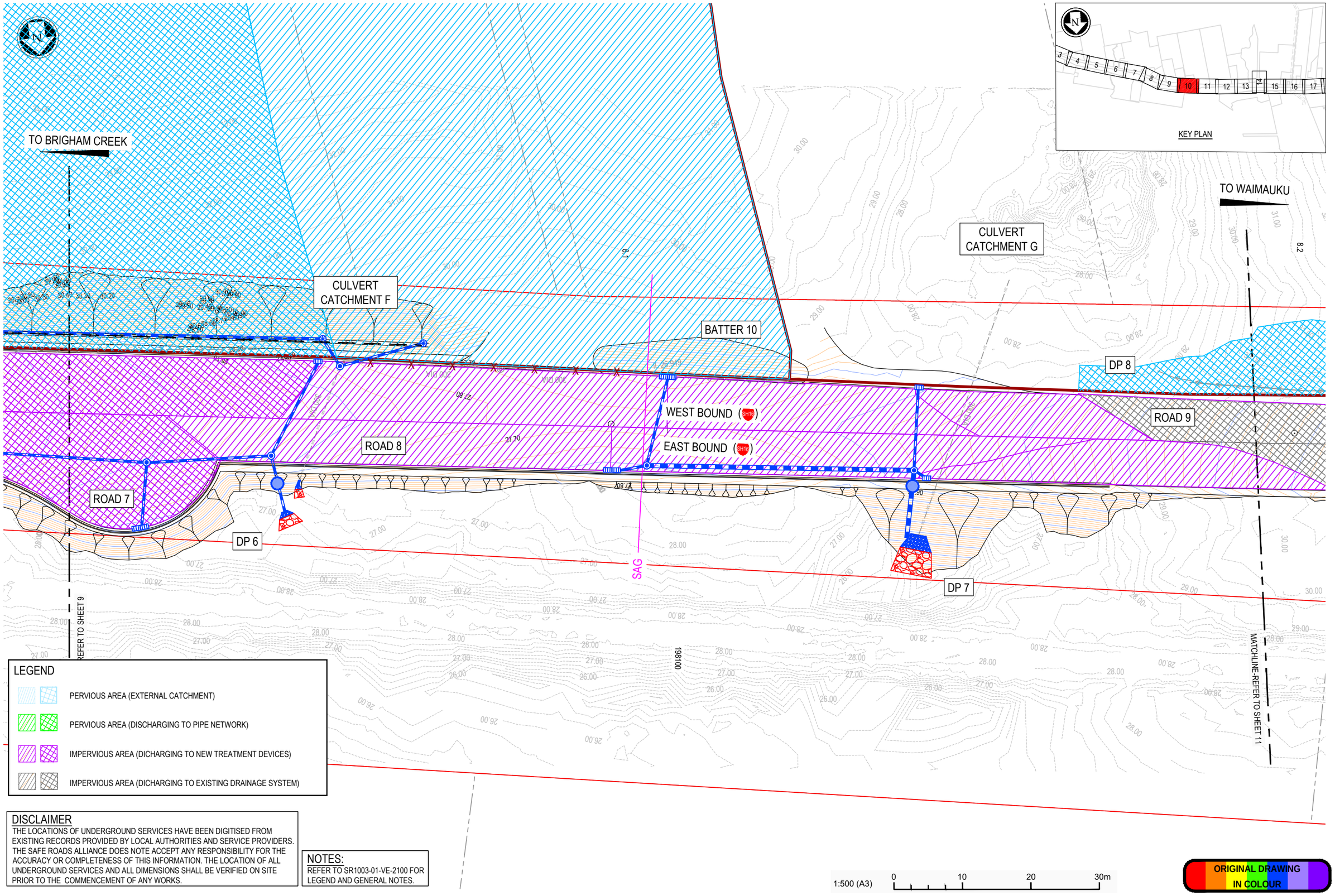

LEGEND

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NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: CATCHMENT PLAN SHEET 10 OF 23

Document No. P:\341341907-Shared\Auckland-Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\B Pre-implementation\CAD - VE\Sketches\SR1003-01-SK-2101-2124 CATCHMENT PLAN.dwg

DO NOT SCALE

IF IN DOUBT ASK.

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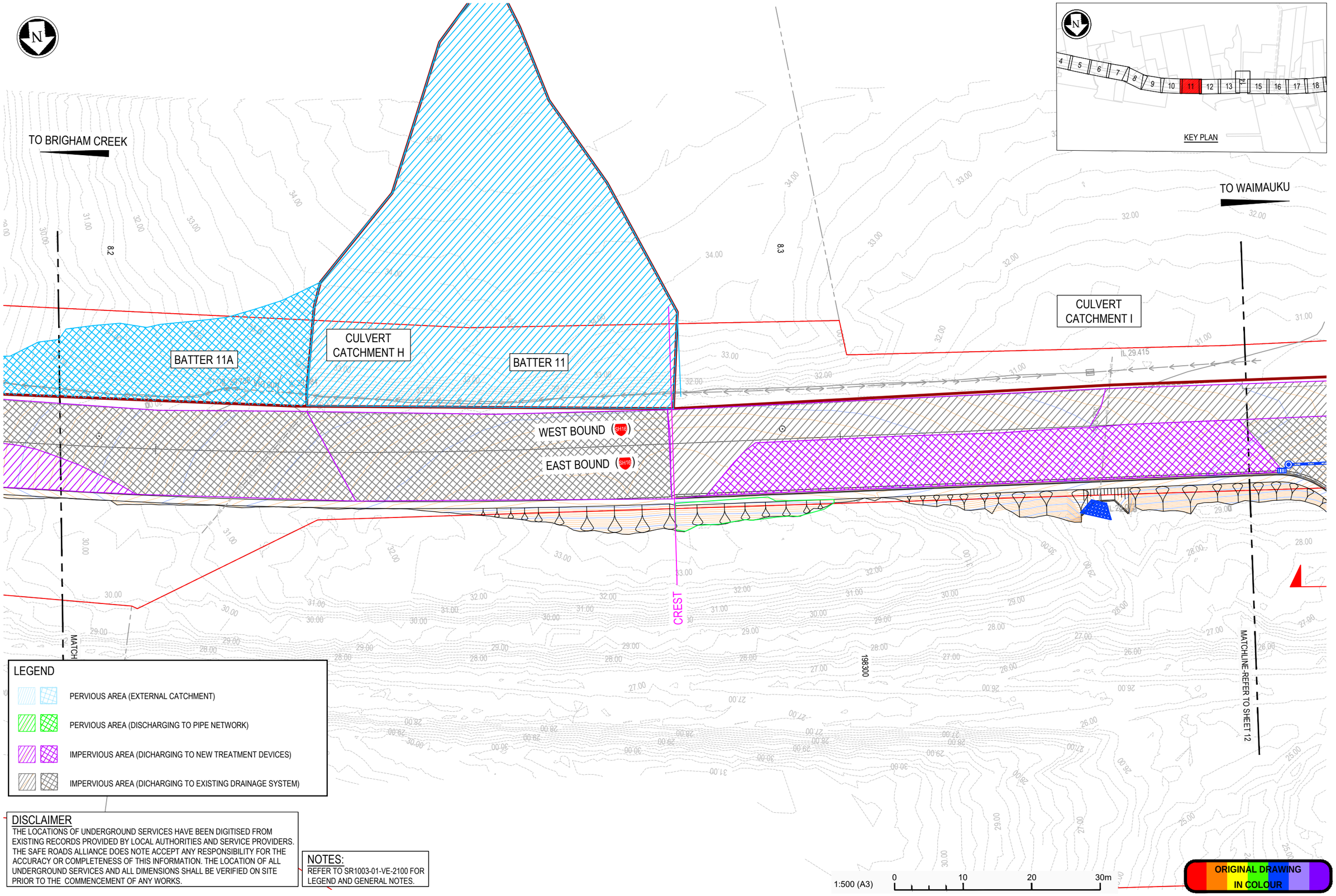

LEGEND

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NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: CATCHMENT PLAN SHEET 11 OF 23

DO NOT SCALE

IF IN DOUBT ASK.

Document No. P:\341\341907\Shared\Auckland-Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\IB Pre-implementation\CAD - VE\Sketches\SR1003-01-SK-2101-2124 CATCHMENT PLAN.dwg

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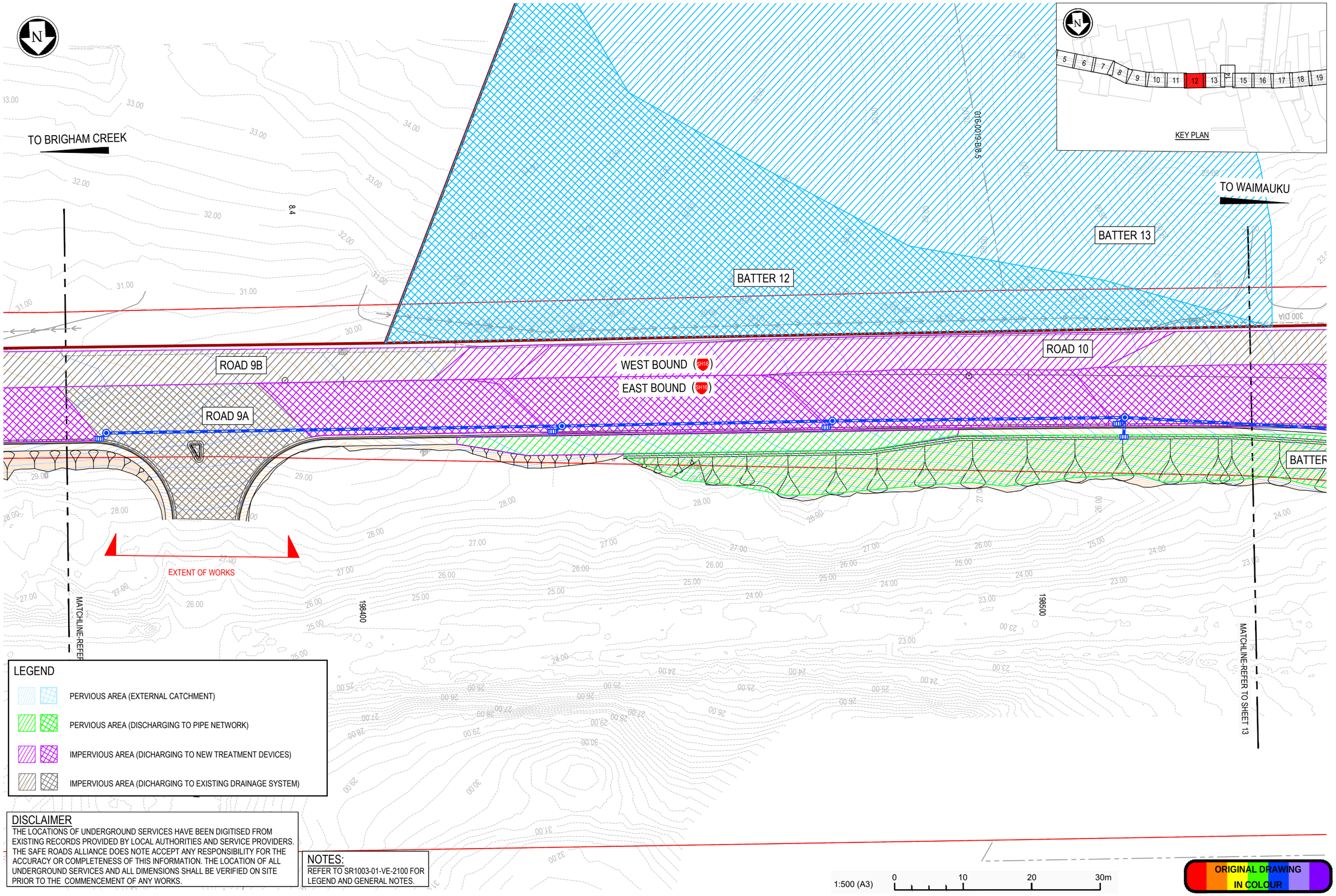

LEGEND

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NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

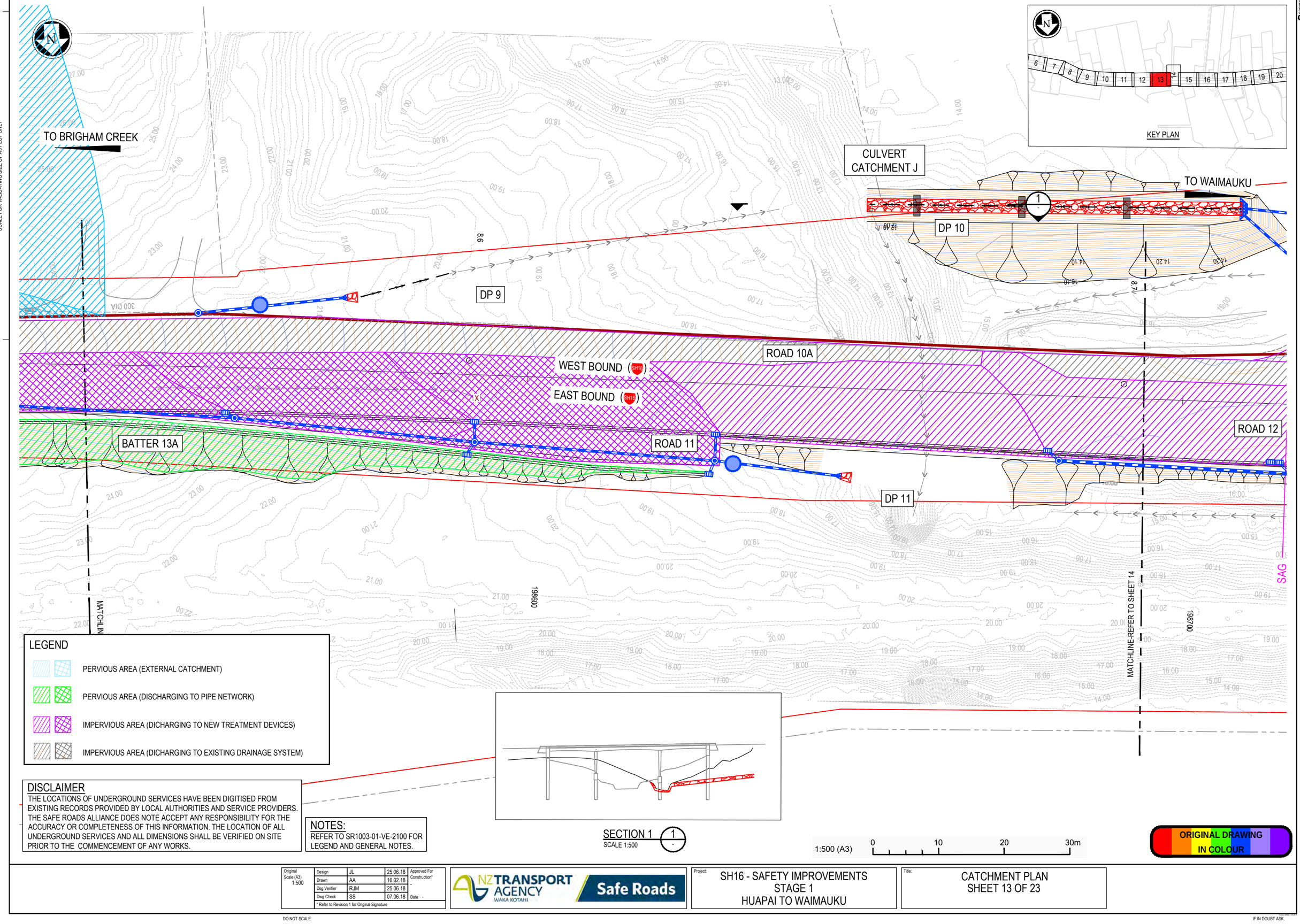
Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: CATCHMENT PLAN SHEET 12 OF 23

DO NOT SCALE

IF IN DOUBT ASK.

Document No. P:\341\341\1907.Shared\Auckland-Northland\SH16 - Brigham Creek to Waimauku\i00 Drawings\8 Pre-implementation\CAD - VE\Sketches\SR1003-01-SK-2101-2124 CATCHMENT PLAN.dwg



LEGEND

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SECTION 1 — 1

SCALE 1:500

1:500 (A3) 0 10 20 30m

ORIGINAL DRAWING IN COLOUR

Original Scale (A3) 1:500				
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Drawn	AA	16.02.18	-	
Dwg Verifier	RJM	25.06.18		
Dwg Check	SS	07.06.18	Date -	

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NZ TRANSPORT AGENCY WAKA KOTAHI — Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: CATCHMENT PLAN SHEET 13 OF 23

DO NOT SCALE

IF IN DOUBT ASK.

Document No. P:\341319411907-Shared\Auckland-Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\B Pre-implementation\CAD - VE\Sketches\SR1003-01-SK-2101-2124 CATCHMENT PLAN.dwg

N

MATCHLINE-REFER TO SHEET 13

TO BRIGHAM CREEK

ROAD 12

SAG

ROAD 12A

ROAD 13

FOSTER RD

EXTENT OF WORKS

EAST BOUND (SH16)

WEST BOUND (SH16)

ROAD 12B

FROSTER

CULVERT
CATCHMENT K

TO WAIMAUKU

MATCHLINE-REFER TO SHEET 15

KEY PLAN

7 8 9 10 11 12 13 14 15 16 17 18 19 20 21

LEGEND

- PERVIOUS AREA (EXTERNAL CATCHMENT)
- PERVIOUS AREA (DISCHARGING TO PIPE NETWORK)
- IMPERVIOUS AREA (DICHARGING TO NEW TREATMENT DEVICES)
- IMPERVIOUS AREA (DICHARGING TO EXISTING DRAINAGE SYSTEM)

DISCLAIMER

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NOTES:

REFER TO SR1003-01-VE-2100 FOR LEGEND AND GENERAL NOTES.

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	Dsg Verifier	RJM	25.06.18	
	Dwg Check	SS	07.06.18	Date -

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Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: CATCHMENT PLAN SHEET 14 OF 23

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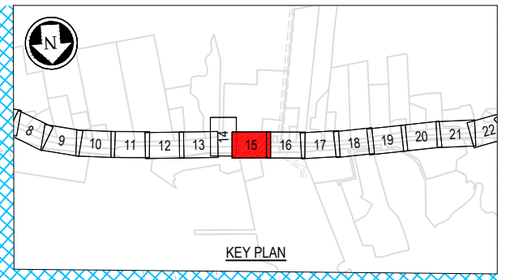
SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY



KEY PLAN

TO BRIGHAM CREEK

TO WAIMAUKU

WEST BOUND (SH16)

EAST BOUND (SH16)

MATCHLINE-REFER TO SHEET 14

MATCHLINE-REFER TO SHEET 16

198800

198900

LEGEND

- PERVIOUS AREA (EXTERNAL CATCHMENT)
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Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: CATCHMENT PLAN SHEET 15 OF 23

DO NOT SCALE

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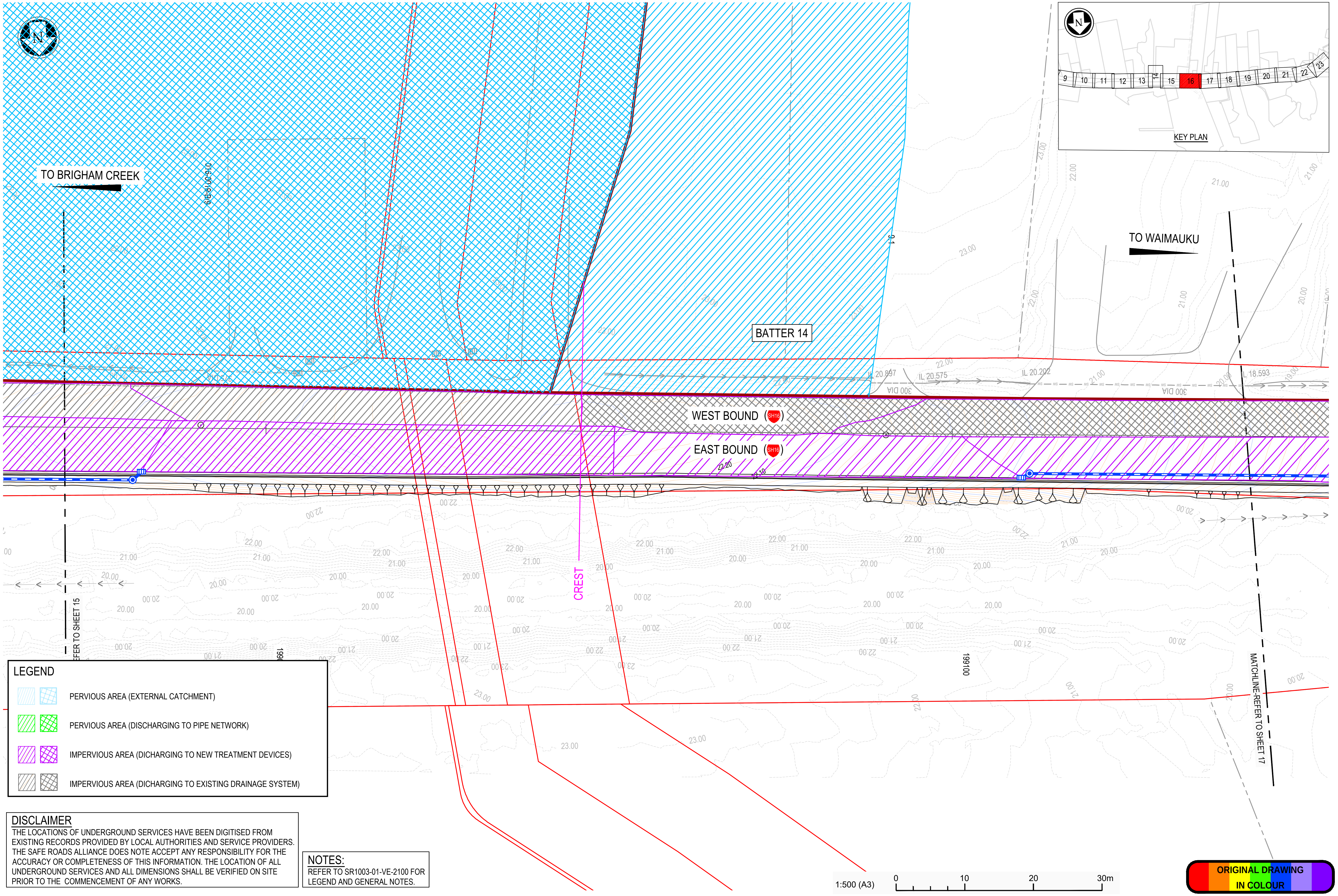

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Dwg Check	SS	07.06.18	Date -

* Refer to Revision 1 for Original Signature

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Title: CATCHMENT PLAN SHEET 16 OF 23

DO NOT SCALE

IF IN DOUBT ASK.

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SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY

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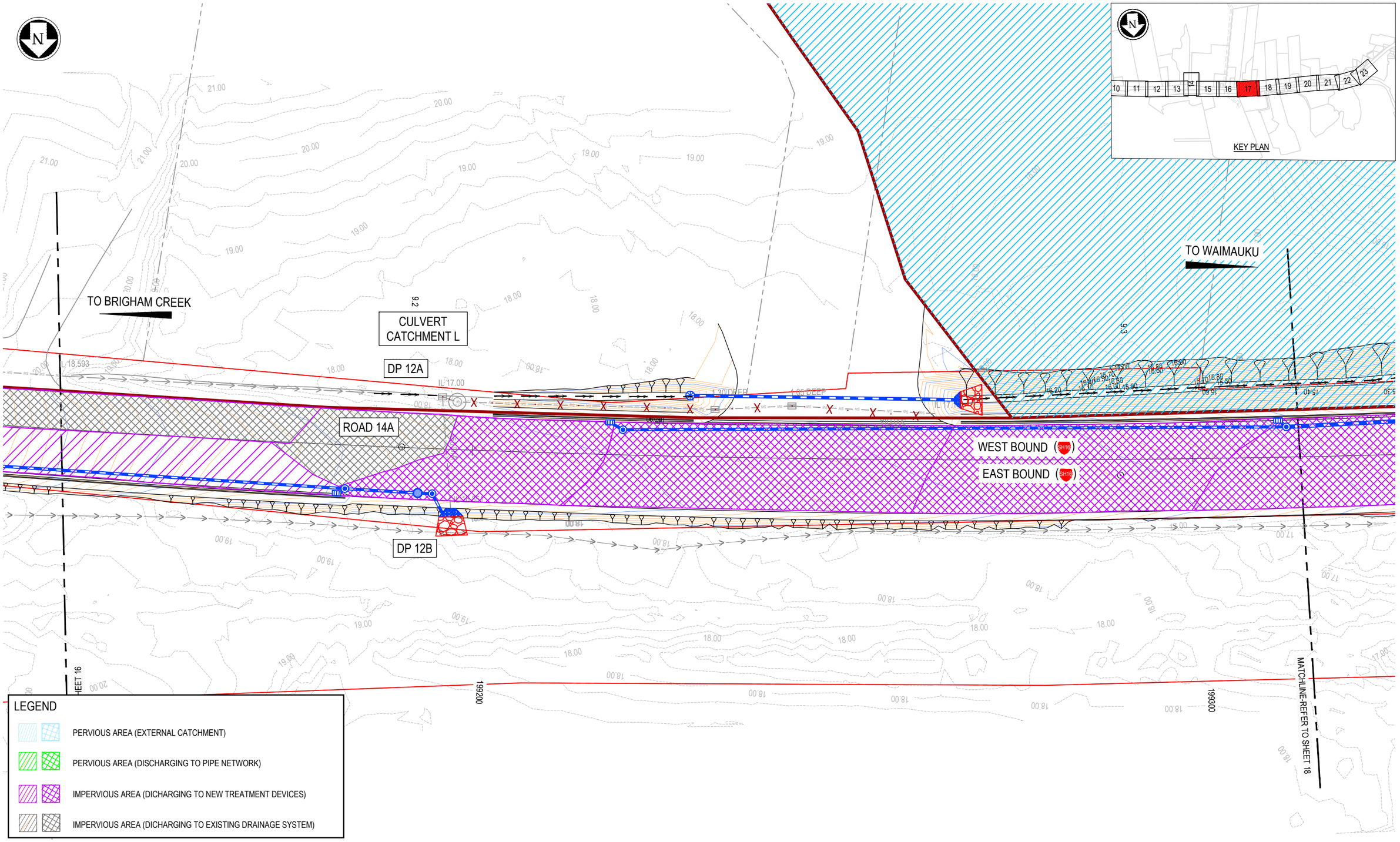

HEET 16

LEGEND

- PERVIOUS AREA (EXTERNAL CATCHMENT)
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Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: CATCHMENT PLAN SHEET 17 OF 23

DO NOT SCALE

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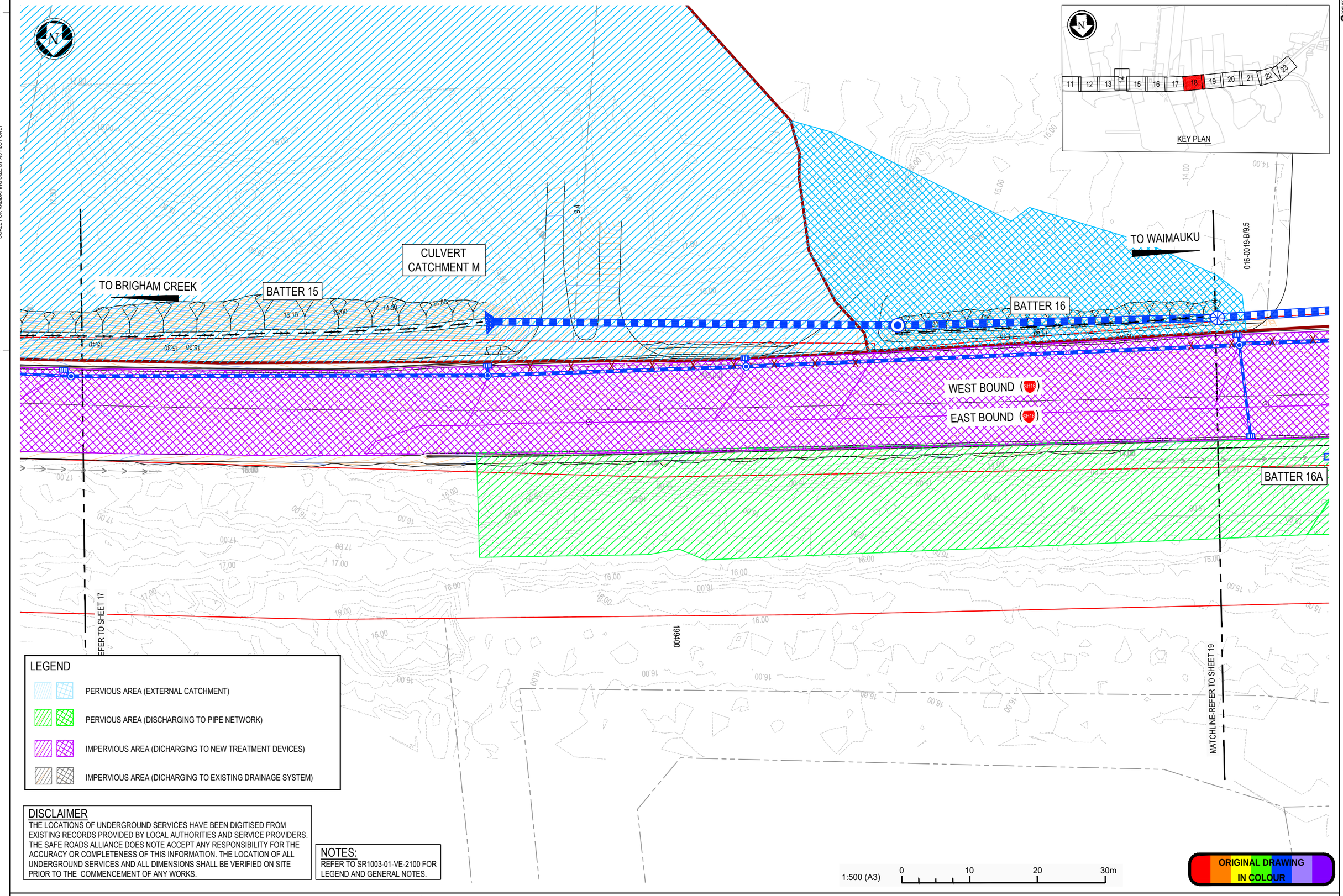

LEGEND

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	Dwg Check	SS	07.06.18	Date -
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NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: CATCHMENT PLAN SHEET 18 OF 23

DO NOT SCALE

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Document No. P:\341\341\1907-Shared\Auckland-Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\8 Pre-implementation\CAD - VE\Sketches\SR1003-01-SK-2101-2124 CATCHMENT PLAN.dwg

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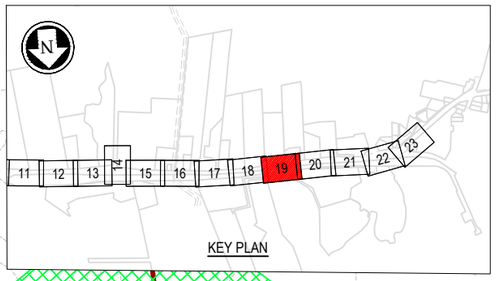

TO BRIGHAM CREEK

016-0019-B/9.5

CULVERT CATCHMENT N

TO WAIMAUKU

BATTER 17

WEST BOUND (SH16)

EAST BOUND (SH16)

ROAD 14

ROAD 15

BATTER 16A

BATTER 16B

DP 12

DP 13

SAG

CENT OF WORKS

450 CONC

225 CONC

225 CONC

JOYCE ADAMS PL

199500

199600

SHEET 18

MATCHLINE-REFFER TO SHEET 20

LEGEND

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Dwg Check	SS	07.06.18	Date	-

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NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: CATCHMENT PLAN SHEET 19 OF 23

DO NOT SCALE

IF IN DOUBT ASK.

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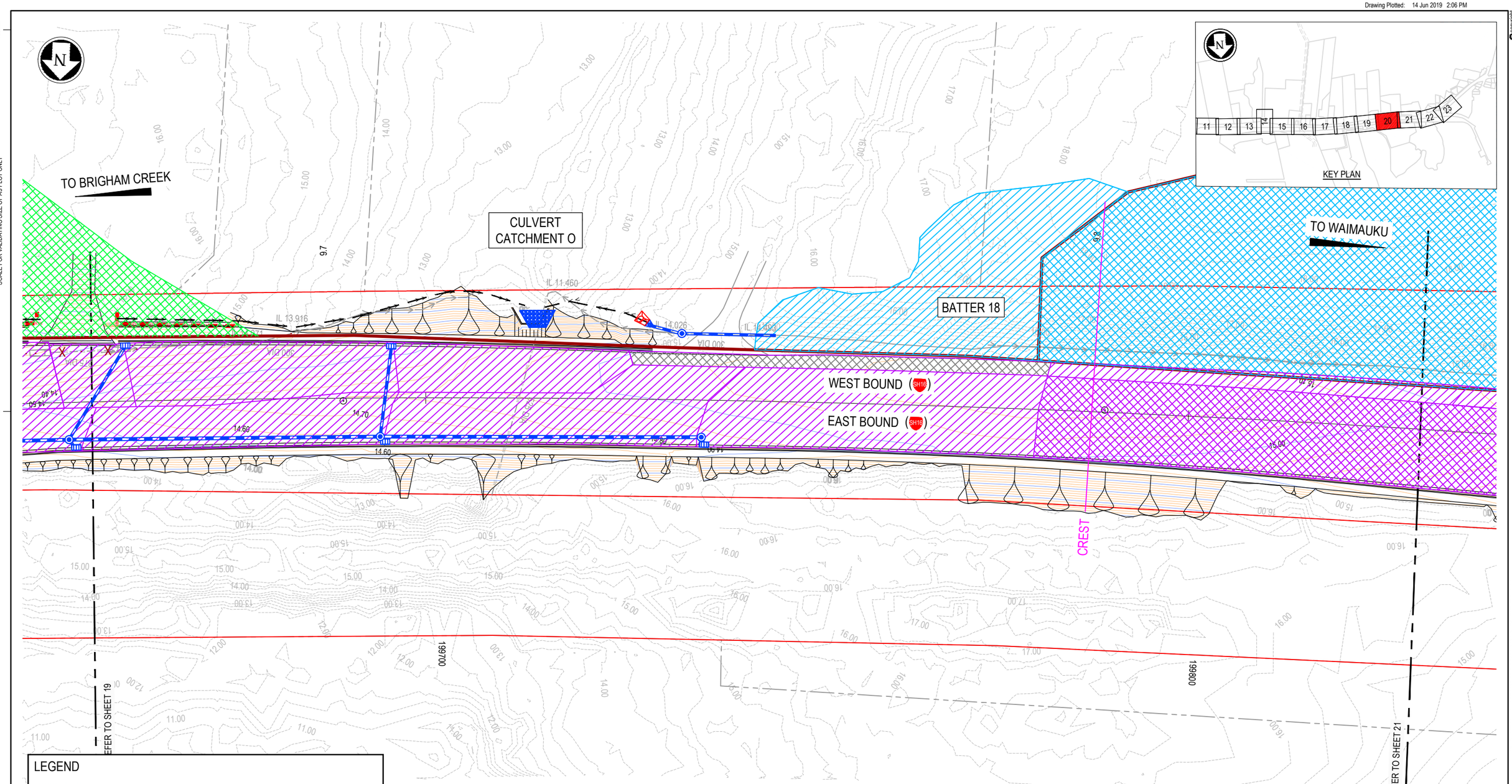

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	Dsg Verifier	RJM	25.06.18	
	Dwg Check	SS	07.06.18	Date -

* Refer to Revision 1 for Original Signature

NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: CATCHMENT PLAN SHEET 20 OF 23

Document No. P:\341\341907-Shared\Auckland-Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\8 Pre-implementation\CAD - VE\Sketches\SR1003-01-SK-2101-2124 CATCHMENT PLAN.dwg

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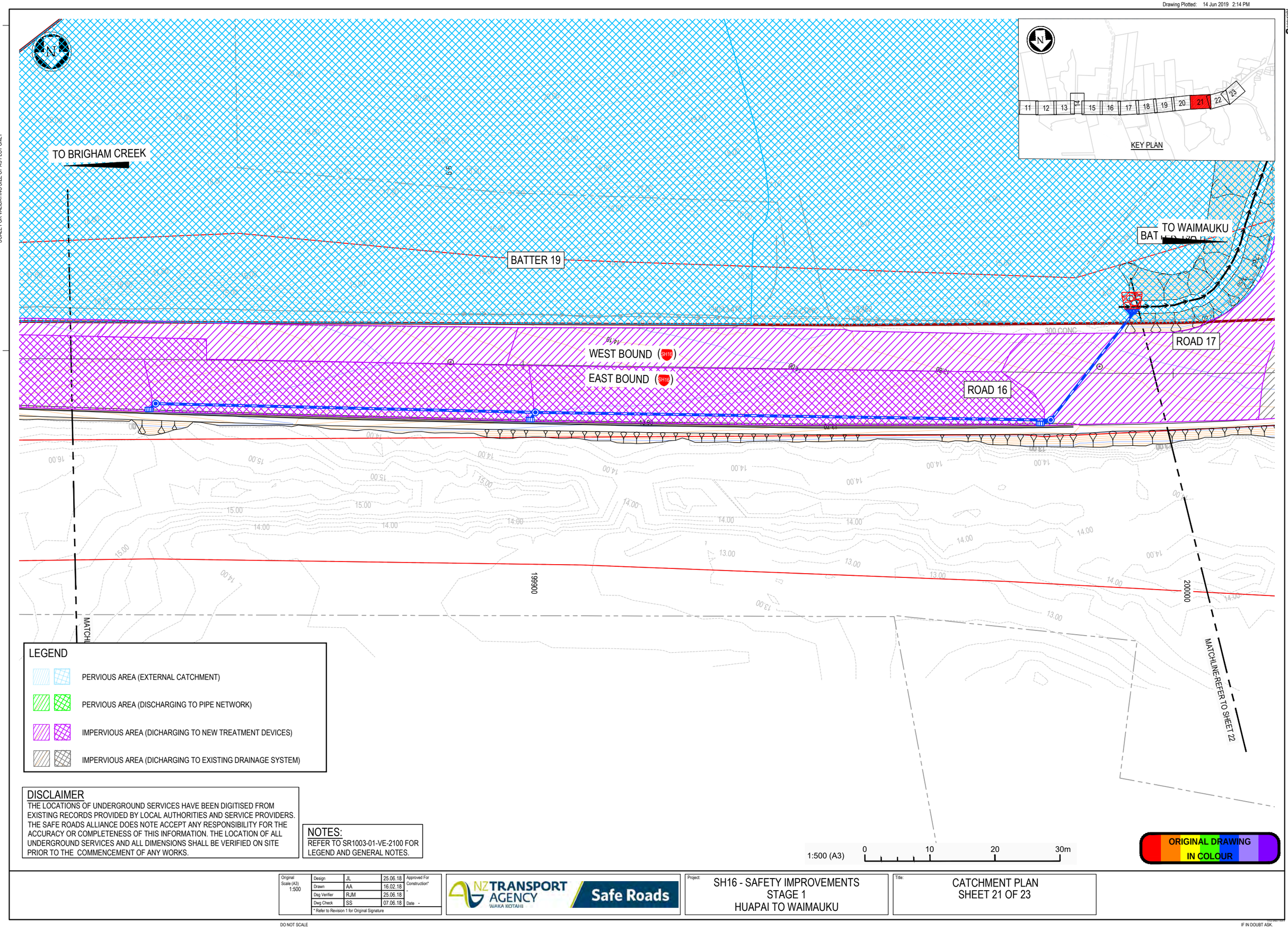

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	Dwg Check	SS	07.06.18	Date -
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NZ TRANSPORT AGENCY WAKA KOTAHI — Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: CATCHMENT PLAN SHEET 21 OF 23

Document No. P:\341341\907-Shared\Auckland-Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\8 Pre-implementation\CAD - VE\Sketches\SR1003-01-SK-2101-2124 CATCHMENT PLAN.dwg

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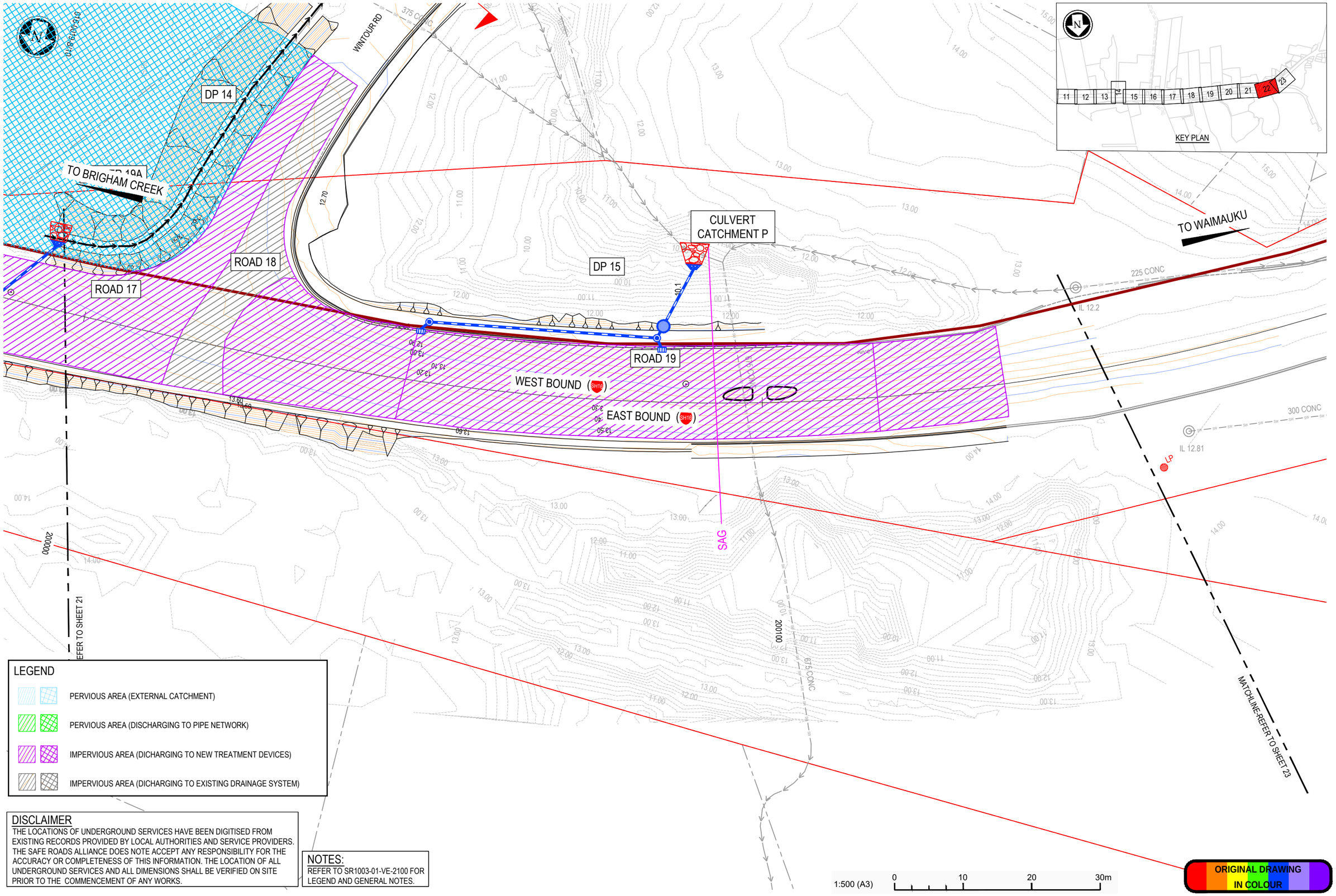

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NZ TRANSPORT AGENCY WAKA KOTAHI | Safe Roads

Project: SH16 - SAFETY IMPROVEMENTS STAGE 1 HUAPAI TO WAIMAUKU

Title: CATCHMENT PLAN SHEET 22 OF 23

DO NOT SCALE

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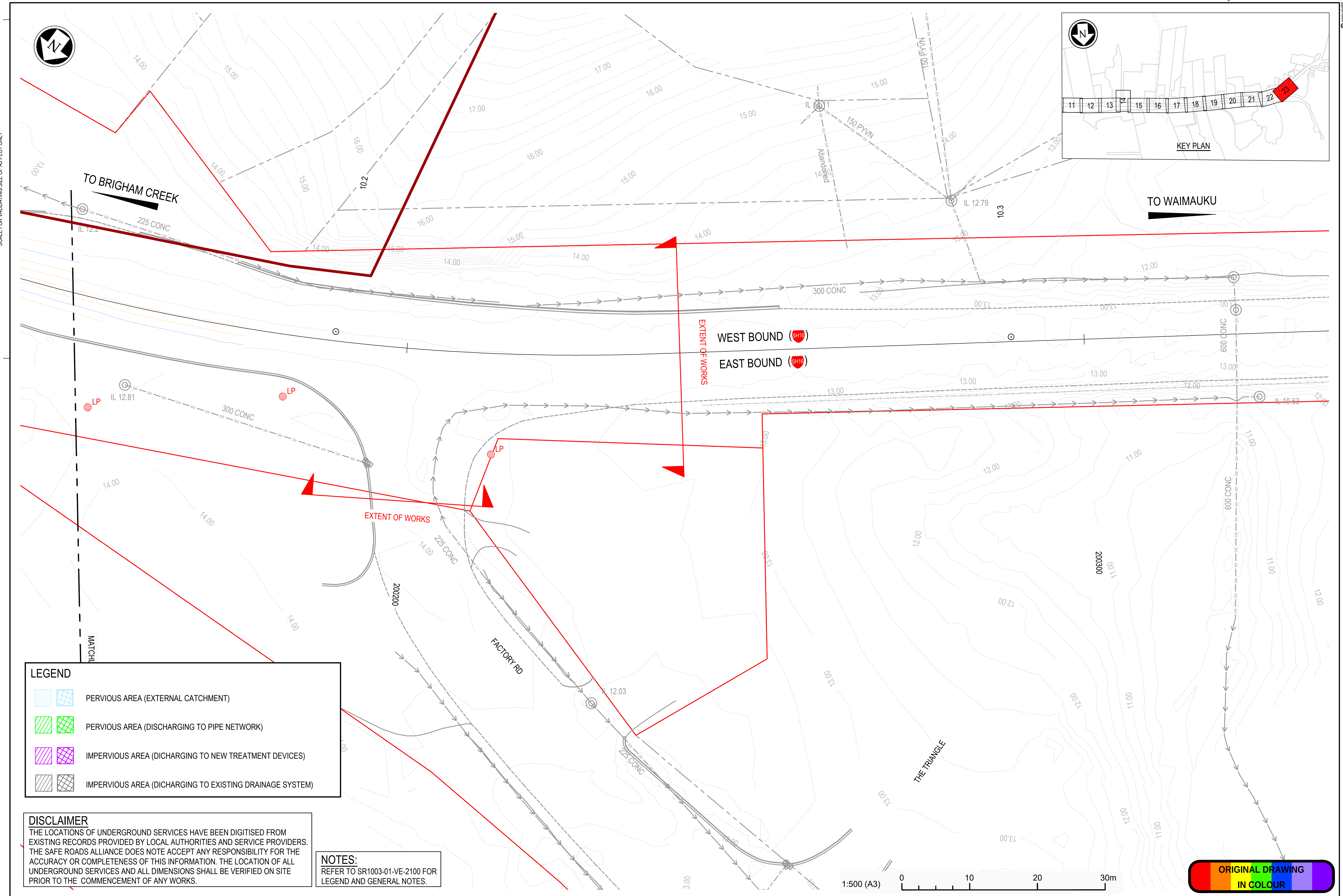

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	Dwg Check	SS	07.06.18

Approved For Construction* -
Date -
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NZ TRANSPORT AGENCY WAKA KOTAHI — Safe Roads

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Title: CATCHMENT PLAN SHEET 23 OF 23

Document No. P:\341\3411907-Shared\Auckland-Northland\SH16 - Brigham Creek to Waimauku\00 Drawings\B Pre-implementation\CAD - VE\Sketches\SR1003-01-SK-2101-2124 CATCHMENT PLAN.dwg

SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY 100mm 0

APPENDIX E

EXISTING CROSS-CULVERT SUMMARY

APPENDIX F

CROSS-CULVERT FLOW SUMMARY

Table E: Existing cross culverts summary (Stage 1)

				EXISTING HYDROLOGY [4]					EXISTING CULVERT CONDITION [5]			EXISTING CAPACITY	
	Catchment Name	Name (Ch)	Zoning [2]	Pervious area (ha) [3]	Impervious area (ha) [3]	Total (ha)	Q10 (m^3/s)	Q100 (m^3/s)	Age (years)	Diameter (m)	Length (m)	Qex (m^3/s) [6]	Comment
Stage 1	A	196750	Urban - Single	2.2	3.6	5.8	1.01	1.85	18	0.525	19.64	0.673	Less than Q10
	B	196910	Future Urban	1.7	0.3	2.1	0.36	0.73	7	0.375	22.1	0.253	Less than Q10
	C	197400 **	Future Urban	353.7	27.2	380.9	22.76	47.31	N/A	N/A	N/A	N/A	Kumeu No2 Bridge
	D	197550	Future Urban	5.5	0.7	6.2	1.07	2.19	N/A	0.700	33.9	1.620	Less than Q100; Culvert based on site observation
	E	197780	Future Urban	7.4	0.7	8.2	1.08	2.23	28	0.375	42	0.537	Less than Q10
	F	198050	Future Urban	1.5	0.4	1.9	0.34	0.68	15	0.300	17.84	0.154	Less than Q10
	G	198140	Rural	12.6	1.1	13.7	1.76	3.65	28	0.300	39.56	0.112	Less than Q10
	H	198220	Rural	0.2	0.1	0.3	0.05	0.10	4	0.300	25.5	0.100	Equal to Q100
	I	198330	Rural	2.4	0.3	2.7	0.47	0.96	15	0.300	21.16	0.226	Less than Q10
	J	198660 **	Rural	1183.6	89.5	1273.1	54.62	113.69	N/A	N/A	N/A	N/A	Berry Creek Bridge
	K	198760	Rural	20.4	1.8	22.3	2.60	5.39	N/A	0.375	12.42	0.772	Less than Q10
	L	199220	Rural	2.4	0.4	2.8	0.50	1.01	18	0.375	16.01	0.304	Less than Q10
	M	199360 *	Rural	6.6	0.7	7.3	0.99	2.03	N/A	N/A	N/A	N/A	No existing culvert
	N	199580	Rural	35.6	2.9	38.5	4.03	8.36	24	1.6 W x 1.8 H	15.1	9.264	Box culvert. Greater than Q100.
	O	199710	Rural	8.1	0.8	8.8	1.08	2.24	24	0.450	24.07	0.767	Less than Q10
	P	200080	1/6 Urban - Single 5/6 Rural	52.8	10.0	62.8	6.28	12.76	24	0.675	35.93	1.673	Less than Q10

Notes:

1. * Existing culvert not found at existing low point; ** Not analysed, included for completeness of catchments; N/A Information not available or applicable.
2. As defined in the Unitary Plan.
3. Pervious and impervious area are based on the existing condition as shown in aerial photograph. A minimal of 7% is assumed for impervious area for catchments lack of defined urban development/impervious area, or identified as green field and rural lots. Road impervious area is included in the impervious area, with area equating to 11m wide multiplied by the length of catchment interception.
4. Peak stormwater runoff is calculated using the SCS method as per the ARC TP108.
5. As per supplied NZTA RAMM data.
6. Existing capacity based on assessment of culverts for the follow scenarios and assumptions, the lesser of the two are recorded in the table:
    a. Outlet controlled – tailwater at outlet is assumed to be at the top of the pipe; headwater level is set at road level.
    b. Inlet controlled – modelled based on orifice follow where $Q=0.65A(2gh)^{1/2}$; h is limited to the road level

Table F: Culvert catchment flow summary (Stage 1)

Stage 1		Existing Areas (ha)			Existing Flow, Q (m^3/s)		Proposed Areas (ha)			Proposed Flow, Q (m^3/s)		Change in imperviousness	Note
Catchment Name	Culvert Location (CH)	Impervious	Pervious	Total	Q10	Q100	Impervious	Pervious	Total	Q10	Q100		
A	196750	3.56	2.20	5.76	1.01	1.85	3.68	2.09	5.76	1.01	1.86	2.01%	
B	196910	0.34	1.74	2.08	0.36	0.73	0.38	1.69	2.08	0.36	0.73	2.18%	
C	197400	27.18	353.75	380.92	22.76	47.31	27.30	353.63	380.92	22.76	47.32	0.03%	Kumeu No 2 Bridge
D	197550	0.67	5.52	6.19	1.07	2.19	0.76	5.44	6.19	1.08	2.20	1.43%	
E	197780	0.75	7.45	8.20	1.08	2.23	0.79	7.41	8.20	1.08	2.23	0.50%	
F	198050	0.35	1.52	1.88	0.34	0.68	0.43	1.45	1.88	0.34	0.68	4.23%	
G	198140	1.06	12.63	13.69	1.76	3.65	1.09	12.60	13.69	1.76	3.65	0.18%	
H	198220	0.07	0.19	0.26	0.05	0.10	0.09	0.18	0.26	0.05	0.10	4.88%	
I	198330	0.33	2.36	2.69	0.47	0.96	0.36	2.33	2.69	0.47	0.96	1.21%	
J	198660	89.46	1183.60	1273.06	54.62	113.69	89.63	1183.43	1273.06	54.62	113.69	0.01%	Berrys Creek Bridge
K	198760	1.85	20.41	22.25	2.60	5.39	1.92	20.34	22.25	2.61	5.40	0.31%	Existing cross culvert under Froster Road
L	199220	0.41	2.42	2.84	0.50	1.01	0.46	2.37	2.84	0.50	1.02	1.79%	
M	199360*	0.67	6.62	7.30	0.99	2.03	0.71	6.59	7.30	0.99	2.04	0.53%	No cross culvert identified currently.
N	199580	2.91	35.63	38.54	4.03	8.36	2.96	35.58	38.54	4.04	8.36	0.13%	Box culvert, 1.6m W x 1.8m H
O	199710	0.76	8.08	8.84	1.08	2.24	0.79	8.05	8.84	1.08	2.24	0.38%	
P	200080	10.00	52.80	62.80	6.28	12.76	10.09	52.71	62.80	6.28	12.77	0.13%	

APPENDIX G

EXISTING HIGHWAY WATERCOURSES

SRA-SH16-STAGE 1
Stormwater - Existing State

Waikoukou Stream

Kaipara River

Kumeu River

Kumeu River

1

2

3

4

Joyce Adams Place Drain

Ahukuramu Stream

Waimauku

Factory Road

Wintour Road Drain

Coopers Creek

Trigg Road

Muriwai Rd