TP108 Assessment – Pre-Development

Part A - Catchment Area and Main Channel

Project:	Parameter	Value	Note
	Total Area (km2)	0.3019	
Ararimu Road Managed Fill - Pre-Development	Impervious Area (km2)	0.006029	
	Pervious Area (km2)	0.295871	
	Channelisation Factor (C)	0.8	0.6 = Piped, 0.8 = Grass Channel
	Catchment Length (km)	0.803	Slope Sheet
	Catchment Slope (Sc)	0.041	Slope Sheet

Part B - Curve Number and Initial Abstraction

Soil Name & Classification	Cover Description	Curve Number (CN)	Area (km2)	Product CN x Area
Class C	Impervious	98	0.006029	1
Cass C	Pervious	74	0.295871	22
Total			0.3019	22
CN (Weighted)	(Total CN x Area)/Total Area			74
Ia (Weighted)	(5 x Pervious Area) / Total Area			4.9

Part C - Time of Concentration

Parameter	Equation	Value
Runoff Factor =	CN / (200-CN)	0.59
Tc (Hrs) =	0.14 x C X L ^ 0.66 x (CN/(200-CN)) ^ -0.55 x Sc ^ -0.3	0.34
SCS Lag "Tp" (Hrs) =	2/3 x Tc	0.22

Part E - Storage

Parameter	Equation	Value
Catchment Area (km2)	-	0.3019
Storage (S)	25.4 x [(1000/CN-10)]	87.03

Part D - Runoff Volumes and Peak Discharge

Description	Equation	Value	Value	Value	Unit
ARI	-	10-Year	2-Year	95%ile	
24 hr Rainfall Depth	P_{24}	119	76.6	35	mm
C*	(P24 - Ia) / (P24 - 2Ia + 2S)	0.403	0.298	0.151	mm
Specific Flow Rate	q* (from Fig 5.1)	0.086	0.0667	0.035	m3/s/km2 mm
Peak Flow Rate (Qp)	q* x A x P24	3.09	1.54	0.37	m3/s
Runoff Depth (Q24)	(P24 - IA)^2 / (P24-Ia)+S	64.73	32.39	7.73	mm
Runoff Volume (V24)	1000 * Q24 * A	19,541	9,778	2,335	m3

TP108 Assessment – Post-Development

Part A - Catchment Area and Main Channel

Project:	Parameter	Value	Note
Arararimu Road Managed Fill - Post-Development	Total Area (km2)	0.3019	
	Impervious Area (km2)	0.006029	
	Pervious Area (km2)	1.52622	
	Channelisation Factor (C)	0.8	0.6 = Piped, 0.8 = Grass Channel
	Catchment Length (km)	0.803	Slope Sheet
	Catchment Slope (Sc)	0.05	Slope Sheet

Part B - Curve Number and Initial Abstraction

Soil Name & Classification	Cover Description	Curve Number (CN)	Area (km2)	Product CN x Area
Class C	Impervious	98	0.006029	1
Cass C	Pervious	74	0.199441	15
Class C	Pervious	80	0.09643	8
Total			0.3019	23
CN (Weighted)	(Total CN x Area)/Total Area			76
Ia (Weighted)	(5 x Pervious Area) / Total Area			4.9

Part C - Time of Concentration

Parameter	Equation	Value
Runoff Factor =	CN / (200-CN)	0.62
Tc (Hrs) =	0.14 x C X L ^ 0.66 x (CN/(200-CN)) ^ -0.55 x Sc ^ -0.3	0.31
SCS Lag "Tp" (Hrs) =	2/3 x Tc	0.21

Part E - Storage

Parameter	Equation	Value
Catchment Area (km2)	-	0.3019
Storage (S)	25.4 x [(1000/CN-10)]	78.48

Part D - Runoff Volumes and Peak Discharge

Description	Equation	Value	Value	Value	Unit
ARI	-	10-Year	2-Year	95%ile	
24 hr Rainfall Depth	P_{24}	119	76.6	35	mm
C*	(P24 - Ia) / (P24 - 2Ia + 2S)	0.429	0.320	0.165	mm
Specific Flow Rate	q* (from Fig 5.1)	0.091	0.072	0.039	m3/s/km2 mm
Peak Flow Rate (Qp)	q* x A x P24	3.27	1.67	0.41	m3/s
Runoff Depth (Q24)	(P24 - IA)^2 / (P24-Ia)+S	67.60	34.23	8.34	mm
Runoff Volume (V24)	1000 * Q24 * A	20,409	10,335	2,519	m3

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BUN60425181

Development of 1618 Ararimu Road, Papakura, s92 Response 14/04/2025

This information has been prepared in response to the section 92 request for 1618 Ararimu Road, Papakura dated 14/04/2025.

Culvert 1
Culvert SWL-1-1 with upstream IL=123.13m, public road minimum level of Rl129.00m :
In a 10yr AEP rain event for a flow of 8.20m3/s, the maximum water level will be RL=125.01m which is higher by 0.88m than the soffit level which is RL124.13m.
In a 2.1 degrees 100yr AEP rain event for a flow of 14.88m3/s the maximum water level will be RL=127.82m and the outlet velocity will be 4.96m/s. The water depth above the inlet will be higher than the recommended 3.0m value by 1.69m. The outlet velocity is higher by 0.96m/s than the recommended value of 4m/s. The minimum freeboard will be provided
In a 3.8 degrees 100yr AEP rain event for a flow of 17.80m3/s the maximum water level will be RL=129.63m and the outlet velocity will be 5.93m/s. The water depth above the inlet will be higher than the recommended 3.0m value by 3.5m. The outlet velocity is higher by 1.93m/s than the recommended value of 4m/s. The public road will be overtopped.
HW view is that this culvert is undersized and to be re-designed to comply with SWCOP.

Healthy Waters advise that Culvert 1 is undersized. The culvert should be re-designed to comply with the current SWCOP (Stormwater Code of Practise) to ensure that adverse flooding effects . This is to ensure that adverse flooding effects.

The information in relation to the water levels seems to be incorrect. The flood assessment with drawing series 55000(plans) and 55500(sections) show a maximum water level of 125.65m in a 3.8 degrees 100yr AEP rain event, similar to what is shown on Auckland GIS. The public road minimum level is at the RL 129m, 3.35m above the maximum water level In a 3.8 degrees 100yr AEP rain event.
Please, provide the model with the information which was used to formulate the above question.
The proposed private culvert is sized to allow the 100-year event to overflow the private accessway and do not significantly affect water levels on downstream properties.
A larger culvert will increase the water flow and ultimately flood levels on the downstream properties.

Please do not hesitate to contact us if you have any questions on this s92 Response,

Written By:

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Limitations

- This assessment contains the professional opinion of Civix Limited Staff relating to this development. Civix Limited Staff used their professional judgement and acted in accordance with the standards of care and skill normally exercised by professional engineers providing similar services in similar circumstances. No other express or implied warranty is made as to the professional advice contained in this report.
- We have prepared this assessment in accordance with the brief provided and following our terms of engagement. The information contained in this assessment has been prepared by Civix Limited for the client and is exclusively for its client use and reliance. It is not possible to make an assessment of this work without understanding the terms of engagement under which it has been prepared, including the scope of the instructions and directions given to and the assumptions made by Civix Limited. The assessment will not address issues which would need to be considered for another party if that parties' particular circumstances, requirements and experience were known and, further, may make assumptions about matters of which a third party is not aware. No responsibility or liability to any third party is accepted for any loss or damage arising out of the use of or reliance on this assessment by any third party.
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Methodology for the installation of the permanent culverts at 1618 Ararimu Road, Papakura.

The methodology referenced below can be found in "GD05 Erosion and Sediment Control – Section G4.2.3 - Pg158.

Although a dam and pump method were considered for the installation of this culvert at Ararimu Road, it was not chosen for the reasons listed below.

- Unreliable nature of gasoline pumps, if left unattended overnight.
- Noise pollution of gasoline pump over extended periods of time, particularly overnight.
- The extent of the diversion needed to accommodate the culvert would require a considerable pumping distance.
- The possible requirement for fish passage.

A temporary waterway diversion has therefore been chosen for the installation of the permanent culvert at the chosen site.

Temporary waterway diversions enable in-stream works to be undertaken without working in wet conditions and without moving sediment into the watercourse. They can also allow any works to be undertaken within permanent, intermittent, and ephemeral watercourses.

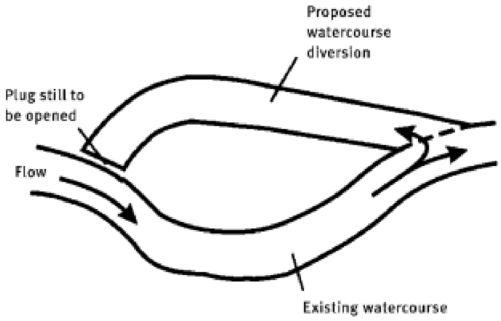
Methodology.

1. The diversion channel should be excavated leaving a plug/dam at each end so that the watercourse does not breach the diversion. The size of the diversion channel should allow enough room for easy installation for both the entry and exit wingwalls of the proposed culvert. Along with the stabilised area specified (riprap).
2. Size the diversion channel to allow for a 5% AEP rain event but consider the implications for secondary flow paths and upstream flood effects of having a larger event, up to 1% AEP.
3. The diversion channel should be appropriately stabilised to ensure it does not become a source of sediment. Suitable geotextile cloth, preferably woven, should be anchored in place to the manufacturer's specifications, which will include trenching into the top of both sides of the diversion channel to ensure that the fabric does not rip out. The appropriate Geotextile can be determined from section E3.5 of GD05.
4. Once the channel is stabilised, open the downstream plug to allow water to flow up the channel, keeping some water within the channel to reduce problems when the upstream plug is excavated. Then open the upstream plug, allowing water to flow into the channel.
5. A non-erodible dam should be placed immediately in the upstream end of the existing channel.
6. Where a compacted earth bund is used, it must be stabilised with an appropriate geotextile pinned over the upper face and adjacent to the lower face for scour protection. In most cases, sandbag dams can be used to construct the dam.
7. A non-erodible downstream dam should then be installed to prevent backflow into the construction area. The existing watercourse is subsequently drained by pumping to a sediment retention pond, where the ponded water can be treated before it re-enters the live section of the watercourse. The structure and all channel works are then completed.
8. The appropriate ESC methods should be in place to ensure no contaminants form the proposed works enter the river at any point during construction.

Methodology for the installation of the permanent culverts at 1618 Ararimu Road, Papakura.

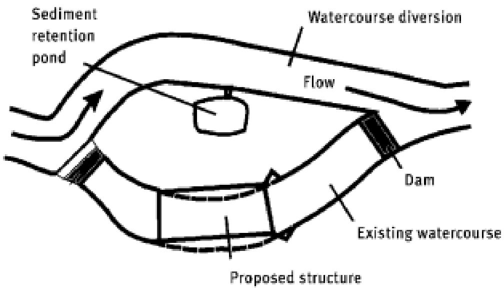
9. The downstream dam should be removed first, allowing water to flood back into the original channel. The upstream dam is then removed, and both ends of the diversion channel are filled in with non-erodible material. Any sediment-laden water should be pumped to a sediment retention pond or dewatered. The remainder of the diversion channel should be filled in and stabilised.

A four-step diagram can be seen below as mentioned in Section G.4.2.3. – GD05 pg159.



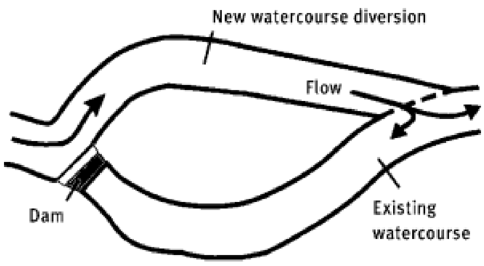
1.

Figure 119: Diversion channel prior to plug removal



2.

Figure 120: Dewatering construction area into a sediment pond



3.

Figure 121: Opening bypass channel and closing off existing one.

Methodology for the installation of the permanent culverts at 1618 Ararimu Road, Papakura.

4.

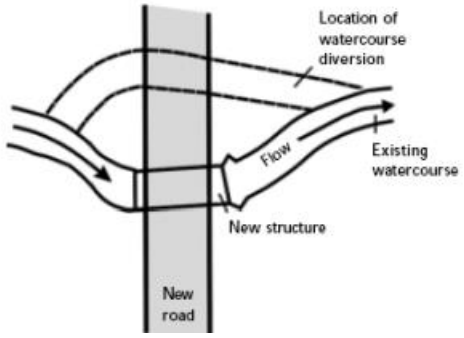


Figure 122: Re-establishment of flow in original channel.

Maintenance.

Continued and detailed maintenance is required to minimise sediment generation within the diversion. The following signs should be noted and remedied immediately to ensure the correct operation of the diversion;

• The geotextile lining ripping.

• Scour occurring where the flow re-enters the channel.

• Undercutting of the diversion lining.

Fish Passage:

To ensure minimum disruption to fish passage within the river the proposed diversion should be 85% of size of channel crossing as per GD05 – G.4.2.1 - pg156.

Careful consideration to the levels throughout the diversion is required to ensure that the proposed diversion does not create a barrier to fish passage. TP131 – 3.3 – pg11.

Possible barriers to fish passage include.

Height:

- Any in-stream configuration, whether natural or artificial can become an insurmountable obstacle for fish if it causes a sudden change in the water surface or bed level. In the case of an artificial structure, this situation may occur at installation or develop as a result of subsequent erosion.

Water velocity and turbulence:

- Steepness, constricted flows, and low bed roughness may lead to water velocities that exceed the swimming capability of fish and so prevent upstream passage. In addition, uniform conditions of gradient, roughness, and depth can lead to an absence of low velocity zones where fish can rest and recover after swimming to exhaustion. Until recently, the expectation has been that building additional roughness into a channel would improve fish passage. Thus, the use of corrugated pipe or the inclusion of baffles and weirs has often been recommended to improve fish passage through culverts.

Methodology for the installation of the permanent culverts at 1618 Ararimu Road, Papakura.

Water depth:

- Insufficient water depth in channels and culverts often causes passage problems for the larger swimming species. Aprons at the outlets of culverts can present barriers during periods of low flows. In New Zealand, many upstream migrating fish species are small, can spend a considerable amount of time out of water, and have good climbing ability. Therefore, shallow depth is not necessarily a problem and could even be exploited as a means of excluding the larger introduced species.

Channel length:

- Channel length may be a problem for fish if water velocity restricts the distance, they can travel at any one time to less than the full channel length. Even if the fish can maintain a stationary position between periods of forward movement, the high-energy cost involved may mean that they become exhausted before they reach the end.

Light:

- The effect of light, or the lack of it, on fish migration remains an area of debate both here in New Zealand and overseas. Darkness is not a barrier for elvers and there is evidence that banded kokopu can migrate through long dark culverts. Information on other species is lacking, but observations indicate that many indigenous fish only require very low light levels in order to migrate. Fish release trials undertaken in Auckland culverts showed that fish will pass through when light levels are as low as 0.4% of natural light levels.

Climbing medium:

- In order to surmount obstacles, climbing fish species such as elvers and koaro require a continuous smooth wetted margin. A small break in this wetted margin, water turbulence and/or wave action can block the upstream passage of the most determined migrators.

In regard to surface water & ground water contributions to the permanent stream:

- The surface water flow from upstream catchments will remain flowing through the stream and will be unaffected.
- Also, the earthworks will be undertaken in stages, with completed areas progressively stabilised throughout the earthworks phase to ensure changes to the catchment contributing to the stream are kept minimum.
- It is intended on completing the earthworks moving from the south-west of the site towards the north to completion.
- The surface water from the area which is active with earthworks will be diverted through dirty water bunds into the sediment retention pond or decanting earth bunds, prior to discharged into the stream.
- Earthworks movements will be done in the most productive way, isolating cut and fill areas and completing them within their closest distances possible.
- Note, the imperviousness of the site is not changed, and bulk earthworks are designed in such a way that the overall direction of water flows across the site remains unchanged. Therefore, the ground water is anticipated to have minimal impact.
- Although ground water is not expected in the elevated areas where cut is proposed, if encountered during earthworks, it will be treated as surface water and will be diverted via dirty water bund into the sediment retention pond from where it will be treated and discharged into the stream. Also, no earthworks are proposed below stream level.