PATTLE DELAMORE PARTNERS LTD
Level 2, 134 Oxford Terrace
Christchurch Central, Christchurch 8011
PO Box 389, Christchurch 8140, New Zealand

Office +64 3 345 7100
Web **www.pdp.co.nz**

11 March 2025

Jon Trewin
Policy Planner
Selwyn District Council
2 Norman Kirk Drive
ROLLESTON 7643

Dear Jon

ROLLESTON ACCESS IMPROVEMENTS: NOR STORMWATER REVIEW - PACKAGE 2

1.0 Introduction

Selwyn District Council (SDC) engaged Pattle Delamore Partners Ltd (PDP) to provide a technical review of the proposed stormwater design for the SH1 Rolleston Access Improvements as part of the Notice of Requirements (NoR). The technical review consisted of the following proposed works:

- Package 1 – SH1 / Dunns Road Roundabout and associated works.
- Package 2 – Overpass and balance of the works.

As part of the technical review, PDP provided comments on the stormwater management report for packages and any further information (RFI) required for SDC to determine the effects of the NOR.

This letter provides a summary of the technical review of Package 2.

1.1 Information Reviewed

The following information was reviewed:

- *BECA, SH1 Rolleston Access Improvements – Stormwater Management Report Package 2 (Rev 01, Nov 2024).*

The following information was considered as part of the review:

- *Waka Kotahi, Assessment of Effects on the Environment: SH1 Rolleston Access Improvements – Package 1 (30 October 2024).*
- *Waka Kotahi, Notice of Requirement for Alteration of a Designation s181(1) Resource Management Act 1991: Designation NZTA-1 (October 2024)*
- *Consent Order Decision No. [2024] NZEnvC 269 (31 October 2024).*

1.2 Purpose

The purpose of this letter is to summarise the review process and provide recommendations to SDC.

2.0 RFIs & Responses

PDP reviewed the technical information provided, as listed in Section 1.1, and issued a register of RFI's and responses to SDC. The review timelines are listed below.

- PDP issues the RFI register on 12 December 2024.
- SDC provided an updated RFI register with responses from the applicant on 27 February 2025.

PDP reviewed the responses as received on 27 February 2025 from the applicant and provided closing comments to be considered by SDC. Refer to Attachment 1 for the RFI register relating to the proposed stormwater design for Package 2.

3.0 Recommendations

PDP is satisfied that the applicant has addressed the RFI's for the NoR Package 2.

- Flood Risk Assessment

  Based on the responses provided in terms of the "flood risk assessment", PDP is satisfied that the proposed activity is likely to have a less than minor effect on the downstream and upstream environment.

PDP recommend that a flood risk assessment is undertaken if the existing levels are unable to be kept.

4.0 Limitations

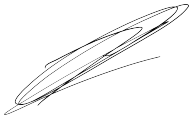
This report has been prepared by Pattle Delamore Partners Limited (PDP) on the basis of information provided by Selwyn District Council. PDP has not independently verified the provided information and has relied upon it being accurate and sufficient for use by PDP in preparing the report. PDP accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the provided information.

This report has been prepared by PDP on the specific instructions of Selwyn District Council for the limited purposes described in the report. PDP accepts no liability if the report is used for a different purpose or if it is used or relied on by any other person. Any such use or reliance will be solely at their own risk.

Yours faithfully

PATTLE DELAMORE PARTNERS LIMITED

Prepared by



Philip Claassens

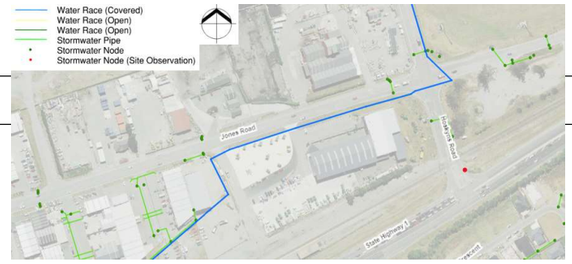
Technical Director - Water Infrastructure

Reviewed & Approved by

Murray Kerr

Technical Director – Water Infrastructure

Attachment 1: RFI register.

RFI Register - Stormwater				
Document reference	**SDC Request**	**Beca Response**		**SDC Response**
60	2.3 Contaminated Land Detailed Site Investigation Note - At stormwater disposal relies on discharge to ground, it is critical that the contaminated land risk is understood. As indicated in the Package 2 report, we concur that it is critical that testing is done at the locations of the proposed ponds.	Noted.		Closed
61	2.3 Groundwater (incl Geotechnical Interpretive Report) The highest groundwater depth was based on a short monitoring period between 12 July and 12 August 2024. Has the highest recorded groundwater in the area been considered based on any other monitoring data? And if so, what was the highest recorded?	The Project specific piezo monitoring period was limited to the duration of site works, which occurred over winter when the water table was expected to be higher. The nearest long term monitoring bore to the Project site is M36/0085 (1km west from the roundabout) on CanterburyMaps, which indicates groundwater levels from 7.4 to 20.9m below ground level (based on data from 1982 to 2010). The groundwater level adopted for design is at approximately the 90th percentile of the long-term groundwater levels observed in M36/0085. A longer-term record including more recent data at monitoring bore M36/0217 (located 3.5km northeast of the overpass) shows levels from 10.5-21.8m bgl (from 1974 to 2024), which are deeper than the design groundwater level of 9.5 m bgl.		Closed - Response Satisfactory
62	2.6.3 Jones Road & Hoskyns Road Location of historic flooding mentioned, but location in Figure 2-8 is not shown. Can the location of the historic flooding be confirmed.	See Figure 2-8 to the right with historic flooding area marked in red. Image to the right shows the kerb breakout subject to flooding. Image from Google Streetview precedes maintenance carried out in the area to remove debris etc.		Closed - Response Satisfactory
63	3.2 Design Assumptions A key design assumption is that "As a minimum, the design will include first flush treatment, attenuation and disposal to ground up to the 1% AEP event for an impervious area equal to the additional impervious area created by the project". It is noted that some catchments with additional impervious area, no treatment is proposed. Refer to RFI 70	Section 5.4 of the Stormwater Assessment Report discusses four areas; •Additional impervious area (12,300m²) •Existing SH1 CSM2 affected area (10,900m²) •Catchment area discharging to proposed stormwater basins (29,800m²) •Catchment area discharging to proprietary treatment devices (2,000m²) Due to the widening of SH1, the treatment and soakage swale that was installed along the south side of SH1 as part of the CSM2 works and managed 10,900m² catchment area is to be removed. This catchment area will now discharge into the proposed stormwater basins and forms part of the 29,800m² catchment area. The 29,800m² impervious area treated and discharged to ground at the basins, less the 10,900m2 impervious area of lost treatment and discharge to ground from the CSM2 swale, is, on balance a gain of 18,900m² of new impervious catchment area treated and discharged to ground in the new basins. Additionally, a catchment area South of the overpass has proprietary treatment devices proposed for a catchment area of 2,000m². Therefore, a total area of 20,900m² area will be treated as part of the project, which is greater than the 12,300m² additional impervious area created by the project. NZTA have taken a pragmatic approach, treating the first flush where practicable. There are several minor catchments, identified in Section 5.3 Minor Catchments of the report, that were usable to discharge to the stormwater management basins. The Rolleston Drive South Catchment was assessed as at risk of an increase in contaminant load and therefore proprietary treatment has been proposed. For the other minor catchments, a high contaminant load is not anticipated, and the additional catchment area is minor (compared to the adjacent new road catchment which will be treated in the basin). Treatment (which would require another small device or proprietary devices) is therefore not necessary.		Closed - Response Satisfactory
64	3.2 Design Assumptions Note - A key design assumption is that the existing site levels in critical locations will be retained as to not alter existing overland flow paths. From the SDC flood hazard mapping (200-year), a major overland flow path is to the north of the proposed overpass and a lesser to the south. A flood risk assessment as per the SDC Engineering Code of Practice may not be required if it can be confirmed that there is no change.	Agreed. The intention is for existing site levels in critical locations to be kept the same where possible. An assessment of the existing vs the proposed site levels will be carried out during detailed design to confirm. If levels are unable to be kept the same, then a flood model will likely be required to determine suitable remedial measures. The type and location of remedial measures will be dependent on the location and the severity of the impact and is expected that this work will be completed within the designation footprint.		Closed - Response satisfactory - recommend that a flood assessment to be completed if the pre-development (existing) site levels are altered/impacted.
65	3.4.1 Rainfall Applicant to confirm the location or station used to extract the data. It appears that the rainfall data is from the Burnham RAWS station. This is similar to Package 1.	The HIRDS V4 data was taken from the BURNHAM RAWS site (ID:O00886).		Closed - Response Satisfactory
66	3.4.5 Ground Soakage Rates The total contributing catchment is > 1,000 m2 and there is a residential area downstream of the proposed site. Based on Table 3-4, what was the justification for the lower factor of safety applied (i.e., 5 vs the table recommended 10)?	The consequence of failure is assessed as minor based on the existing scenario and the scale of the existing catchment and the proposed works. Within the Project extents, the existing drainage is limited along the state highway to a number of soak pits as described in Section 2.6 of the report. The Project is estimated to create an additional 12,300m² of impervious area, however, as described A63, the proposed stormwater basins are designed to capture and discharge to ground up to the 1% AEP event for 29,800m² of impervious area (including the catchment area offset from the affected CSM2 works). In the event that the soakage rate is not as high as anticipated, then in a large event the basins could fill up and overflow to the south, however the basin would still provide some attenuation. This overflow path to the south would be along the existing secondary flow paths. See attached flood SDC map overlaid with the project extents – Attachment 9. Due to the significant size of the existing upstream catchment relative to the additional impervious area, and the attenuation effect of the new basin on the additional runoff, the increase in downstream flooding is expected to be immaterial.		Closed - Response Satisfactory
67	3.4.5 Ground Soakage Rates Observation - The SDC engineering code of practice requires consideration to WWDG Chapter 6 when considering infiltration rates. The recorded infiltration rates are high (as expected for the type of soils) and the design soakage rate is higher that the 75 mm/hr recommended by WWDG. This is acceptable based on the result and agree with recommendation made that further soakage test is required during construction. Test should be done at location and depth proposed of proposed soakage basins.	The 75mm/hr in WWDG refers to infiltration (i.e. flow through designed sand media to provide treatment) rather than soakage (i.e. more rapid discharge to ground of post-first flush volume). The design soakage rates for Package 2 included in Table 3-5 of the stormwater report are soakage rates, not infiltration rates. The infiltration media for the first flush basins will be design during the detailed design stage of the project. The design will follow best practice guidance from "CRC for Water Sensitive Cities - Appendix C: Guidelines for filter media in stormwater biofiltration systems, which is based on extensive research and operational experience. Infiltration through the design soakage media is likely to be in the region of 100mm-300mm/hr initially, but this is likely to reduce over time due to clogging and compaction. However, this expected first flush infiltration rate is not a key parameter for sizing the first flush infiltration basins. The first flush infiltration basins are sized to capture the first flush runoff volume (i.e. runoff from 25mm of rainfall). The drain down time for the long-term case is checked assuming a minimum 20mm/hr infiltration rate (with clogging), with a maximum drain down of 48 hours to maintain healthy grass cover. The attenuation storage in the soakage basins has been sized based on the inflow and outflow, which were determined using the design soakage rates from Table 3-5 and the basin area, for various event durations. Further testing of the soakage rates of the underlying ground will be carried out during construction to confirm soakage rates in the locations of first flush and soakage basins. If poor rates are identified then the assumed infiltration and soakage rates and design will be re-assessed, however this is considered unlikely.		Closed - Response Satisfactory

68	4.3.1 Road Corridor Catchment Referencing Figure 4.1, there will be an expected change in slope in some areas in the catchment (e.g., overpass). Has consideration been given to the effect on stormwater runoff due to the change in slope and/or material (hardfill)?	Impervious catchment areas have been determined and are shown in section 4.3.2 Road Corridor Catchments in the report. Impervious areas include road, footpath, hardstanding and gravel shoulders. All other areas have been determined as pervious. The runoff coefficients used to develop the design are shown in Section 3.4.2 Runoff Coefficients of the report. Changes in gradient were considered during the preliminary design, however, due to only minor areas having an increase in slope relative to the scale of the Project, no adjustments have been made to runoff coefficient values shown in the report. For the channel flow width calculations, the long fall and crossfall of the road has been considered in each channel to provide sufficient collection and conveyance of stormwater.		Closed - Response Satisfactory
69	4.3.3 Cross-Drainage Catchments Note - This is a critical design assumption and it is recommended that the design levels are verified against existing.	Refer to A64.		Closed - Refer to A64 response
70	4.4.2 Treatment For both the infiltration basin and the proprietary devices - To understand the potential effect of runoff, the contaminants expected from the road is listed, but will there be an increase or decrease in the concentrations due to the proposed activity? What is the expected removal efficiency of the proposed devices and, based on the efficiency to remove the required pollutants, is the conclusion that the proposed treatment provided is sufficient treatment (based on relevant water quality guidelines and/or consents)? https://niwa.co.nz/freshwater/urban-runoff-quality-information-system-urqis can be consulted for water quality data.	The Project may result in additional contaminant loads. The key pollutants in road runoff being gross pollutants, suspended sediments, heavy metals (in particular copper and zinc), hydrocarbons and nutrients. It is proposed to carry out first flush treatment where practicable as mitigation, with devices sized in accordance with industry standards. First flush infiltration basins, which are proposed for the vast majority of the catchment, are shown in the literature (including CCC's WWDG) to have good removal efficiencies for TSS, metals and nutrients. Specific proprietary devices will be selected during the detailed design stage, but will be selected in discussion with the maintaining authority as described in section 4.4.2.2 Proprietary Devices of the Stormwater Management Report. NZTA have not assessed contaminant load pre- and post- the Project or loads removed by the proposed treatment devices due to: •the variability in assumptions about contaminant loads generated (the Project involves safety improvements and modifications to an existing state highway, so the contaminant load change this is not as simple as say for a new road or converting a rural area to a residential subdivision). •the variability in removal efficiencies in the literature. NZTA have taken a pragmatic approach, treating the first flush where practicable, and sizing devices using accepted industry guidelines, which is consistent with accepted industry practice around NZ. Currently, only a small section of SH1 has formal treatment from the Rolleston Drive junction heading northeast towards Christchurch. Other than that, only informal treatment occurs in the project catchment within the grassed berm areas. For the proposed Project, the first flush basins and proprietary treatment devices have a catchment area much greater than the additional impervious area created as part of the Project. Therefore, the impact of the Project on water quality is expected to be less than minor.		Closed - Response Satisfactory
71	4.4.3 Discharge to Ground Refer to RFI 61 - Consideration needs to be given to the highest recorded groundwater level (the recorded period of July to August 2024 is considered short) and that should be used to determine if the performance of the proposed infiltration basin will be affected by groundwater mounding or not. It is likely that the highest historical recorded groundwater level is well outside of the influence of groundwater mounding, however it is important to consider available historic information as part of the assessment.	The Project specific piezo monitoring period was limited to the duration of site works, which occurred over winter when the water table was expected to be higher. The nearest long term monitoring bore to the Project site is M36/0085 (1km west from the roundabout) on CanterburyMaps, which indicates groundwater levels from 7.4 to 20.9m below ground level (based on data from 1982 to 2010). The groundwater level adopted for design is at approximately the 90th percentile of the long-term groundwater levels observed in M36/0085. A longer-term record including more recent data at monitoring bore M36/0217 (located 3.5km northeast of the overpass) shows levels from 10.5-21.8m bgl (from 1974 to 2024), which are deeper than the design groundwater level of 9.5 m bgl. Based on the data review, the vertical separation of groundwater from the stormwater discharge devices (i.e. basin inverts etc), are sufficiently deep that further consideration of mounding issues/effects are not required.		Closed - Response Satisfactory
72	4.4.4 Attenuation Can sizing calculations be provided for both the sizing of the attenuation and the treatment?	The preliminary design informs the consenting requirements and provides for the footprint. The calculations will be refined during the detailed design based on geometric detailed design. Detailed design calculations will be included in the detailed design reports.		Closed - Response Satisfactory
73	4.4.4 Attenuation Reference is made in the last paragraph to the small sections of new impervious areas not being able to be conveyed to the basins. The report states that the stormwater from these areas will be managed in a way that matches the existing network in each catchment and that allowance will be made to cater for the increase in impervious areas. Would this allowance be to match pre-development runoff up to and including the 1% AEP runoff event?	The existing catchpits and soak pits are assumed to have been designed to manage the 10% AEP rainfall event (i.e. SDC's primary system standard). On this basis, the replacement of existing catchpits and soak pits and any connected new network will be designed to manage the runoff from the contributing catchment and discharge it to ground in the 10% AEP event. It is important to note that these areas are the exception, and vast majority the new impervious area will be conveyed to the stormwater basins and discharged to ground up to the 1% AEP event. This approach will mitigate the effects of the additional impervious area.		Closed - Response Satisfactory
74	4.4.5 Cross-Drainage The cross-drainage has been designed to collect the eastern and western cross-catchments. In section 2.5 it is indicated that there is no existing cross-drainage through SH. Will the proposed cross-drainage infrastructure result in a change in flood risk downstream now that there is new flow paths via the proposed cross-drainage infrastructure? If so, what will the effect of this cross-drainage infrastructure be?	Refer to A64. It is not proposed to modify the existing overland flow paths as part of the Package 2 works, and therefore no cross-drainage is proposed as part of the Package 2 works. Refer to section 2.5 Existing Overland Flow Paths and section 4.3.3 Cross-Drainage of our Package 2 report.		Closed - Response Satisfactory
75	5.2.1 Overpass North Catchment The second paragraph has missing text.	"Christchurch RV Centre" wording was missing from the report, see updated report in Attachment 11 and updated text below:	**5.2 Major Catchments** **5.2.1 Overpass North Catchment** The Overpass North catchment is delineated by the high point in the new overpass and the junction with Jones Road to the north. A small section of Jones Road will form part of the overpass north catchment based on the geometric design levels. The removal of the existing Christchurch RV Centre (currently a private commercial site) will provide space adjacent to the overpass abutment on the north-west side for the first flush and soakage basins for stormwater management (Overpass North basins). Stormwater from the overpass north catchment will have first flush treatment (via infiltration in a first flush basin) and runoff up to the 1% AEP event will be conveyed to the soakage basin, attenuated and discharged to ground. Due to limited space, stormwater will be collected in catchpits and conveyed through a piped network to the first flush and soakage basins. As noted in Section 2.3 the investigations to date show some existing contaminated land in the vicinity of the proposed basins. Further investigation is required, including proposed TP20 and TP21. The results of this additional testing will inform the management approach, which may include excavation of material and disposal to a facility licensed to accept the concentrations observed.	Closed - Response Satisfactory
76	5.2.1 Overpass North Catchment & 5.2.2 Overpass South Catchment It is proposed that catchpits and pipes will capture and convey the stormwater runoff towards the basins. Will this infrastructure be sized to capture up to and including the 1% AEP runoff?	There is limited space within the project extents for secondary flow paths to convey stormwater towards the basins. As such, the catchpit and pipe network has been designed to capture and convey the 1% AEP runoff to the stormwater basins.		Closed - Response Satisfactory
77	5.3 Minor Catchments Refer to RFI 63 - It is indicated that runoff from the increased impervious areas will not be treated, but in the design assumptions it is stated that runoff from additional impervious areas will be treated. It is noted that for Jones Road Catchment (450 m2), the additional area is due to a shared walkway and this may not require treatment. It is unclear if this is the same for the Western Catchment (580 m2). The impact of the additional impervious catchment can be assessed and compared to the existing (e.g., NZTA Stormwater Treatment Standard for State Highway Infrastructure).	Refer to A63. No water quality treatment is proposed for the Western Catchment. This catchment cannot be connected to the new basin. As the catchment is not expected to have a high contaminant load and the catchment area is minor (compared to the adjacent new road catchment which will be treated in the basin), treatment (which would require another small device or proprietary devices) is not considered necessary.		Closed - It is noted that it is a small additional impervious area which provides access to existing access ways and Tennyson Street which is unlikely to impact (increase) the traffic and contaminants.
78	6 Construction Stormwater Management Is there an increased risk of flooding during the construction phase and if so, how will it be managed?	Construction phase stormwater management is not expected to increase flood risk. Construction stormwater will be managed through the erosion and sediment control (E&SC) plan and will follow the fundamental principles of good E&SC practice for the Canterbury region. This would include consideration of existing overland flow paths and of spillways or overflows for erosion and sediment control devices in over-design events.		Closed - Response Satisfactory
79	DRG 2102: Civil - Drainage (Sheet 2 of 7) Runoff captured by SWSD-9 is proposed to be directed to the first flush and soakage basins. Will this be feasible considering the RL (based on the plan contours) are roughly 54.4 m (rough rim elevation) and the GL around the basins are 55.0 m RL. It does not look like the basins have been modelled, but the water level in the basins may impact the hydraulic performance of SWMH-8 and SWSD-9. Something that should be resolved as part of design development going forward.	Hydraulic grade line checks were carried out during the preliminary design stage to confirm the routing of the stormwater was feasible. Civil modelling (in Open Roads) will be carried out during the detailed design stage and further hydraulic checks carried out on the network (including tailwater levels at basins) to confirm hydraulic performance.		Closed - Response Satisfactory