



PRELIMINARY ENGINEERING REPORT

SEWER MAIN RENEWAL

PARKLANDS AVENUE, BELL BLOCK

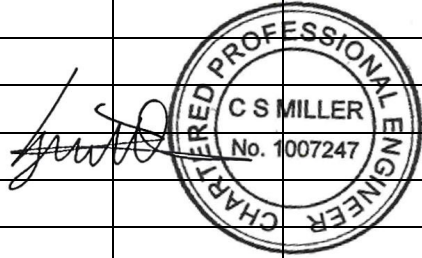
FOR NEW PLYMOUTH DISTRICT COUNCIL

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		Signature			
		Date			
		Signature			
		Date			
		Signature			
		Date			



Report Prepared by:

Will Adlam
Civil Structural Engineer MEngNZ

Reviewed by:

Luke Bunn
Senior Civil Engineer CMEngNZ (EngTech)

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1. INTRODUCTION

We have been engaged by the New Plymouth District Council, NPDC to provide preliminary engineering services for the proposed sewer main renewal adjacent to the proposed Parklands Avenue extension, Bell Block, as illustrated in Figure 1-1 below.

This report should be read in conjunction with the Red Jacket Drawing set DWG-100-501.

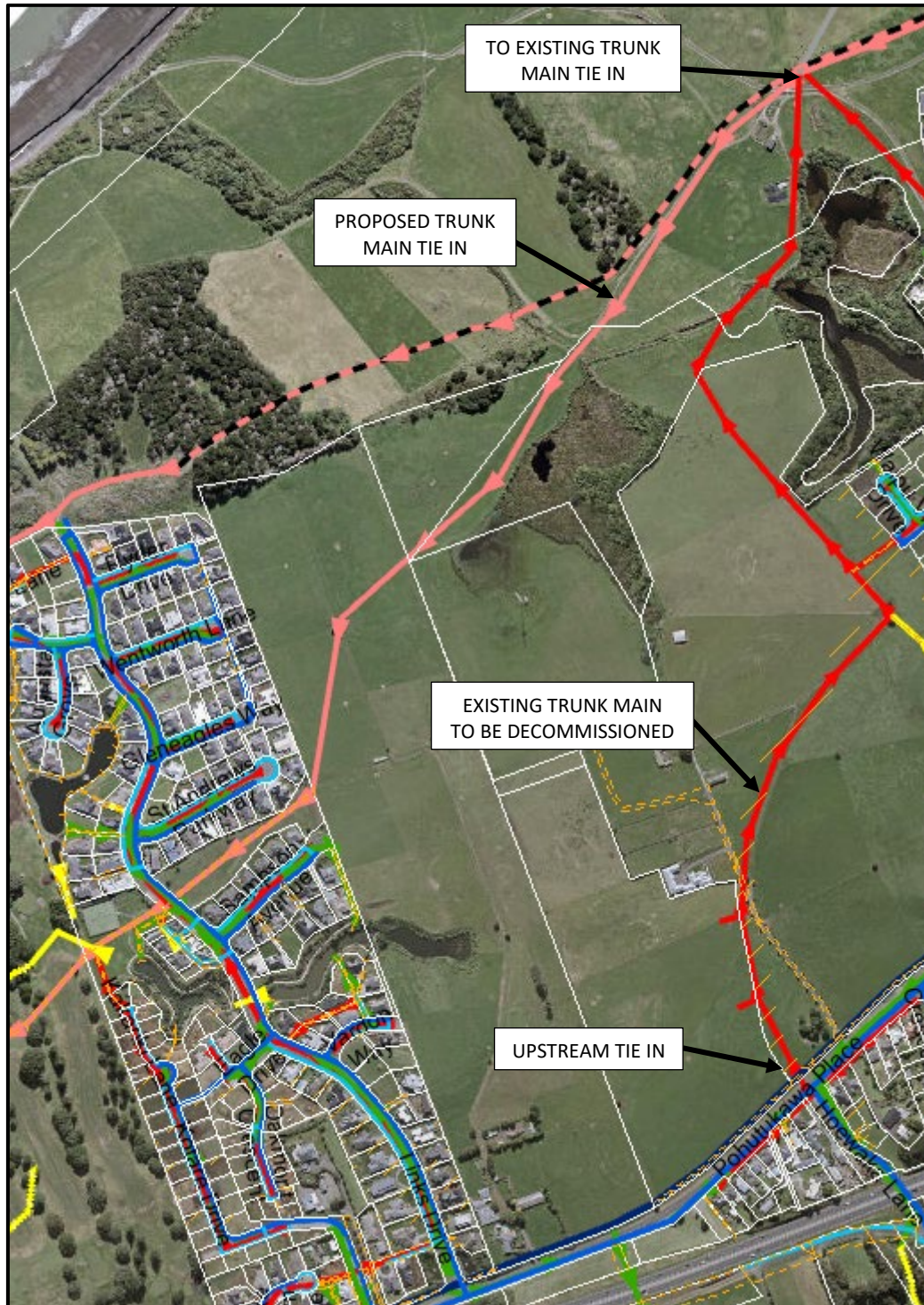


Figure 1-1: NPDC GIS Aerial Image

1.1 EXISTING SEWER MAIN

The existing section of sewer main which forms the subject of this report is located between the existing manhole on the northern side of Pohutukawa Place, NPDC Asset ID 40028935 and the existing manhole to the northwest of Elsmere Avenue NPDC Asset ID 40029130.

The existing sewer main is a mixture of DN150 and DN200 asbestos cement pipes at an average overall grade of approximately 0.55%, although NPDC data indicates some sections are as flat as 0.31%.

Whilst the existing pipe is a mixture of DN150 and DN200 pipe, the overall capacity appears to be restricted by the section of DN150 main below the junction with the Parklands Avenue main Asset ID 40029646.

NPDC GIS data indicates that the existing asbestos cement pipe was installed in 1977. Generally, an asbestos cement pipe has a design life of 50 years therefore, the existing main is nearing the end of its design life.

2. PROPOSED SEWER MAIN ALIGNMENT

The existing sewer main is located within a section of undeveloped Residential A (Res A) land as identified in the NPDC operative district plan.

There is a proposed residential development within the Res A land which encompasses the existing sewer main alignment. The proposed development seeks to make connections to the existing sewer main to service the proposed development.

Based on the limited remaining design life of the existing sewer main and the proposed residential development, NPDC has identified this as an opportunity to renew, realign and regrade the existing main to futureproof the network. The proposed upgrade involves moving the tie into the trunk main downstream, thus allowing the main to be regraded and increasing the overall capacity.

2.1 PROPOSED ALIGNMENT

The proposed alignment ties into the trunk main at NPDC manhole Asset ID 4002912. This alignment largely follows the existing main within the bounds of the proposed residential development. At the western extent of the proposed development where the existing main heads north, the proposed alignment continues northwest, shortening the flow path by approximately 616 m.

This shortened length and downstream tie in location point, allows the new main to be regraded to a grade of 0.67% for the first 600 m and 0.81% until the tie into the existing main. This provides a significant increase in grade when compared to the existing average grade of 0.55%.

2.1.1 CH 0 - CH 500 m

The proposed alignment starts at the existing manhole Asset ID 40028935 on Pohutukawa Place. The proposed sewer alignment largely follows the existing alignment for the first 500 m.

Within this section the alignment has been designed to keep the new sewer main within one lane of the proposed carriageway, allowing for a stormwater main within the other lane and a utility trench within the berm on each side of the proposed carriageway.

This ensures that all services can achieve the appropriate separation and minimum cover in accordance with the NPDC Land Development and Infrastructure Standard and remain within the carriageway extents not requiring easements within private property.

2.1.2 CH 500 – 670 m

Within this section, the proposed alignment deviates significantly from the existing alignment to follow the proposed carriageway alignment and to provide a shorter alignment length. The proposed sewer alignment effectively cuts the corner as it veers to the west of the existing alignment at CH 500 m before roughly re-joining it at CH 670 m.

2.1.3 CH 670 – 950 m

Within this section the alignment has been designed to keep the new sewer within one lane of the proposed carriageway, allowing for a stormwater main within the other lane and a utility trench within the berm on each side of the proposed carriageway. This ensures that all services can achieve the appropriate separation and minimum cover in accordance with the NPDC Land Development and Infrastructure Standard and remain within the carriageway extents not requiring easements within private property.

2.1.4 CH 950 – CH 1,077 m

Beyond Chainage 950 m the proposed alignment diverges significantly from the existing alignment. Where the existing alignment veers to the east, the proposed alignment continues straight across an existing culvert crossing to SMH13 before veering west to tie into the trunk main at NPDC manhole Asset ID 40029127, downstream of the existing tie in.

2.2 CONNECTION TO MAIDA VALE

The existing sewer reticulation includes a DN150 private connection leading east from NPDC manhole Asset ID 21853017 to service the nearby Maida Vale retirement village. This manhole will be utilised as a part of the proposed upgrade.

2.3 CONNECTIONS TO SUMMERSSET RETIREMENT HOME

Two existing DN150 private laterals connect to the existing sewer network at existing NPDC manholes, 40028990 and 40029027 respectively. These connections must be maintained during construction works. Proposed SSMH-A and SSMH-B will be installed near the existing manholes to allow for the proposed laterals to tie into the existing laterals at the boundary.

2.4 SEWER MAIN TO PARKLANDS AVE

The existing sewer connection to the Parklands Avenue reticulated network has also been realigned as part of this design. The new alignment ties into the existing NPDC manhole Asset ID 40172353 before veering to the south to the proposed SSMH-H. This realignment allows the sewer to better follow the proposed Parklands Avenue extension.

3. CAPACITY ASSESSMENT

A preliminary high-level capacity assessment for the existing network and proposed alignment network has been carried out in accordance with the NPDC and STDC Land Development and Subdivision Infrastructure Standard, based on NZS4404:2010

The capacity assessment has been undertaken using Autodesk Storm and Sanitary Analysis (SSA) to determine the network capacity based on the designed and existing sewer reticulation.

The peak wet weather flow for the combined subdivision and existing flows have been calculated using the following assumptions:

- (a) Average daily water flow shall be 250 L/person/day.
- (b) Average dwelling occupants shall be 2.6 people per dwelling.
- (c) Currently the existing main services 86 dwellings from Pohutukawa Place, 33 Dwellings from Parklands Avenue, and 2 rest homes.
- (d) There are a proposed 110 Residential Lots within the proposed development.
- (e) There are a proposed 88 Residential Lots within the future development.
- (f) Peak dry weather factor shall be 2.5
- (g) Peak wet weather factor shall be 2
- (h) The existing DN600 NPDC Sewer Main to the north of the development, Asset ID 40029520, is flowing at full Capacity (0.267 m³/s)
- (i) Mannings' coefficient of Roughness is 0.012 for uPVC Pipes and 0.013 for Concrete pipes.

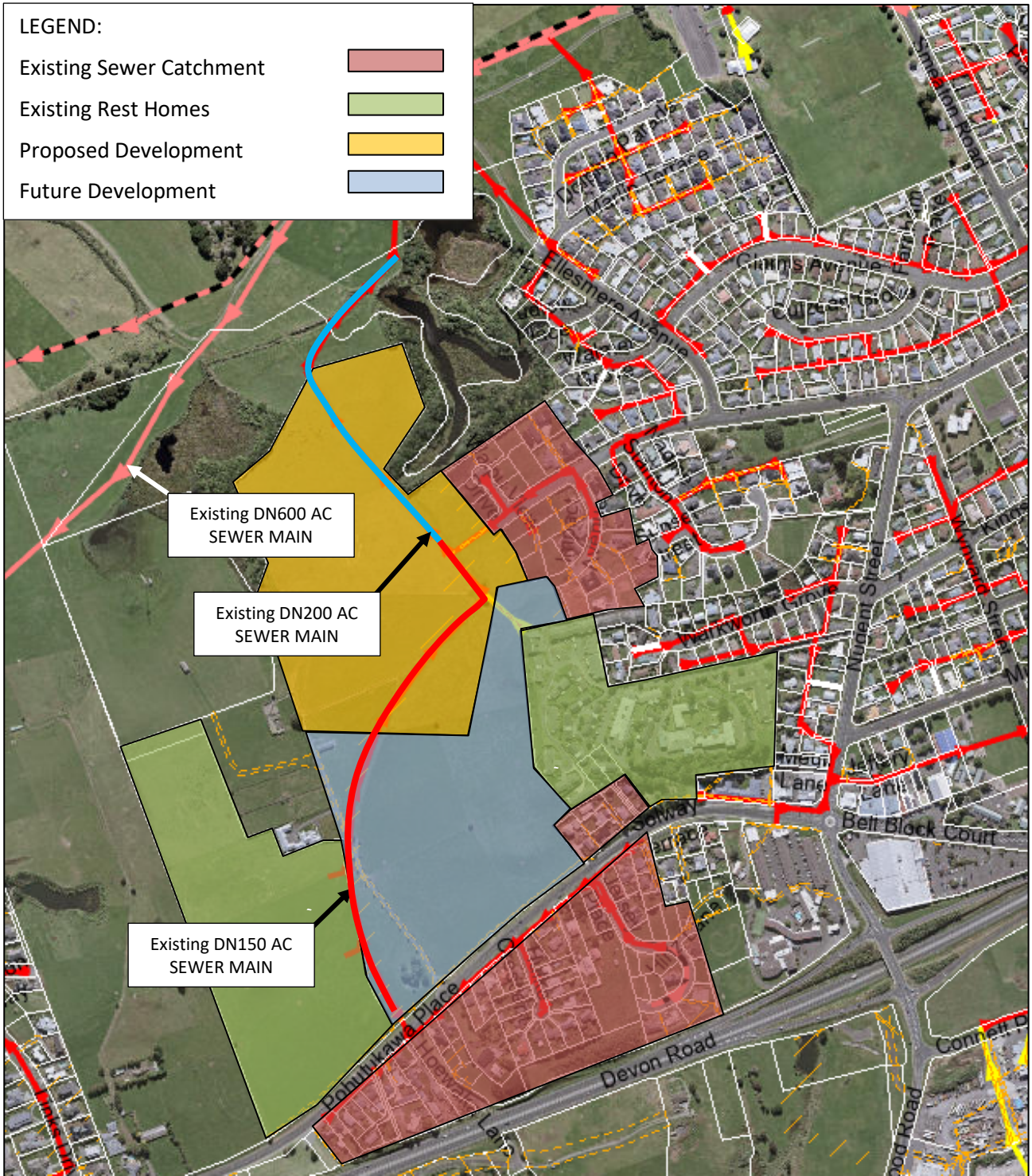


Figure 3-1: Sanitary Sewer Contributing Catchments

3.1 EXISTING DN150/200 MAIN

The existing DN150 Asbestos cement pipe has been assessed using the existing catchment areas only, as identified in Figure 3-1 above. The DN150 Asbestos Cement Pipe extends from Pohutukawa Place to the south to a DN200 Asbestos Cement Pipe opposite the Parklands Avenue intersection to the east. Ultimately, the DN200 asbestos cement pipe discharges into the NPDC DN600 reticulated sewer main to the north, as shown in Figure 3-1 above.

The peak wet weather flows and peak dry weather flows for the existing catchment only are detailed in Table 3-1 below.

Table 3-1: Existing Sewer Network Peak Flows

Pipe No#	NPDC Asset ID	Diameter (m)	Slope (%)	Design Flow Capacity (m ³ /s)	Peak Dry Weather Flow (m ³ /s)	Condition	Peak Wet Weather Flow (m ³ /s)	Condition
1	40029610	0.150	0.91	0.015	0.001	Normal	0.003	Normal
2	40029643	0.150	0.53	0.011	0.001	Normal	0.003	Normal
3	40029664	0.150	0.57	0.012	0.003	Normal	0.007	Normal
4	40033529	0.150	0.55	0.012	0.005	Normal	0.012	Capacity
5	40033530	0.150	0.56	0.012	0.005	Normal	0.012	Capacity
6	40033525	0.150	0.61	0.012	0.005	Normal	0.012	Capacity
7	40033531	0.150	0.53	0.011	0.005	Normal	0.011	Surcharged
8	21853018	0.150	0.27	0.008	0.008	Capacity	0.009	Surcharged
9	40172357	0.150	4.83	0.034	0.0001	Normal	0.001	Normal
10	40029647	0.150	0.35	0.009	0.008	Normal	0.009	Capacity
11	40033535	0.200	0.28	0.017	0.008	Normal	0.009	Normal
12	40033532	0.200	0.34	0.019	0.008	Normal	0.009	Normal

The existing sewer network will surcharge under Peak Wet Weather Flows and is at capacity in Peak Dry Weather Flows.

Therefore, it is recommended to increase the diameter and grade of the proposed reticulated sewer network to accommodate the existing contributing catchments.

3.2 PROPOSED DN225 MAIN

The proposed DN225 uPVC SN16 main has been assessed using the existing and proposed catchment areas as detailed in Figure 3-1 above.

Proposed Alignment 1 is described in Section 3 above and the peak sewer flows for the proposed network are in Table 3-2 below.

Table 3-2: Alignment 1 - Proposed DN225 Sewer Network Peak Flows

Pipe No#	Start Manhole	End Manhole	Diameter (m)	Slope (%)	Design Flow Capacity (m ³ /s)	Peak Wet Weather Flow (m ³ /s)	Condition
1	EXMH 1	MH A	0.225	0.67	0.040	0.004	Normal
2	MH A	MH B	0.225	0.67	0.040	0.004	Normal
3	MH B	MH C	0.225	0.67	0.040	0.008	Normal
4	MH C	MH D	0.225	0.67	0.040	0.015	Normal
5	MH D	MH E	0.225	0.67	0.040	0.015	Normal
6	MH E	MH F	0.225	0.67	0.040	0.016	Normal
7	MH F	MH G	0.225	0.67	0.040	0.017	Normal
8	EXMH 2	MH H	0.225	1.93	0.068	0.001	Normal
9	MH G	MH H	0.225	0.81	0.044	0.024	Normal
10	MH H	MH I	0.225	0.81	0.044	0.024	Normal
11	MH I	MH J	0.225	0.81	0.044	0.024	Normal
12	MH J	MH K	0.225	0.81	0.044	0.025	Normal
13	MH K	MH L	0.225	0.81	0.044	0.025	Normal
14	MH L	MH M	0.225	0.81	0.044	0.026	Normal
15	MH M	MH N	0.225	0.81	0.044	0.026	Normal
16	MH N	EXMH 3	0.225	0.81	0.044	0.026	Normal

The design outputs from SSA provide a Peak Wet Weather Flow of 0.026 m³/s before connecting to the NPDC reticulated sewer main via the NPDC sewer manhole, asset ID 40029127, which is assumed to be flowing at full capacity as stated above.

Using a DN225 sewer main will not surcharge the proposed sewer reticulation within the development. The DN225 sewer system at 0.67% minimum grade has a total capacity of 0.040 m³/s therefore, the designed network has approximately 0.013 m³/s capacity left.

4. CONSTRUCTABILITY

4.1 TWO-STAGE CONSTRUCTION

The proposed alignment has an option to construct in 2 stages. The downstream section of the alignment can be constructed as stage 1. This downstream stage includes all elements of the new main that service the proposed subdivision and would likely be constructed in conjunction with the subdivision.

Stage 2 would consist of the section upstream of the proposed subdivision. This stage could be completed in conjunction with stage 1 or at a later date. If stage 1 was constructed without stage 2 there would be a drop manhole structure installed at the temporary tie in point to account for the elevation difference. Temporary pumping systems will likely be required at several points during the construction of stage 2 due to the similar alignment to the existing main.

4.2 NEW AND EXISTING MAIN CLASHES

The vertical and horizontal alignment of the proposed sewer main has been completed taking into consideration existing site features, subsoil conditions, the proposed and future development, and the alignment of the existing sewer main.

Taking this into consideration the proposed sewer alignment crosses the existing sewer main in five places along its length. These locations are at chainages 305 m, 630 m, 645 m, 700 m, and 865 m.

Since the upstream tie in is common, but the two pipes are on distinctly different grades it is expected that the new main will be below the existing main when it crosses at CH630 and beyond. This will need to be confirmed at the detailed design stage, however, if confirmed it would allow the new sewer to be laid from the downstream end up to CH305 m whilst the existing main remains in service. The final section from CH305 m to CH 0 m would likely require a bypass pump during construction.

4.3 DEPTH TO INVERT AND GTW

Another consideration for constructability is the invert depth of the new alignment. The typical depth of the new alignment is between 2.5 m and 3.0 m below the existing/proposed ground level with some areas reaching 4.5 m below ground level, bgl.

This invert depth is significantly below the nearby measured groundwater table, GWT at approximately 2.0 m bgl. Subsoil investigations within the area also suggest that layers of sand and organic peat are typically found beneath 4.5 m of Taranaki Volcanic Ash. The combination of high GWT with sand and peat subsoils could result in unstable trench excavations and a significant dewatering requirement.

5. COST ESTIMATE

Due to current volatility in the construction market pricing has been sought from local contractors. This has not yet been received and will be passed on in due course.

6. LIMITATIONS

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