Infrastructure Report

TWO CHAIN ROAD LTD.

TWO CHAIN ROAD INDUSTRIAL PARK PLAN CHANGE

PROJECT 15010

ISSUE Final – 21 SEPTEMBER 2021

INNO PROJECTS

Contents

QUALITY ASSURANCE

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1. Introduction

1.1. Purpose

Inovo Projects Ltd has been engaged by Two Chain Road Ltd to complete an Infrastructure Assessment for a proposed industrial development at 7-183 Two Chain Road, located to the southwest of the Rolleston IZone Industrial Park. This Infrastructure Assessment has been prepared in support of a proposed Plan Change application for development of the site for industrial use (Business 2A zoning).

The purpose of this report is to provide information on;

- Existing infrastructure around the site
- Proposed infrastructure for the development
- Conformance to national standards, Selwyn District Council's (SDC) policies and best practices relating to subdivision development, in particular:
  - Waterways, Wetlands and Drainage Guide (Christchurch City Council)
  - Selwyn District Council's *Engineering Code of Practice* (SDC ECOP)
  - NZS4404:2010 Land Development and Subdivision Infrastructure

1.2. Limitations

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Where information has been supplied to us for the purpose of the report by another party, this information is believed to be reliable but we can accept no responsibility if this should prove not to be so.

2. Site Overview

2.1. Site Description

The Two Chain Road Plan Change site (the 'Site') is approximately 98 ha in area, and is located to the southwest of the Rolleston IZone Industrial Park & Business Hub. The site is bounded by Two Chain Road to the north, Walkers Road to the west, the Main South Line railway corridor / State Highway 1 to the south, and the Midland Line railway to the east.

The site is currently zoned rural inner plains, with the land to the southwest being Rural Outer Plains with special designation for Rolleston Prison, Residential Living Z and Residential Living 1 to the southeast (across SH1), Business B2 to the northeast (across the Midland Line), and Rural Inner Plains to the northwest.

The site is typically gently sloping (1:200) from northwest to southeast, that is from Two Chain Road towards State Highway 1. Part of the Paparua Stockwater Race network crosses the site at the western end, and a second minor branch enters and terminates within the site boundary at the eastern end.

The site covers 13 separate land parcels used mainly as small farmland holdings. The site has been used for farming purposes for at least the last 80 years and is currently covered in a variety of pasture and shelter belts.

2.2. Groundwater & Bores

Well logs from the Environment Canterbury (ECan) database indicate that the depth to groundwater in the area is approximately 15-20m.

There are 7 bores on the site with recorded use as stock water and domestic supply (information from Canterbury Maps). Table 1 summaries the bore depth, diameter and recorded usage.

Table 1 – Well Data

Address	Well No.	Depth	Diameter	Recorded Use
7 Two Chain Rd	M36/4334	40m	150mm	Domestic Supply
15 Two Chain Rd	M36/4655	25m	51mm	Stock Supply
77 Two Chain Rd	M36/0084	35m	150mm	Domestic Supply
113 Two Chain Rd	M36/0010	82m	51mm	Not Used
93 Two Chain Rd	M36/3090	41m	150mm	Domestic & Stockwater
113 Two Chain Rd	M36/7457	35m	150mm	Domestic & Stockwater
183 Two Chain Rd	M36/5525	47m	150mm	Irrigation, Domestic Supply

There are 2 recorded community supply wells neighbouring the site with drinking water protection zones which overlap the site boundary. One is located within the Rolleston Prison site to the west (bore M36/4459, 55.5m deep) and the other down-gradient on the southern side of SH1 (bore M36/0026), near the end of George Street cul-de-sac. Bore M36/0026 in George Street was decommissioned along with a reservoir in 1996 as part of town water supply reticulation upgrade works and is classified on Canterbury Maps as "buried/unlikely still exists". The site area does not fall within the Christchurch Groundwater Recharge Zone.

2.3. Existing Infrastructure

There is limited SDC infrastructure servicing the site with the exception of DN63mm potable water submain at the eastern end of the site (before crossing to the northern side of Two Chain Road). There is a Ø150mm water main located to the northeast of the site at the corner of Railway Road and Jones Road (across the Midland Line railway), and an existing Ø150mm water supply main in Walkers Road. Existing infrastructure within the neighbouring industrial subdivisions to the northeast can be extended to the proposed development. Further discussion of water supply is found in Section 5.

An existing Ø225mm gravity sewer main is located at the corner of Railway Road and Jones Road which conveys wastewater eastwards to the George Holmes pump station (located at the corner of Jones Road and George Holmes Road). From this pump station wastewater is pumped directly to the 'The Pines' Wastewater Treatment Plant (WWTP) to the southwest along Burnham School Road. Further discussion of sewer infrastructure is found in Section 4.

2.4. Drainage Features

The site is gently sloping at 1:180 to 1:200 gradient to the south-southeast. The ground surface is slightly undulating with shallow flood channels crossing the sites as is typical of the Canterbury Plains.

A branch section (lateral) of the Paparua Stockwater Race network crosses the site from north to south, passing through a culvert under Two Chain Road approximately 275m northeast of Walkers Road, then running parallel to a fenceline across the site before deviating slightly and passing through a culvert under the Main South Line railway and Main South Road (SH1). A second minor lateral enters and terminates within the site at two locations further to the east along Two Chain Road at No. 15 (Lot 2 DP27804) and No. 25 Two Chain Road (Lot 1 DP27804). These minor laterals terminate in soakpits discharging to ground within the site. A section of main channel of the Paparua Stockwater Race network (Railway Road branch) curves around the eastern boundary of the site (but outside the site boundary), before passing through a culvert under the Main South Line and the Main South Road (SH1).

The Main South Railway along the southeast boundary forms a barrier to overland flood flows. With the exception of the two water race culverts mentioned above, no evidence has been found of drainage culverts passing under the Main South Railway line (any culverts, if they do exist, have become overgrown and blocked due to lack of use). Borrow pits excavated immediately up-slope of the railway line serve as means of discharge of stormwater runoff to ground.

2.5. Geotechnical Investigation

A geotechnical investigation report has been prepared by Coffey Tetra Tech to provide information on the underlying soil conditions. The investigation included a desktop review and site walk over.

A summary of the ground profile provided by Coffey Tetra Tech is as follows:

- 0.3m topsoil, overlying
- 0.5 to 2m sandy silt loam, overlying
- Sandy GRAVELS to depth

3. Stormwater

3.1. Existing Stormwater Management

Discharge of stormwater to ground is common practice in the Rolleston area due to free-draining nature of the underlying gravels. As such, Rolleston has little stormwater reticulation network as most stormwater is discharged directly to ground via soakage pits and basins. Recent subdivisions near to the proposed rezoning, such as the Stonebrook residential subdivision to the south, and IZone and IPort Business Parks to the north and northeast have utilised soakage to ground for stormwater management.

3.2. Stormwater Disposal

Geotechnical investigations for nearby sites have indicated good drainage characteristics and that discharge to ground is feasible, as typical of the Rolleston area. As with all ground soakage systems, the efficiency can decrease over time. However, by adopting a conservative approach to the design of the systems, ensuring that there are adequate options for future upgrading and making allowance for secondary flows, ground soakage systems can provide a cost-effective long-term solution to stormwater disposal.

Individual sites will discharge primary runoff from rooves and hardstand areas directly to ground via on-site soak pits. The soak pits will be constructed as part of building consent process at building stage. Soakpits for individual sites will be sized to deal with storms up to the 2% AEP 1 hour event. All drainage infrastructure and soakpits associated with future roads will be constructed as part of any future subdivision and will be vested in SDC. Soakpits for road drainage will be sized to deal with storms up to the 10% AEP 10-minute event.

In general, the first flush stormwater runoff (i.e., first 15 to 25mm of any storm) is more polluted than the stormwater runoff from the remainder of the storm event. The first flush is generally treated using treatment systems which provide higher levels of contaminant removal than the treatment systems required for subsequent stormwater runoff. This first flush can be treated through a swale or infiltration basin or proprietary stormwater treatment devices such as hydrodynamic separators.

Stormwater runoff from large rainfall events which exceed the first flush capacity can be discharged directly to ground using rapid infiltration trenches or soakpits. Ponding areas may be required to temporary store runoff from large hardstand areas where runoff rate exceeds infiltration capacity of rapid infiltration trenches or soakpits.

Adequate measures would need to be implemented to ensure the effects of the discharge on the underlying groundwater are reduced to an acceptable level using suitable treatment and attenuation devices as required. Resource consent for stormwater discharge to ground from the plan change sites will be obtained from Environment Canterbury (ECan) at the subdivision consent stage. Any consents required from ECan for stormwater discharge from roads to vest will be transferred to SDC as required.

Flows in excess of the capacity of the primary system can be directed to the roads which will act as secondary flow paths to safely convey stormwater through the development.

It is expected that all stormwater will be able to be permitted to discharge to ground and that from a stormwater perspective, the plan change can be supported with areas set-aside if required, for stormwater treatment and attenuation as outlined above.

3.3. Flood Risk

As is typical of the Canterbury Plains, overland flow generated by continuous heavy rain or thunderstorms that the land cannot absorb becomes concentrated in shallow channels that cross the plains. Shallow channels can be observed crossing the site and continuing to the Main South Railway embankment along the southeast boundary which forms a barrier to overland flow (no evidence has been found of drainage culverts passing under the Main South Railway line).

Flood modelling maps for the Selwyn region showing the extent and depth of potential flooding during a 200-year ARI or 0.5% AEP rainfall event are available to view on SDC's website. **Figure 1** below shows the predicted flooding for the subject site.

The predicted floodwater depth is generally less than 0.5m except where existing former borrow pits or soak holes excavated to facilitate soakage to ground indicate ponding depths of 1.5m to 3m, or where water ponds up against the Main South Railway embankment. It is noted that SDC flood model does not take into account infiltration or discharge to ground via soakpits. In practice, overland flow across the railway line is unlikely to occur and floodwaters will enter soak pits / former borrow pits and discharge to ground.

Figure 1 – Flood Modelling from SDC Flooding Map

A more detailed flood risk assessment will be carried out at subdivision consent application stage as required by Section 106 of the Resource Management Act. Overland flow from upstream catchments will be considered to ensure that any potential adverse stormwater effects can be appropriately mitigated and minimum floor level rules set at the time of subdivision development.

In general, ground levels for lots will be set above internal road levels so the roads act as secondary flow paths to safely convey floodwaters to the downslope side of the site.

4. Wastewater

4.1. Existing Network

The site is currently not connected to the Rolleston wastewater network. There is existing gravity wastewater infrastructure in Jones Road to the northeast (across the Midland rail line), and running past the southwest end of the site in Walkers Road. Existing dwellings on the site discharge via septic tanks and on-site wastewater disposal fields.

4.2. Existing Network Capacity

Refer to the Wastewater Network Capacity Assessment prepared by WSP attached as Appendix A for an assessment of the capacity of the existing gravity and network. WSP have developed a network capacity model for SDC and have completed an analysis of the impact of the proposed site development on the existing network. This analysis also considered other proposed plan changes in the Rolleston and West Melton areas to ensure that sufficient capacity is available within the network or to find any potential areas where upgrades would be required in order to service the proposed Two Chain Road development.

Discharge from the development was assessed by WSP to have a ADWF of 5.9 L/s and PWWF of 14.2L/s based on average dry weather flow of 0.06 L/s/ha using historic flow records from the George Holmes pump station which services the IZone and IPort industrial catchment area.

WSP investigated connection into the existing SDC wastewater network at 2 locations, one being an existing manhole in Jones Road (Asset ID 78634), and the other being through a manhole on Walkers Road (Asset ID 98559).

Analysis by WSP indicates capacity constraints in the gravity network downstream if the development were to connect via Manhole 98559 in Walkers Road. This would result in surcharging during dry weather flows and flooding during wet weather flows.

Analysis by WSP indicates that servicing the development via an existing manhole (ID 78634) in Jones Road and discharging via gravity to the George Holmes pump station has sufficient capacity for the proposed development, while also considering other potential plan changes within the Rolleston area.

Refer to the Wastewater Network Capacity Assessment prepared by WSP attached as Appendix A for an assessment of the capacity of the existing rising main network to The Pines WWTP. The Pines WWTP has not been assessed if there is sufficient capacity to accept flow from this development, but it is understood capacity at the Pines WWTP is scheduled for upgrades within the LTP to provide capacity for up to 120,000 person equivalents.

4.3. Proposed Wastewater Reticulation

Servicing the development from the existing manhole in Jones Road via gravity is possible for approx. 1/3 of the site if the gravity system is extended from Johns Road along Two Chain Road. However, due to the shallow gradients either a lift station or low-pressure sewer would be required to service the remainder of the site.

Servicing the development via gravity drainage to Walkers Road is not feasible due to the shallow depth of the existing sewer and the topography falling from Walkers Road to Jones Road. Either a lift station or low-pressure sewer would be required to discharge to existing gravity sewer in Walkers Road.

From a wastewater perspective, the plan change can be supported with new infrastructure servicing the plan change area as outlined above.

5. Potable Water

5.1. Existing Reticulation

The Rolleston township reticulated supply extends along Two Chain Road as a Ø63mm sub-main from Jones Road to halfway along the proposed block on the northern side of Two Chain Road. There is a Ø150mm uPVC water main located to the northeast of the site at the corner of Railway Road and Jones Road (across the Midland Line railway). This changes to a Ø300mm mPVC main at the intersection of Jones Road and Izone Drive some 180m to the east.

There is also a Ø150mm uPVC watermain in Walkers Road extending from the Dunns Crossing/Walkers Road/ SH1 intersection to part way along the eastern side of Walkers Road which is the main water feed to the Rolleston Prison site.

5.2. Water Demand

Water demand for the site is based on peak design flow rate is 1 litre per second per hectare (1 L/s/ha) in accordance with 'NZS4404:2010 *Land Development and Sub-Division*' and the SDC Engineering Code of Practice. Demands from the proposed plan change site would result in a peak demand of 98.3 L/s for consumptive use.

The water supply demands for firefighting are based on the SNZ PAS 4509:2008 FW4 classification for buildings. FW4 requires that 50L/s is provided by a hydrant within 135m of the hazard, with an additional 50 L/s required (total 100L/s) from 3 additional hydrants (4 total) within 270m of the hazard. In such instances where the required fire water classification exceeds FW4, additional on-site storage will need to be provided by the building owners to ensure sufficient capacity for firefighting. Firefighting classification of individual buildings and fire water storage requirements would be determined and managed at time of building consent.

5.3. Network Capacity

Refer to the Water Supply Network Capacity Assessment prepared by WSP attached as Appendix B for an assessment of the upgrades required to the SDC water supply network to service the plan change area. The assessment carried out by WSP included demands on the system for the current proposed plan change for a 27 Ha extension of the IPort Business Park.

WSP considered options for connection to the existing network via both Jones Road (300mm dia. Main) and Walkers Road (150mm dia. Main). Sufficient capacity is available for the development to be serviced from Jones Road with network upgrades (upsizing reticulation pipes) near the IZone water supply headworks site. The second option considered a connection from the existing main within Walkers Road, however this resulted in high headloss within the existing main and widespread low pressure within the residential zone south of the highway. Therefore, connecting via Jones Road is the preferred option.

From a water supply perspective, the plan change can be supported with an extension of existing infrastructure and some internal network upgrades to service the plan change area.

6. Power / Telecommunications

6.1. Power

Power will be provided to all allotments to utility company and industry standards. All network and reticulation cabling will be installed underground. Transformer kiosk sites will be located at locations approved by the utility company and SDC.

The nearest substation is the Rolleston Zone Substation located at the corner of Burnham School Road and Dunns Crossing Road. The nearest transformer kiosks are located at 10 Railway Road and outside Rolleston Prison on Walkers Road. There are existing overhead 11kV powerlines and an underground 11kV cable running along the southern side of Two Chain Road, and existing 11kV underground cables running along the western side of Walkers Road that loop into the transformer located at Rolleston Prison. There are also overhead lines running along the western side of Walkers Road that carry both 11kV and 33kV power. There is also an overhead 11kV supply which crosses over SH1 and the Main South railway corridor and terminates within the plan change site.

Full appraisal of the network extension requirements will be carried out by the network provider once the Plan Change approval has been obtained. Orion have advised they have already started planning network upgrades and associated distribution reinforcement to service the residential and commercial development in Rolleston, including a new Zone Substation at Burnham. There is an estimated 18-24 months turnaround time from initial planning to approval and construction of the required electrical infrastructure upgrades to supply the plan change sites.

From an electricity supply perspective, the plan change can be supported with an extension of existing infrastructure and provision of local transformers to service the plan change area.

6.2. Streetlighting

Streetlighting will be provided to roading and reserves in accordance SDC engineering standards where required. The applicant will provide a streetlight style consistent with styles used elsewhere in Rolleston.

6.3. Telecommunications

Telecommunications will be provided to all sites in the form of fibre optic network installed to utility company and industry standards. The existing fibre network in Jones Road can be extended to the subject sites and distributed to individual allotments. All network and reticulation cabling will be installed underground.

7. Roading

7.1. Road Layout

The proposed primary roading layout is yet to be developed, however site access will be likely be developed off Two Chain Road and Walkers Road.

Access points and internal roading layouts will be determined during the subdivision design stage in consultation with SDC.

7.2. Road Stormwater Drainage

Stormwater runoff within road corridors will be conveyed via kerb and channel into appropriately spaced sumps or roadside swales. All sumps will have trapped and/or inverted outlets, and connected to the piped stormwater network or conveyance swales. The road corridor will be used as overland flow paths to direct stormwater runoff when the drainage network is at full capacity.

8. Earthworks

8.1. Bulk Earthworks

The topography of the existing site is generally sloping to the south/southeast at an average gradient of 1:200 and approximately 7m total elevation change across the site (refer to LiDAR contour plans included in Appendix C)

Bulk earthworks design will be determined at detail design stage. Consideration will be given to providing overland flow paths along internal roads to maintain existing flow patterns.

To avoid carting material off-site earthworks will be designed to achieve a cut/fill balance across the site. Any filling operations exceeding 300mm depth will be carried out in accordance with NZS4431:1989 *Code of Practice for Earthfill for Residential Development*. It is envisaged that material won from site, will be sufficient to use as structural engineered fill.

All earthworks will be carried out in accordance with principles outlined on the Environment Canterbury's *Erosion Sediment Control Toolbox* to minimising the adverse effects of erosion and sedimentation during construction. Dust generation from earthworks operations is expected to be no worse than if paddocks were cultivated as part of normal farming operations.

9. Summary & Conclusion

Primary stormwater runoff from rooves and hardstand areas will be discharged directly to ground via soakpits or drainage trenches. The development will be designed to ensure that secondary flow will safely drain from buildings via the internal roads.

Wastewater from the site can be connected to the existing SDC gravity sewer by extending the network in Jones Road under the Midland railway line and southwest along Two Chain Road. At least two thirds of the site will require either low pressure sewer or a lift station to discharge into the gravity network. Gravity discharge to Jones Road will pass through to the George Holmes pump station which then pumps directly to The Pines Wastewater Treatment Plant.

Potable water reticulation can be provided by extending the existing SDC network in Jones Road under the Midland railway line and southwest along Two Chain Road. Additional upsizing of water mains on Izone Drive to the IZone headworks will be required to ensure adequate supply is available for the proposed development.

Existing electricity and fibre broadband networks neighbouring the site can be extended to service the proposed plan change area. Electricity and telecommunications will be provided to all sites to utility company and industry standards. All cables within the development sites will be installed underground and kiosks will be constructed on separate individual lots.

From an infrastructure perspective, the plan change can be supported by either the extension of existing infrastructure from neighbouring subdivisions or the provision of new/upgraded water supply and wastewater infrastructure to service the development area.

APPENDIX A | WSP Wastewater Network Capacity Assessment

Project Number: 3-C2333.00

Rolleston Two Chain Road Plan Change

27 July 2021

CONFIDENTIAL

Wastewater Network Capacity Assessment

wsp

150 YEARS IN AOTEAROA

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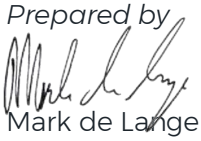

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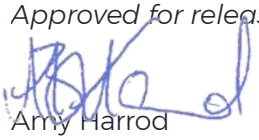

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Document History and Status

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Revision Details

Revision	Details
1	Revision as per comments form Rolleston Industrial Developments Ltd.

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Disclaimers and Limitations

This report ('**Report**') has been prepared by WSP exclusively for Rolleston Industrial Developments Ltd. ('**Client**') in relation to the Two Chain Road Plan Change in Rolleston ('**Purpose**') and in accordance with the scope of works provided via email on 6 July 2021. The findings in this Report are based on and are subject to the assumptions specified in the Report and other model modelling reports addressed to Selwyn District Council. WSP accepts no liability whatsoever for any reliance on or use of this Report, in whole or in part, for any use or purpose other than the Purpose or any use or reliance on the Report by any third party.

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1 Summary

WSP was engaged by Rolleston Industrial Developments Ltd. to complete a wastewater network capacity assessment to support the plan change of 98.3 ha of land on Two Chain Road in Rolleston to industrial. This assessment was completed using the network hydraulic model that WSP has developed for Selwyn District Council (SDC).

The assessment found that the existing gravity network in the George Holmes pump station catchment, and the pump station, have sufficient capacity for the predicted increased flows. Based on this, the wastewater network has capacity to allow for the rezoning of this land for the plan change application.

2 Assumptions

2.1 General

- The recently updated Eastern Selwyn Sewerage Scheme (ESSS) hydraulic model was used as the base network for this assessment. All modelling was completed in InfoWorks ICM v6.0.9 (WSP model reference: dcapa500app57.corp.pbwan.net/SDC Wastewater Models). In this model, network asset data and contributing population were recently updated however updates to the calibration are required for select areas. The limitations applying the uncalibrated model were considered in this assessment and are detailed later in this report.
- Other recent land use changes and developments that were considered in this assessment include the Iport 27 ha Extension (industrial), the Holmes Block (residential) and known West Melton plan changes available on SDC's website. Figure 2-1 presents an overview of the wastewater network that may receive flows from the proposed industrial area on Two Chain Road, identifying the location of the George Holmes and Burnham School Road pump stations. The location of all development blocks considered in this assessment are also indicated on Figure 2-1.

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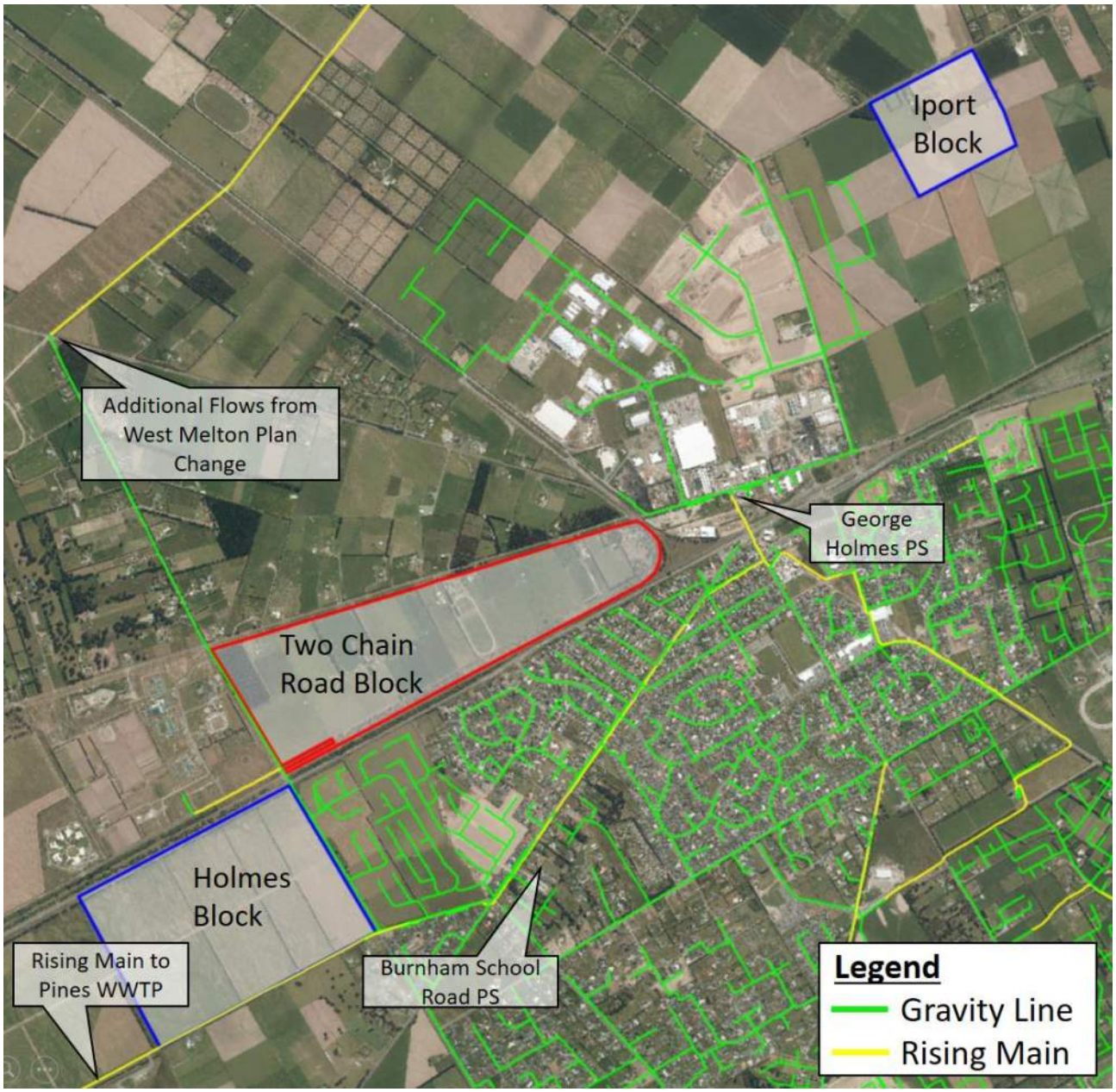

Figure 2-1: Wastewater Network Overview

- To conservatively represent flow conditions the highest observed rate of groundwater ingress to the wastewater collection system was assumed. This high groundwater was observed in June 2014, affecting the communities of Prebbleton, Lincoln and Springston and was applied in the model as a constant baseflow.
- The model has been run with 1 in 5-year ARI 12-hour design event to replicate wet weather flow (WWF), as this was previously determined to be the critical storm duration for the ESSS system. To truly understand the impact of rainfall, a variety of rainfall events would need to be considered. However, there are many variables to consider, including but not limited to, the annual exceedance probability (AEP), intensity, duration and timing of the event (in relation to flows in the wastewater system). Comprehensive modelling of a variety of design rainfall events has not been conducted as part of this query.

2.2 Scenario Specific

The approach to calculating the design flow from the Two Chain Block is consistent with what was used for the Iport 27 ha Extension assessment. Flow records from the George Holmes pump

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station for the period 1 January 2019 – 31 December 2019 were assessed, and the following was determined:

- Average dry weather flow per hectare = 0.06 L/s/ha;
- Peak flow peaking factor of 2.4;
- No wet weather response was observed.

These parameters were then used to calculate flows for the Two Chain Block which are presented in Table 2-1.

Table 2-1: Calculated Flows for the Plan Change Block

Plan Change Block	Area (ha)	Calculated ADWF (L/s)	Calculated PWWF (L/s)
Two Chain Road	98.3	5.9	14.2

2.3 Model Updates

As was noted above, the recently updated ESSS network model was applied for this assessment. As several calibration issues were identified in the model update and have yet to be resolved, the following adjustments have been made in order to apply the model for study:

- During the update it was found that modelled volumes in the Wilfield pump station catchment were underrepresented compared to observed data, which also resulted in the underprediction of volumes at the downstream Gainsborough pump station (terminal West Melton pump station). As a temporary fix the contributing population in the Wilfield pump station catchment was increased to match observed volumes. This resolved volume errors at both pump stations.
- During the update it identified that the pumps at the George Holmes pump station appear to be have been replaced since the original model was built. The model has a peak pump rate of approximately 70 L/s while observed data has a typical flowrate of approximately 90 L/s, with peak flowrates up to 135 L/s. As a temporary fix the main pump at the George Holmes pump station was replaced with a fixed pump with a discharge of 90 L/s.

2.4 Additional Development Areas

As was highlighted above, the Iport 27 ha Extension (industrial), the Holmes Block (residential) and known West Melton plan changes were considered as part of this assessment. The following presents how each was represented in the model for this assessment.

Iport 27 ha Extension

As part of the *Iport 27 ha Extension Wastewater Capacity Assessment* completed by WSP in December 2020, a design flow of 3.9 L/s was calculated for this development block. For the current study this flow was applied as a constant inflow to manhole 658244 at the intersection of Transportation Drive and Freight Drive. This load point is indicated on Figure 2-2, being downstream of both load points assessed in the December 2020 report.

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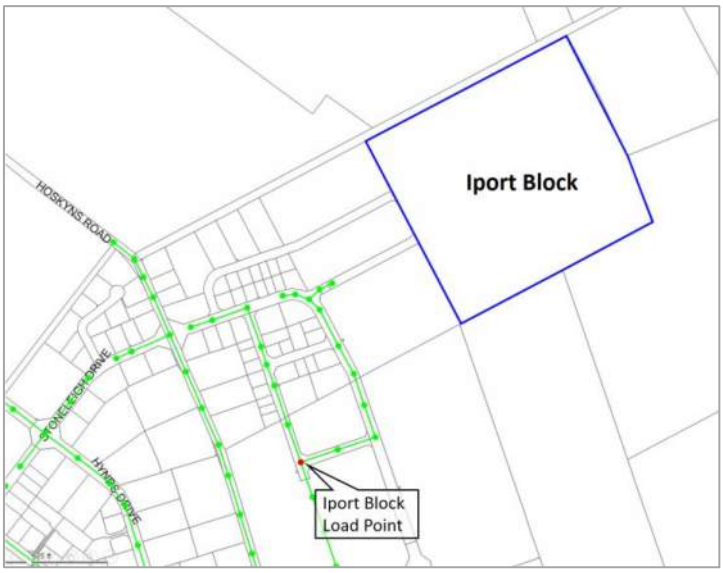

Figure 2-2: Iport Block Assumed Connection Point

Holmes Block

For the *Rolleston West Plan Change Wastewater Capacity Assessment* completed by WSP in November 2020 both a dry and wet weather flow scenario were run to assess impacts on the network. For the dry weather flow scenario, a population of 3105 was added to the model, assuming a per capita wastewater flow of 220 L/h/d and applying a design wastewater discharge profile with a peaking factor of 2.5 (as per SDC's Engineering Code of Practice). The wet weather scenario was run the with a calculated design flow of 39.5 L/s applied as a constant flow. No contributing area or population for the plan change area was added as these are accounted for in the flow applied.

For the current assessment it has been assumed that all flows from the Holmes Block discharge by gravity to manhole 43404 on Dunns Crossing Road. This load point is indicated on Figure 2-3.

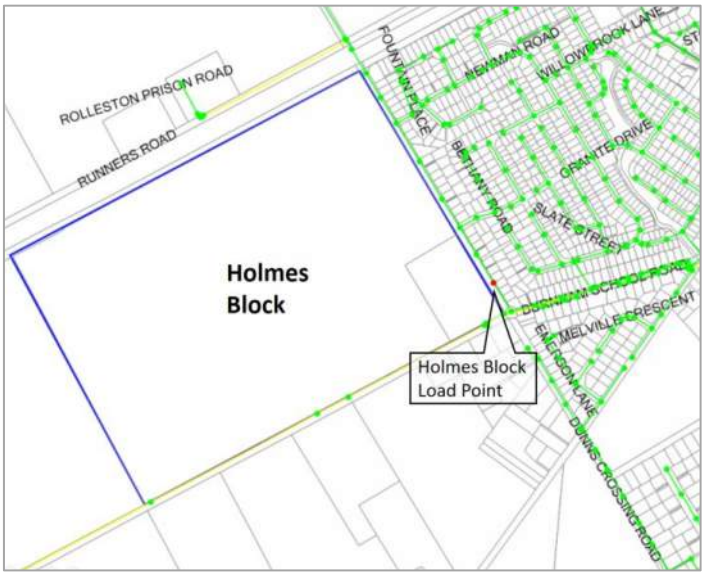

Figure 2-3: Holmes Block Assumed Connection Point

West Melton Plan Changes

Four proposed Plan Changes were represented in the model for this assessment having a total of 858 lots. Details of the proposed plan changes are as follows:

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- Plan Change 59 – 72 lots
- Plan Change 67 - 131 lots
- Plan Change 74 - 130 lots
- Plan Change 77 - 525 lots

Flows from the West Melton plan change areas were calculated in accordance with SDC's Engineering Code of Practice. Table 2-2 below summarises the potential flows from the developed plan change areas in West Melton.

Table 2-2: Calculated Flows for West Melton Plan Change Areas

Plan Change Block	Proposed No. of Lots	Population	Calculated ADWF (L/s)	Calculated PWWF (L/s)
West Melton (PC numbers 59, 67, 74 and 77)	858	2317	5.9	29.5

Calculated design flows from West Melton were loaded directly to the Gainsborough pump station wet well. A model scenario was set up for both dry weather and peak wet weather flow conditions, corresponding to the dry and wet scenarios modelled for the Holmes Block.

3 Wastewater Servicing Options

There are two nominated connection points for the Two Chain Road Block to SDC's gravity network. The flows from the site may be split once the site develops but for the purposes of this assessment each connection point has been considered separately to take the full flow:

1. **Option 1 – Service via Jones Road:** Flows are loaded to manhole asset ID 78634 at the intersection of Railway Road and Jones Road. The flows are then conveyed through the gravity network to George Holmes Road pump station which pumps directly to the Pines WWTP in a common rising main it shares with Burnham School Road PS.
2. **Option 2 – Service via Walkers Road:** Flows are loaded to manhole asset ID 98559 at the intersection of Two Chain Road and Walkers Road. The flows are then conveyed by gravity to Burnham School Road pump station and directly to the Pines WWTP through a common rising main shared with George Holmes Road pump station.

Figure 3-1 presents the location of the connection point options described above.

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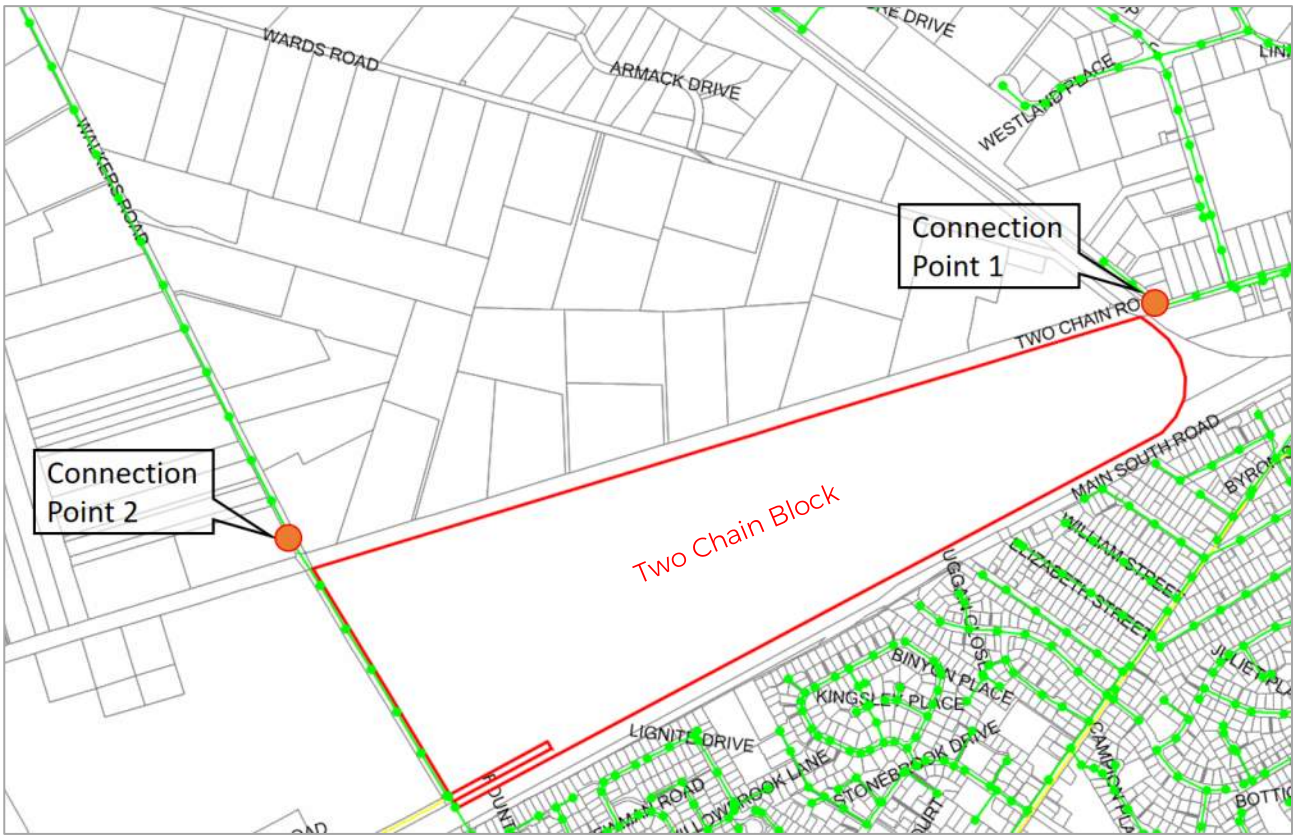

Figure 3-1: Two Chain Block Connection Point Options

4 Modelling Methodology

Servicing Options 1 and 2 were modelled using the following methodology:

1. A base dry weather scenario was created in the ESSS network model. In this scenario two new subcatchments were added to represent the Holmes Block and West Melton Plan Change areas. Population was assigned to these subcatchments to allow the impact of the diurnal flow from the developments to be assessed. A third new subcatchment was added to represent flows from Iport 27 ha Extension. As this is an industrial area, the calculated design flow was applied as a constant flow.

2. A base wet weather scenario was again created in the ESSS network model. In this scenario three new subcatchments were added to represent the Holmes Block, West Melton Plan and Iport 27 ha Extension. The maximum calculated design flow was applied as a constant flow with no contributing area or population as these are accounted for in the flow applied. The flow applied for the Iport 27 ha Extension is the same in both the dry and wet weather scenarios.

3. Simulations were run to assess the impact of the Two Chain Block on the existing network during dry and wet weather.

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5 Modelling Results

The predicted impact of the two connection options is presented for below.

5.1 Option 1 - Service via Jones Road

5.1.1 Dry Weather Results

No issues are predicted in the gravity network downstream of the connection point. George Holmes pump station is also predicted to have capacity to accommodate dry weather flows from the Two Chain Block. With the George Holmes pump station pumping increased flows from the Two Chain Block, the Burnham School Road pump station is still capable of pumping the peak inflow.

Figure 5-1 presents the model maximum hydraulic grade line (HGL) profile for Option 1 under peak dry weather flow conditions from the load point to the George Holmes PS.

5.1.2 Wet Weather Results

As no wet weather flow response has been observed in the George Holmes pump station, and were not included for the Two Chain Block, peak wet weather results are the same as those reported for dry weather conditions.

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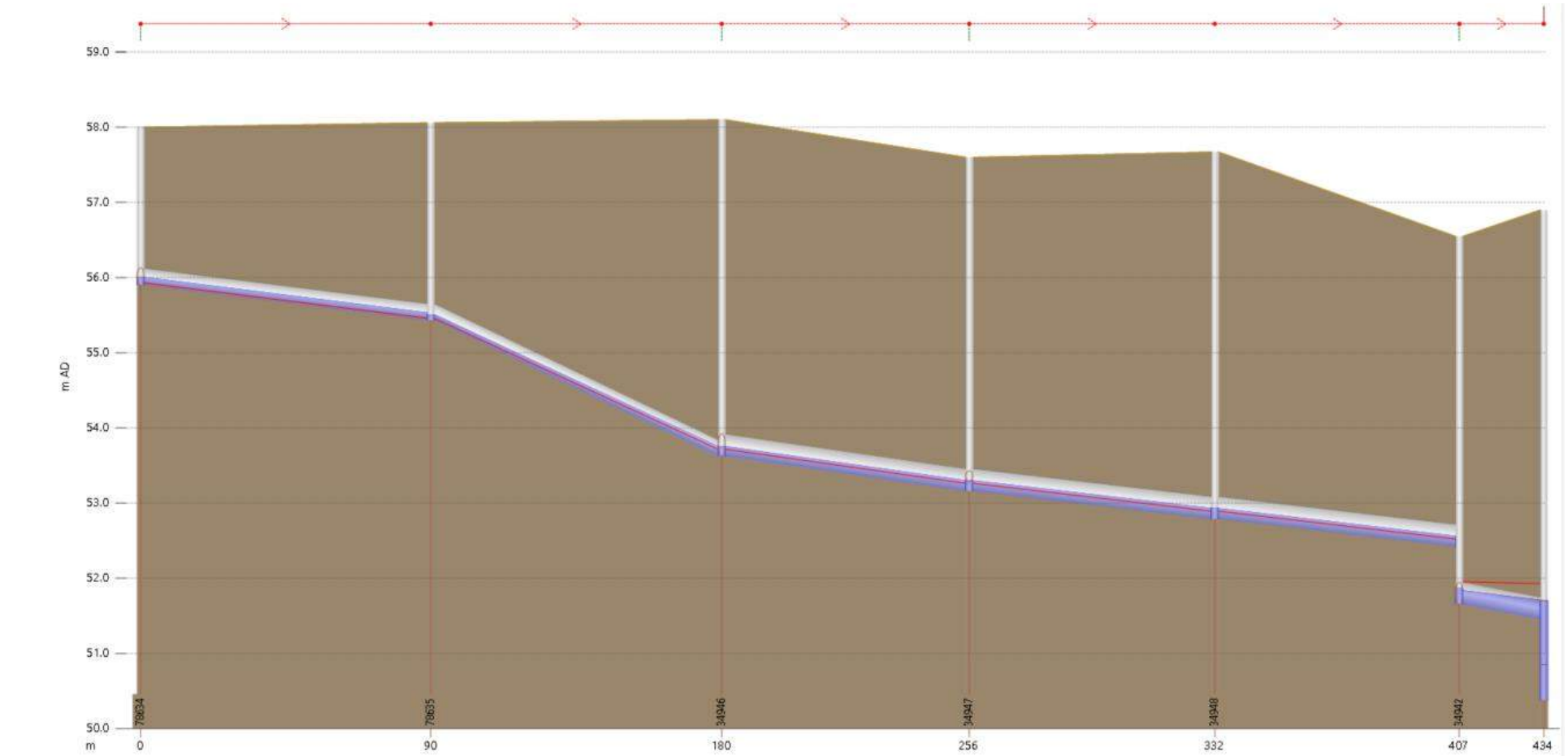

Link		78634.1		78635.1		34946.1		34947.1		34948.1		34942.1	
width (mm)		225		225		300		300		300		300	
US flow (l/s)		15.04		15.09		33.01		33.24		33.38		63.58	
surc		0.45		0.58		0.46		0.46		0.46		0.85	
r.pfc (l/s)		37		74		86		77		77		97	
Node	78634		78635		34946		34947		34948		34942		-
ground (m AD)	58.000		58.060		58.100		57.600		57.670		56.550		-
Ch floor lev (m AD)	55.900		55.430		53.620		53.160		52.790		51.650		-
vol.lost (m3)	0.0		0.0		0.0		0.0		0.0		0.0		0.0

Figure 5-1: Long section at PDWF in the from manhole Asset ID 78634 to George Holmes PS. Predicted levels in the current system without the Two Chain Block is shown by the red line.

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5.2 Option 2 - Service via Walkers Road

5.2.1 Dry Weather Results

The gravity network downstream of the Two Chain Block load point is predicted to surcharge under peak dry weather flow conditions. No manhole overflows are predicted, however the maximum water level is within 0.5 m from the ground surface at manhole Asset ID 43403 on Dunns Crossing Road. The Burnham School Road pump station is predicted to have capacity to accommodate additional peak flows.

Figure 5-2 presents the model maximum HGL profile for Option 2 under peak dry weather flow conditions from the load point to the Burnham School Road pump station.

5.2.2 Wet Weather Results

Under peak wet weather flow conditions flooding is predicted from manhole Asset ID 43403 on Dunns Crossing Road due to limited pipe capacity. To resolve flooding, an upgrade of approximately 2.2 km of pipe along Dunns Crossing Road and Burnham School Road is required. If these pipes were to be upgraded, the peak wet weather inflow to Burnham School Road pump station is 99 L/s, however the current modelled capacity is 94 L/s. This indicates that in addition to network upgrades, the capacity of the Burnham School Road pump station may need to be increased to accommodate flows from the Two Chain Block.

Figure 5-3 presents the model maximum HGL profile for Option 2 under peak wet weather flow conditions from the load point to the Burnham School Road pump station.

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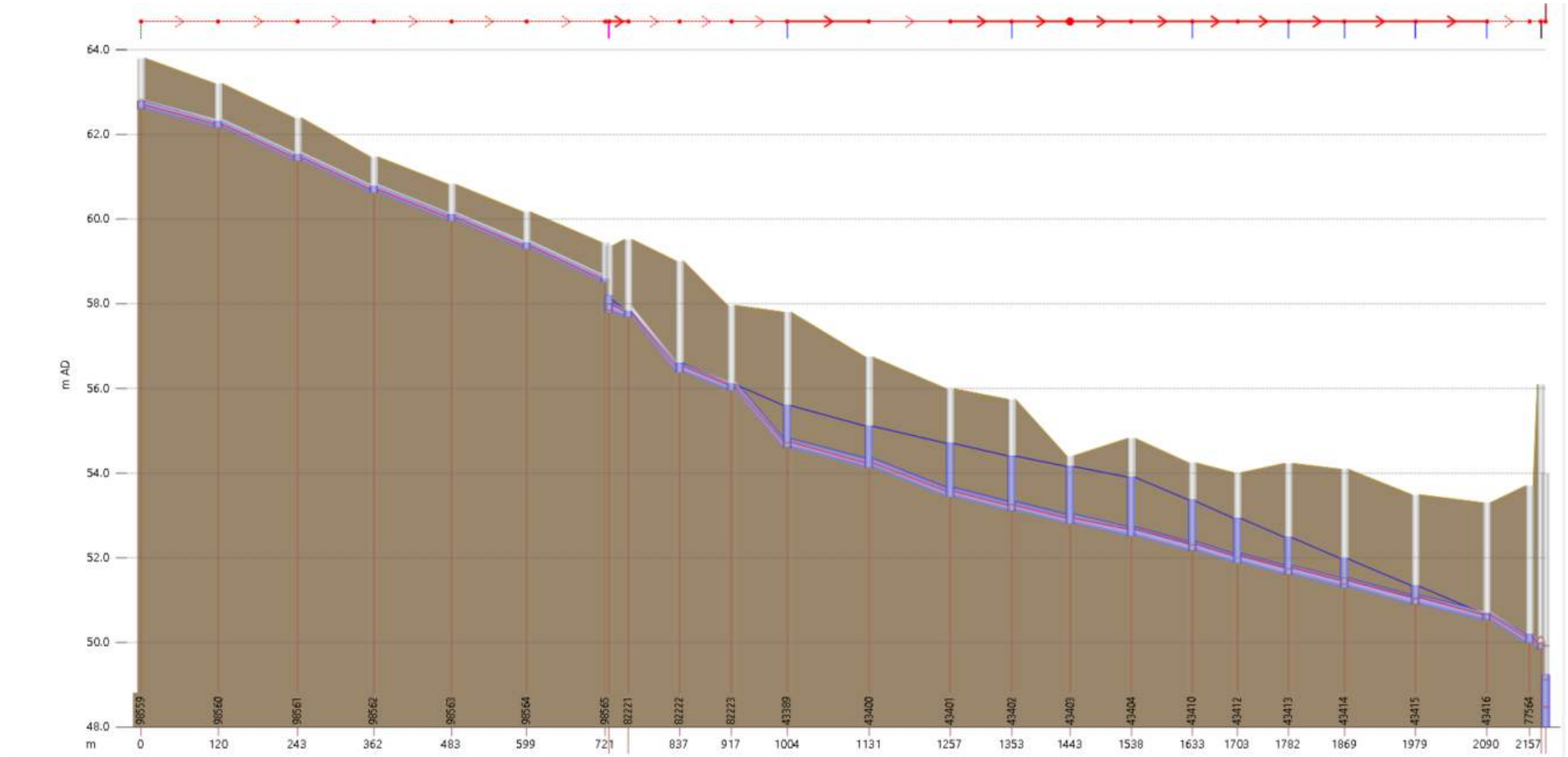

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width (mm)	225	225	225	225	225	225	-	280	225	225	225	225	225	225	225	225	225	225	225	225	225	225	-
US flow (l/s)	29.33	29.33	29.33	29.33	29.33	29.33	-	44.18	42.05	39.58	36.09	32.72	31.02	31.01	31.19	38.36	38.26	38.30	38.38	38.68	38.82	38.90	-
surc	0.79	0.64	0.68	0.67	0.66	0.63	-	0.78	0.94	1.00	2.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	0.92	-
r.pfc (l/s)	31	41	41	38	39	41	31	119	37	65	31	38	30	30	29	31	33	31	30	31	30	46	-

Node	-	98560	98561	98562	98563	98564	-	-	82222	82223	43389	43400	43401	43402	43403	43404	43410	43412	43413	43414	43415	43416	-
ground (m AD)	-	63.200	62.390	61.470	60.820	60.170	-	-	59.010	57.963	57.800	56.740	55.990	55.740	54.410	54.820	54.240	-	54.230	54.090	53.490	53.300	-
Ch floor lev (m AD)	-	62.160	61.380	60.620	59.960	59.290	-	-	56.380	55.960	54.590	54.130	53.440	53.110	52.810	52.510	52.160	-	51.600	51.300	50.900	50.520	-
vol.lost (m3)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-

Figure 5-2: Long section at PDWF in the from manhole Asset ID 98559 to Burnham School Road PS. Predicted levels in the current system without the Two Chain Block is shown by the red line.

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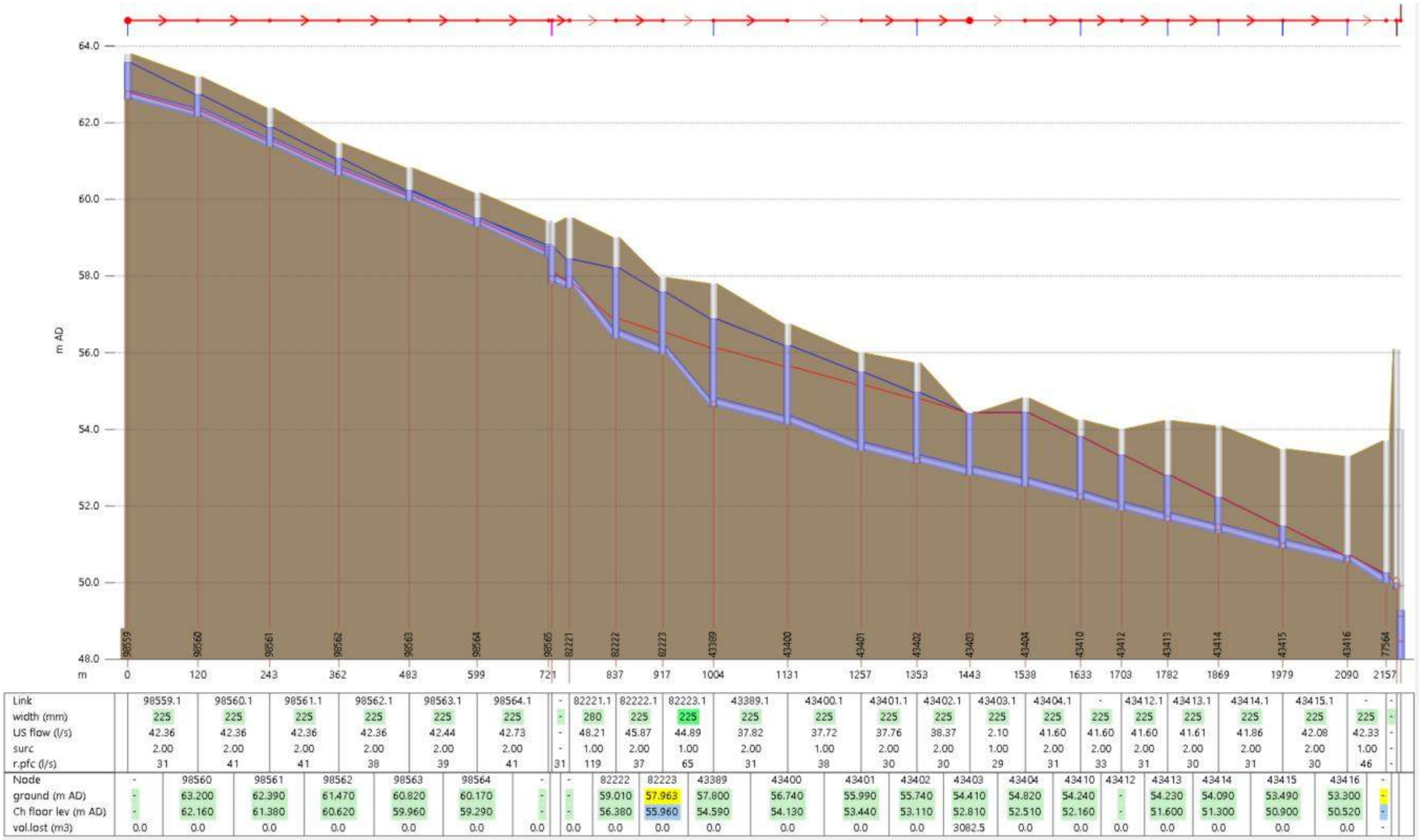

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width (mm)	225	225	225	225	225	225	-	280	225	225	225	225	225	225	225	225	225	225	225	225	225	225	-
US flow (l/s)	42.36	42.36	42.36	42.36	42.44	42.73	-	48.21	45.87	44.89	37.82	37.72	37.76	38.37	2.10	41.60	41.60	41.60	41.61	41.86	42.08	42.33	-
surc	2.00	2.00	2.00	2.00	2.00	2.00	-	1.00	2.00	1.00	2.00	1.00	2.00	2.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00	1.00	-
r.pfc (l/s)	31	41	41	38	39	41	31	119	37	65	31	38	30	30	29	31	33	31	30	31	30	46	-

Node	-	98560	98561	98562	98563	98564	-	-	82222	82223	43389	43400	43401	43402	43403	43404	43410	43412	43413	43414	43415	43416	-
ground (m AD)	-	63.200	62.390	61.470	60.820	60.170	-	-	59.010	57.963	57.800	56.740	55.990	55.740	54.410	54.820	54.240	-	54.230	54.090	53.490	53.300	-
Ch floor lev (m AD)	-	62.160	61.380	60.620	59.960	59.290	-	-	56.380	55.960	54.590	54.130	53.440	53.110	52.810	52.510	52.160	-	51.600	51.300	50.900	50.520	-
vol.lost (m3)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3082.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-

Figure 5-3: Long section at PWWF in the from manhole Asset ID 98559 to Burnham School Road PS. Predicted levels in the current system without the Two Chain Block is shown by the red line.

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6 Conclusions

Servicing the Two Chain Block through manhole Asset ID 78634 on Jones Road (Option 1) is not predicted to cause any capacity issues in the downstream network under both dry and wet weather flows. The George Holmes pump station is also predicted to have sufficient capacity to cater for the additional flow from the development.

Servicing the Two Chain Block through manhole Asset ID 98559 on Walkers Road (Option 2) is predicted to result network surcharging under dry weather flow conditions and overflows during wet weather. To resolve capacity issues, network upgrades will be required along Dunns Crossing Road and Burnham School Road, as well as a potential upgrade of the Burnham School Road pump station.

7 Limitations

- This assessment has not considered whether the Pines WWTP has capacity to accept flow from the developments.
- Flows to the George Holmes pump station are based on flow records for 2019 provided by SDC.
- During validation of the model a wet weather response was identified in the Runners Road pump station catchment (upstream of Burnham School Road pump station) that has not been represented in the model. This may result in the peak wet weather inflows to the Burnham School Road pump station underrepresented by the current model.

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APPENDIX B | WSP Water Supply Network Capacity Assessment

Project Number: 3-C2333.00

Rolleston Two Chain Road Plan Change

27 July 2021

CONFIDENTIAL

Water Supply Network Capacity Assessment

wsp

150 YEARS IN AOTEAROA

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Document Details:

Date: 26 July 2021
Reference: 3-C2333.00
Status: Final

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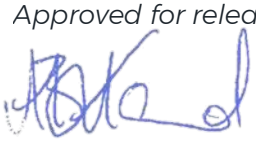
Principal Hydraulic Modeller – Water

Approved for release by



Amy Harrod
Head of Water - Christchurch

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Document History and Status

Revision	Date	Author	Reviewed by	Approved by	Status
0	16/07/2021	MdL	DJ	AH	Final
1	26/07/2021	MdL	EB	AH	Final

Revision Details

Revision	Details
1	Revision as per comments form Rolleston Industrial Developments Ltd.

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Disclaimers and Limitations

This report ('**Report**') has been prepared by WSP exclusively for Rolleston Industrial Developments Ltd. ('**Client**') in relation to the Two Chain Road Plan Change in Rolleston ('**Purpose**') and in accordance with the scope of works provided via email on 6 July 2021. The findings in this Report are based on and are subject to the assumptions specified in the Report and other model modelling reports addressed to Selywn District Council. WSP accepts no liability whatsoever for any reliance on or use of this Report, in whole or in part, for any use or purpose other than the Purpose or any use or reliance on the Report by any third party.

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1 Summary

WSP was engaged by Rolleston Industrial Developments Ltd. to assess the water supply network capacity and options to support the plan change of 98.3 ha of land on Two Chain Road in Rolleston to industrial.

Our assessment has identified that connection of the Two Chain Block to the Rolleston water supply network through the existing DN 300 main on Jones Road will not have any adverse effects that impede the rezoning of the land for industrial use. New sources and select pipe upgrades will be required to meet peak demand and reduce pipe headlosses. Required upgrades will include outlet pipes from the Izone water treatment plant (WTP) and approximately 425 m of pipe on IZone Drive.

SDC has additional wells and network upgrades planned as part of their ongoing water supply long-term planning. Therefore, depending on the timing of system upgrades and the timing of the uptake and construction on the proposed plan change area, sufficient water supply may be available to service Two Chain block.

2 Assumptions

The site was added to the demand in the 2020 peak day model. The demand assumptions are as follows:

- The peak design flow is 1 litre per second per hectare (1 L/s/ha) in accordance with 'NZS4404:2010 Land Development and Sub-Division' as adopted for the Izone Industrial Park and previous IPort assessments.
- Other developments that were considered in this assessment include the IPort 27 ha Extension (as is documented in memorandums addressed to Rolleston Industrial Developments Ltd. from December 2020).

Table 2-1 summarises the water supply demand at the Two Chain Road industrial area.

Table 2-1: Water Supply Demand at the Proposed Development

Area	Area (ha)	Peak Demand (L/s)
Two Chain Road	98.3	98.3

3 Water Supply Servicing Options

There are two nominated connection points to SDC's existing water supply network. Demand from the site may be split once the site develops but for the purposes of this assessment each connection point has been considered separately to take the full demand:

1. **Option 1 – Service via Jones Road:** Demand is loaded to the DN 300 main at the intersection of Jones Road and Izone Drove.

2. **Option 2 – Service via Walkers Road:** Demand loaded to the DN 150 main on Walkers Road at the west end of the site (DN 150 main is the largest pipe crossing the highway at rail lines at the west end of the Two Chain Block).

Figure 3-1 presents the location of the connection point options described above.

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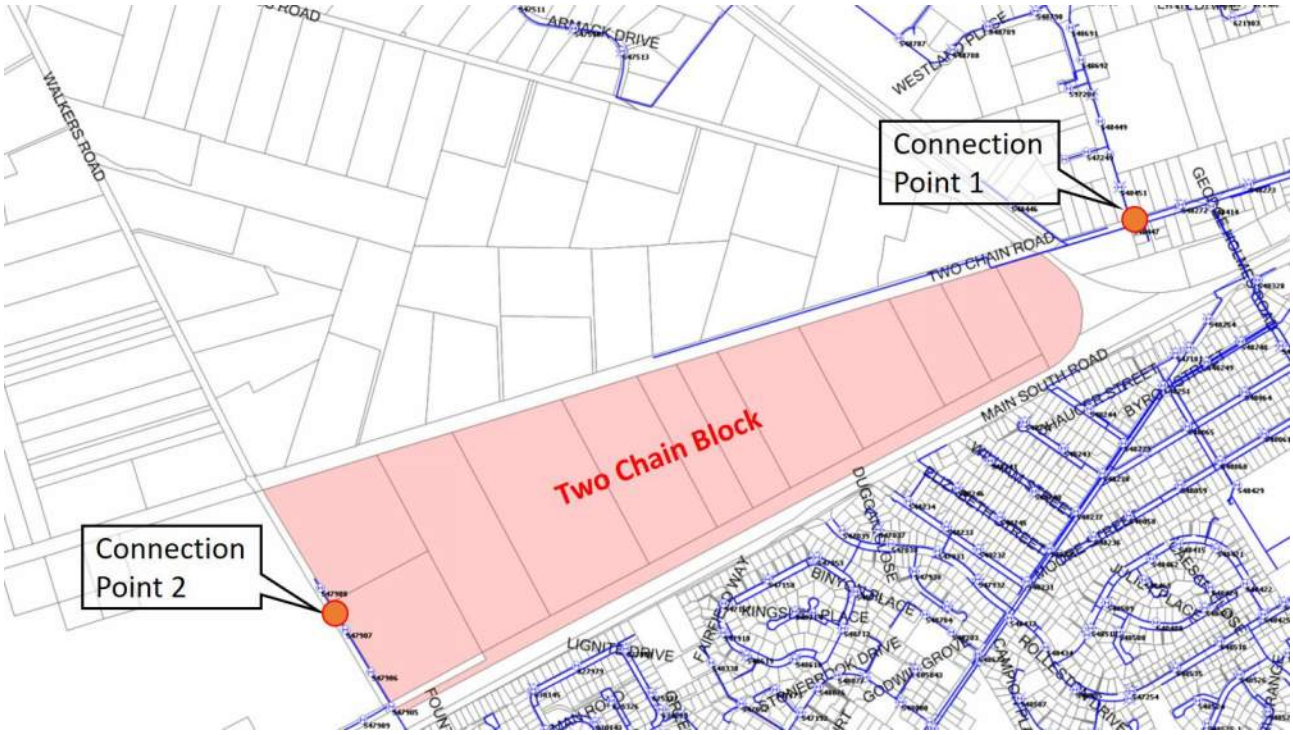

Figure 3-1: Demand connection points into Rolleston Water Supply network

4 Water Supply Infrastructure Recommendations

4.1 Impact on Current Network

Option 1 – Service via Jones Road

The below figures present the hydraulic performance of the existing network with demand added to the Two Chain Industrial area as per Option 1. Figure 4-1 presents maximum pipe headloss and Figure 4-2 presents minimum pressure, both under peak day demand.

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Figure 4-1: Option 1 Headlosses (m/km) in Rolleston Water Supply network

As seen on Figure 4-1, headlosses in the DN 300 main on Izone Drive have increased to above 10 m/km from the outlet of the IZone Water Treatment Plant (WTP) to the development connection point. Previously, in the Iport 27 ha Block network capacity assessment, it was noted that the headlosses in main had increased beyond the desired maximum of 4 m/km

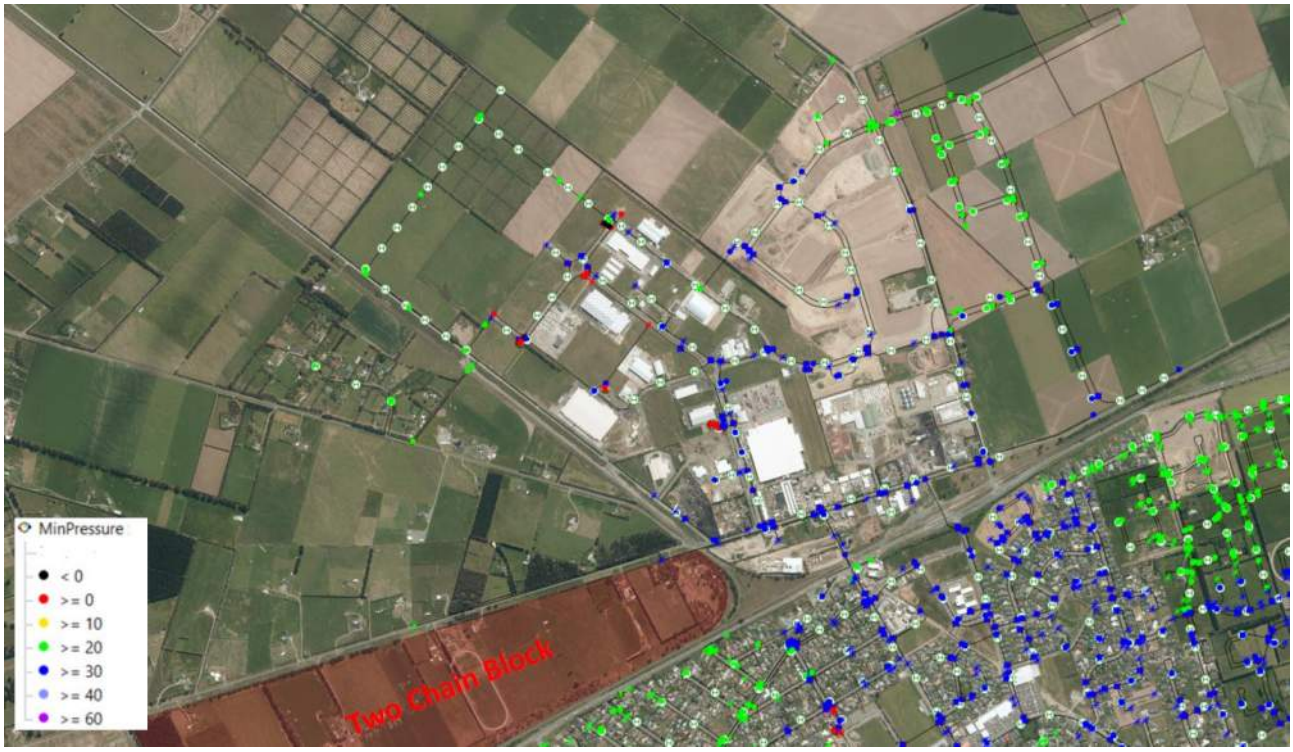

Figure 4-2: Option 1 Minimum pressure (m) in Rolleston Water Supply network

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As shown in Figure 4-2, minimum pressures are below 30 m in the northern portions of the network (Detroit Drive area and connection points of the Iport 27 ha Block). The Izone demand exceeds the current well capacity, leading to the Izone Reservoir level dropping rapidly during peak demand and resulting in low pressures.

It is recommended that for this option the site be serviced by extending the existing DN 300 main on Jones Road into the Two Chain Road Block. This main will be suitable to provide the required fire flows (FW4) to the Two Chain Block, however details of this will need to be confirmed during design.

Option 2 – Service via Walkers Road

Figures 4.3 and 4.4 present maximum pipe headloss and minimum pressure respectively for Option 2 under peak day demand.

Figure 4-3: Option 2 Headlosses (m/km) in Rolleston Water Supply network

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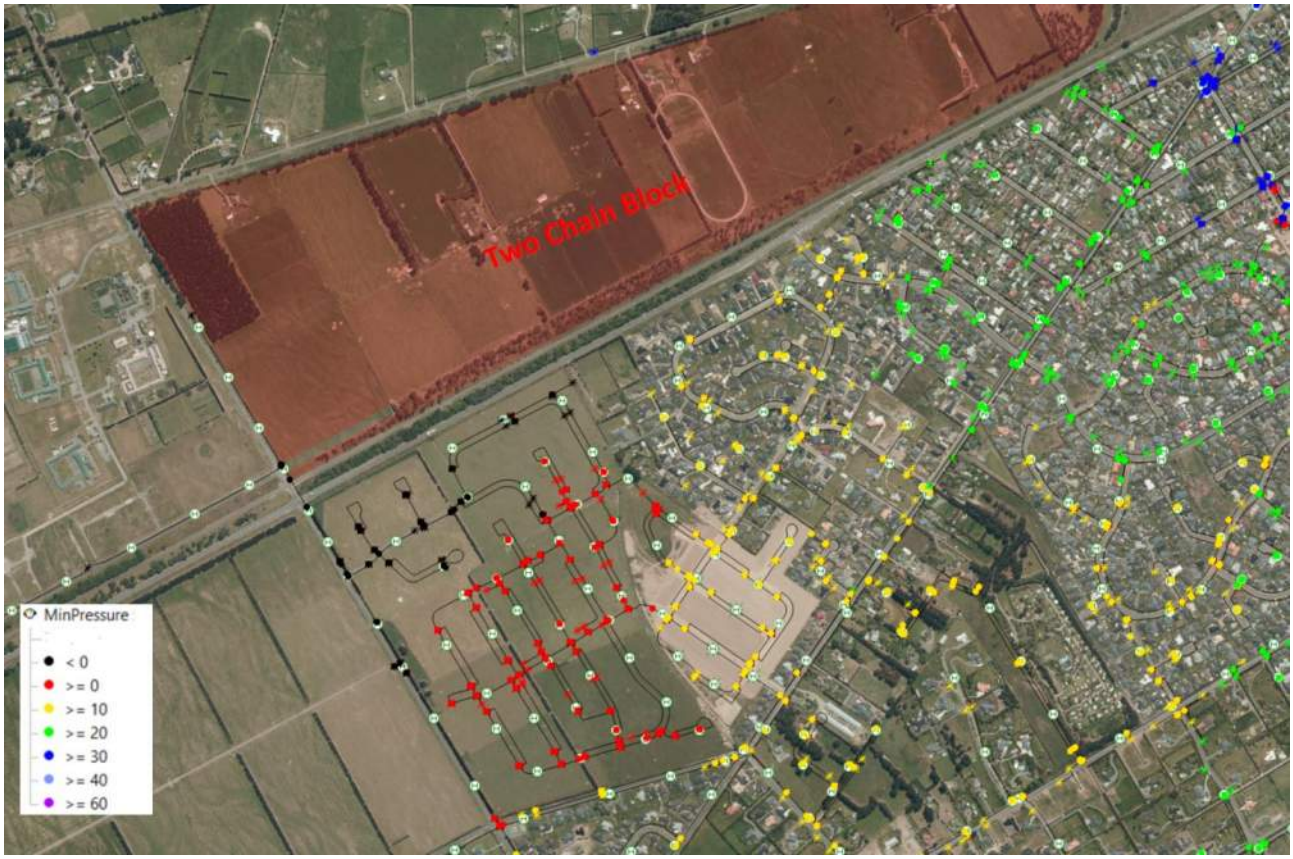

Figure 4-4: Option 2 Minimum pressure (m) in Rolleston Water Supply network

As seen on the above figures, servicing the Two Chain Block via the DN 150 at the western end of the block results in substantial headlosses, and widespread low pressure south of the highway. It is not recommended the Two Chain Block be serviced through this portion of the network at its existing size.

4.2 Servicing Options

The following recommendations were developed to improve pressure and reduce headlosses in the network:

- Upgrade the Izone WTP (with additional new sources) and outlet pipe, as well as approximately 425 m of pipes on IZone Drive; or
- Add new sources (wells) within the Izone / IPort area.

The location of the required network upgrades are shown below on Figure 4-5

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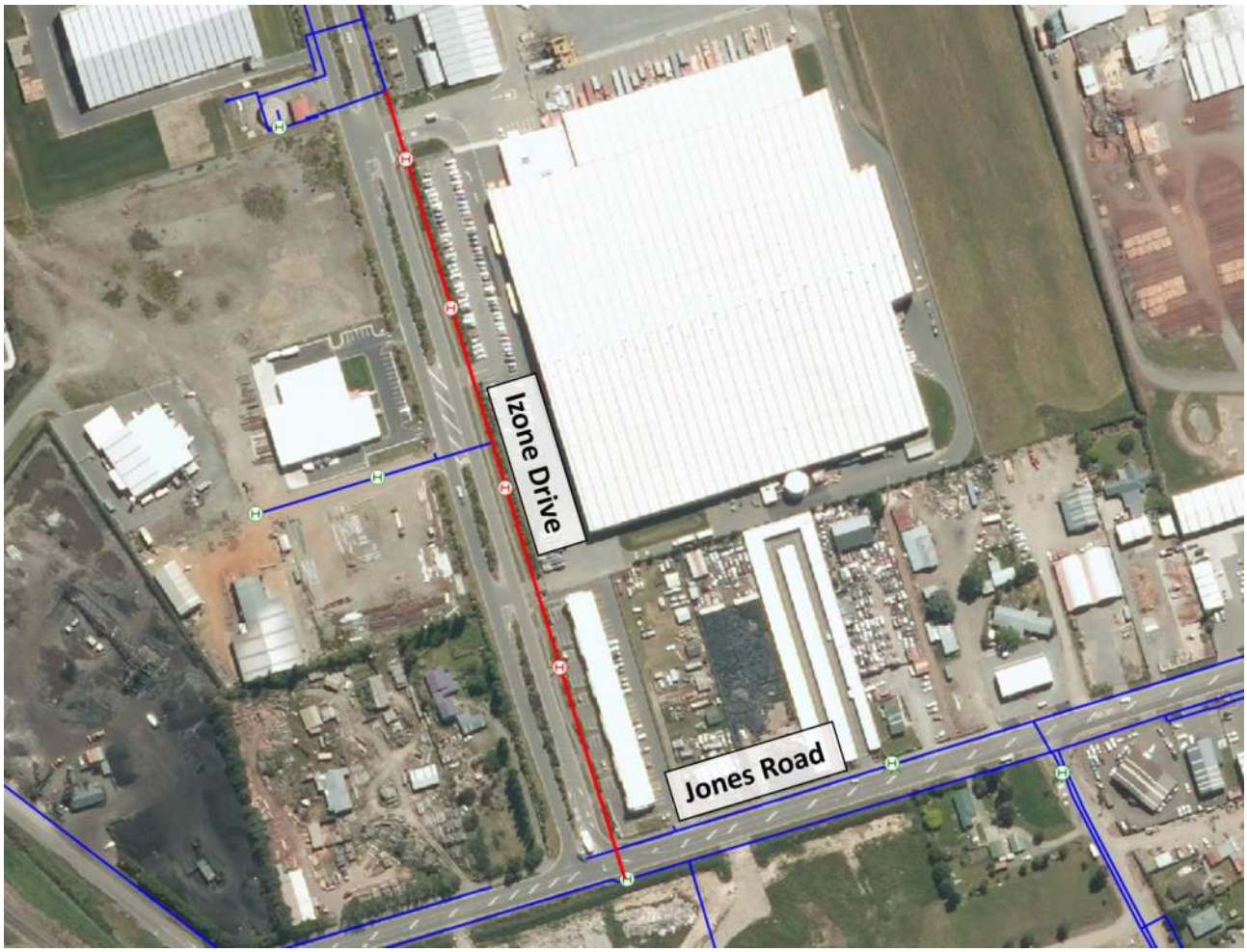

Figure 4-5: Pipe Upgrades Required to Service Two Chain Block (Upgrades Shown in Red)

5 Conclusions

Additional local wells or network upgrades (treatment plant upgrade and pipe upgrades) will be required to meet the design flow determined for the Two Chain industrial area without reducing the level of service in the surrounding network. SDC has additional wells and network upgrades planned as part of their ongoing water supply long-term planning. Therefore, depending on the timing of system upgrades and the timing of the uptake and construction on the proposed plan change area, sufficient water supply may be available to service Two Chain block.

6 Limitations

This memorandum has the following limitations:

- This assessment has only considered the existing demand and demand from the developments noted.
- This assessment has not considered any local pipework within the Two Chain area. Internal pipework to service individual lots will need to be designed accordingly to accommodate peak day/ hour demand.

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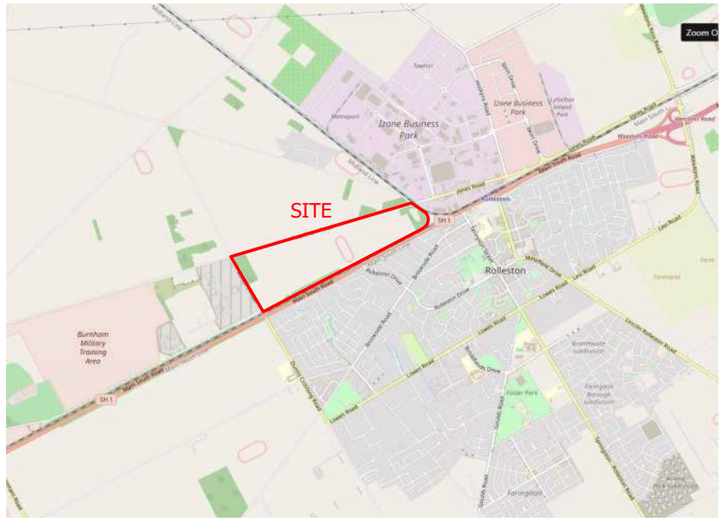
APPENDIX C | Site Plans

- Site Location Plan
- Site Overview Plan including LiDAR Contours & Aerial Photogragh
- Detailed Site Plans showing Lot & DP Numbers

TWO CHAIN ROAD INDUSTRIAL PARK

TWO CHAIN ROAD, ROLLESTON



LOCATION PLAN

REV	DESCRIPTION	DATE
A	FOR COMMENT	17/08/21

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DRAWING NO: 000 REV. A

PROJECT NO: 15010

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TWO CHAIN ROAD INDUSTRIAL PARK

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122 Montreal St,
Sydenham,
Christchurch 8023
PO Box 7069
Sydenham 8240

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NOTES

1. LiDAR data from LINZ Data Service - 1m DEM
2. LiDAR Major contours 2.5m interval, minor 0.5m.
3. Boundary Information from LINZ Data Service
4. Existing services information from Selwyn District Council

Rev#	Description	Drawn	Date
B	Revised Issue	CPS	13.09.21
A	Preliminary	CPS	09.07.21

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Approved TDM
Date 09.07.21

Client: **TWO CHAIN ROAD INDUSTRIAL LTD**

Project: **TWO CHAIN ROAD INDUSTRIAL PARK**

Drawing Title: **SITE OVERVIEW PLAN**

Status: **FOR INFORMATION**

Drawing No. **15010-S-001**

Rev **B**

FILE: O:\1. Projects\DS15000\15010 - Two Chain Industrial Park\05 Information Management\03 Engineering\02 CAD\15010 - S - 001.dwg PLOTTED: 13/09/2021 5:44:18 pm BY: Chris Sexton

NOTES

1. Boundary Information from LINZ Data Service

LEGEND

Site Boundary

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Rev#	Description	Drawn	Date
A	FOR INFORMATION	ABM	24.08.21

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Approved TDM
Date 24.08.2021

Client: **TWO CHAIN ROAD INDUSTRIAL LTD**

Project: **TWO CHAIN ROAD INDUSTRIAL PARK**

Drawing Title: **EXISTING SITE DETAILED PLAN SHEET 1**

Status: **FOR INFORMATION**

Drawing No. **15010-E-101** Rev A

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NOTES

1. Boundary Information from LINZ Data Service

LEGEND

Site Boundary

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A	FOR INFORMATION	ABM	24.08.21

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Project: **TWO CHAIN ROAD INDUSTRIAL PARK**

Drawing Title: **EXISTING SITE DETAILED PLAN SHEET 2**

Status: **FOR INFORMATION**

Drawing No. **15010-E-102**

Rev A

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NOTES

1. Boundary Information from LINZ Data Service

LEGEND

Site Boundary

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Rev#	Description	Drawn	Date
A	FOR INFORMATION	ABM	24.08.21

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Project **TWO CHAIN ROAD INDUSTRIAL PARK**

Drawing Title **EXISTING SITE DETAILED PLAN SHEET 3**

Status **FOR INFORMATION**

Drawing No. **15010-E-103**

Rev A

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