Appendix A

Infrastructure Assessment

Infrastructure Report

ROLLESTON WEST RESIDENTIAL LTD
ROLLESTON WEST PLAN CHANGE
PROJECT 14720

ISSUE FINAL – 12 NOVEMBER 2020

INOVO PROJECTS

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QUALITY ASSURANCE

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REVIEWED & APPROVED BY	PETER MCAULEY	DIRECTOR		12 NOVEMBER 2020

1. Introduction

1.1. Purpose

Inovo Projects Ltd has been engaged by Rolleston West Residential Ltd to complete an Infrastructure Assessment for proposed predominantly residential developments on the western side of the township of Rolleston, at #385 Burnham School Road (Holmes Block) and a second site at on the west side of Dunns Crossing Road centrally located between Brookside Road and Selwyn Road (Skellerup Block), in support of a Plan Change application for development of approximately 2,100 residential lots across the two sites.

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

This report may not be reproduced, in whole or in part, without our prior written approval. This report has been prepared for the purpose stated in the report and may be relied upon for that purpose only. Assumptions made in the preparation of the report are as expressly stated in the report or set out below.

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 Rolleston West Plan Change site is existing farmland of approximately 160 ha in two blocks. The plan change covers two separate parcels known as the "Holmes Block" (approx. 87.53ha) and the "Skellerup Block" (approx. 72.69 ha).

2.1.1. Holmes Block

The first block is commonly called the Holmes Block and is a rectangular section of land of 87.53 ha bounded by State Highway 1 to the northwest, Dunns Crossing Road to the northeast, Burnham School Road to the southeast and the Council owned utilities site to the southwest. The land is currently zoned Living 3 in the Selwyn District Operative Plan for which there is already an Outline Development Plan (ODP) indicating patterns of urban growth.

The site is immediately adjacent to existing Living "Z" zone over Dunns Crossing Road to the northeast with a Living 2 zone being immediately opposite on the east-southeast side of Burnham School Road. The site also bounds the Outer Plains rural zone to the north, west and south directions.

The site is typically gently sloping (1:200) from northwest to southeast, that is from State Highway 1 to Burnham School Road. There is a small water race that currently enters the property from the State Highway 1 approximately 175 metres east from the western boundary. The race then runs perpendicular to the slope and into the block for approximately 310 metres from where it turns to the southwest at about 90 degrees to the boundary and exits the block to the neighbouring Council's land. There are no other water bodies over the land

The site has been used for farming purposes for the last 50 years and is currently covered in variety of irrigated pasture. There are some pine shelter belts but otherwise there is no other vegetation within the Block itself. Along entire frontage of both Dunns Crossing Road and Burnham School Road berm however there are attractive native plantings approximately 3 metres wide.

2.1.2. Skellerup Block

The second block of land under the plan change application known as the Skellerup Block is essentially a rectangular section of land of 72.69 ha to the west of Dunns Crossing Road centrally located between Brookside Road to the North and Selwyn Road to the south. The land is currently zoned Living 3 in the Selwyn District Operative Plan for which there is already an Outline Development Plan (ODP) indicating patterns of urban growth. The land is bounded by a combination of Living "Z" and Inner Plain rural zoned land to the north east immediately over Dunns Crossing Road, and by Outer Plains rural land to the northwest, southwest and south east.

The site is typically gently sloping (1:200) from northwest to southeast. There are no water bodies over the land. The site has been used for farming purposes for the last 50 years and is currently covered in variety of irrigated pasture. There are some pine shelter belts but otherwise there is no other vegetation within the Block itself. Along entire frontage of the Dunns Crossing Road berm however there are attractive native plantings approximately 3 metres wide.

2.2. Ground Conditions

A geotechnical investigation and assessment of suitability for subdivision has been carried out by Coffey Services (NZ) Limited as described in their report titled *Rolleston West Plan Change Geotechnical Assessment Report* (Ref 773-CHCGE281253) dated November 2020.

The ground model for the site is described as river alluvium deposits typically consisting of sandy gravel / gravelly silt (grading to sandy gravel) to greater than 20m depth.

2.3. Groundwater & Bores

The Environment Canterbury (ECan) GIS database shows 1 irrigation well within the Holmes Block and 2 within the Skellerup block. The productive water supply wells range in depth from 60 to 99m. There are no domestic or water supply wells located within the subject sites.

The nearest community supply well (M36/0085) described on the ECan database is approximately 500m up gradient from the Holmes block. No other community supply wells are within 1000m of the site. The site does not fall within a theoretical Community Drinking Water Supply Protection Zone.

There is an existing well (BX23/0830) located at 28 McLenaghan Road some 500m east of the northeast corner of the Skellerup Block. This well is nominated for SDC Water Treatment Plant but has not been developed yet.

The highest measured depth to groundwater in wells near the site varies between 15 and 20m below ground level.

2.4. Existing Infrastructure

There is no existing SDC infrastructure located within the two subject sites. However, existing infrastructure to the neighbouring residential subdivisions to the east can be extended to the proposed development.

An existing Ø300mm sewer rising main is located within Burnham School Road which conveys wastewater from the pump station located at the corner of Burnham School Road and Brookside Road, and pumps 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.

There is an existing Ø110mm water supply main in Burnham School Road and Ø150mm main in Dunns Crossing Road adjacent to the Holmes block. There is a Ø200mm water main in Dunns Crossing Road opposite the northeast corner of the Skellerup Block, with a Ø100mm connection eastwards across to Brenley Drive. Further discussion of water supply is found in Section 5.

2.5. Drainage Features

Both blocks are 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 section of the Paparua Stockwater Race network crosses the northwest corner of the Holmes Block and then southwards along the western boundary before passing under Burnham School Road.

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 to the east of the proposed rezoning have utilised soakage to ground for stormwater management.

3.2. Stormwater Disposal

Geotechnical investigations for the rezoning sites confirm the sites have good drainage characteristics and that discharge to ground is feasible.

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 the house building stage. Soakholes for house sites will be sized to deal with storms up to the 10% AEP 1 hour event.

Runoff from hardstand areas and roads will be collected and treated before discharging into ground via soakpits or infiltration trenches. Where kerb and channel is used then pit and pipe network is used to convey stormwater to soakpits or infiltration basins / trenches. As with similar residential subdivisions in Rolleston, it is proposed to provide treatment swales along road edges which then discharge into ground via soakpits. Soakpits for road drainage will be sized for up to 2% AEP events plus runoff from residential lots once the on-site soakpit is inundated. All drainage infrastructure and soakpits associated with future roads will be constructed as part of any future subdivision and will be vested in SDC.

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.

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 developments.

Consent or a certificate of compliance 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 will be transferred to SDC as required.

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 for stormwater treatment and attenuation as outlined above.

3.3. Flood Management

Detailed model results showing the extent and flood depth are available to view on the SDC's website. The map shows the extent and depth of potential flooding during a 200-year ARI* or 0.5% AEP flood resulting from heavy rainfall. **Figure 1** below shows the predicted flooding for the subject sites.

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. The flood modelling indicates channels crossing or originating within the subject sites and continuing over the south boundary of both blocks. The predicted floodwater depth is generally less than 0.4m.

In general, ground levels for residential 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.

Construction of a potential noise bund along the SH1 boundary to the Holmes Block will partially cut-off overland flow from up-slope. Flow cut off by the potential noise bund would be directed along roadside drains.

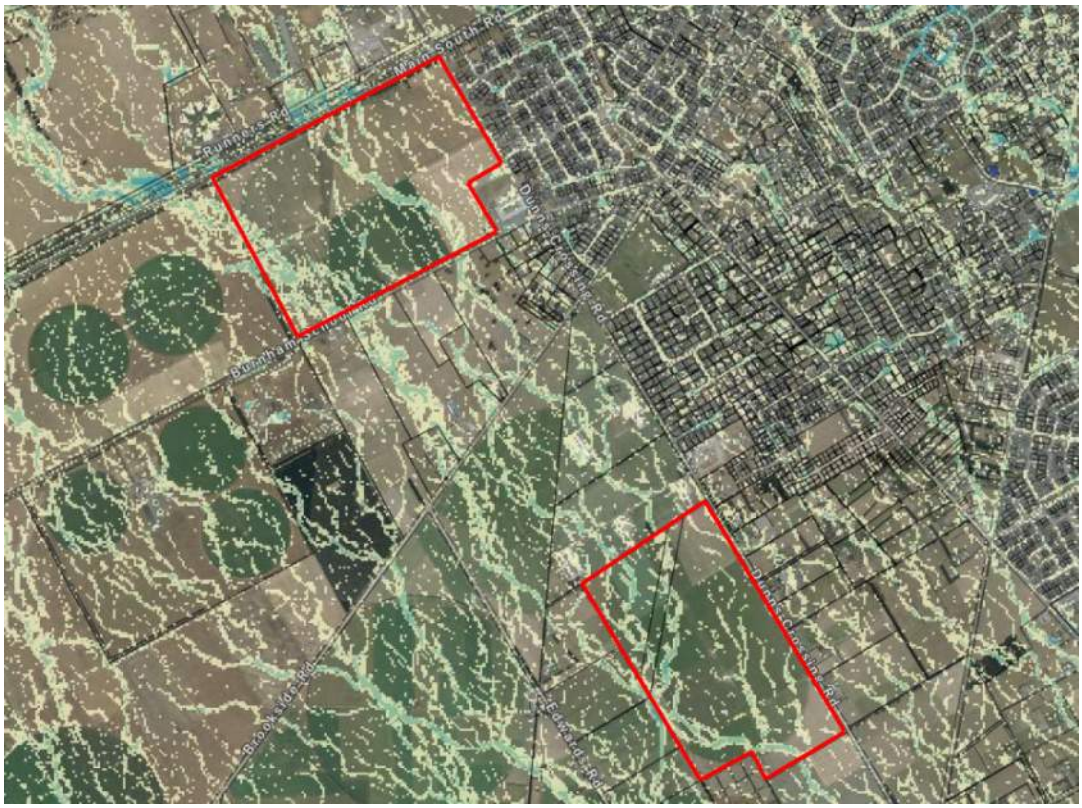

Figure 1 – Flood Modelling from SDC Flooding Map

A 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 and / or residential development.

4. Wastewater

4.1. Reticulation

Only approximately half of the Holmes block can be serviced by gravity sewer connecting to the existing gravity network at the intersection of Dunns Crossing Road / Burnham School Road. This relies on extending the Ø225 at 1:250 grade from Dunn's Crossing Road along Burnham School Road, up the west boundary of the school, and then zig-zagging across as grade and minimum cover allows. The southwest half of the site would require either gravity to a new pump station at Burnham School Road or utilise local pressure sewer discharging into the gravity network. It is anticipated that a new pump station to service the Holmes Block will be required, and as one option potentially discharging into the existing Ø300mm rising main in Burnham School Road to convey wastewater directly to The Pines Wastewater Treatment Plant (WWTP).

The Skellerup Block cannot currently be serviced by extending the existing SDC gravity sewer network south along Dunns Crossing Road due to the site being at a lower elevation. The Skellerup block will require a pump or lift station to discharge either into the existing gravity network, the existing rising main in Selwyn Road, or a new dedicated rising main constructed to The Pines WWTP.

Analysis by WSP indicates capacity constraints in the existing trunk sewer from 232 Dunns Crossing Road to Goulds Road Pump station via Carlyle Lane, East Maddisons Road, Oak Tree Lane and Goulds Road. Upgrades to the existing gravity sewer network could be required.

A new sewer pump station located further south along Dunns Crossing Road is anticipated to service the Skellerup Block as well as future residential development to the east of Dunns Crossing Road. This pump station could discharge into the existing Ø630mm PE rising main in Selwyn Road to the south or via new dedicated rising main to The Pines WWTP. The final location of a new sewer pump station and rising main able to service the Skellerup Block will be determined during subdivision design in consultation with SDC.

4.2. Network Capacity

Refer to the Wastewater Network Capacity Assessment prepared by WSP attached as Appendix A for an assessment of the capacity of the rising main network to The Pines WWTP.

Modelling analysis by WSP indicates that the existing Ø225mm gravity main in Burnham School Road and Burnham School Road Pump Station has capacity for the additional flows from the Holmes Block, with possible upgrades required to the gravity network to prevent surcharging during wet weather flows. Modelling analysis of a pumped discharge into the Ø300 uPVC sewer rising main in Burnham School Road indicates that the addition of the Holmes Block will not cause any issues with pumped discharge from the Burnham School Road and George Holmes Road pump stations which also use this line.

Modelling analysis by WSP indicates that the existing Ø630mm gravity main in Selwyn Road has capacity for the additional flows from the Skellerup Block, although it would increase the incidence of surcharging in the gravity network draining to the Selwyn Road Pump Station. WSP noted that ongoing development in Prebbleton, Lincoln and South Rolleston will trigger the requirement for capacity upgrades to the Selwyn Road Pump Station in the future.

An alternative solution is to construct a dedicated rising main from a new sewer station in Dunns Crossing Road directly to The Pines WWTP.

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. Reticulation

The Rolleston township reticulated supply extends along Burnham School Road (Ø110mm main) and Dunns Crossing Road (Ø150mm main) south and east of the Holmes block. The watermain extends along the east side of Dunns Crossing Road heading south to just opposite the northeast corner of the Skellerup Block, changing from Ø150 to Ø200mm main just south of Boulez Mews. There is a Ø100mm cross connection across to Jean Archie Drive and then to 28 McLenaghan Drive where a public water supply well is still to be commissioned.

The SDC 5Waters Activity Management Plan Volume 2 – Water (2018) indicates the Ø200mm main is proposed to continue south along Dunns Crossing Road to Selwyn road, and along Selwyn Road to connect with existing Ø200mm main at the intersection of East Maddison's Road and Selwyn Road.

The existing reticulation can be extended into each of the plan change blocks along proposed spine roads with minor upgrading of the existing network. Additional connections to other parts of the Rolleston township reticulation network to the east to increase network connectivity and resilience will be determined at the subdivision design stage.

The internal pipework within the development will be designed to accommodate peak demand including provision for fire-fighting demand in accordance with SDC's *Engineering Code of Practice* and SNZ/PAS 4509:2008 *Fire Service Code of Practice*.

5.2. 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.

Upgrade options considered by WSP included upgrading the existing water supply mains to each of the plan change sites or development of a new supply bore(s) in the proposed development area. WSP noted that a future potable water supply bore will become available at 28 McLenaghan Road to the east of the Skellerup block sometime in the future, but that the current estimated yield will not be enough to accommodate the new developments. A potential new well site could be developed within or near the proposed development areas to reduce the need for upgrades of existing pipelines and to improve the resilience of the water supply network to the west side of Rolleston township.

From a water supply perspective, the plan change can be supported with upgrades or extension of existing infrastructure to service the plan change area as outlined above.

6. Power / Telecommunications

6.1. Power

The Rolleston Zone Substation is located at the corner of Burnham School Road and Dunns Crossing road. 11kV underground cables as well as 11 & 33 kV overhead network cables are located within Burnham School Road and Dunns Crossing road which can be extended to provide sufficient power to the development.

Full appraisal of the network extension requirements will be carried out by the network provider once the Plan Change approval has been obtained.

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 on separate lots at locations approved by the utility company and SDC.

6.2. Streetlighting

Streetlighting will be provided to roading and reserves in accordance SDC engineering standards. 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 Dunns Crossing 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 shown on the ODP plans attached to the planning application. There are several proposed connections onto Dunns Crossing Road and Burnham School Road. Possible future connections into neighbouring land surrounding the ODP sites are indicated.

The proposed secondary roading patterns have been indicatively shown on the ODP plans attached to the planning application. Tertiary roads to further subdivide the main roading patterns will be determined during the subdivision design stage in consultation with SDC.

All road corridors will have 13m-23m legal width. Rights of way will be between 3.5m and 6.5m, dependant on the number of users and length of ROW.

7.2. Road Cross Section

Standard “SDC Low Profile” kerb and channel will be used in all roads in the subdivision, with cutdowns where appropriate for pedestrian crossings and ROW’s.

Asphalt footpaths are proposed in the roading network in accordance with SDC Engineering Code of Practice and in keeping with other recent subdivisions in Rolleston. Footpath layout and links to green spaces will be discussed further with SDC at the engineering approval stage.

7.3. 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 with height difference of approximately 4.5m and 7m total elevation change for the Holmes and Skellerup blocks respectively (refer to LiDAR contour plans included in Appendix C)

Bulk earthwork design will be determined by providing overland flow paths along roads and achieving a minimum grade of from the top of kerb to the rear of the sections fronting the road. The design philosophy for the setting of earthwork levels will be determined by the following criteria:

1. Road gradients not to exceed 1 in 20, not to be less than 1:450 where possible
2. Cut/fill balance where applicable
3. Overland flow paths for the subdivision are to follow the road layout, with the overall site overland flows not being different to the current situation.

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 on residential lots and roads 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.

9. Summary & Conclusion

Primary stormwater runoff from residential allotments will be discharged directly to ground. Soakpits on individual sites will be constructed as part of the building consent process. Drainage and soakpits associated with roads will be constructed as part of any future subdivision and vested in SDC. The development will be designed to ensure that secondary flow will safely drain from the sections via the roading networks.

The majority of new sites can be serviced by gravity sewer network discharging to new pump stations to be developed to cater for each block. The Holmes Block pump station, as an option, could discharge into the existing Ø300mm rising main in Burnham School Road. It is anticipated that a new pump station would be developed further south along Dunns Crossing Road to service the Skellerup Block as well as land to the east. This pump station could discharge into the existing Ø630mm rising main in Selwyn Road or via a new rising main directly to The Pines Wastewater Treatment Plant.

Water reticulation will be an extension of the existing SDC water reticulation network bordering the site. Extension of the existing main in Dunns Crossing Road to connect to the existing network in Selwyn Road may be required to ensure adequate water supply. Additional connections to other parts of the SDC network to the east will be determined at the subdivision stage to increase network connectivity and resilience.

Existing electricity and fibre broadband networks in the neighbouring developments can be extended to service the proposed plan change areas. 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 water supply and wastewater infrastructure to service the development areas.

APPENDIX A | WASTEWATER CAPACITY ASSESSMENT

Memorandum

To	Tim Carter, Bruce Van Duyn
Copy	Sue Harrison, Murray England
From	Charlotte Mills
Office	Christchurch
Date	10 November 2020
File/Ref	3-C2210.00
Subject	Rolleston West Plan Change Wastewater Capacity Assessment

1 Summary

WSP was engaged by Rolleston West Residential Ltd. to complete a wastewater network capacity assessment for two developments in Rolleston. The Holmes Block will be of approximately 87.5 ha, with up to 1,150 lots proposed and the Skellerup Block will be 72.7 ha with up to 950 lots.

The developments connect to separate parts of the trunk network and do not impact on each other. Our assessment has considered two options for each development:

1. Gravity connection to the gravity network
2. A pumped connection to a pressure main.

Our assessment has found that connection of the developments to the gravity network is predicted to cause overflows in wet weather unless pipe upgrades are constructed. Their connection to the trunk pressure mains are predicted to have less negative impacts. For each development there is also an option to construct a new pipeline from the development directly to the Pines wastewater treatment plant. Therefore, in our professional opinion, there are viable wastewater options to allow re-zoning of this land for residential use.

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2 Assumptions

2.1 General

- The existing 2019 wastewater model was used, which was modelled in InfoWorks ICM v6.0.9 (WSP model reference: *chpc044:40000/SDC Wastewater Models*). This is the most up-to-date version of the model, used for the Resilience Master Planning project completed for SDC in 2019. During the Resilience Study bulk population updates were applied so model matched SDC's 2019 population estimates, and the new Prebbleton pump station was added to the model, which diverts Prebbleton flows away from Lincoln directly to the Selwyn Road Pump Station (PS). An overview of the system is presented in Figure 1.

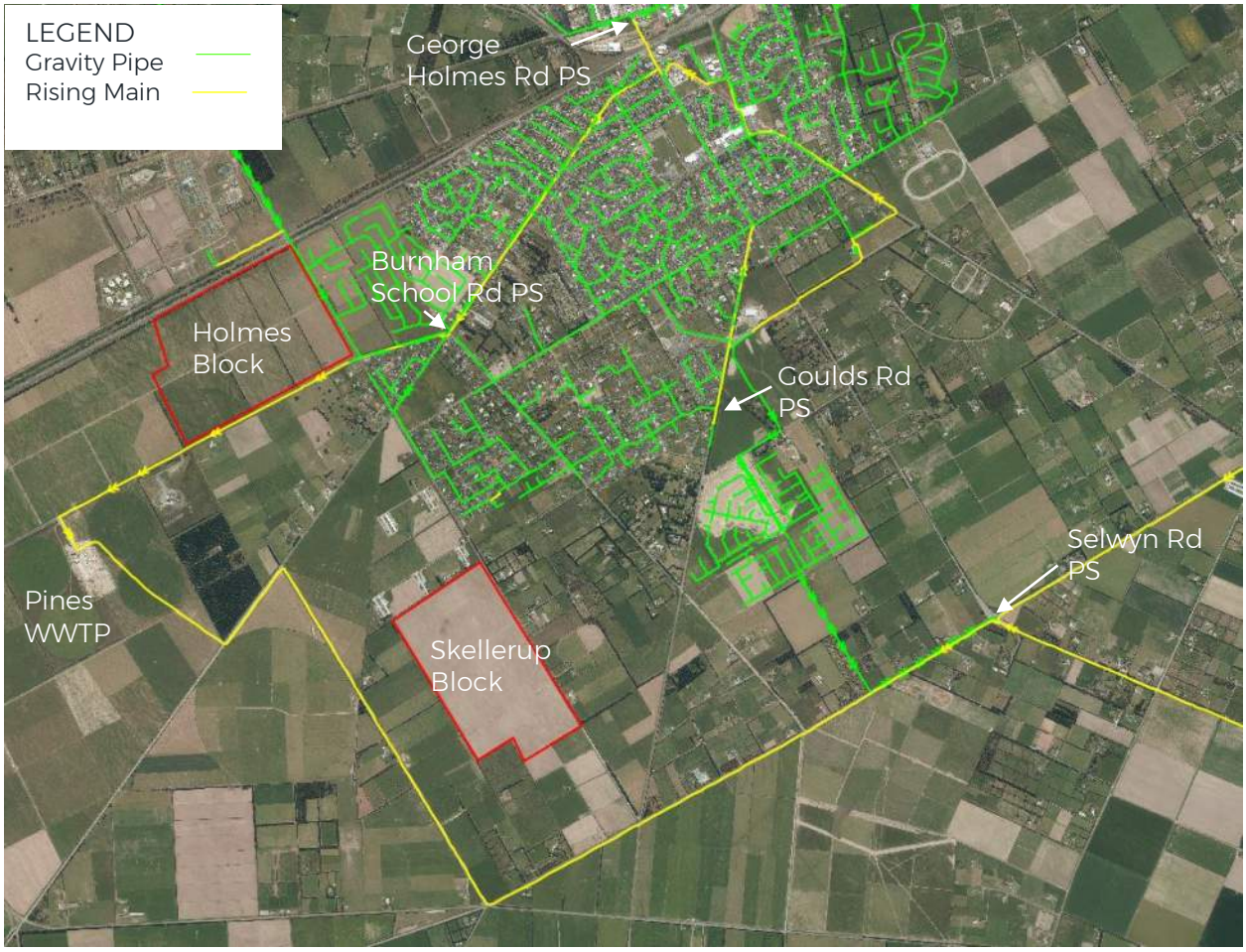


Figure 1: Wastewater System Overview

- Apart from the updates discussed above, the model asset data has not had an extensive update since the model was first built in 2016, as such it does not include infrastructure for recent subdivisions within the Lincoln, Prebbleton and Rolleston townships. However, as this assessment will focus on the trunk infrastructure capacity this does not impact the confidence in the model results for this assessment.

- 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

- Flows from the plan change area were calculated using the following assumptions:
  - Up to 1150 lots will be developed at the Holmes Block and up to 950 lots will be developed at the Skellerup Block (email from Bruce Van Duyn on 3 November 2020);
  - Population per lot is 2.7 (SDC's Engineering Code of Practice);
  - Consumption rate is 220 l/h/d (SDC's Engineering Code of Practice);
  - The peak to average flow rate for dry weather is 2.5 (SDC's Engineering Code of Practice);
  - The peaking factor for wet weather on peak dry weather is 2 (SDC's Engineering Code of Practice).

Table 2-1 below summarises the potential flows from the developed plan change area.

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

Plan Change Block	Proposed No. of Lots	Population	Calculated ADWF (L/s)	Calculated PWWF (L/s)
Holmes	1150	3105	7.9	39.5
Skellerup	950	2565	6.5	32.7

3 Wastewater Servicing Options

There are three easily identified options to service each block:

Holmes Block

1. Connect to gravity network on Dunns Crossing Road. The flows would then be conveyed via Burnham School Road PS directly to the Pines WWTP in a common rising main it shares with George Holmes Road PS.
2. Pump into common rising main on Burnham School Road
3. Construct new pipeline to take the developments flows directly to the Pines WWTP

Skellerup Block

1. Connect to gravity network on Dunns Crossing Road. The flows would then be conveyed via Goulds Road PS and Selwyn Road PS to the Pines WWTP.
2. Pump into rising main on Selwyn Road
3. Construct new pipeline to take the developments flows directly to the Pines WWTP

4 Modelling Methodology

For each block options 1 and 2 were modelled. Option 3 for each block appears viable at this stage, as they are located close to the Pines WWTP and does not require modelling.

The following methodology was undertaken:

1 The existing 2019 model, with no amendments was used as the Base scenario.
2 Two new scenarios were created, for both dry weather and wet weather flow comparisons, and two new sub-catchments representing the developments were included in both.
3 The dry weather scenario was updated to include the developments population to allow the impact of the diurnal flow from the developments to be assessed.
4 The wet weather scenario was run the with the maximum flow 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.
5 Simulations were run to assess the impact of the development on the existing network during dry and wet weather.

5 Modelling Results

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

5.1 Holmes Block

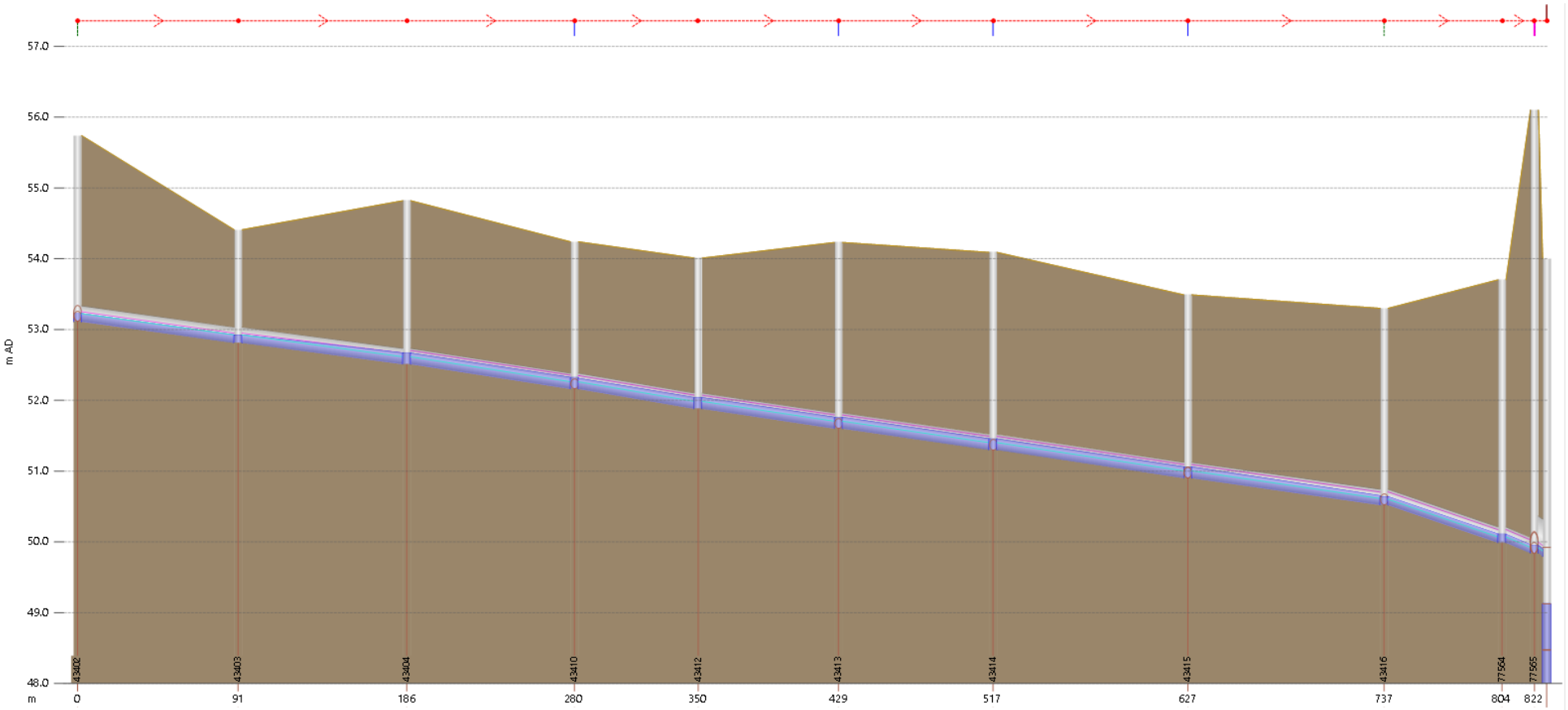
5.1.1 Option 1 – Gravity connection

5.1.1.1 Dry Weather Results

No issues are predicted in the gravity network downstream of the connection point (manhole Asset ID 550881), refer to Figure 2. Burnham School Road PS also is predicted to have capacity for dry weather flow from the Holmes Block.

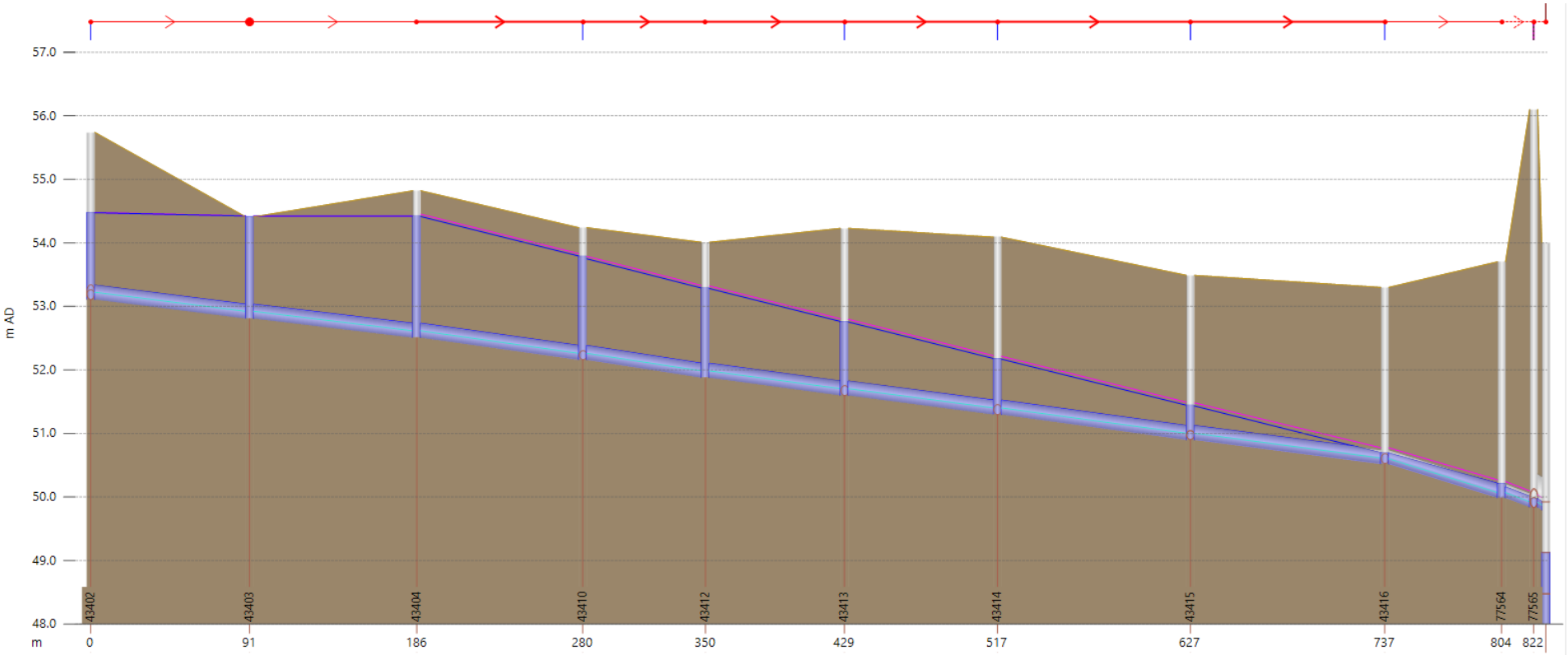
5.1.1.1 Wet Weather Results

During wet weather flow the gravity network is predicted to surcharge and a manhole overflow is predicted at (manhole Asset ID 550880) due to the flows from the Holmes Block, refer to Figure 3. However, Burnham School Road PS is predicted to have capacity for the wet weather flow. Therefore, upgrading approximately 640 m of pipe would be an option to allow connection of the development.



Link		43402.1	43403.1	43404.2	43410.1	43412.2	43413.1	43414.2	43415.1	43416.2	-	-
width (mm)		225	225	225	225	225	225	225	225	225	225	-
US flow (l/s)		14.78	14.19	25.33	24.94	24.79	24.77	24.61	24.62	24.52	24.50	-
r.pfc (l/s)		30	29	31	33	31	30	31	30	46	46	-
Node	43402	43403	43404	43410	43412	43413	43414	43415	43416	77564	-	-
ground (m AD)	55.740	54.410	54.820	54.240	54.010	54.230	54.090	53.490	53.300	53.703	-	-
Ch floor lev (m AD)	53.110	52.810	52.510	52.160	51.880	51.600	51.300	50.900	50.520	49.988	-	-

Figure 2: Long section at PDWF in the from manhole Asset ID 550879 to Burnham School Road PS. Predicted levels in the current system without the Holmes development is shown by the light blue line.



Link	43402.1	43403.1	43404.2	43410.1	43412.2	43413.1	43414.2	43415.1	43416.2	-
width (mm)	225	225	225	225	225	225	225	225	225	225
US flow (l/s)	11.45	2.74	41.96	41.56	41.52	41.51	41.51	41.67	41.67	-
r.pfc (l/s)	30	29	31	33	31	30	31	30	46	46

Node	43402	43403	43404	43410	43412	43413	43414	43415	43416	77564	-
ground (m AD)	55.740	54.410	54.820	54.240	54.010	54.230	54.090	53.490	53.300	53.703	-
Ch floor lev (m AD)	53.110	52.810	52.510	52.160	51.880	51.600	51.300	50.900	50.520	49.988	-

Figure 3: Long section at PWWF in the from manhole Asset ID 550879 to Burnham School Road PS. Predicted levels in the current system without the Holmes development is shown by the light blue line.

5.1.2 Option 2 – Connection to Pressure Main

Connection to the pressure main on Burnham School Road has been assessed in the model. Burnham School Road and George Holmes Road pump stations also use this pressure main so the impact on their flowrate is reported. As there is very little wet weather response in the catchments of these two pump stations and the pump stations are not running frequently there is no difference between the dry and wet weather results.

5.1.2.1 Dry Weather and Wet Weather Results

Burnham School Road PS peak flow rate drops from 94 l/s to 75 l/s, when it pumps at the same time as the Holmes development. However, the predicted peak flow into the station is 20 l/s so the reduction in pump flow rate does not cause an issue.

George Holmes Road PS peak flow rate drops from 63 l/s to 50 l/s, when it pumps at the same time as the Holmes development. However, the predicted peak flow into the station is 10 l/s so the reduction in pump flow rate does not cause an issue. It is important to note the industrial flow information has not been updated since 2016 so the modelled flowrate may be underpredicted.

5.2 Skellerup Block

5.2.1 Option 1 – Gravity connection

5.2.1.1 Dry Weather Results

During dry weather flow the gravity network is predicted to surcharge downstream of the connection point (manhole Asset ID 550940), but no overflows are predicted due to the flows from the Skellerup Block, refer to Figure 4. Goulds Road PS does not have sufficient capacity for the dry weather flow.

5.2.1.2 Wet Weather

During wet weather flow the gravity network is predicted to surcharge and a manhole overflow is predicted at (manhole Asset ID 550940) due to the flows from the Skellerup Block, refer to Figure 5. Goulds Road PS does not have sufficient capacity for the wet weather flow.

Therefore, upgrading approximately 2200 m of gravity pipe and the upgrade of Goulds Road PS and rising main would be required to allow connection of the development. Whether further upgrades of the system are required after the upgrade of Goulds Road PS has not been assessed at this time.

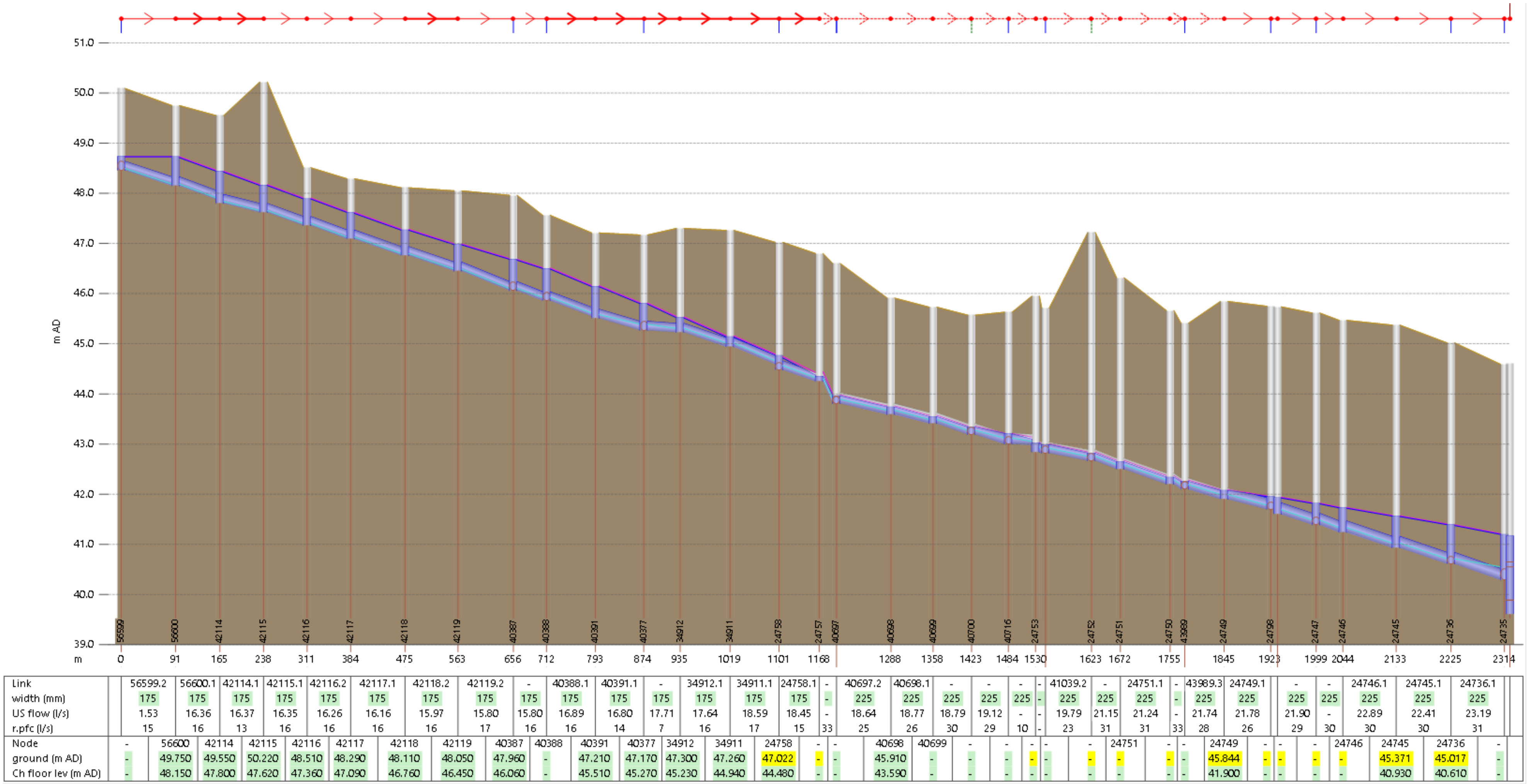


Figure 4: Long section at PDWF in the from manhole Asset ID 550939 to Goulds Road PS. Predicted levels in the current system without the Skellerup development is shown by the blue line.

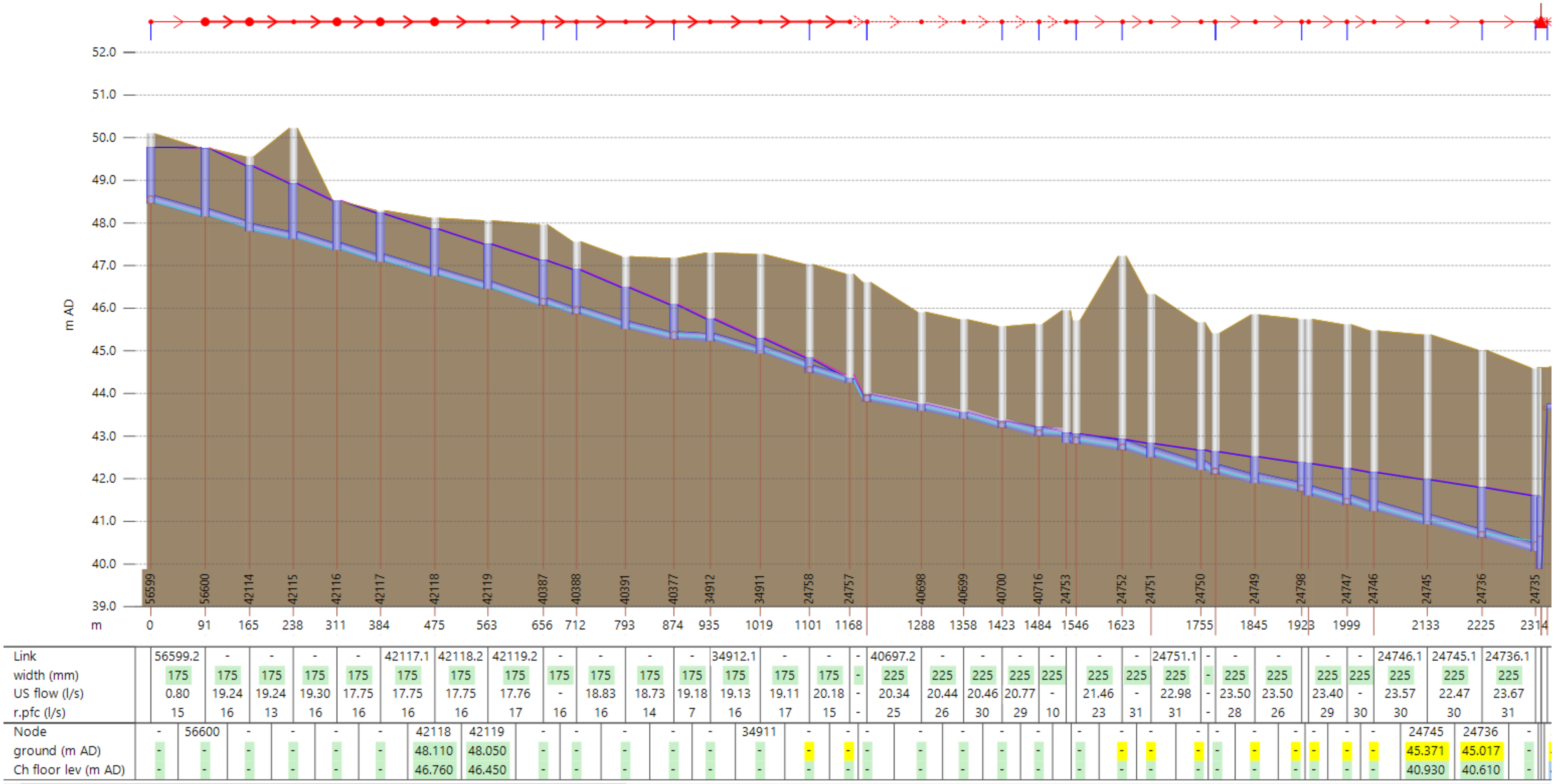


Figure 5: Long section at PWWF in the from manhole Asset ID 550939 to Goulds Road PS. Predicted levels in the current system without the Skellerup development is shown by the blue line.

5.2.2 Option 2 – Connection to Pressure Main

Connection to the pressure main on Selwyn Road has been assessed in the model. Selwyn Road PS also uses this pressure main so the impact of its flowrate is reported. Selwyn Road PS receives flow from Lincoln and Prebbleton, which have a response to rainfall so the wet weather results are different to the dry weather results.

5.2.2.1 Dry Weather

Selwyn Road duty pump peak flow rate drops from 244 l/s to 238 l/s, when it pumps at the same time as the Skellerup development. However, the predicted peak flow into the station is slightly above this flowrate but there is sufficient volume in the pump station that the peak wet well level does not change significantly.

5.2.2.2 Wet Weather

Selwyn Road PS peak flowrate drops from 370 l/s to 356 l/s, when it pumps at the same time as the Skellerup development. Peak flow into the station is slightly above this flowrate and the peak water level in the wet well is predicted to increase by 300 mm. Surcharging in the gravity network is already predicted due to the wet well level so this is increased but the water level is still 3 m below ground level. However, with the ongoing development happening in Prebbleton, Lincoln and South Rolleston Selwyn Road PS will require a capacity upgrade in the future.

6 Conclusions

Our assessment has found that connection of the two developments to the gravity network is predicted to cause overflows in wet weather unless pipe upgrades are constructed. Their connection to the trunk pressure mains are predicted to have less negative impacts. However, the alternative option to service the two developments with two new separate pipelines that go directly to the Pines WWTP is worth considering further.

7 Limitations

- This assessment has not considered whether the Pines WWTP has capacity to accept flow from the developments.
- Industrial flow information has not been updated since 2016 so the modelled flowrate to George Holmes Road PS may be underpredicted.

Prepared by:	Reviewed by:	Approved for Release by:
		
Charlotte Mills	**David Ripley**	**Sue Harrison**
Principal Environmental Engineer	Team Leader - Water	Project Director

APPENDIX B | WATER SUPPLY CAPACITY ASSESSMENT

Memorandum

To	Tim Carter, Bruce Van Duyn
Copy	Sue Harrison, Murray England
From	Belen Rada Mora
Office	Christchurch
Date	12 November 2020
File/Ref	3-C2210.00
Subject	Rolleston West Plan Change Water Supply Assessment

1 Summary

WSP was engaged by Rolleston West Residential Ltd. to assess the water supply network capacity and options to support the land-use plan change at the Holmes and Skellerup blocks in Rolleston. The developments are approximately 160 ha in total and allow for up to 2,100 lots. This assessment has aligned with the Selwyn District Council (SDC) objectives as part of their Master Planning when proposing upgrades to the network.

Subject to the recommendations in this memorandum, there are no water supply constraints which would impede rezoning of this land for residential use.

2 Assumptions

The two developments were added to the demand in the 2020 peak day model. The demand assumptions are as follows:

- Holmes Block Development: 87.5 ha will be developed with up to 1,150 lots;
- Skellerup Block Development: 72.7 ha will be developed with up to 950 lots;
- Rolleston domestic peak day water demand is 2,906 L/property/day as indicated in 2020 Master Planning project for SDC;
- Leakage rate is 88 L/property/day as indicated in SDC Water Balance report in 2019 by Thomas Consultants.
- Connection to network as shown in Figure 2-1 below:
    - Holmes connected to the DN 150 uPVC main on Burnham School Road (intersection between Burnham School Rd and Dunns Crossing Rd)
    - Skellerup Block Development connected to the DN 200 uPVC main on Dunns Crossing Rd

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Figure 2-1: Connections of new development into Rolleston Water Supply network

Table 2.1 below summarises the Water Supply demand at the proposed developments:

Table 2.1 Water Supply Demand at the Proposed Developments

Area	Properties	Demand (L/prop/day)	Peak Factor	Leakage (L/prop/day)	Average Demand (L/s)	Peak Demand (L/s)
Holmes Block	1,150	2,906	1.64	88	39.85	64.61
Skellerup Block	950	2,906	1.64	88	32.92	53.37

- A summary of the water source current capacity in Rolleston is provided in Table 2.2.

Table 2.2 Rolleston Water Resource - Current Capacity

Sites Available	Well	Capacity (L/s)
Izone	1	63
	2	55 (throttled)
	3	60
	4	60
Moore Street	*1*	55
	2	50
Overbury	*1*	42
Helpet	*1*	60
	2	40

3 Water Supply Infrastructure Recommendations

3.1 Impact of Holmes and Skellerup Developments on Current Network

The hydraulic assessment for the current Rolleston supply is show in Figure 3-1 and Figure 3-2.

Both developments would be supplied from existing well sites such as Izone, Helpet and Moore Street, with new wells planned to accommodate future demand at these preferred sites as well new well sites proposed for McLenaghan Road and Dalwood Crescent. It is important to mention that current and future well capacity is available to service the developments.

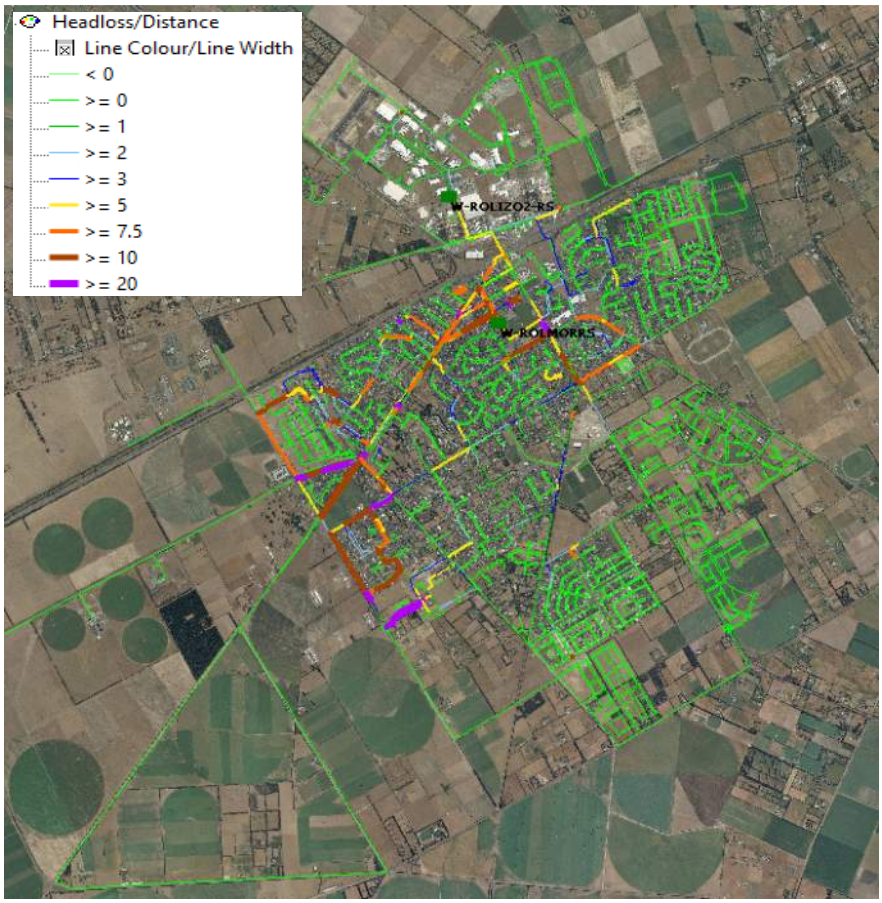


Figure 3-1: Headlosses (m/km) in Rolleston Water Supply network

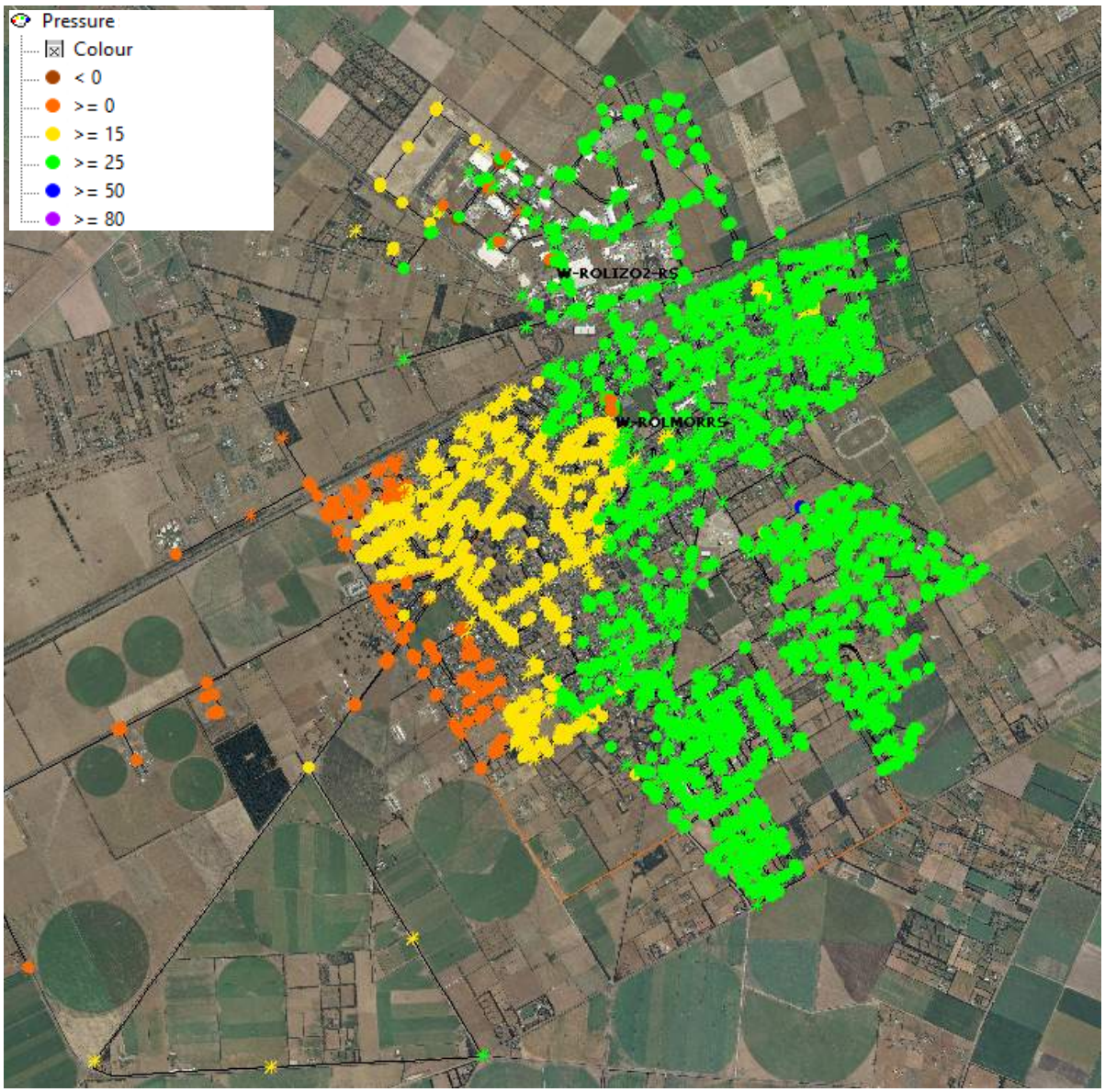


Figure 3-2: Minimum pressure (m) in Rolleston Water Supply network

Figure 3-1 and Figure 3-2 highlight low levels of service (LoS) in some areas of the network once the Holmes and Skellerup developments are connected to the network. This is because the existing pipes are required to deliver a higher flow than designed for, resulting in low pressure and high headlosses in parts of the network.

Two options were considered to improve the LoS when supplying the new developments:

- Option 1: Local pipe upgrades and utilise the current available sources
- Option 2: New wells located

3.2 Option 1: Local Upgrades

A high-level hydraulic assessment was carried out to ensure the network can deliver levels of service to the developments.

This option involves supplying water from the east side of the network, where there is enough well capacity to meet the demand. Infrastructure upgrades would be required along Burnham School Road, Brookside Road, Dunns Crossing Road, and Selwyn Road.

Figure 3-3 shows the network upgrades required to meet LoS with both developments connected to the network:

- Pipe upgrades along Brookside Rd and Burham School Rd. This helps supplying the Holmes Block development from the East side of the network.

- New pipe network along Selwyn Rd and Dunns Crossing Rd, connecting the Skellerup Block development to the east side of the network.

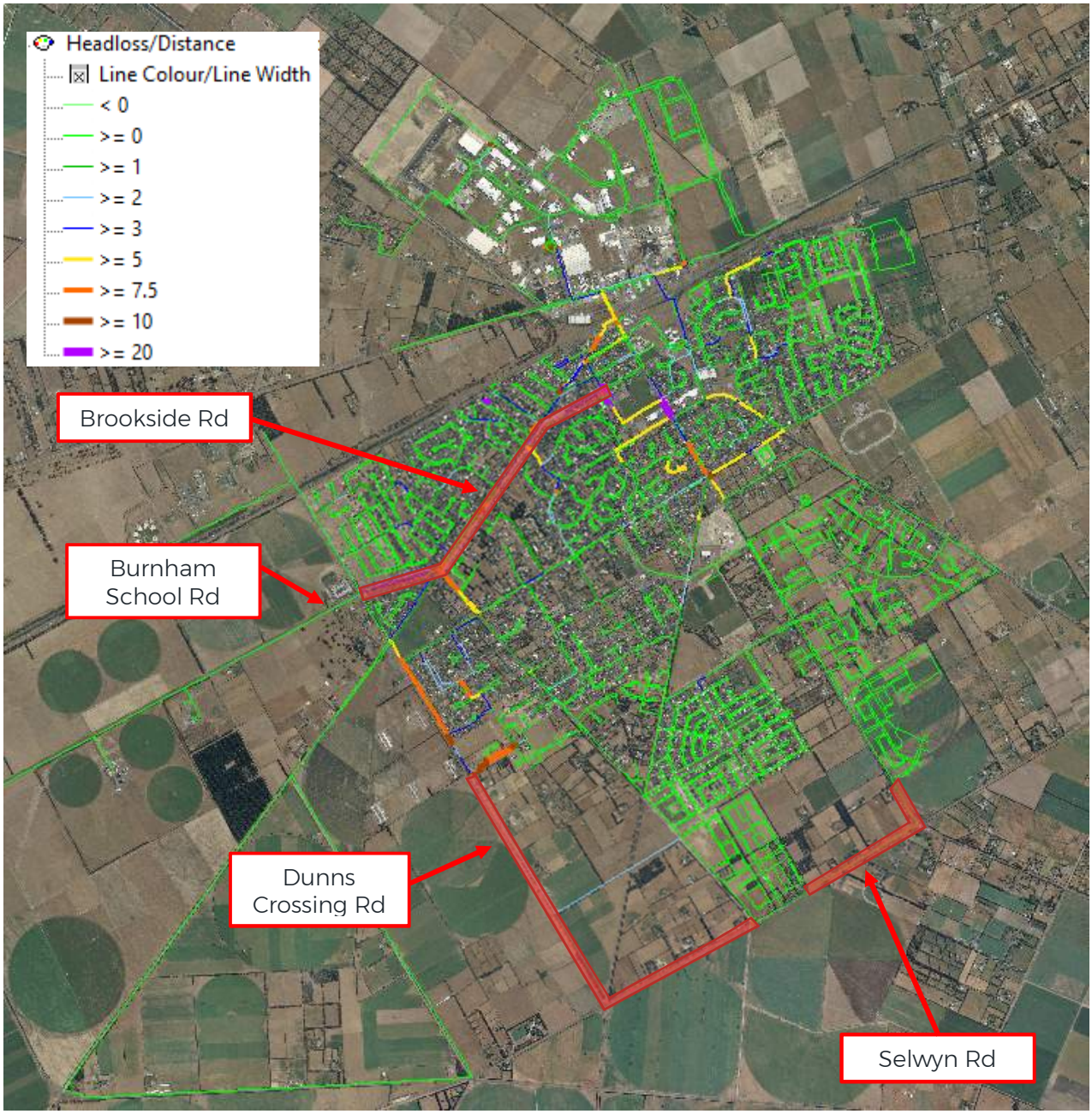


Figure 3-3: Headlosses (m/km) in Rolleston Water Supply network after upgrades are in place

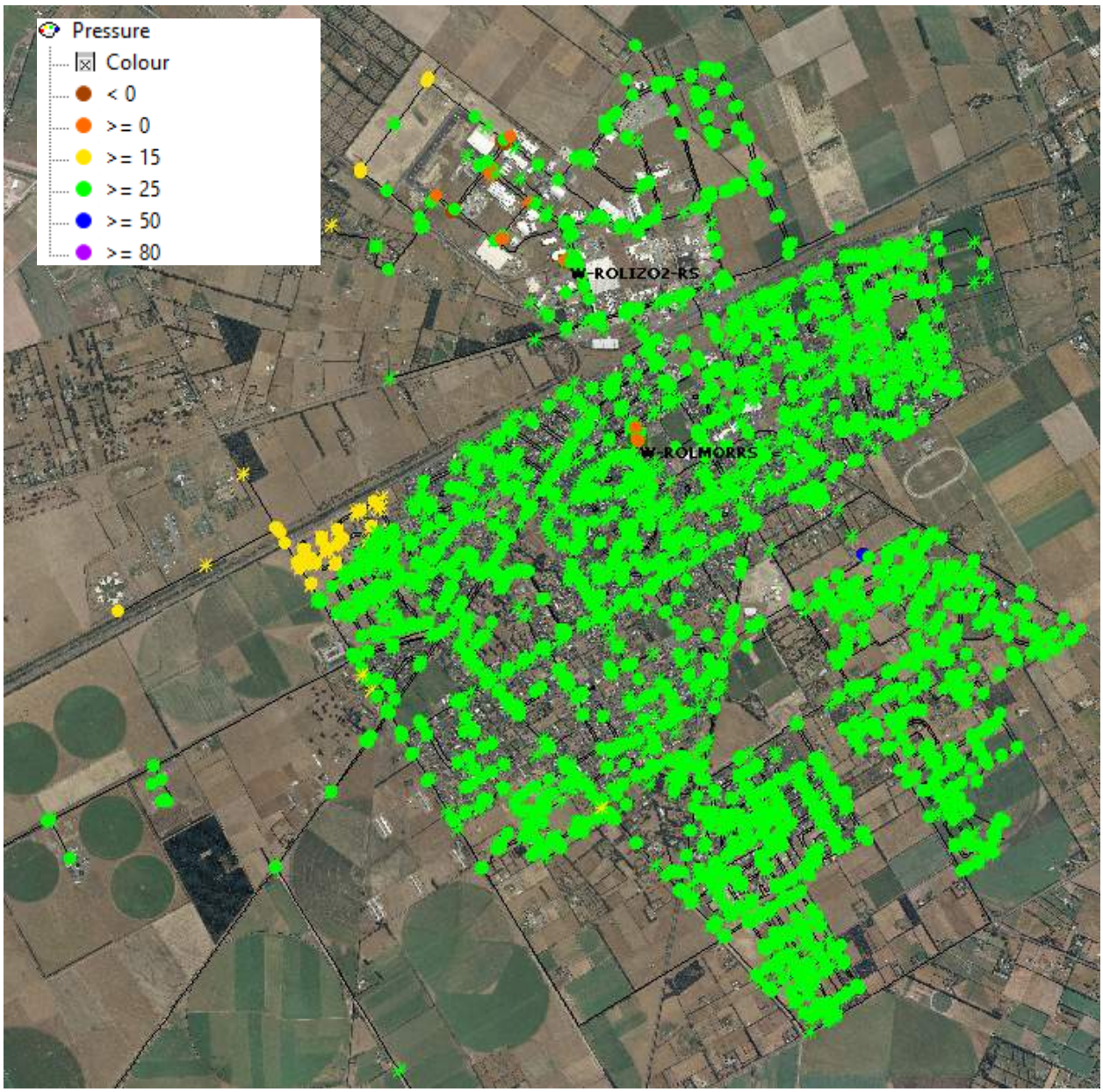


Figure 3-4: Minimum pressure (m) in Rolleston Water Supply Network after upgrades are in place

3.3 Option 2: Install New Well within the west side of the Rolleston network

SDC are currently reviewing and updating the water supply master plan which considers new well sites and trunk mains to service the development areas and improve network resilience. WSP understands that a future well will be available at McLenaghan Road. The current estimated yield will not be enough to accommodate the new developments. However, there could be potential for a new well site to be developed within the local development area, reducing the need for some pipe upgrades.

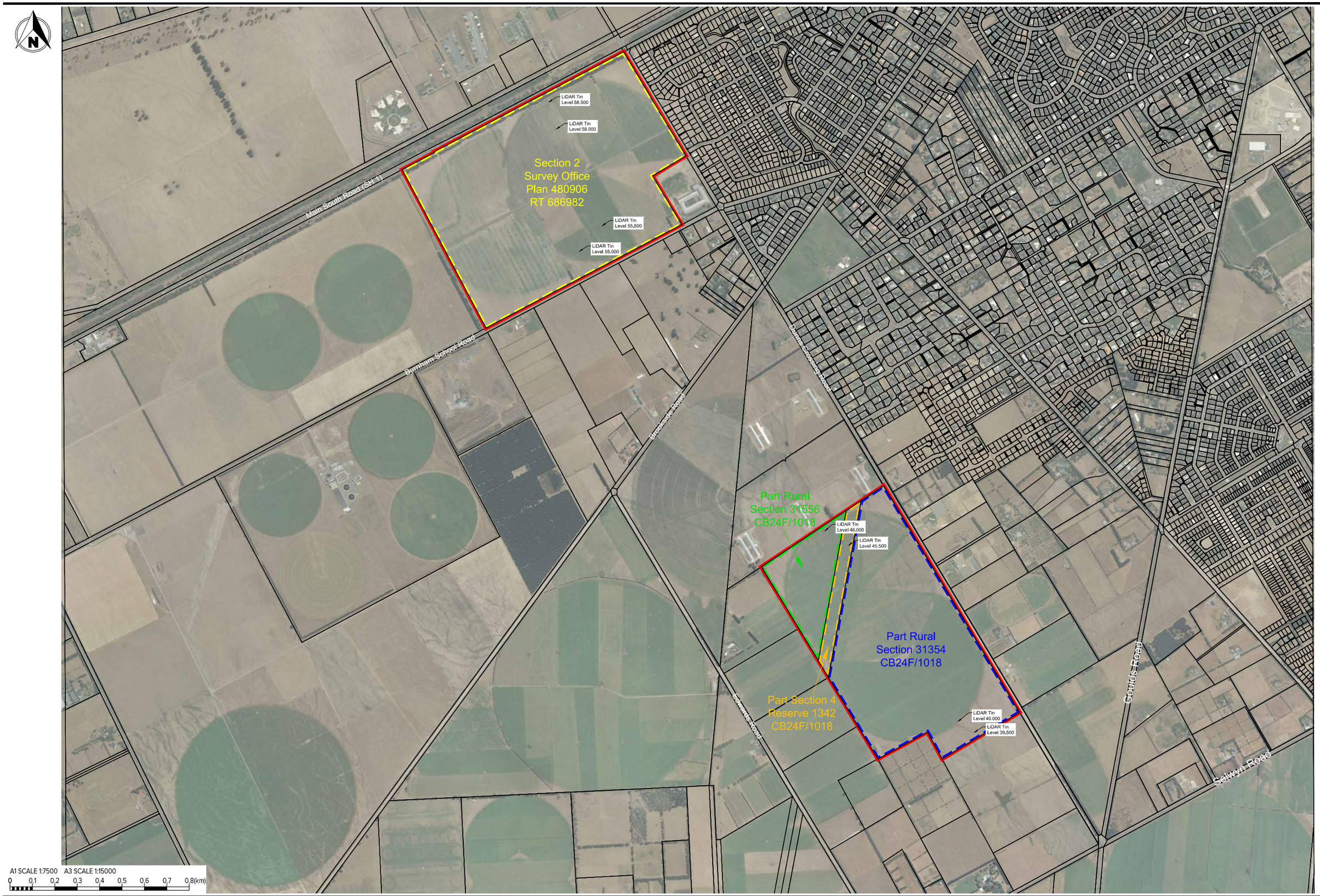
4 Limitations

This memorandum had the following limitations:

- This assessment has only considered the existing water supply network operation with the additional demand from the proposed development. It does not account for any future neighbouring developments and their impact on the water supply network.
- This assessment has not considered any Fire Flow requirements.
- This assessment has not considered the localised pipework within the development. The internal development pipework will need to be designed accordingly to accommodate peak day / hour demand.

Prepared by:	Reviewed by:	Approved for Release by:
		
Belen Rada, Engineer - Water	**Estelle Boivin**, Principal Hydraulic Modeller	**Dan Johnson**, Project Director

APPENDIX C | LiDAR CONTOUR PLANS



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-	-	-	-
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-	-	-	-
A	Preliminary Issue	BH	12.11.20

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Scale A3
DO NOT SCALE FROM DRAWING

Designed BH
Approved PM
Date 03.11.20

Client **ROLLESTON WEST RESIDENTIAL LIMITED**

Project **ROLLESTON WEST PLAN CHANGE**

Drawing Title **EXISTING TITLES**

Status **FOR INFORMATION**
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Drawing No. **14720-E-200**

Rev A

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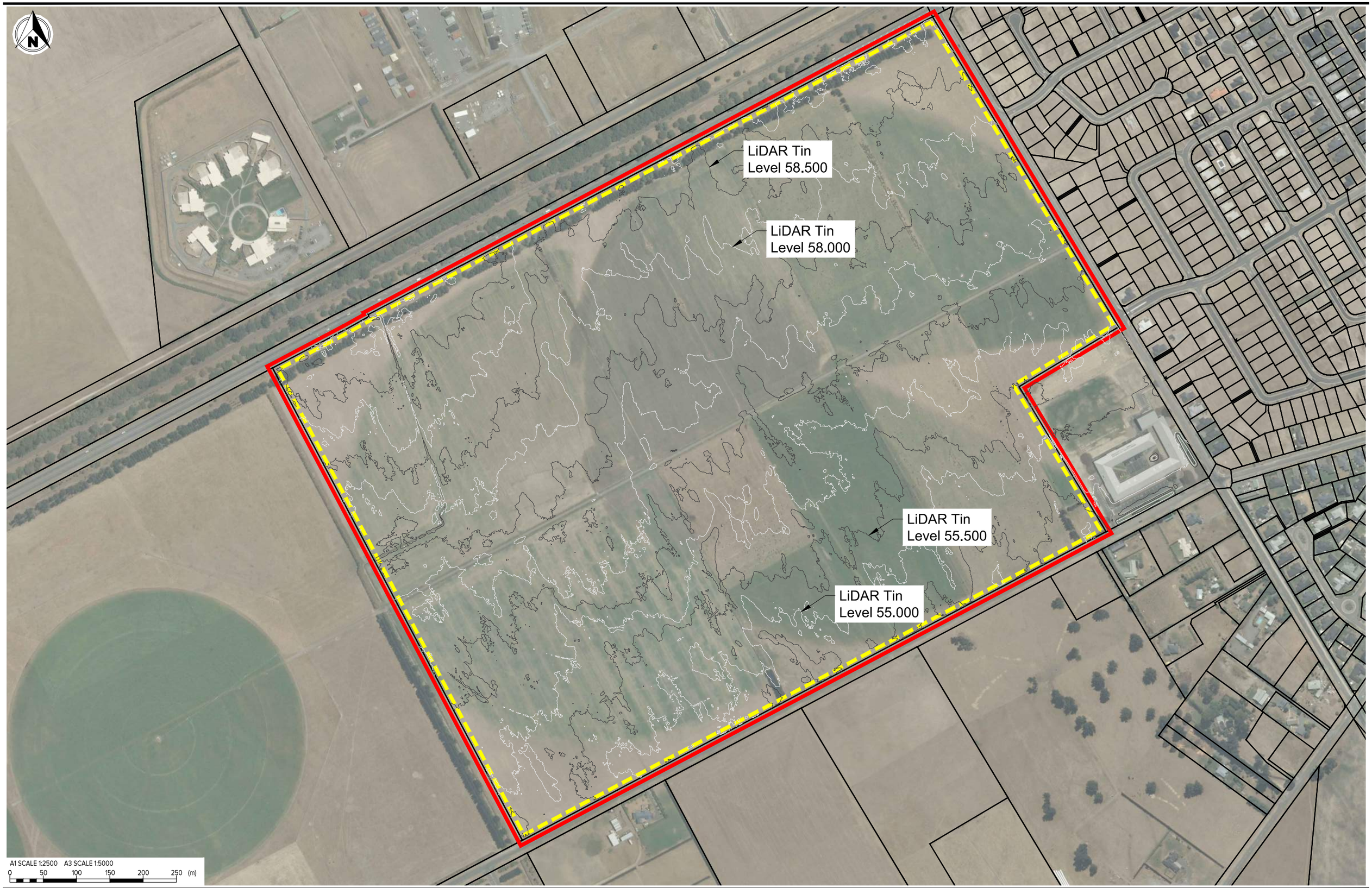

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Project: **ROLLESTON WEST PLAN CHANGE**

Drawing Title: **HOLMES BLOCK LIDAR CONTOURS**

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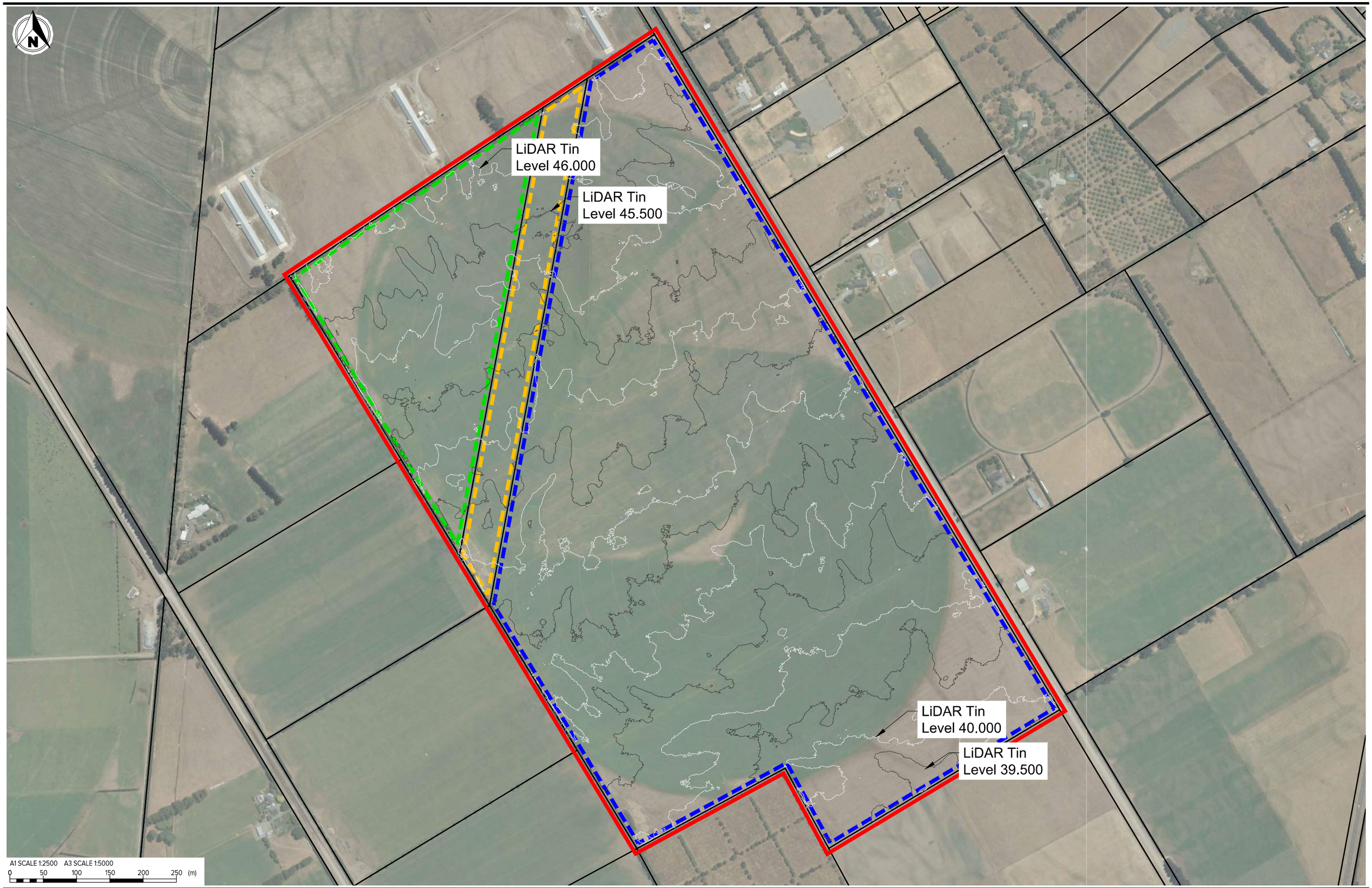

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Project **ROLLESTON WEST PLAN CHANGE**

Drawing Title **SKELLERUP BLOCK LIDAR CONTOURS**

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