



## **FLINT'S PARK MIXED USE PRECINCT QUEENSTOWN**

### **ADDENDUM TO FLINT'S PARK INFRASTRUCTURE AND SERVICING REPORT**

**Project: 1252A**



## DOCUMENT CONTROL RECORD

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## 1 EXECUTIVE SUMMARY

This report along with the appended plans and calculations have been prepared by Candor<sup>3</sup> to support an SHA application for land located on the northern side of Frankton-Ladies Mile Hwy (SH6), Queenstown as shown in Figure 1 in this report. The land is referred to as the Flint's Park Mixed Use Precinct and the report addresses the provision of all infrastructure needed to service the area for residential and commercial development with a particular emphasis on roading, stormwater, wastewater and water supply and is an extension of an earlier report dealing with land further to the west in the same vicinity.

A Geotechnical Investigation Report has been prepared by Geosolve, reference 190162, Preliminary Geotechnical Report, Flint's Park Mixed Use Precinct confirming that the land is stable and suitable for development subject to works being carried out in accordance with the recommendations contained within that report. The earthworks required to effect any development are relatively minor and constitute a reshaping of the land to allow for suitable overland flowpaths and formation of a stormwater detention basin and there are no technical impediments to carrying out the works to meet the requirements of the Geotechnical Report. (refer Appendix D)

In support of a Housing Infrastructure Fund (HIF) Business Case Bid, an Integrated Transport Assessment (ITA) was carried out on behalf of QLDC. This assessed the impact of the proposed QLDC indicative masterplan for the wider Ladies Mile area (of which Flint's Park Mixed Use Precinct forms a part) and identified a package of transport measures to mitigate the impact of this scale of development. QLDC, Otago Regional Council and NZTA have since agreed a programme (Programme 3) of funding for these improvements. The detailed business case identified that developers will be responsible for the funding and construction of all the internal roading and 3 waters infrastructure, with QLDC being responsible for the construction of all external transport and 3 waters infrastructure. As such, the wider transport impacts of the Flint's Park Mixed Use Precinct development have been assessed, and the wider off-site transport mitigation measures required have been identified and agreed upon.

Access from Frankton-Ladies Mile Hwy (State Highway 6) is a key factor in allowing development to proceed. It has been determined by NZTA in conjunction with other stakeholders that a new roundabout shall be constructed on Frankton-Ladies Mile Hwy at the intersection with Howard's Drive to provide access to the land to the north of Frankton-Ladies Mile Hwy. NZTA has commenced preliminary design work. The owners of Lot 4, 7 DP 463532 and Section 42-44 Block III Shotover Survey District which sits immediately west of the subject site are working with the Glenpanel LP to ensure that roading access for the subject land will be provided through their land. The masterplans for both developments are generally consistent in showing a road parallel to Frankton-Ladies Mile Hwy that will link to the new roundabout proposed by NZTA.

An addendum to the Transport Assessment Report submitted with the Flint Park's SHA application has been prepared to support the application for a SHA which reports on the proposed internal walking/cycling/bus connectivity and the proposed internal road layout. The Transport Assessment concludes that there is no reason that the land is not declared an SHA and is suitable for development.

A number of proposals for the treatment and disposal of stormwater runoff from the property have been assessed in this report. All scenarios assume that the runoff from a 20% ARI will be discharged through an existing stormwater pipe that lies within Howard's Drive and it is demonstrated within this report that sufficient attenuation can be provided on the subject land to allow this discharge to happen in accordance with QLDC standards. In large storm events overland flow naturally tracks to the east towards Lake Hayes however this report also looks at the possibility of discharge of the 1% ARI overland flow through the pipe down Howard's Drive to cover the eventuality that urbanisation of the catchment interrupts overland flows to Lake Hayes on a temporary or long term basis. The conclusion of this report is that all options assessed are technically possible and there is no impediment to the treatment and disposal of stormwater runoff from the site.

WSP Opus prepared a Scoping and Concept Design Report for QLDC in support of an application to the Government's Housing Infrastructure Fund which sets out the requirements of wastewater from the area north of the Frankton- Ladies Mile Hwy. This report concludes that a new pump station and



potentially storage must be provided by the developers for the land north of the Frankton-Ladies Mile Hwy and west of the line created by an extension of Howards Drive to the base of Slopehill (referred to in the WSP Opus Report as areas 1.1 and 3.1). The Report also concludes that the *“The Shotover Waste Water Treatment Plant was built with capacity for the Frankton-Ladies Mile Hwy developments, and hence there is an available pipe entry to the headworks launder within the plant.”*

Glenpanel LP accepts the contents of the WSP Opus Report and will work with the owners within the catchment to effect a new pump station and infrastructure as necessary to connect to the Shotover Treatment Plant to facilitate development. There are no technical reasons why this cannot be carried out successfully.

As regards water supply the WSP Opus report prepared for Council confirms that ***“the existing bore field at Shotover Country is currently undergoing a capacity upgrade, which will also provide sufficient capacity to service the Frankton-Ladies Mile Hwy development without further upgrades.”***

The Report goes on to conclude that two new reservoirs of 1000m<sup>3</sup> capacity will be required to be constructed on Slope Hill at an RL of no less than 423m. Water from the Shotover Country bore field will need to be pumped to these new reservoirs which can then gravity feed a water supply network for the land to the north of the Frankton-Ladies Mile Hwy. We understand that QLDC have carried out further work on the reservoir location and the reservoirs will probably now be sited at RL 407m. This does not change the conclusion of this report.

Glenpanel LP accepts the contents of the WSP Opus Report and will work with QLDC and the owners within the catchment to effect the new reservoirs and infrastructure as necessary to facilitate development. There are no technical reasons why a water supply network cannot successfully be designed and constructed to service this land.

Utility services being power and telephone services can be upgraded to service the development. Written confirmation from the various providers is appended to this report confirming this statement.

**Based on preliminary design work carried out to date there are no technical impediments to providing any of the necessary services to allow residential development of the land that is the subject of this report. There are no technical engineering reasons why the land should not be declared an SHA and subsequently proceed through a consenting process and be developed to provide much needed housing for the Queenstown area.**

## 2 INTRODUCTION

In response to a housing shortage the Queenstown Lakes District Council has been looking at options for making more land available for development and an indicative masterplan was prepared for the Ladies Mile area in 2017. They have also had a Scoping and Concept Design Report prepared by WSP Opus to look at the infrastructure required to allow development of the land as supporting documentation for a successful application to the Government's Housing Infrastructure Fund. The opportunity exists for land owners in this area to apply to Council to have their land declared a Special Housing Area prior to this legislation becoming redundant.

Glenpanel LP wishes to develop a parcel of land sited to the north of the Frankton-Ladies Mile Highway into 96 dwellings, a school and some mixed use development and has prepared this application in support of an application to have the land declared an SHA. Included in this report is an overview of the infrastructure needed to support development together with an analysis as to how this can be provided if the land is granted SHA status. A copy of the proposed Flint's Park Mixed Use Precinct Masterplan is included in Appendix A.

### 3 EXISTING SITE DESCRIPTION

The proposed development is located to the northern side of Frankton-Ladies Mile Hwy, Queenstown, as shown in the figure below. The proposed SHA area is approximately 7.87ha in size and comprises Lot 1 DP12822, Lot 16 DP12921; Section 51, Part Section 45-46 and Part Section 50 Block III Shotover Survey District.



Figure 1 Approximate extent of the proposed Flint's Park Mixed Use Precinct SHA

Frankton-Ladies Mile Hwy runs along the southern boundary of the property with rural land to the east and west. The property immediately north of Frankton-Ladies Mile Hwy is flat for approximately 250-400m after which the land starts to climb the lower slopes of Slope Hill, a prominent Queenstown landscape feature. To the east and west of the subject property the land is currently rural and of similar character. To the south west of the site on the opposite side of Ladies Mile is the Queenstown Country Club which is approved as an SHA and under development. To the immediate south of the site on the opposite side of the Frankton-Ladies Mile Hwy is a flat parcel of land dominated by a large house and a significant area of structured landscape planting.

There are several buildings associated with the Ladies Mile Pet Lodge within the subject area. Several shelterbelts are dotted throughout the property as can be seen from the aerial photo to support farming operations.

## 4 EARTHWORKS

### 4.1 Bulk Earthworks

A Geotechnical Investigation Report has been prepared for the site by Geosolve Ltd. which is included in this SHA Application (Refer to Appendix A5). The report confirms that the land is suitable for development and there are no technical matters raised in the report that are grounds for declining an SHA application.

In order to develop the site into residential allotments it will be necessary to re contour the land to provide more regular shapes and appropriate road gradients. While it is a matter for assessment at Resource Consent stage some commentary on the earthworks necessary to implement the masterplan is provided to give a better understanding of the proposed project.

Bulk earthworks for the proposed development will be carried out over the entire site. Preliminary design work indicates that approximately 9,000m<sup>3</sup> of fill will need to be placed to shape the site to ensure that in large storm events overland flows can be managed without causing inundation of dwellings or allowing stormwater runoff to flow across Frankton-Ladies Mile Hwy.

In order to detain stormwater in large storm events and prevent the issues noted above, the setback that is required along Frankton-Ladies Mile Hwy will be shaped to provide the detention area required for stormwater. This is commented on in more detail in the stormwater section of this report however the volume of detention required is 14,000m<sup>3</sup> providing sufficient material to complete the necessary filling on site and it is not envisaged that soil materials will need to be imported to or exported from the site to complete earthworks. Any surplus soil from the construction of the proposed detention basins can be used within the site.

### 4.2 Sediment and Erosion Control

Erosion and sediment control measures will be designed in accordance with clause 2.3.7 of the QLDC Code of Practice and will be established prior to construction beginning. Controls will then be monitored throughout the construction phase. The removal of any measures will not occur until all surfaces have been sufficiently stabilised. Erosion and Sediment Control will be incorporated into the detailed engineering design work and will be in accordance with appropriate QLDC guidelines with works generally undertaken as follows:

- Construction of a stabilised vehicle entrance at the entrance to any stage.
- Install clean water diversion drains to redirect upstream runoff where required.
- Construct the Sediment Retention Pond(s).
- Construct silt fences and earth bunds around the perimeter directing water to sediment retention ponds.
- Carry out any clearing required
- Strip topsoil and stockpile on site.
- Carry out cut to fill earthworks.
- Complete civil works as appropriate with topsoil respread and grassing on completed areas as soon as possible after works are complete.
- Re-spread topsoil immediately after completion of earthworks on areas not subject to civil works.
- Seed area with grass seed and where necessary, straw mulch.
- Remove erosion and sediment control measures once site is stabilised.

The site is proposed to be treated predominantly by a number of Sediment Retention Ponds (SRP) treating areas of up to 5ha each. Continuous earth bunds will pick up runoff from overland flow / contour drains, and direct it to the ponds. The SRP will have storage volume equal to 3% of its catchment area and will be PAC flocculent dosed to assist in the settling of suspended soil particles. All chemical treatment will be designed by the contractor and submitted to council for approval prior to works commencing.



Subject to detailed design and consenting the extension of the pipeline from Howard's Drive may be constructed early and ahead of earthworks so as to provide an outlet from the sediment control ponds.

Additional measures will be employed to minimise potential erosion on site such as; completing the earthwork stages as quickly as possible, and minimising exposed areas or stabilising as soon as possible following achievement of final level.

**Technically there are no impediments to carrying out earthworks in a manner that will result in stable platforms for development and, with appropriate sediment control measures in place to minimise sediment runoff during works, there is no reason from an earthworks perspective that the land cannot be declared an SHA.**

## 5 ROADING

### 5.1 Existing Roading

Currently the site is accessed off the Frankton-Ladies Mile Hwy (SH6) through a driveway into the Pet Lodge and a farm gate access.

In support of a Housing Infrastructure Fund (HIF) Business Case Bid, an Integrated Transport Assessment (ITA) was carried out on behalf of QLDC. This assessed the impact of the proposed QLDC indicative masterplan for the wider Ladies Mile area (of which Flint's Park Mixed Use Precinct forms a part) and identified a package of transport measures to mitigate the impact of this scale of development. QLDC, Otago Regional Council and NZTA have since agreed a programme (Programme 3) of funding for these improvements. The detailed business case identified that developers will be responsible for the funding and construction of all the internal roading and 3 waters infrastructure, with QLDC being responsible for the construction of all external transport and 3 waters infrastructure. As such, the wider transport impacts of the Flint's Park Mixed Use Precinct development have been assessed, and the wider off-site transport mitigation measures required have been identified and agreed upon.

### 5.2 Proposed Roading

An addendum to the original Flint's Park Transport Assessment Report has been prepared to support the application to have the proposed Flint's Park Mixed Use Precinct development declared an SHA. This Report sets out the proposed internal walking/cycling/bus connectivity and the proposed internal road layout. A copy of this assessment is appended to the SHA application and should be read in conjunction with the comments below.

The main access to the site will be from a proposed roundabout at the intersection of SH6 / Howards Drive which is being led by QLDC and NZTA. This roundabout sits within the neighbouring property. The owners of this property are also seeking to have their property become an SHA and are working with Glenpanel LP to effect all of the necessary infrastructure.

The development of the subject site will require the construction of numerous local roads, including roads of varying width and function such as Collector/Connector Roads, Local Roads and private laneways/private Jointly Owned Access Lots (JOAL).

The roads will be designed in accordance with Clauses 3.3.1 and 3.3.2 of the QLDC Land Development Code of Practice. The legal width of the roads proposed will generally vary from 15.0m to 18.0m for Collector/Connector Roads and Local Roads and typically 8m for private laneways, as shown on the Masterplan drawings and set out in this SHA application below.

#### Vested Roads

##### Road 1 – Collector / Connector Road

This road will connect the development to the main roundabout access at the Howards Drive / SH 6 and will run east/west parallel to SH6 along the landscape buffer set back. The road is proposed to sit within a 15m road reserve which widens to 18.0m through the village centre with the following cross section:

- 0.4m berm from property boundary to back of footpath.
- 1.8m footpath.
- 2.4m indented parking.
- 7m carriageway.
- 2.4m indented parking.
- 1m berm to landscape buffer.
- Total = 15m. (18m wide through village to accommodate a full footpath on both sides)

**Road 1** is future proofed to accommodate bus movements should this become a bus route in the future and is consistent with what is proposed on adjacent land holdings. On street parking will be provided on both sides of the street and cyclists will have the option to ride on the road or, in likely the case of less confident or recreational cyclists, on the parallel segregated footpath / cycleway to the south of Road 1 in the landscape buffer area.

#### **Road 2 - Collector/Connector Road**

This road runs east west generally along the base of Slope Hill. The road is proposed to have an 18m road reserve with the following cross section:

- 1.3m berm from property boundary to back of footpath.
- 1.8m footpath.
- 2.4m indented parking.
- 7m road.
- 2.4m indented parking.
- 1.8m footpath.
- 1.3m berm from property boundary to back of footpath.
- Total = 18m.

**Road 2** is future proofed to accommodate bus movements should this become a bus route in future. On street parking is provided on the south side of the street and partly on the north side (none proposed parallel to the Neighbourhood Park). Cyclists will ride on the road. The cross section is consistent with adjacent land holdings.

**Road 3 – Local Road** - north/south route separating the proposed school from the commercial area, 18m road reserve with the following cross section:

- 1.8m berm from property boundary to back of footpath.
- 1.8m footpath.
- 2.4m indented parking.
- 6m road.
- 2.4m indented parking.
- 1.8m footpath.
- 1.8m berm from property boundary to back of footpath.
- Total = 18m.

Cyclists will ride on the road.

#### **Private Laneways/JOAL's**

Typical lane widths will be 8m.

Final roading cross sections will be subject to Council consenting processes and some change may be expected although this is not anticipated to be significant. All roads will be constructed in accordance with clause 3.4 of the QLDC Land Development Code of Practice standards with kerb and channel, footpaths and a hotmix surface. Parking and appropriate landscaping will be provided where required. The Transport Assessment Report details the proposed parking levels and locations.

The structural design of pavements will be carried out in accordance with clause 3.3.3 of the QLDC Land Development Code of Practice. Based on the findings of the Geotechnical Investigation Report there is no reason that the roads cannot be constructed to meet the required standards.

Treatment of stormwater runoff will be managed through a combination of standard road cesspits, swales, raingardens and tree pits.

Street lighting will be provided along all roading in accordance with Council standards set out in clause 3.3.14 of the QLDC Land Development Code of Practice. Street trees and landscaping will also be provided throughout the development in accordance with section 7 of QLDC Land Development Code of Practice.

A masterplan is included with the SHA application setting out intended roading layouts although detailed design and consenting processes may require minor changes. The masterplan is therefore included for information and is only intended to inform the SHA EOI process. The ultimate form of development will be guided by the decisions that Council makes after the land has been declared an SHA and a Resource Consent application for subdivision has been lodged.

There are no technical impediments to carrying out this work, the nature of which is routinely carried out when urbanising rural areas.

**Technically there are no impediments to forming local roading in a manner that will adequately serve the development and as NZTA have already commenced preliminary design for a roundabout on the State Highway to provide access to the wider area there is no reason from a roading perspective that the proposed Flint's Park Mixed Use Precinct development cannot be declared an SHA.**



## 6 STORMWATER

### 6.1 Existing Reticulation and Overland Flow

As part of its Queenstown Country Club development, the Sanderson Group, has constructed a 900mm diameter stormwater pipe up Howards Drive which is intended to service land to the north of Frankton-Ladies Mile Hwy and west of the extension of Howards Drive. The pipe currently ends approximately 100m to the south of Frankton-Ladies Mile Hwy and will need to be extended to service the properties to the north of Frankton-Ladies Mile Hwy. The extension of this pipe will need to be designed in conjunction with the roundabout to be constructed at the intersection of SH6 and Howard's Drive to provide access to the land to the north of Frankton-Ladies Mile Hwy. The subject land lies outside of the design catchment for this pipe.

Based on the existing contour any stormwater runoff that flows from the subject land in large events will flow to the east towards Lake Hayes with no natural flow across Frankton-Ladies Mile Hwy.

### 6.2 Proposed Reticulation System and Treatment

A new stormwater reticulation system will be constructed to serve the proposed development. This network will include the extension of the existing 900mm dia. pipe that sits within Howard's Drive under SH6 and through the neighbouring property to the west. The owner of this property is also seeking to have their land declared an SHA and the parties are working together to effect the necessary infrastructure that supports development.

While the subject land was not included within the design catchment for the outlet pipe 3d stormwater modelling and hydraulic calculations demonstrate that a primary network that will convey the 20% ARI storm event flows as per QLDC standards can be designed and constructed to service the subject land without difficulty. In carrying out this assessment we have assumed a maximum outflow from all of the Flint's Park SHA area (Mixed Use Precinct, Lot 1 DP 22874, part of Lot 1 DP 463532, all of Lot 2 DP 463532, all of Lot 1 DP 20162, and all of Section 1 SO 24954) based on a percentage of the catchment the pipe serves. The maximum allowable outflow calculated from the subject site is 300 l/s in any storm event.

In the Flint Park SHA Application for Lot 1 DP 22874, part of Lot 1 DP 463532, all of Lot 2 DP 463532, all of Lot 1 DP 20162, and all of Section 1 SO 24954 we sized the required detention basins to attenuate the 1% AEP flows back to a maximum discharge of 300 l/s. We have now reworked our calculations and modelling of suitable detention basins to discharge 200 l/s (previously 300 l/s) from the Flint Park land and 100 l/s from the Flint Park Mixed Use Precinct. Our calculations which are appended demonstrate that, with appropriate attenuation, including this land into the catchment for the existing pipe down Howards Drive is feasible.

In our calculations we have not allowed for any infiltration and, as the soils in this area are quite permeable, we believe that detention requirements will drop during detailed design if this is factored into our calculations. We have also allowed for the 1% AEP to be discharged through the pipe down Howards Drive when this is more likely to follow the natural flowpath to the east towards Lake Hayes. Our calculations are considered conservative at this point.

### 6.3 Secondary Overland Flow Paths

The natural overland flow from the site runs to the east towards Lake Hayes and the design and grading of roading for the proposed development is intended to maintain the existing situation. However, with the urbanisation of the catchment, these natural flowpaths will be modified and in the future overland flow in large storm events will likely be conveyed along formed road environments. With the development intentions and timeframes of land owners between Howards Drive and Lake Hayes to the east being unclear and a potential increase in runoff as a result of urbanisation of the subject site there is therefore a possibility that there may be short term conflicts in level or alignment between natural flowpaths and the proposed overland flows down future road alignments.

There are solutions available to avoid or mitigate such conflicts should they arise during detailed design and to demonstrate this to Council we have carried out an assessment assuming that all stormwater runoff from the site in events up to and including the 100 year ARI event are managed within the site and are discharged through the pipe down Howards Drive. This is discussed above. We have also included the runoff from Slope Hill in our analysis and as such believe that this assessment is very conservative. All calculations are included in the appendix to this report.

The exercise that we have carried out shows that it is possible to form a detention basin of sufficient size within the landscape buffer adjacent to Frankton-Ladies Mile Hwy to attenuate runoff from the fully developed Flint Park land holdings including the Mixed Use Precinct back to an outflow of 300 l/s. This means that it is possible to control runoff from events up to and including the 1 in 100 year ARI and discharge this through the pipe down Howards Drive without flow across SH6 and without any need to discharge overland flows through neighbouring properties to the east. A stormwater network has been derived based on the proposed masterplan and has been modelled in 3d including a detention basin to demonstrate that this proposal can be physically effected and preliminary information is appended to this application demonstrating this.

Ideally the future flowpaths post development will reflect the existing natural flowpaths and the analysis that we have carried out is intended only to demonstrate to Council that the development of the Flint Park properties can proceed without reliance on other neighbours, the only exception being the property immediately to the west of the Mixed Use Precinct. These land owners, as previously noted, are also looking to develop their land and have a development track record in the Queenstown area.

#### 6.4 Stormwater Runoff Quality Control

The proposed reticulation will be designed in accordance with clause 4.3.5.1 of QLDC's Code of Practice with treatment of runoff provided using "on-line" treatment devices such as rain gardens, swales and an engineered detention basin before ultimate discharge into the pipe that Sanderson Group have constructed in Howard's Drive. Raingardens and swales within roads can provide "at source" and "train" treatment with retention and contaminant removal for roads and private driveways.



Figure 3 Raingardens / Streetscape at Long Bay Auckland



Stormwater swales Albany Centre Auckland

**Based on work carried out to date there are no technical impediments to managing stormwater runoff from the proposed Flint's Park Mixed Use Precinct development should the land be granted SHA status.**

## 7 WASTEWATER

### 7.1 Existing Infrastructure

The WSP Opus Report commissioned by QLDC in support of their application to the Housing Infrastructure Fund sets out the situation as regards existing wastewater networks in the area as follows -

*“Waste water in the Frankton-Ladies Mile Hwy area currently relies on pump stations to return waste water to the top of the gravity main located in the approach to the Shotover River Bridge. This gravity main acts more as a force main, or inverted siphon through to the launder in the Shotover Waste Water Treatment Plant on the far (west) side of the Shotover River.*

*The existing operational pipe across the bridge is a DN450 steel pipe, and initial assessment by QLDC (and information provisions in the Glenpanel SHA Report) indicates that this pipe has approximately 70 l/s spare capacity. As there is no clear information on the remaining capacity of the DN300 PVC pipe upstream of the bridge, only the smaller rising main discharges will be proposed as discharge into this pipe, and a new rising main to connect to the existing DN450 would be necessary to accommodate flow from areas 1.1 and 3.1.”*

### 7.2 Proposed Infrastructure

#### 7.2.1 Pump Station

The WSP Opus Report commissioned by QLDC states -

*“The fall of the land across the site is generally towards Lake Hayes to the east, requiring a pumped solution to return the waste water towards the Shotover Waste Water Treatment Plant to the west. There are three distinct areas that will require individual pump stations due to localised fall of the land. Areas 2.2, 1.2 and 3.2 will require two smaller pump stations. These pump stations will be built by QLDC. A third pump station will be required for the Areas 1.1 and 3.1, which will be the responsibility of the developer. A rising main in the State highway corridor will be provided by QLDC, from the anticipated location of the pump station through to the existing DN450 pipe at the bridge.”*

Glenpanel LP accepts that it will be necessary to install a new pump station to convey wastewater and will look to work with the adjacent developer to the west of the subject site to design and construct an appropriate pump station to serve areas 1.1 and 3.1 as per the WSP Opus Report. An indicative wastewater network has been derived (see Appendix A3) showing how it is technically possible to install gravity mains running to a pump station that will be in the order of 5m deep to take wastewater from areas 1.1 and 3.1 and convey it to the existing DN450 pipe at the Shotover bridge. Based on the preliminary design work carried out to date there are a number of design solutions that will deliver the required outcomes and what has been presented in this report is included to demonstrate that there is at least one technically viable solution.

Should design work demonstrate that the capacity in any existing gravity mains is marginal it should be possible to set the pump station control systems such that the discharges from individual pump

stations occur in different time windows to ensure all pumps are not discharging simultaneously and that the capacities of the existing mains can be maximised.

#### 7.2.2 Downstream Capacity and Storage

The WSP Opus Report also comments on the capacity of the downstream treatment plant as follows -

*“The Shotover Waste Water Treatment Plant was built with capacity for the Frankton-Ladies Mile Hwy developments, and hence there is an available pipe entry to the headworks launder within the plant. Provisional costing for 12 hours storage at each pump station site has been included to accommodate the gravity flows in the event of an outage. This may not be required if an appropriate level of storage can be achieved within the pipe network, which will become apparent in the design of the local reticulation by the developer.”*

Glenpanel LP accepts that it may be necessary to provide storage in any new pump station should detailed design not be able to demonstrate that the piped network provides adequate storage. They will look to work with the adjacent developer to the west of the subject site to design and construct an appropriate pump station to serve areas 1.1 and 3.1 as per the WSP Opus Report. In the event that the adjoining developer to the west does not move forward within the same timeframes any storage required can be provided within the subject site.

If the conservative ADWF values are used, emergency storage for 641 dwellings and 4.6ha of business land and school will be 380m<sup>3</sup> based on 12 hours storage.

It is also assumed that the Glenpanel LP would be charged development contributions under the 2018/2019 Development Contribution policy or subsequent policies. The current figure being levied is \$3,500 per residential unit. This contribution is assumed to cover the developers cost of any downstream infrastructure upgrades.

#### 7.2.3 Internal Infrastructure

The proposed lots and dwellings will be serviced with a network of 150mm diameter uPVC or PE pipes. The network will be designed in accordance with QLDC's Code of Practice. Preliminary modelling of a network as provided in the appendices to this report demonstrates that there will no problem in delivering a suitable wastewater network.

<p><b>In our opinion there is no impediment to providing wastewater disposal for the Flint's Park Mixed Use Precinct development in accordance with Council standards and good engineering practice which also resolves existing problems facing Council in managing their existing facility.</b></p>
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## 8 POTABLE WATER SUPPLY

### 8.1 Existing Infrastructure

The WSP Opus Report commissioned by QLDC in support of their application to the Housing Infrastructure Fund states that *“There is currently no water supply to the Frankton-Ladies Mile Hwy HIF area”*.

### 8.2 Proposed Infrastructure

#### 8.2.1 Global Infrastructure

The WSP Report goes on to discuss the master planning work that QLDC has been undertaking. The Report states (information relevant to this application in bold) -

*“The master planning work QLDC has been undertaking recommends reservoirs located at height to service consumers without the need for booster pumping. At this stage, there is no specific location identified for the reservoirs, but a minimum height has been identified.*

***The existing bore field at Shotover Country is currently undergoing a capacity upgrade, which will also provide sufficient capacity to service the Frankton-Ladies Mile Hwy development without further upgrades.*** QLDC is still looking at how the existing Kelvin Heights intake and Jacks Point intake can be dovetailed into the existing QLDC network for the purpose of ensuring a future proofed scheme that will meet the demands of their future growth projections. However, the long-term planning from QLDC indicates that 4,400 m<sup>3</sup>/day will be provided for the Frankton-Ladies Mile Hwy area by 2058, which is plenty of supply.

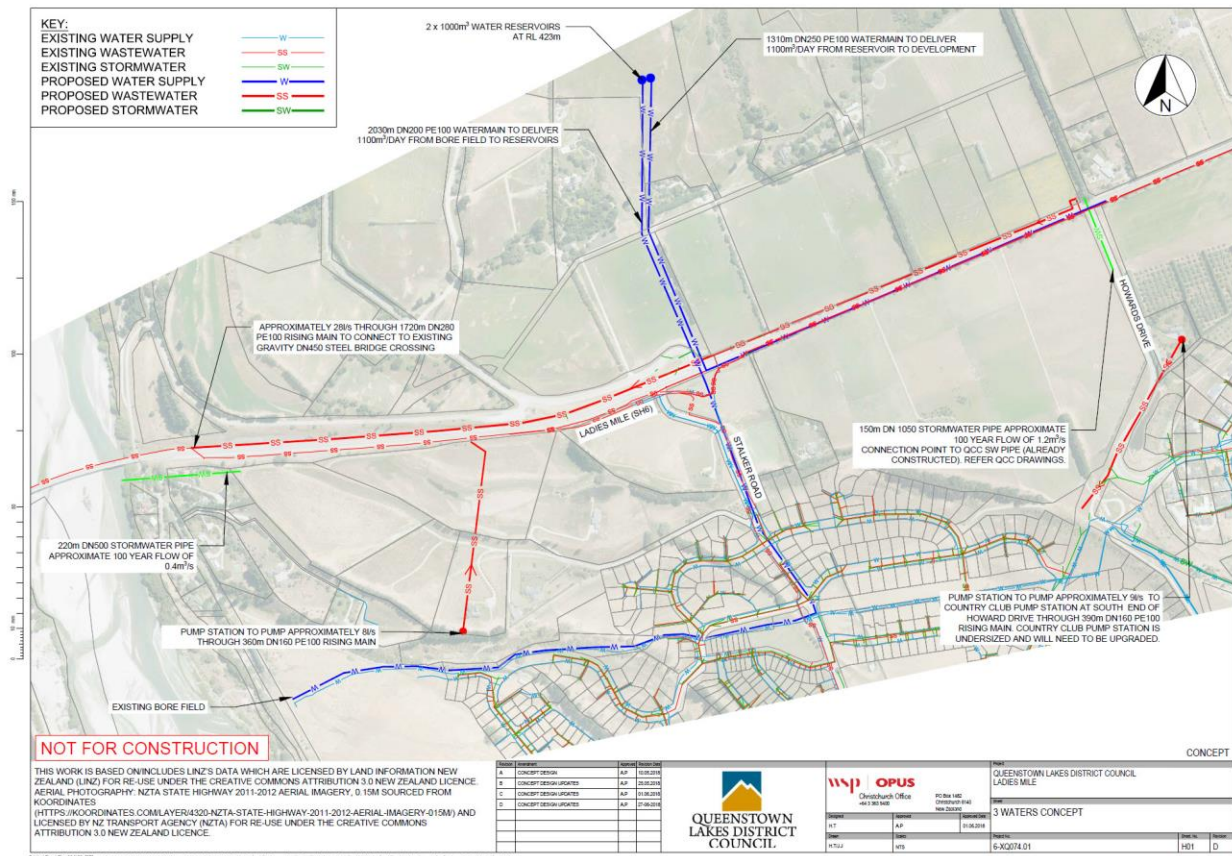
*New reticulation from the Shotover Country bore field is required to charge the new water reservoirs that are needed to service the development. Due to the constrained corridor through Old School Road, where the existing trunk water main and proposed trunk main to the Frankton area are located, the new trunk main to Frankton-Ladies Mile Hwy will need to follow an alternative route.*

*The proposed water main route is adjacent to the existing pipe from the bore field and up through Stalker Road.*

***The recommended position of the new water reservoirs is on Slope Hill above HIF programme area 1.1 and is at a level of approximately RL 423 m to match the height of the reservoirs at Quail Rise.*** This level will give a working pressure of between 400 and 600 kPa to the development areas. The location of the reservoirs is not confirmed at this stage, but work has been started to secure an appropriate site (in terms of access and elevation) by QLDC.

*Reservoir design parameters defined by the QLDC Land Development and Subdivision Code of Practice require service for 6 hours average demand + fire storage as the worst-case scenario. This resulted in 6 hours of 63 l/s total demand, and a reservoir size of 1360 m<sup>3</sup>. In order to provide adequate resilience to the supply, two reservoirs of 1000 m<sup>3</sup> are proposed.”*

Conceptually the WSP Opus report illustrates that treated water will be pumped from the Shotover Country Bore Field to the new reservoir up Stalker Road as shown in the drawing below.



WSP Opus's review of the original Flint Park's Infrastructure Report indicate that QLDC have made progress in determining where the required reservoir on Slopehill might be and that the elevation of this proposed reservoir is now set at RL 407m. With the elevation of the subdivisions across the flats below Slopehill being approximately RL 365m worst case there is no impediment to meeting Council standards as regards the provision of water supply based on these parameters. Even should some lots be introduced at higher elevations we cannot foresee any issues in delivering potable water in accordance with QLDC standards to the proposed developments.

Glenpanel LP accepts the need for and supports the required infrastructure identified by QLDC's master planning exercise and will allow for any necessary rising or falling mains serving these reservoirs within it's development if this is appropriate.

## 8.2.2 Local Infrastructure

As part of any design carried out a water supply model will be prepared to confirm pipe sizing, network pressures and delivery of domestic and fire fighting supply in accordance with QLDC standards. With the construction of the new reservoirs at RL 407m as noted in the paragraph above it is not anticipated that there will be any issues in providing a potable water supply that meets Council standards. It is anticipated that the local mains within the development (excluding rising and falling mains from the new reservoirs) will be of 150mm diameter. In the event that detailed design indicates any areas of low pressures this will be due to friction losses within the piped network and it will be possible to upsize some pipes to reduce

All new infrastructure constructed for this development would then be vested in Council ownership.

### 8.3 Required upgrades

It is assumed that the Flint's Park Mixed Use Precinct development will be levied under the 2018/2019 Development Contribution policy under the Frankton-Ladies Mile Hwy category for their contribution to headworks and trunk infrastructure upgrades. The current figure being levied is \$5,683 per residential unit.

**In our opinion there is no impediment to providing an adequate potable water supply for the Flint's Park Mixed Use Precinct development in accordance with Council standards and good engineering practice and that there are no grounds for declining the SHA based on water supply matters.**

## 9 POWER, TELECOMMUNICATIONS AND GAS

Aurora Energy and Powernet both have high voltage electrical networks adjoining the subject site and they have both confirmed that their networks can supply suitable underground electrical supply to the proposed development.

Fibre optic telecommunications cables exist along the north side of Frankton-Ladies Mile Hwy. These are owned by Chorus who have also confirmed that extensions to their network can be made to provide telecommunications services to the proposed development.

The Shotover Country subdivision has full gas reticulation with gas being provided by Contact / Rockgas who have a 50t buried gas tank located off Jones Ave. A 110mm main runs in Stalker Road past the property boundary and gas reticulation can be made available at the discretion of the developer.

All existing infrastructure is underground and all new reticulation required to service the proposed development will continue this model of service. Confirmation from the network owners has been obtained that they will be able to service the proposed development and these confirmations are contained in the appendices to this SHA application.

Based on the feedback from the Utility Service providers it is not anticipated that there will be any supply or capacity issues that will limit the provision of necessary services and connection can be made available from existing infrastructure at the time of development in accordance with the relevant service provider's specifications.

**Based on the advice from Aurora Energy, Powernet and Chorus there is no impediment to providing adequate utility services for the proposed Flint's Park Mixed Use Precinct development in accordance with Council standards and good engineering practice and that there are no grounds for declining the SHA based on utility service matters.**

## 10 CONCLUSION

This report, along with other specialist documents, has been prepared in support of a SHA application for an area of approximately 7.87ha in size and comprises Lot 1 DP12822, Lot 16 DP12921; Section 51, Part Section 45-46 and Part Section 50 Block III Shotover Survey District. Based on investigations and preliminary work carried out and as presented in this document all necessary services required to facilitate development of the subject land can be provided.

In summary the subject land is

1. Geotechnically stable and there are no matters raised in the Geotechnical Investigation Report that cannot be adequately dealt with during construction to provide stable platforms for dwellings.
2. Free from inundation in large storm events. The land sits well above any floodplains within the wider area and runoff from Slopehill which sits behind the proposed development can be managed within the road corridor and in detention basins sited in the landscape setback adjacent to the Frankton-Ladies Mile Hwy.
3. Able to be serviced adequately with stormwater reticulation in accordance with Queenstown Lakes District Council standards.
4. Able to be provided with adequate wastewater servicing in accordance with Council and standards through the construction of a new pump station and rising mains to connect the proposed development to the existing Shotover Treatment Plant. Additional storage may be required and can be provided if detailed design confirms that this is required. The Shotover treatment plant has been sized to deal with wastewater from the Ladies Mile area and this is confirmed within the WSP Opus HIF Scoping and Concept Report prepared for Council in June 2018.
5. Able to be provided with an adequate water supply in accordance with Council standards and the New Zealand Fire Service Firefighting Water Supplies Code of Practice through an upgrade of existing systems. Two new reservoirs must be constructed on Slope Hill at an RL in excess of 407m to provide adequate pressure for the networks that will need to be constructed to service the proposed developments. The Shotover Country bore field is being upgraded and will have sufficient capacity to provide the volumes of water necessary for the Ladies Mile area. This is confirmed within the WSP Opus HIF Scoping and Concept Report prepared for Council in June 2018.
6. Able to be provided with necessary utility services including power and phone to adequately service the proposed development.

In our professional opinion, there is no technical impediment to providing the necessary infrastructure to serve the proposed Flint's Park Mixed Use Precinct development and there are no engineering matters that prevent the land being declared and SHA and moving forward to provide much needed housing for the township of Queenstown.



**APPENDIX A**  
**FLINT'S PARK MIXED USE ZONE MASTERPLAN**

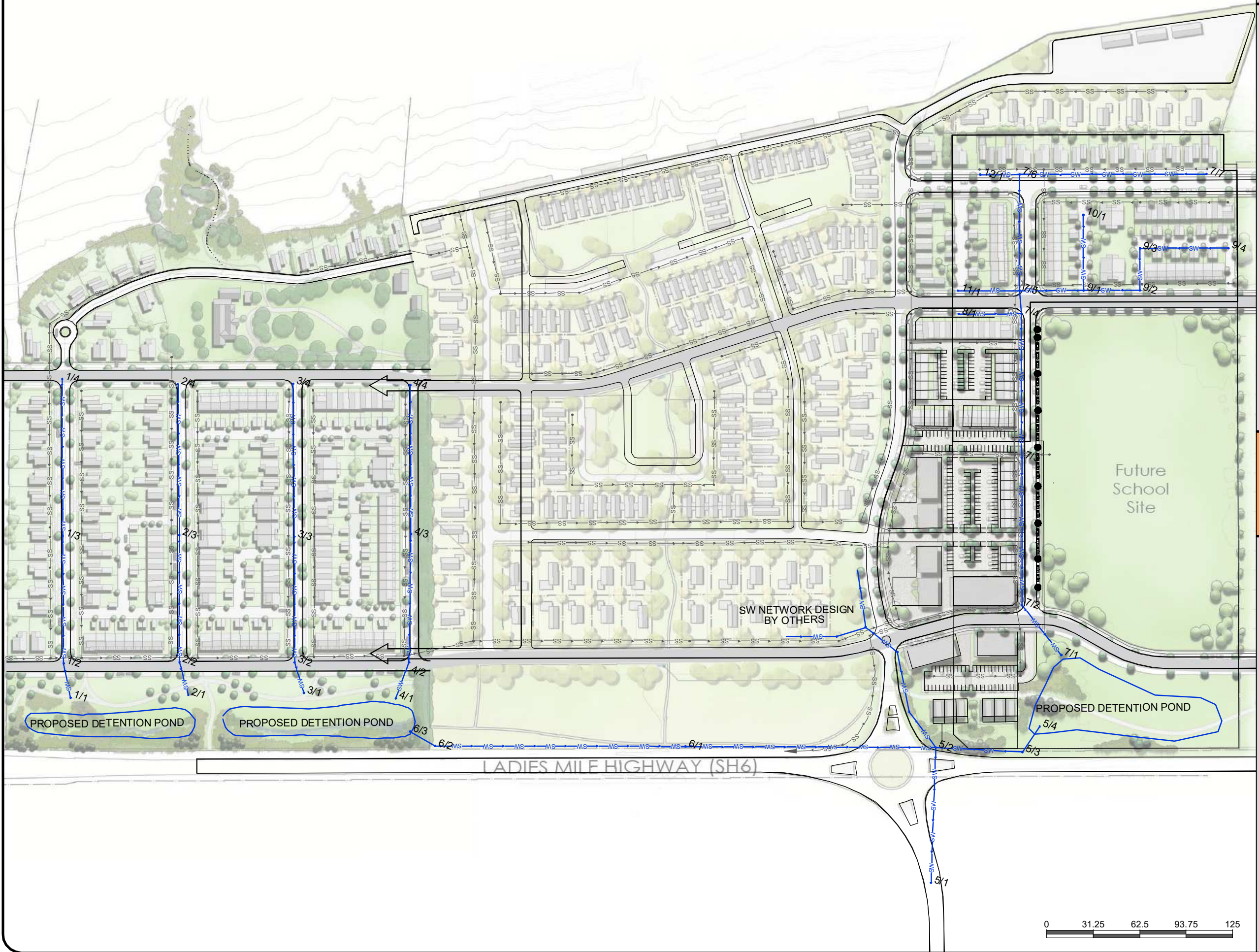


## **APPENDIX B STORMWATER LAYOUTS AND CALCULATIONS**





REV DESCRIPTION APPV'D DATE



**Candor<sup>3</sup>**  
ENGINEERING FOR LIFE

PROJECT  
**FLINT'S PARK  
MIXED USE PRECINCT  
POSSIBLE  
STORMWATER  
OVERALL**

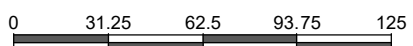
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DATE ISSUED  
MAR 2019

PROJECT NO. **1252B** DRAWING NO. **DR104** REVISION **-**







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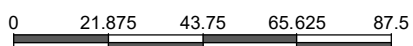
**Candor**<sup>3</sup>  
ENGINEERING FOR LIFE

PROJECT  
**FLINT'S PARK  
MIXED USE PRECINCT  
POSSIBLE  
STORMWATER**

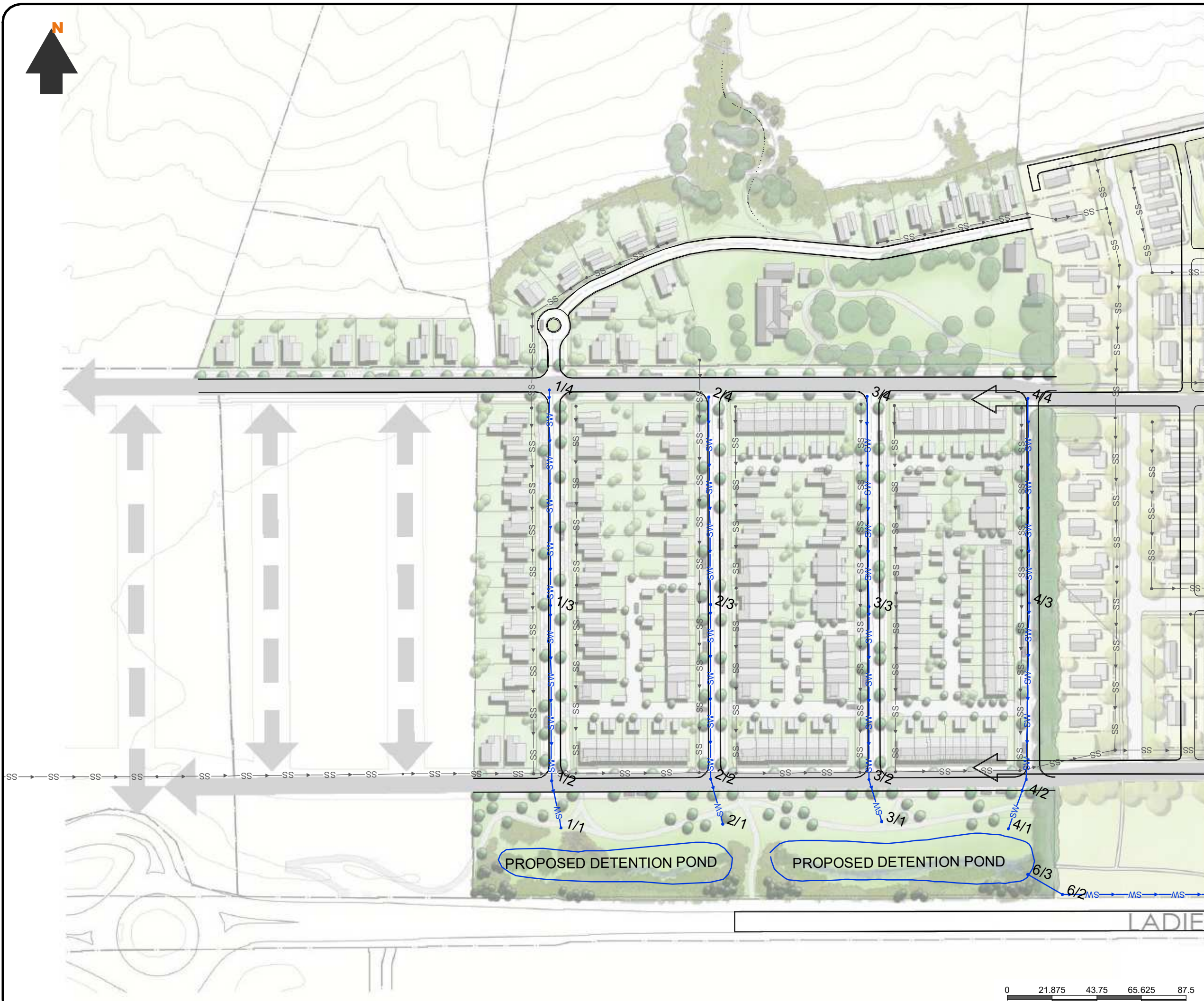
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MAR 2019

PROJECT NO. 1252B  
DRAWING NO. DR105  
REVISION  
-







REV	DESCRIPTION	APPV'D	DATE
<div>Candor<sup>3</sup> ENGINEERING FOR LIFE</div>			
PROJECT FLINT'S PARK MIXED USE PRECINCT POSSIBLE STORMWATER			
CLIENT			
DESIGN BH	SCALE	DATE ISSUED	
DRAWN SH	1:1750 @ A3	MAR 2019	
CHECK			
APPV'D			
PROJECT NO.	DRAWING NO.	REVISION	
1252B	DR106	-	

## STORMWATER HYDROLOGICAL PARAMETERS - POST DEVELOPMENT (INCLUDING SLOPE HILL)

PROJECT: Ladies Mile  
 LOCATION: Queenstown  
 CALC BY: Maryam Hasanzadeh  
 CHECKED BY: Dali Suljic

DATE: 05-Mar-19  
 DATE: 05-Mar-19

HYDROLOGICAL INPUTS						
CATCHMENT NAME	Development 1	Slope Hill 1	Slope Hill 2	Slope Hill 3		
SOIL CLASS	Class A	Class C	Class C	Class C		
IMPERVIOUS (ROADS, ROOFS ETC)	79,500 m <sup>2</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>		
URBAN LAWNS	26,500 m <sup>2</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>	0 m <sup>2</sup>		
PASTURE	0 m <sup>2</sup>	12,051 m <sup>2</sup>	115,091 m <sup>2</sup>	49,098 m <sup>2</sup>		
TOTAL AREA	106,000 m <sup>2</sup>	12,051 m <sup>2</sup>	115,091 m <sup>2</sup>	49,098 m <sup>2</sup>		
IMPERVIOUS	75.0%	0.0%	0.0%	0.0%		
PERVIOUS CN	39.0	74.0	74.0	74.0		
PERVIOUS Ia	5.0 mm	5.0 mm	5.0 mm	5.0 mm		

TIME OF CONCENTRATION INPUTS (COMBINED)						
CHANNELISATION FACTOR	0.6	1	1	1		
CATCHMENT LENGTH	350 m	145 m	700 m	490 m		
CATCHMENT SLOPE	0.010 m/m	0.301 m/m	0.193 m/m	0.246 m/m		
RUNOFF FACTOR	0.713	0.587	0.587	0.587		
TIME OF CONCENTRATION	12.1 mins	4.5 mins	14.6 mins	10.7 mins		
LAG TIME	8.1 mins	3.0 mins	9.8 mins	7.2 mins		

## STORMWATER HYDROLOGICAL PARAMETERS - POST DEVELOPMENT MUP (INCLUDING SLOPE HILL)

PROJECT: Ladies Mile  
 LOCATION: Queenstown  
 CALC BY: Dali Suljic  
 CHECKED BY: John Gardiner

DATE: 20-Mar-19  
 DATE: 20-Mar-19

HYDROLOGICAL INPUTS						
CATCHMENT NAME	Development 2	Slope Hill 4				
SOIL CLASS	Class A	Class C				
IMPERVIOUS (ROADS, ROOFS ETC)	60,055 m <sup>2</sup>	0 m <sup>2</sup>				
URBAN LAWNS	20,181 m <sup>2</sup>	0 m <sup>2</sup>				
PASTURE	0 m <sup>2</sup>	146,515 m <sup>2</sup>				
TOTAL AREA	80,236 m <sup>2</sup>	146,515 m <sup>2</sup>				
IMPERVIOUS	74.8%	0.0%				
PERVIOUS CN	39.0	74.0				
PERVIOUS Ia	5.0 mm	5.0 mm				

TIME OF CONCENTRATION INPUTS (COMBINED)						
CHANNELISATION FACTOR	0.6	1				
CATCHMENT LENGTH	400 m	750 m				
CATCHMENT SLOPE	0.010 m/m	0.254 m/m				
RUNOFF FACTOR	0.712	0.587				
TIME OF CONCENTRATION	13.2 mins	14.0 mins				
LAG TIME	8.9 mins	9.4 mins				

# Candor<sup>3</sup>

ENGINEERING FOR LIFE

## STORAGE CALCULATIONS

(INCLUDING SLOPE HILL)

PROJECT: Ladies Mile  
 LOCATION: Queenstown  
 CALC BY: Dali Suljic  
 CHECKED BY: John Gardiner

DATE: 20-Mar-19  
 DATE: 20-Mar-19

BASIN PARAMETERS						
CATCHMENT NAME	Development 1	Slope Hill 1	Slope Hill 2	Slope Hill 3		
CATCHMENT AREA	106,000 m <sup>2</sup>	12,051 m <sup>2</sup>	115,091 m <sup>2</sup>	49,098 m <sup>2</sup>		
PERCENTAGE IMPERVIOUS	75.0%	0.0%	0.0%	0.0%		
HMS BASIN PARAMETERS - POST DEVELOPMENT						
CATCHMENT NAME	Development 1	Slope Hill 1	Slope Hill 2	Slope Hill 3		
CATCHMENT AREA	0.106000 km <sup>2</sup>	0.012051 km <sup>2</sup>	0.115091 km <sup>2</sup>	0.049098 km <sup>2</sup>		
PERVIOUS AREA CURVE NUMBER	39.0	74.0	74.0	74.0		
PERVIOUS INITIAL ABSTRACTION	5.0 mm	5.0 mm	5.0 mm	5.0 mm		
PERCENTAGE IMPERVIOUS	75.0%	0.0%	0.0%	0.0%		
LAG TIME	8.1 mins	3.0 mins	9.8 mins	7.2 mins		

### STORAGE CALCULATIONS:

LEVEL	ELEMENT DISCHARGE RATE [l/s]					TOTAL DISCHARGE	POND VOLUME	COMMENT
	OUTLET 1 CIRCULAR ORIFICE	OUTLET 2	OUTLET 3	OUTLET 4	OUTLET PIPE SUBTOTAL			
358.10 m	0.0	0.0	0.0	0.0	0.0	0.0 l/s	0.0 m <sup>3</sup>	
358.20 m	10.0	0.0	0.0	0.0	10.0	10.0 l/s	1.7 m <sup>3</sup>	
358.30 m	33.3	0.0	0.0	0.0	33.3	33.3 l/s	8.1 m <sup>3</sup>	
358.40 m	49.1	0.0	0.0	0.0	49.1	49.1 l/s	21.2 m <sup>3</sup>	
358.50 m	60.9	0.0	0.0	0.0	60.9	60.9 l/s	43.0 m <sup>3</sup>	
358.60 m	70.8	0.0	0.0	0.0	70.8	70.8 l/s	76.5 m <sup>3</sup>	
358.70 m	79.4	0.0	0.0	0.0	79.4	79.4 l/s	131.7 m <sup>3</sup>	
358.80 m	87.3	0.0	0.0	0.0	87.3	87.3 l/s	219.3 m <sup>3</sup>	
358.90 m	94.4	0.0	0.0	0.0	94.4	94.4 l/s	351.9 m <sup>3</sup>	
359.00 m	101.1	0.0	0.0	0.0	101.1	101.1 l/s	566.1 m <sup>3</sup>	
359.10 m	107.3	0.0	0.0	0.0	107.3	107.3 l/s	888.7 m <sup>3</sup>	
359.20 m	113.2	0.0	0.0	0.0	113.2	113.2 l/s	1,223.0 m <sup>3</sup>	
359.30 m	118.8	0.0	0.0	0.0	118.8	118.8 l/s	1,569.6 m <sup>3</sup>	
359.40 m	124.2	0.0	0.0	0.0	124.2	124.2 l/s	1,931.1 m <sup>3</sup>	
359.50 m	129.3	0.0	0.0	0.0	129.3	129.3 l/s	2,310.4 m <sup>3</sup>	
359.60 m	134.3	0.0	0.0	0.0	134.3	134.3 l/s	2,709.8 m <sup>3</sup>	
359.70 m	139.0	0.0	0.0	0.0	139.0	139.0 l/s	3,132.2 m <sup>3</sup>	
359.80 m	143.6	0.0	0.0	0.0	143.6	143.6 l/s	3,578.7 m <sup>3</sup>	
359.90 m	148.1	0.0	0.0	0.0	148.1	148.1 l/s	4,061.6 m <sup>3</sup>	
360.00 m	152.4	0.0	0.0	0.0	152.4	152.4 l/s	4,646.4 m <sup>3</sup>	
360.10 m	156.6	0.0	0.0	0.0	156.6	156.6 l/s	5,350.2 m <sup>3</sup>	
360.20 m	160.7	0.0	0.0	0.0	160.7	160.7 l/s	6,077.5 m <sup>3</sup>	
360.30 m	164.7	0.0	0.0	0.0	164.7	164.7 l/s	6,828.7 m <sup>3</sup>	
360.40 m	168.6	0.0	0.0	0.0	168.6	168.6 l/s	7,603.8 m <sup>3</sup>	
360.50 m	172.4	0.0	0.0	0.0	172.4	172.4 l/s	8,403.2 m <sup>3</sup>	
360.60 m	176.2	0.0	0.0	0.0	176.2	176.2 l/s	9,227.0 m <sup>3</sup>	
360.70 m	179.8	0.0	0.0	0.0	179.8	179.8 l/s	10,075.5 m <sup>3</sup>	
360.80 m	183.4	0.0	0.0	0.0	183.4	183.4 l/s	10,948.9 m <sup>3</sup>	
360.90 m	186.9	0.0	0.0	0.0	186.9	186.9 l/s	11,847.4 m <sup>3</sup>	
361.00 m	190.4	0.0	0.0	0.0	190.4	190.4 l/s	12,771.2 m <sup>3</sup>	100yr ARI

### OUTLET PARAMETERS

INVERT 358.10 m  
 DIAMETER 0.23 m  
 HEIGHT  
 SIDE SLOPE



## STORAGE CALCULATIONS - MUP (INCLUDING SLOPE HILL)

PROJECT: Ladies Mile  
LOCATION: Queenstown  
CALC BY: Dali Suljic  
CHECKED BY: John Gardiner

DATE: 20-Mar-19  
DATE: 20-Mar-19

### BASIN PARAMETERS

CATCHMENT NAME	Development 2	Slope Hill 4				
CATCHMENT AREA	80,236 m <sup>2</sup>	146,515 m <sup>2</sup>				
PERCENTAGE IMPERVIOUS	74.8%	0.0%				

### HMS BASIN PARAMETERS - POST DEVELOPMENT

CATCHMENT NAME	Development 2	Slope Hill 4				
CATCHMENT AREA	0.080236 km <sup>2</sup>	0.146515 km <sup>2</sup>				
PERVIOUS AREA CURVE NUMBER	39.0	74.0				
PERVIOUS INITIAL ABSTRACTION	5.0 mm	5.0 mm				
PERCENTAGE IMPERVIOUS	74.8%	0.0%				
LAG TIME	8.9 mins	9.4 mins				

### STORAGE CALCULATIONS:

LEVEL	ELEMENT DISCHARGE RATE [l/s]					TOTAL DISCHARGE	POND VOLUME	COMMENT
	OUTLET 1 CIRCULAR ORIFFICE	OUTLET 2	OUTLET 3	OUTLET 4	OUTLET PIPE SUBTOTAL			
355.80 m	0.0	0.0	0.0	0.0	0.0	0.0 l/s	0.0 m <sup>3</sup>	
355.90 m	10.0	0.0	0.0	0.0	10.0	10.0 l/s	610.7 m <sup>3</sup>	
356.00 m	27.3	0.0	0.0	0.0	27.3	27.3 l/s	1,248.9 m <sup>3</sup>	
356.10 m	38.6	0.0	0.0	0.0	38.6	38.6 l/s	1,915.1 m <sup>3</sup>	
356.20 m	47.2	0.0	0.0	0.0	47.2	47.2 l/s	2,609.9 m <sup>3</sup>	
356.30 m	54.6	0.0	0.0	0.0	54.6	54.6 l/s	3,334.0 m <sup>3</sup>	
356.40 m	61.0	0.0	0.0	0.0	61.0	61.0 l/s	4,087.9 m <sup>3</sup>	
356.50 m	66.8	0.0	0.0	0.0	66.8	66.8 l/s	4,872.5 m <sup>3</sup>	
356.60 m	72.2	0.0	0.0	0.0	72.2	72.2 l/s	5,688.1 m <sup>3</sup>	
356.70 m	77.2	0.0	0.0	0.0	77.2	77.2 l/s	6,535.3 m <sup>3</sup>	
356.80 m	81.8	0.0	0.0	0.0	81.8	81.8 l/s	7,411.9 m <sup>3</sup>	
356.90 m	86.3	0.0	0.0	0.0	86.3	86.3 l/s	8,315.0 m <sup>3</sup>	
357.00 m	90.5	0.0	0.0	0.0	90.5	90.5 l/s	9,242.5 m <sup>3</sup>	
357.10 m	94.5	0.0	0.0	0.0	94.5	94.5 l/s	10,190.1 m <sup>3</sup>	
357.20 m	98.4	0.0	0.0	0.0	98.4	98.4 l/s	11,154.5 m <sup>3</sup>	
357.30 m	102.1	0.0	0.0	0.0	102.1	102.1 l/s	12,135.0 m <sup>3</sup>	
357.40 m	105.6	0.0	0.0	0.0	105.6	105.6 l/s	13,130.7 m <sup>3</sup>	100yr ARI

### OUTLET PARAMETERS

INVERT 355.80 m  
DIAMETER 0.20 m



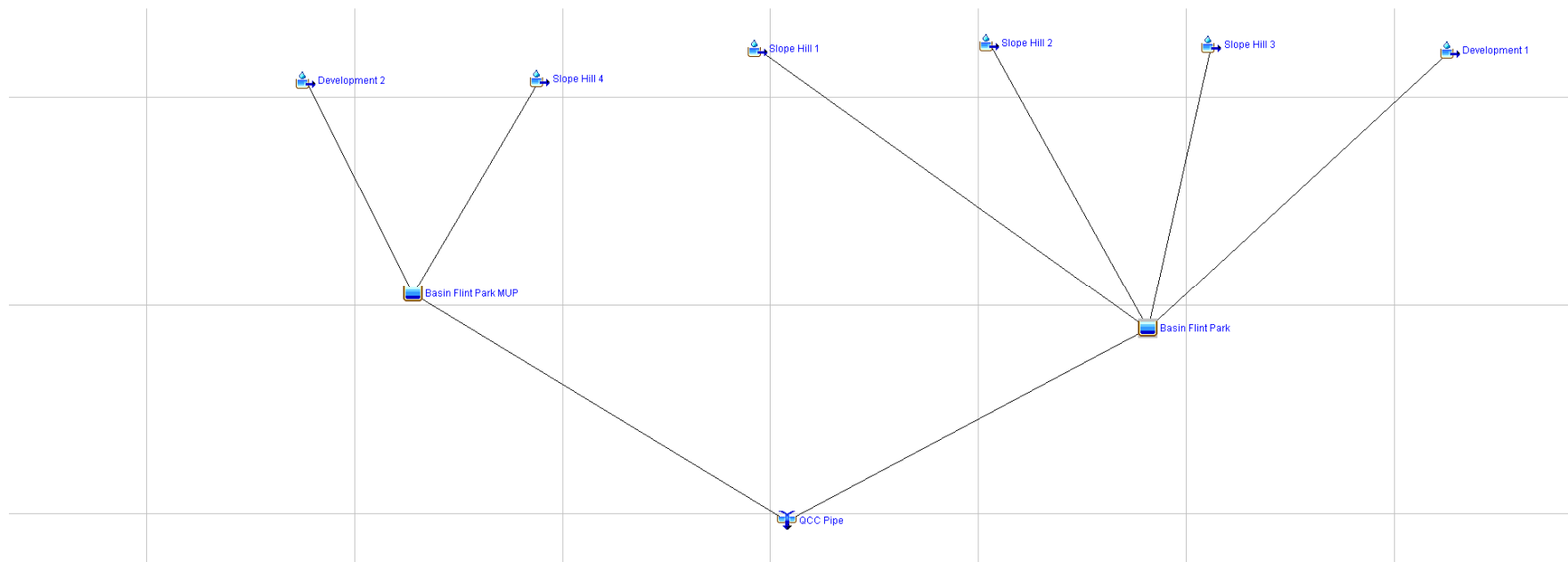
HEIGHT  
SIDE SLOPE



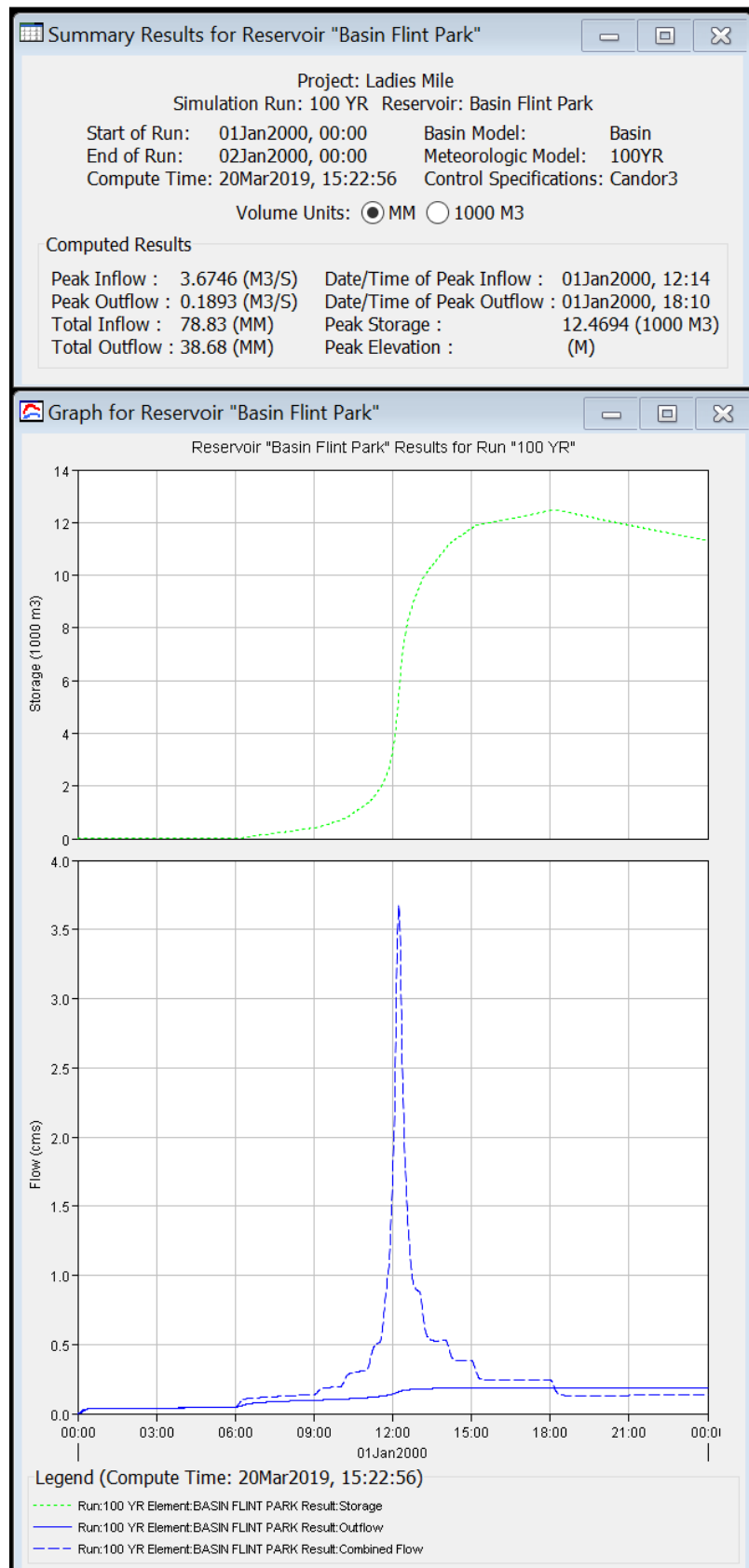


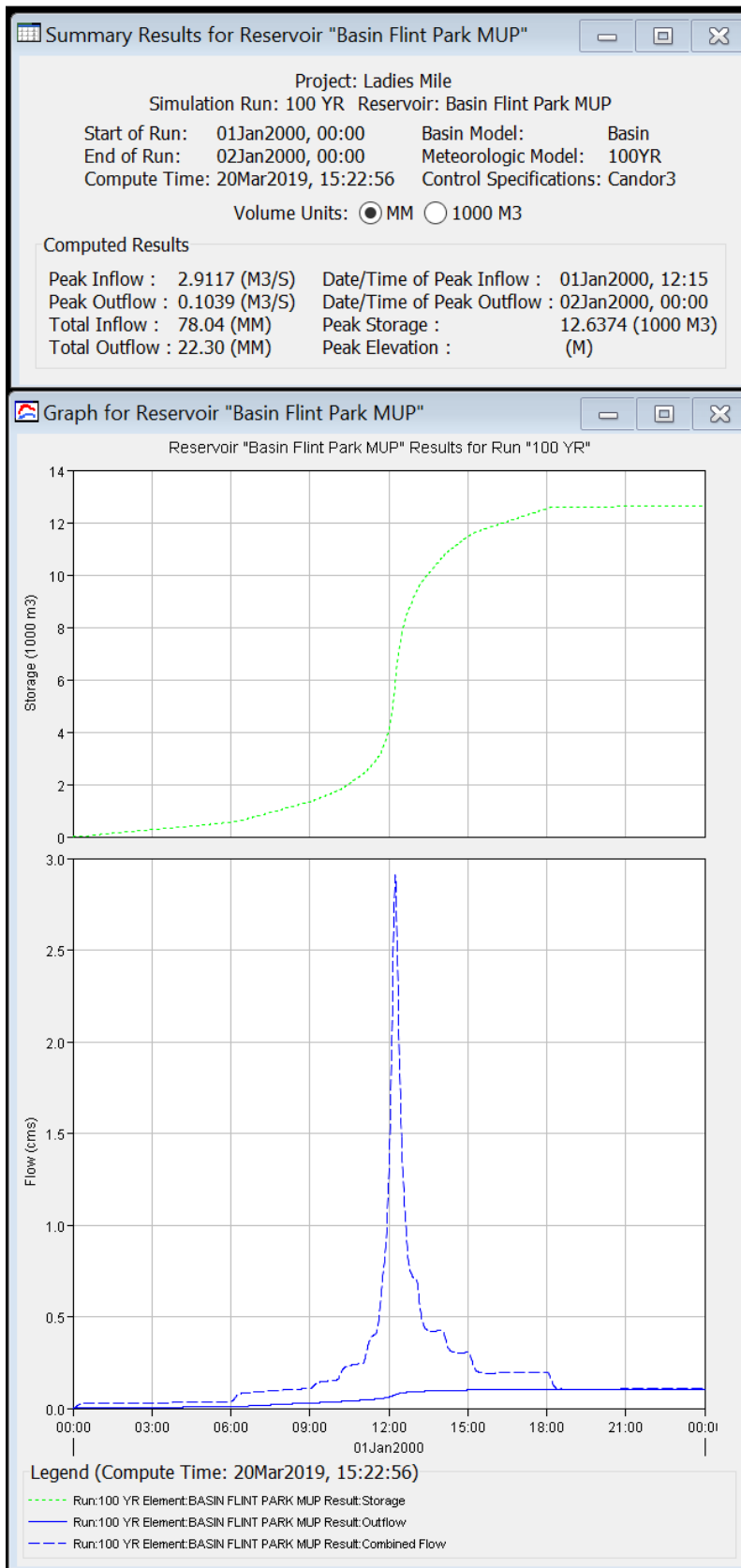
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### 1. MODEL LAYOUT

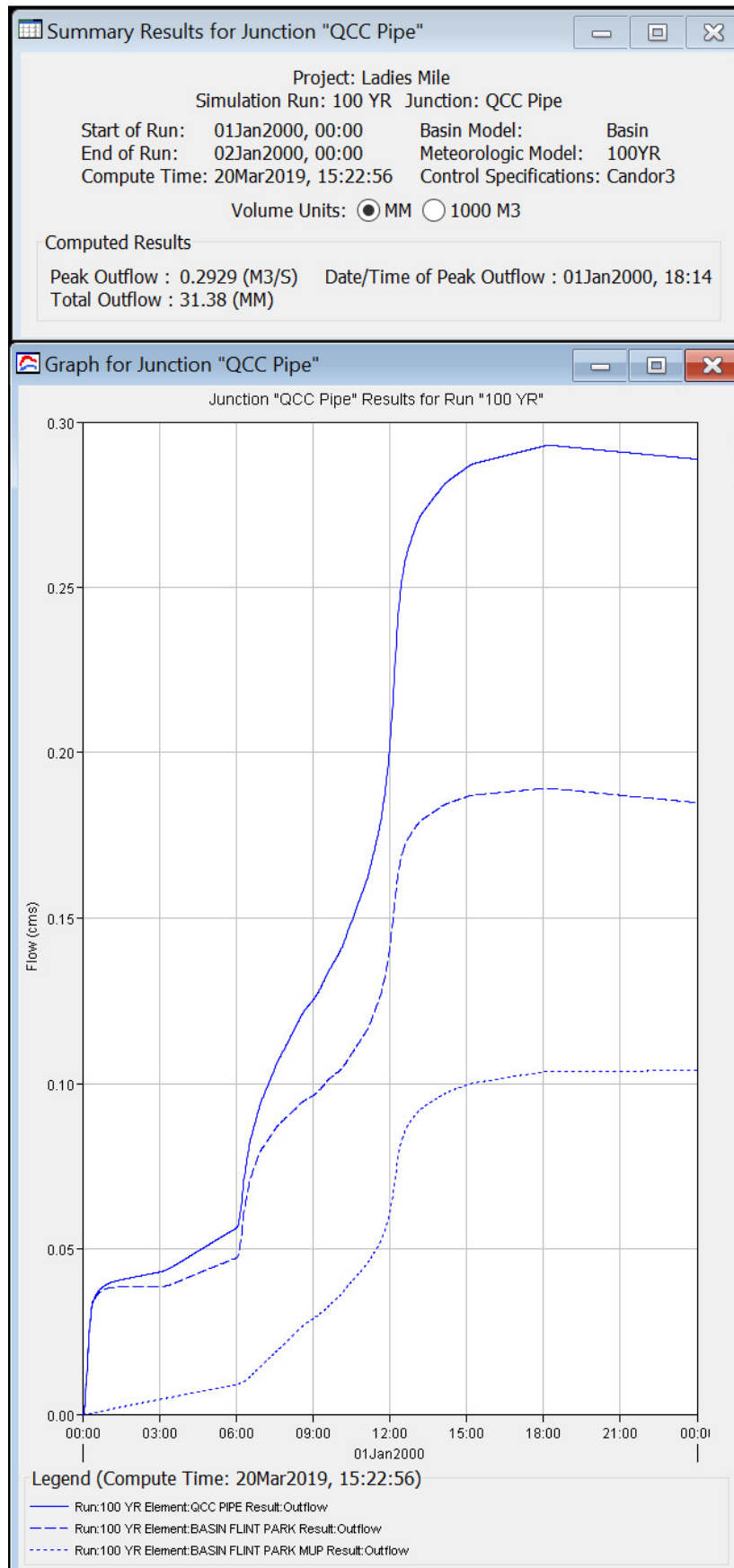


## 2. HYDROLOGICAL OUTPUT – 100 Year ARI (INCLUDING SLOPE HILL)









## **APPENDIX C**

### **WASTEWATER LAYOUTS**





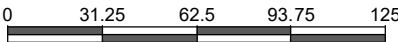
**Candor<sup>3</sup>**  
ENGINEERING FOR LIFE

PROJECT  
**FLINT'S PARK  
MIXED USE PRECINCT**  
**POSSIBLE WASTEWATER  
OVERALL**

CLIENT

DESIGN BH	SCALE 1:2500 @ A3	DATE ISSUED MAR 2019
DRAWN SH		
CHECK APPV'D		

PROJECT NO. 1252B	DRAWING NO. DR 101	REVISION
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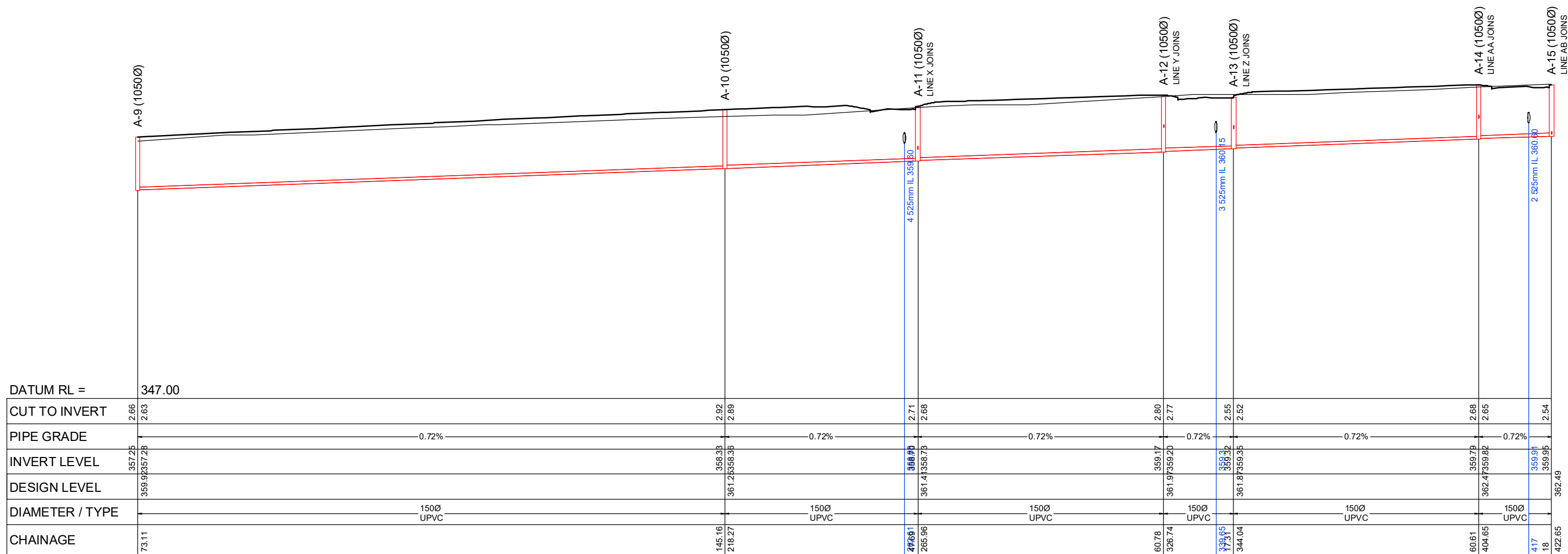













SS LINE A

REVDESCRIPTIONAPPV'DDATE



PROJECT

FLINT'S PARK MIXED USE PRECINCT  
WASTEWATER  
LONGSECTIONS (SHEET 2 OF 21)

CLIENT

DESIGN BH  
DRAWN DT  
CHECK JFG  
APPV'D

SCALE  
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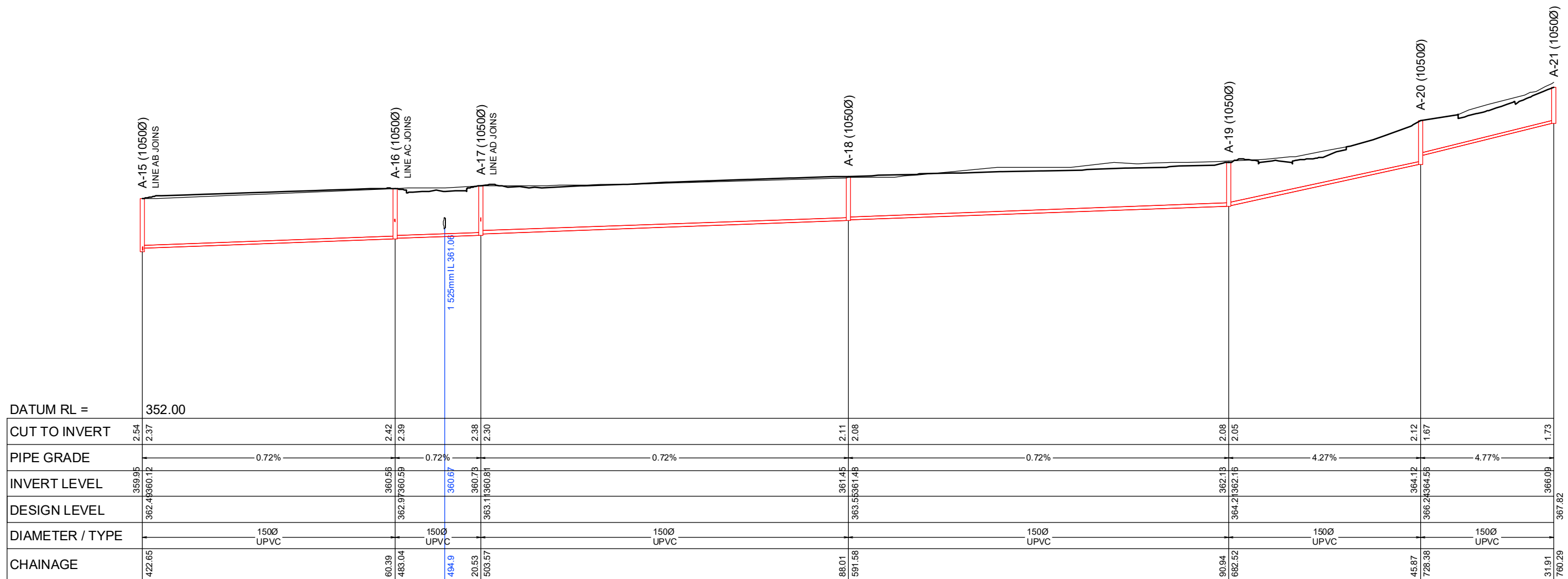
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MAR 2019

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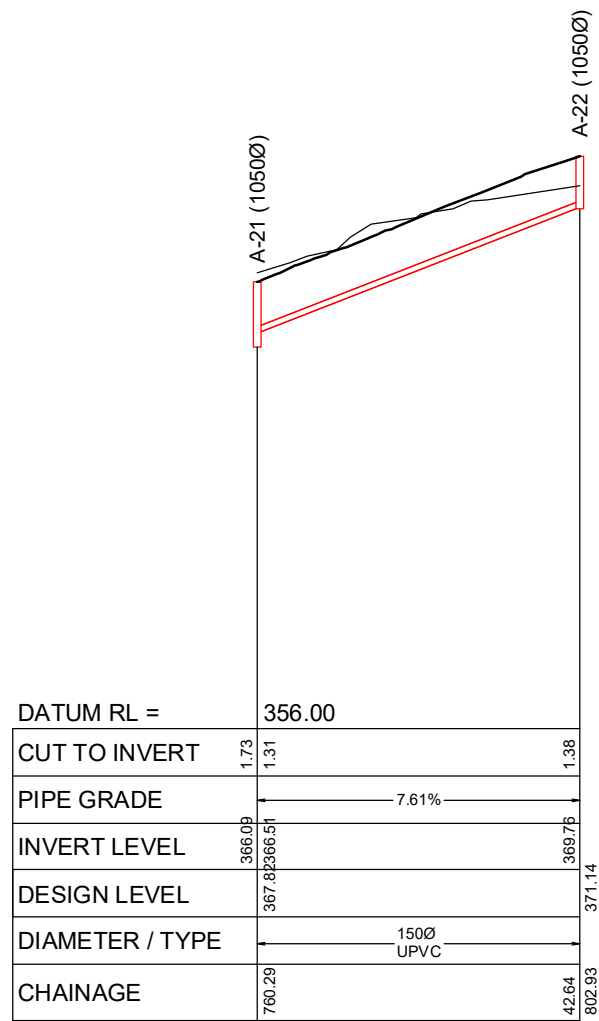
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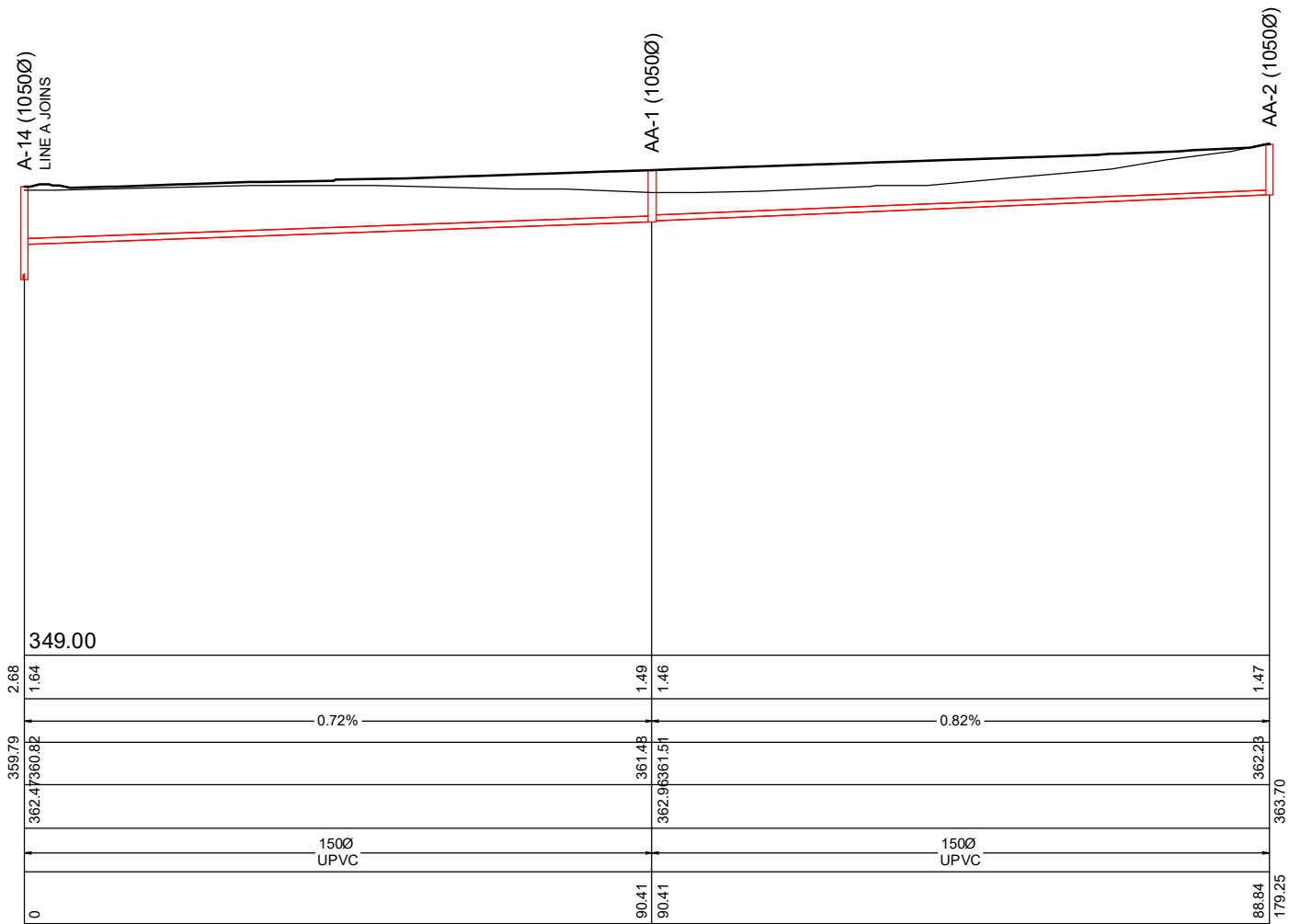
19.03.2019 J:\PROJECTS\_LAND DEVELOPMENT\1252A\_LADIES MILE, QUEENSTOWN\DRAWINGS\KINLOCH DOWNS\SK003A\_OPTION\_10A\_KINLOCH\_DOWNS\_WW LONGSECTIONS.DWG



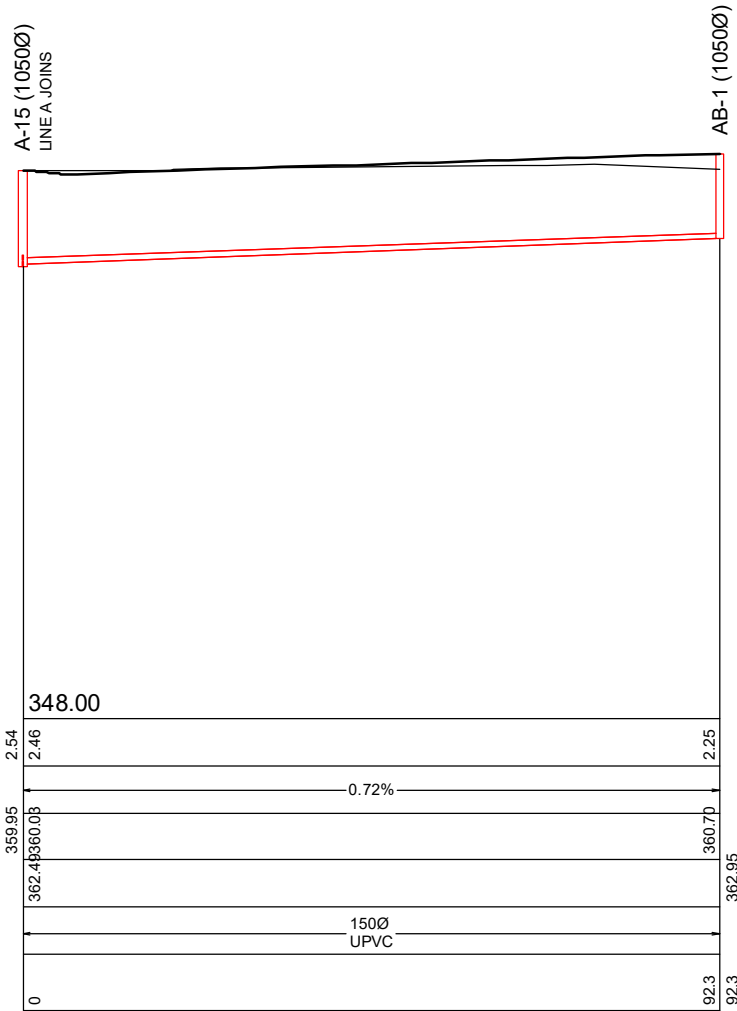
SS LINE A



SS LINE A



SS LINE AA



SS LINE AB

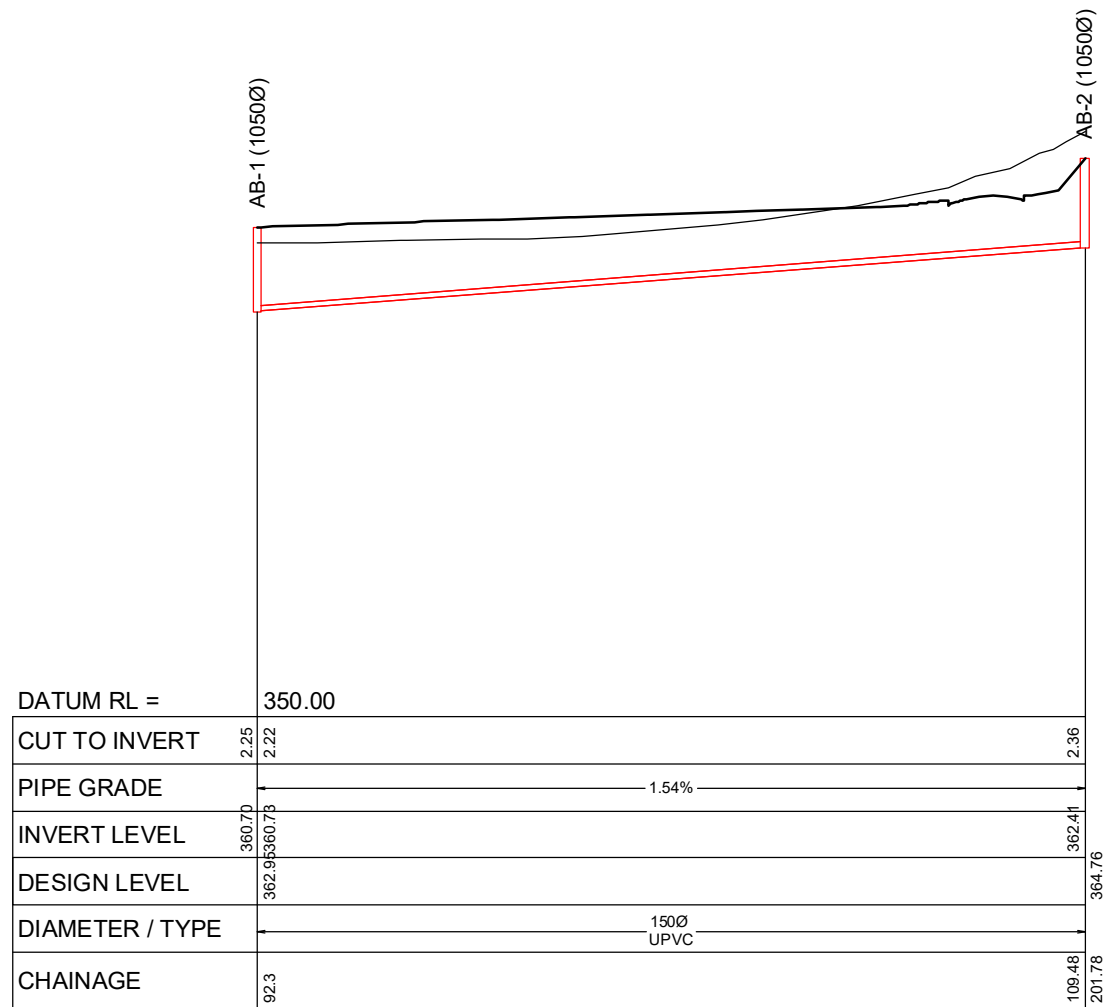
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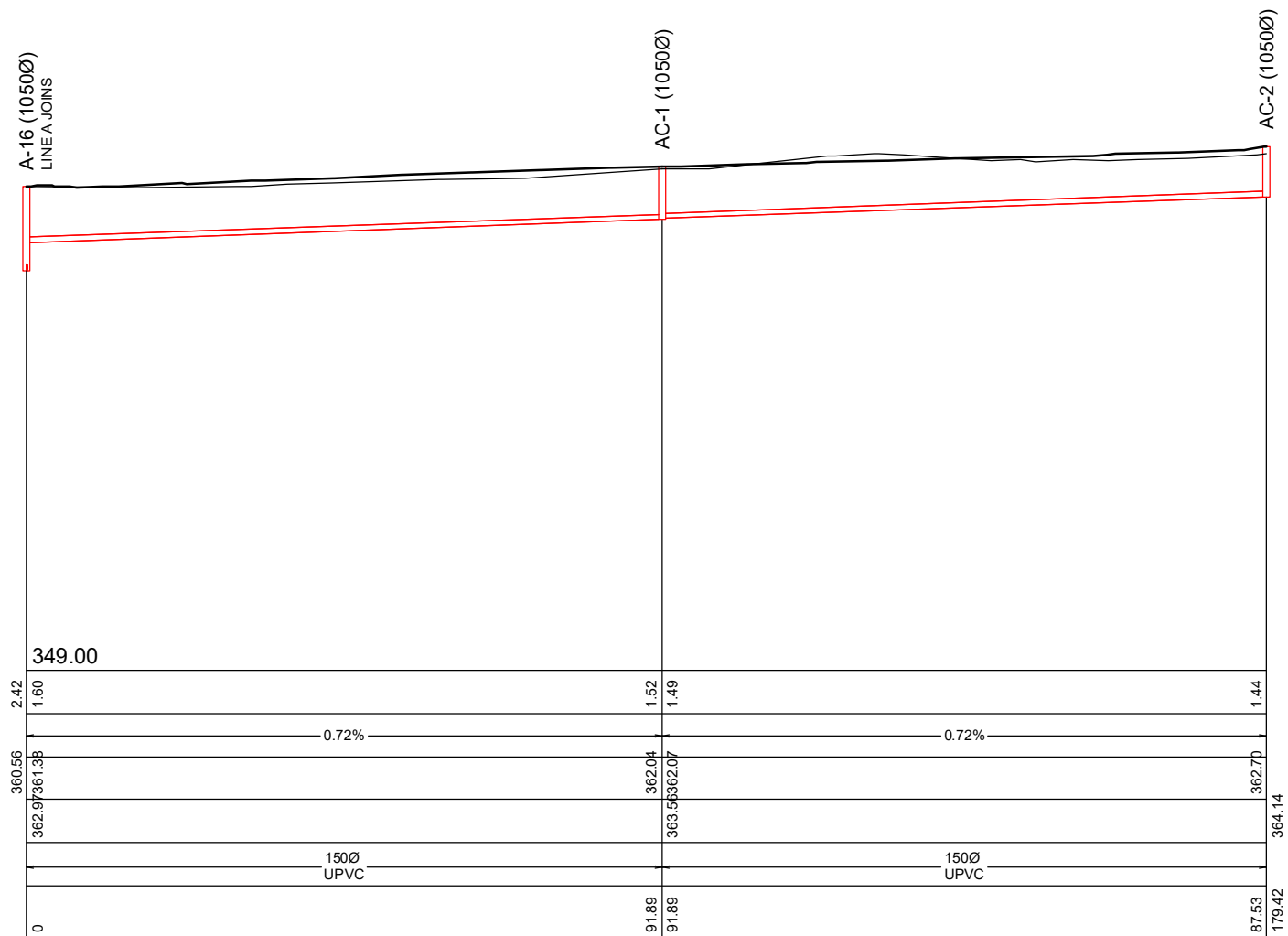
PROJECT  
FLINT'S PARK MIXED USE PRECINCT  
WASTEWATER  
LONGSECTIONS (SHEET 4 OF 21)

CLIENT

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CHECK JFG	1:200 @ A3 V	
APPV'D		
PROJECT NO.	DRAWING NO.	REVISION
1252B	05-103	-



SS LINE AB



SS LINE AC

REV DESCRIPTION APPV'D DATE



PROJECT

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WASTEWATER  
LONGSECTIONS (SHEET 5 OF 21)

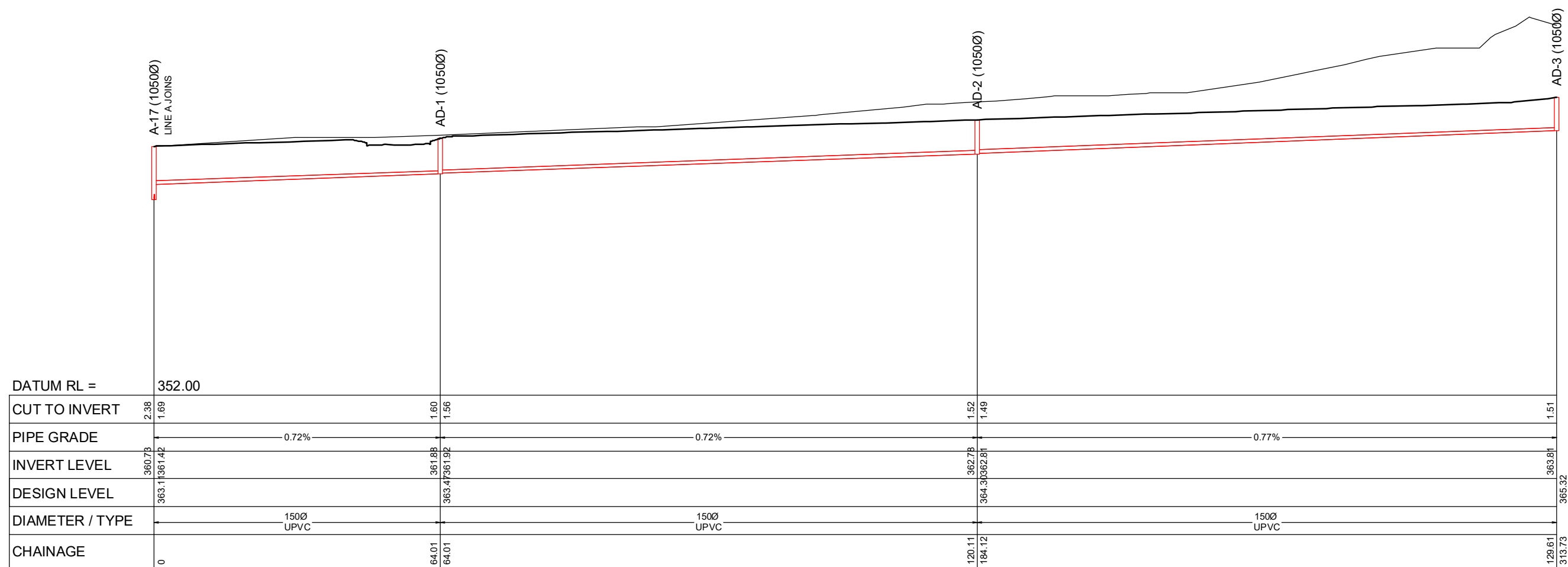
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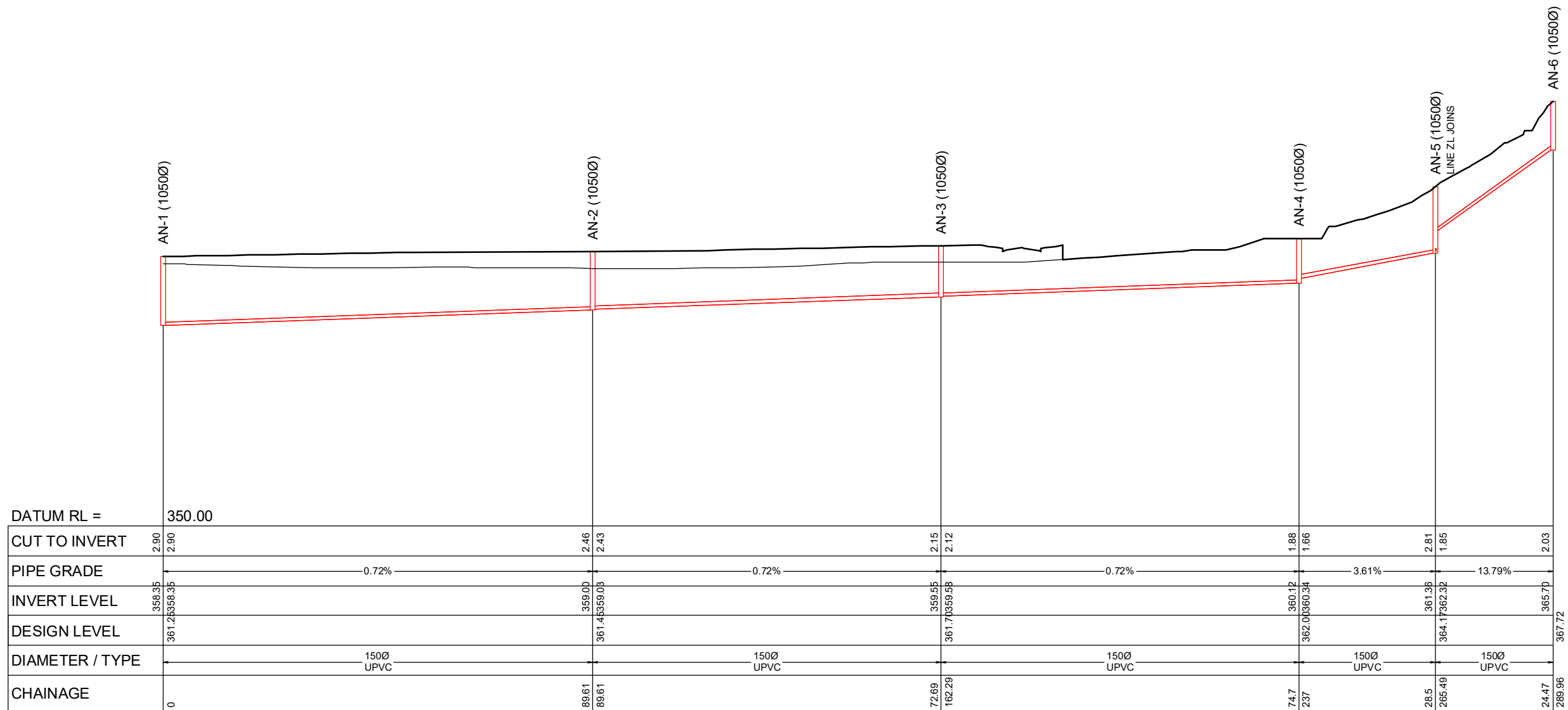
DATE ISSUED  
MAR 2019

PROJECT NO. 1252B  
DRAWING NO. 05-104  
REVISION -



SS LINE AD





SS LINE AN

REV DESCRIPTION APPV'D DATE



PROJECT

FLINT'S PARK MIXED USE PRECINCT  
WASTEWATER  
LONGSECTIONS (SHEET 7 OF 21)

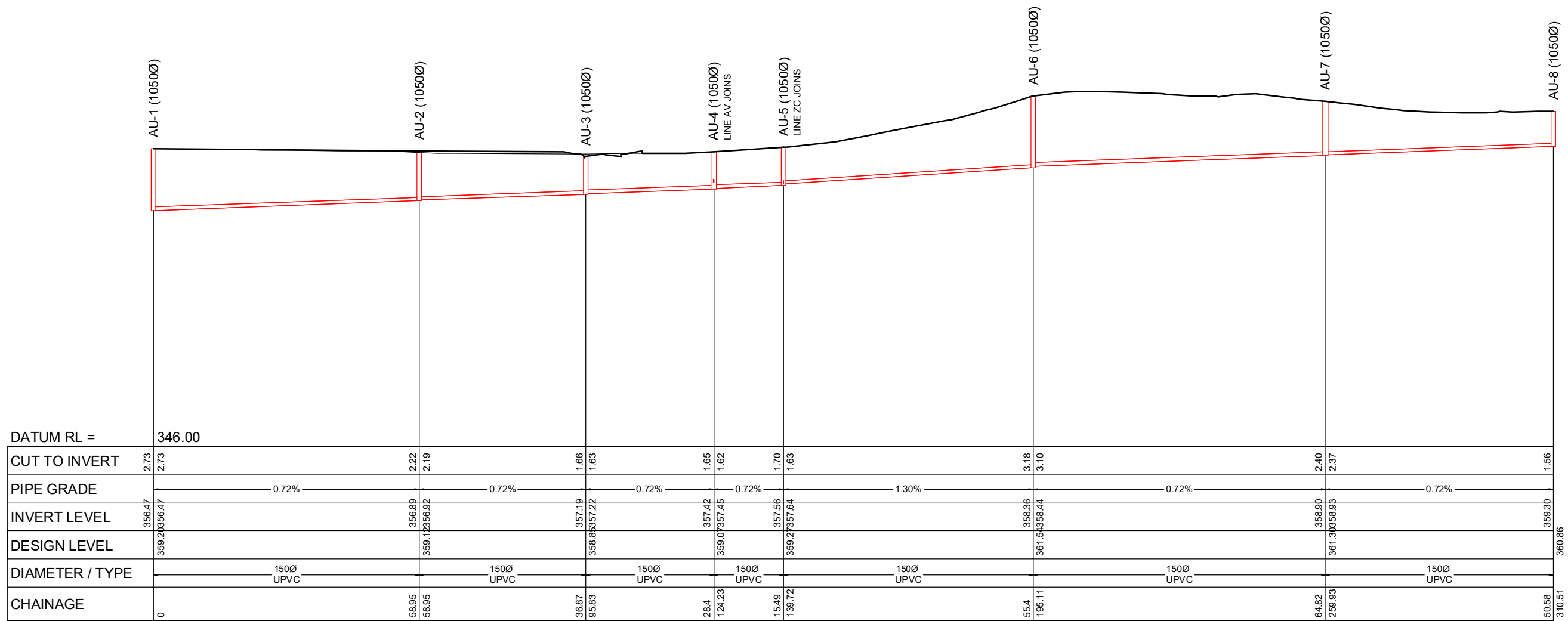
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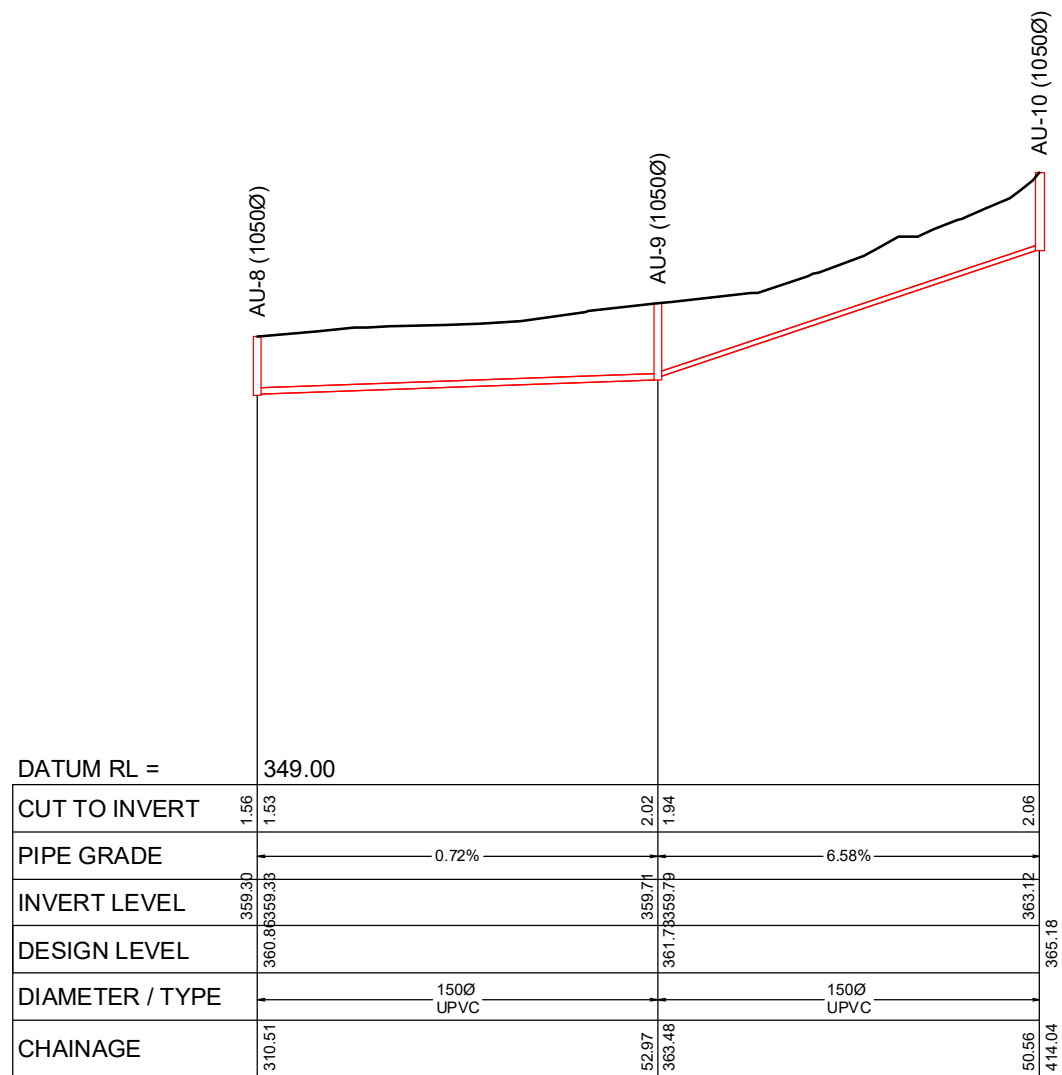
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DATE ISSUED  
MAR 2019

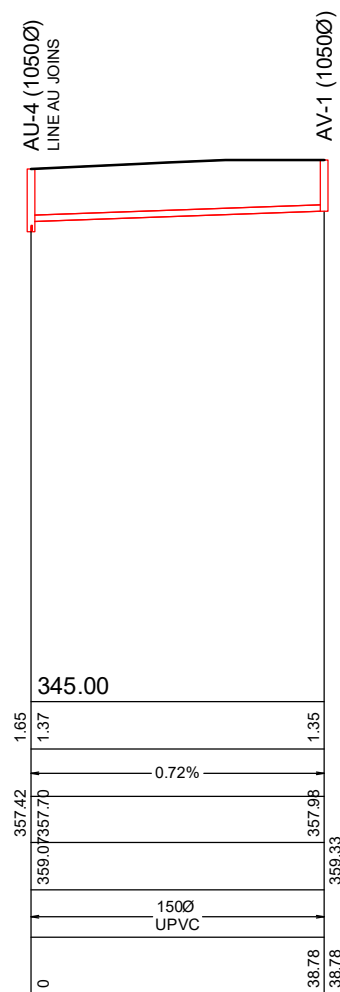
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DRAWING NO. 05-106  
REVISION -



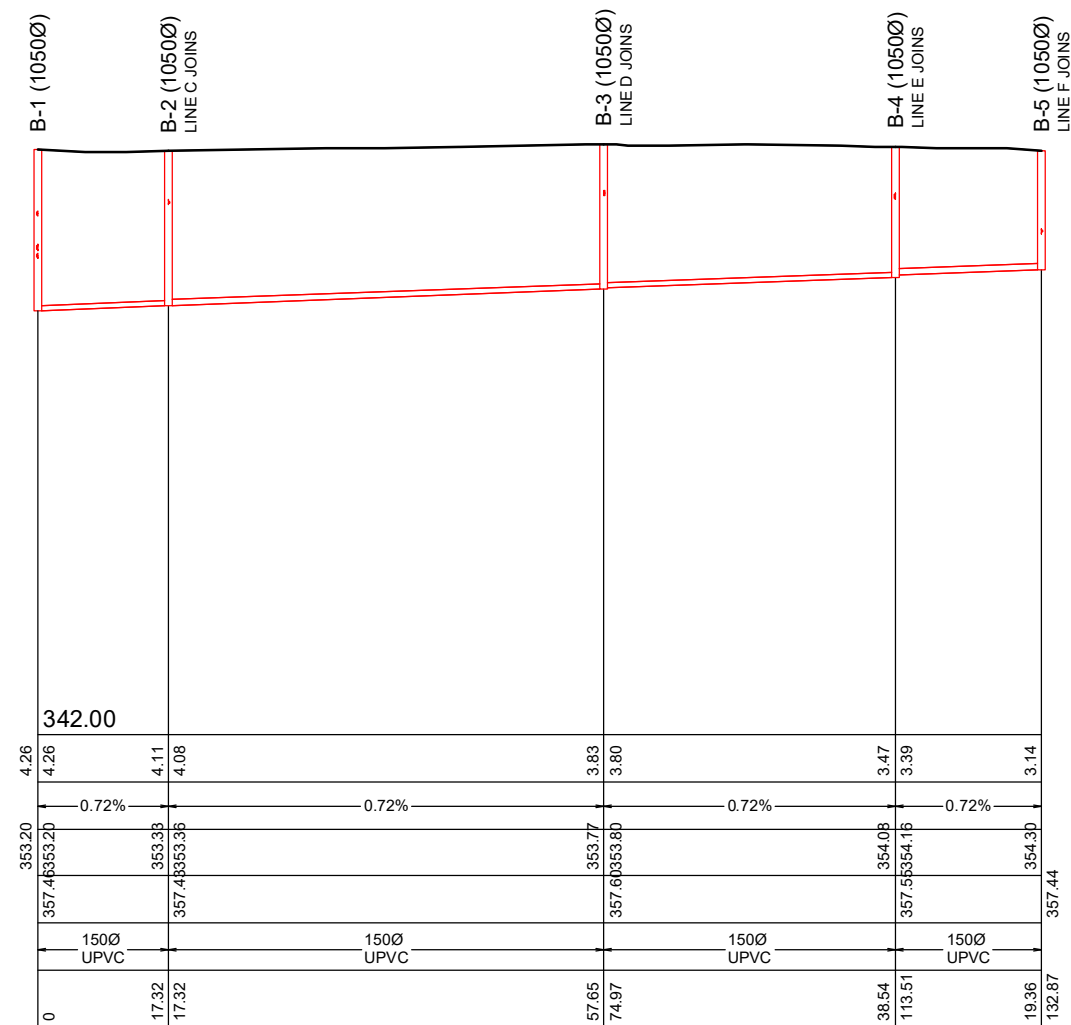
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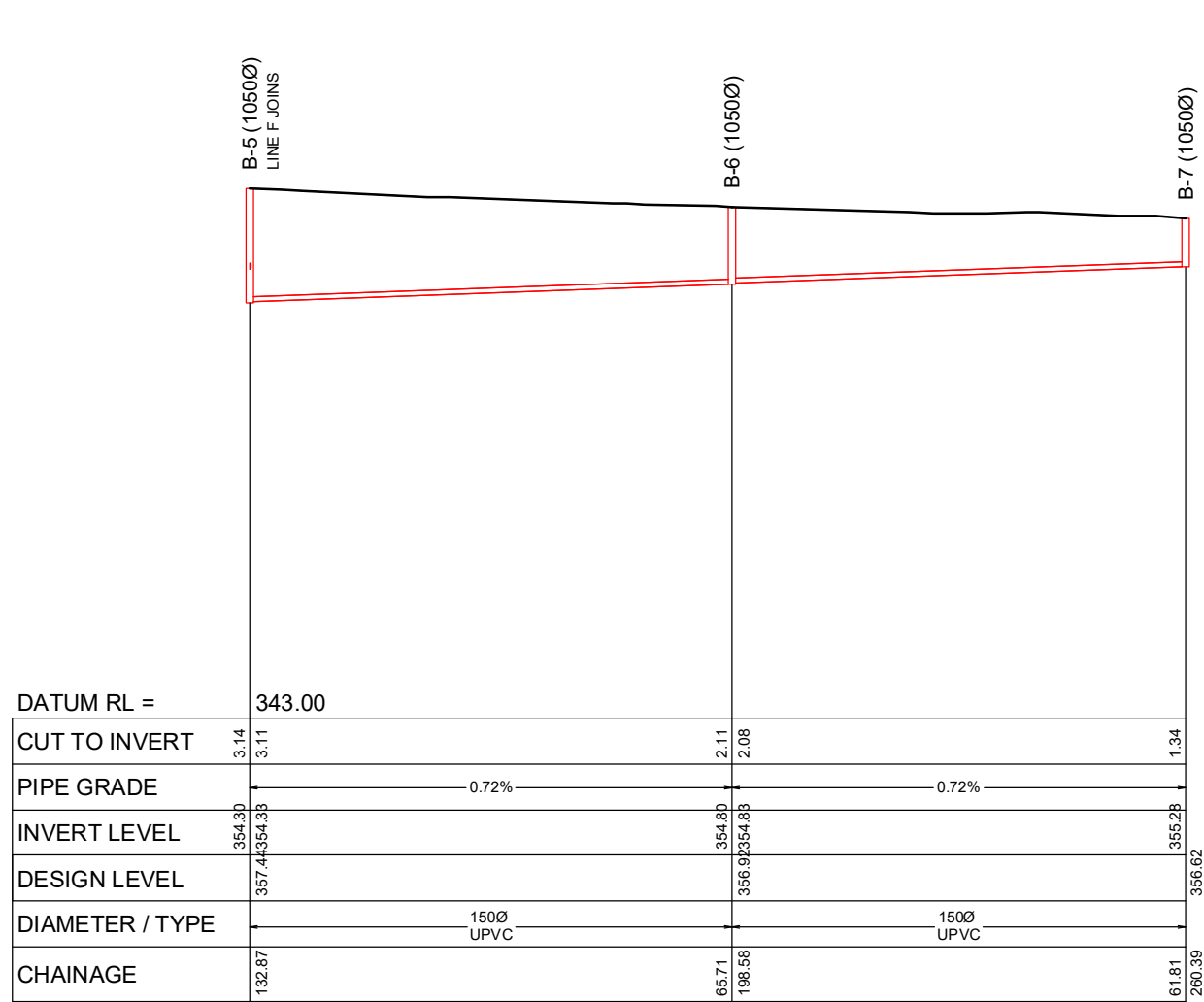
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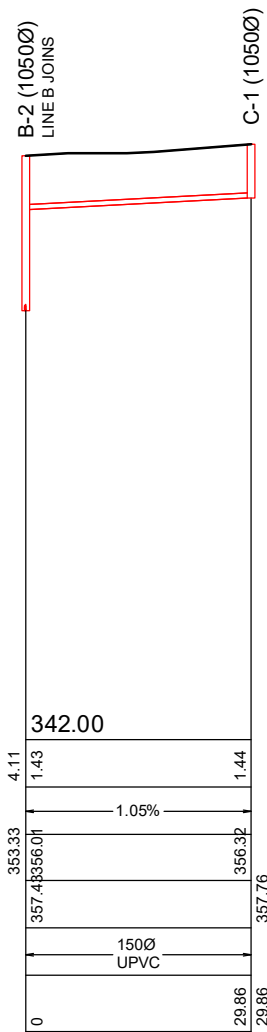
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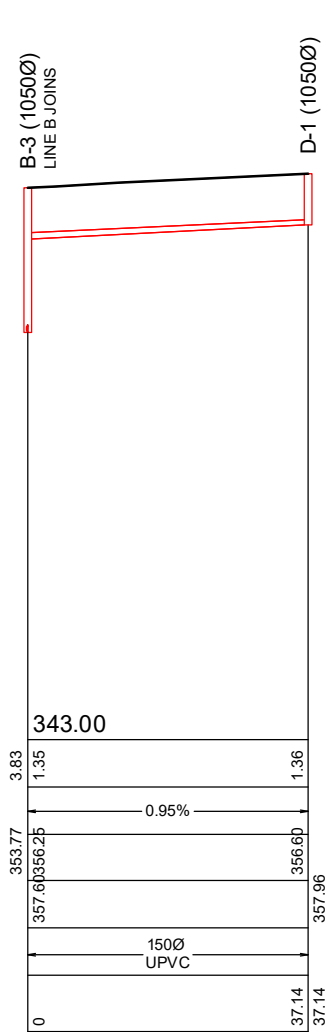
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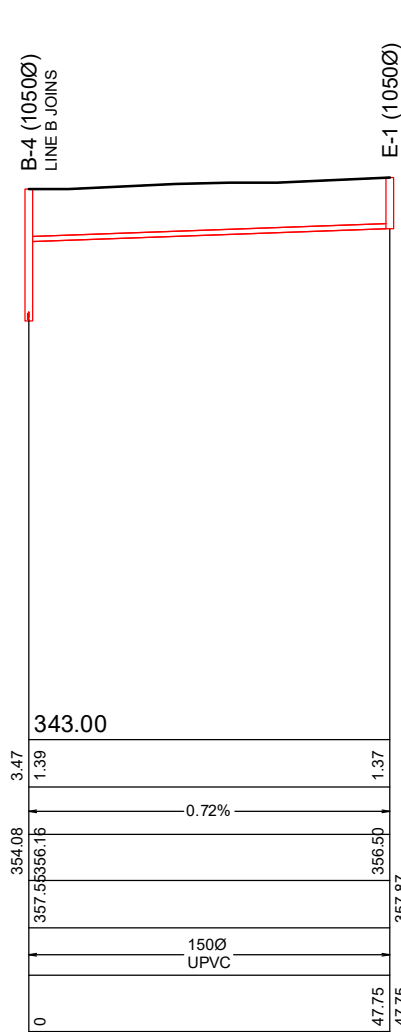
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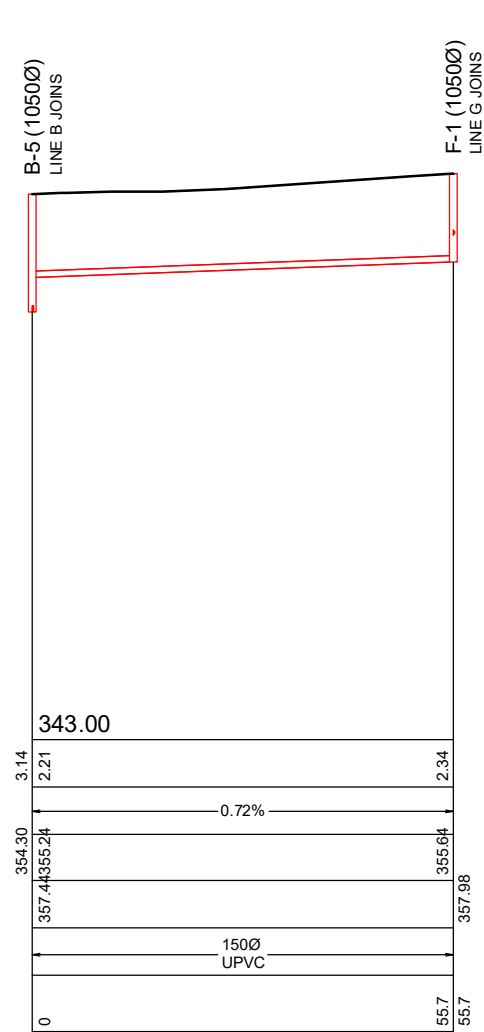
SS LINE C



SS LINE D



SS LINE E



SS LINE F

REV DESCRIPTION APPV'D DATE



PROJECT  
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WASTEWATER  
LONGSECTIONS (SHEET 10 OF 21)

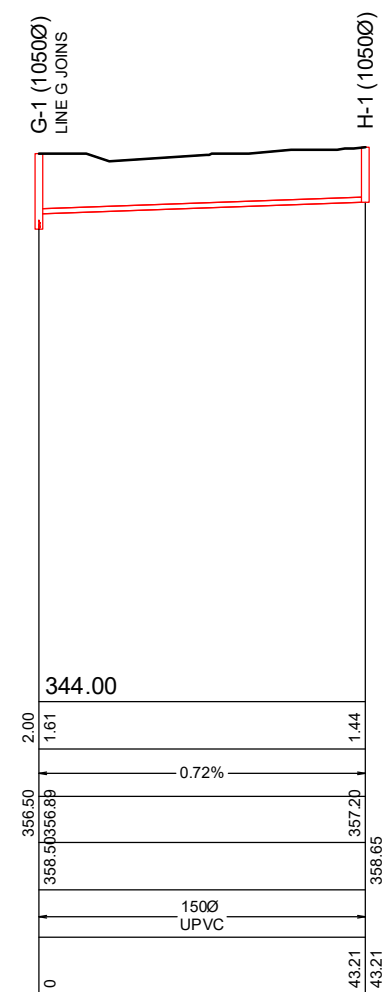
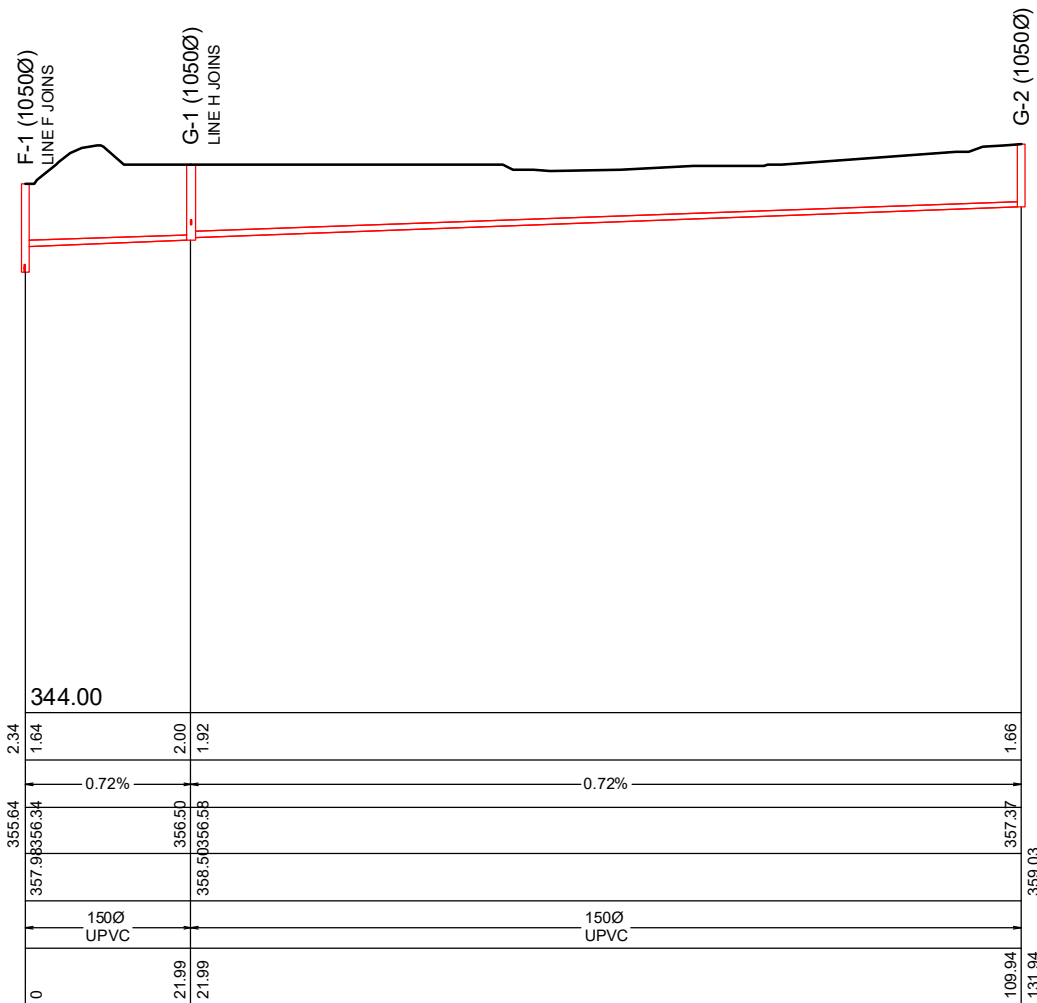
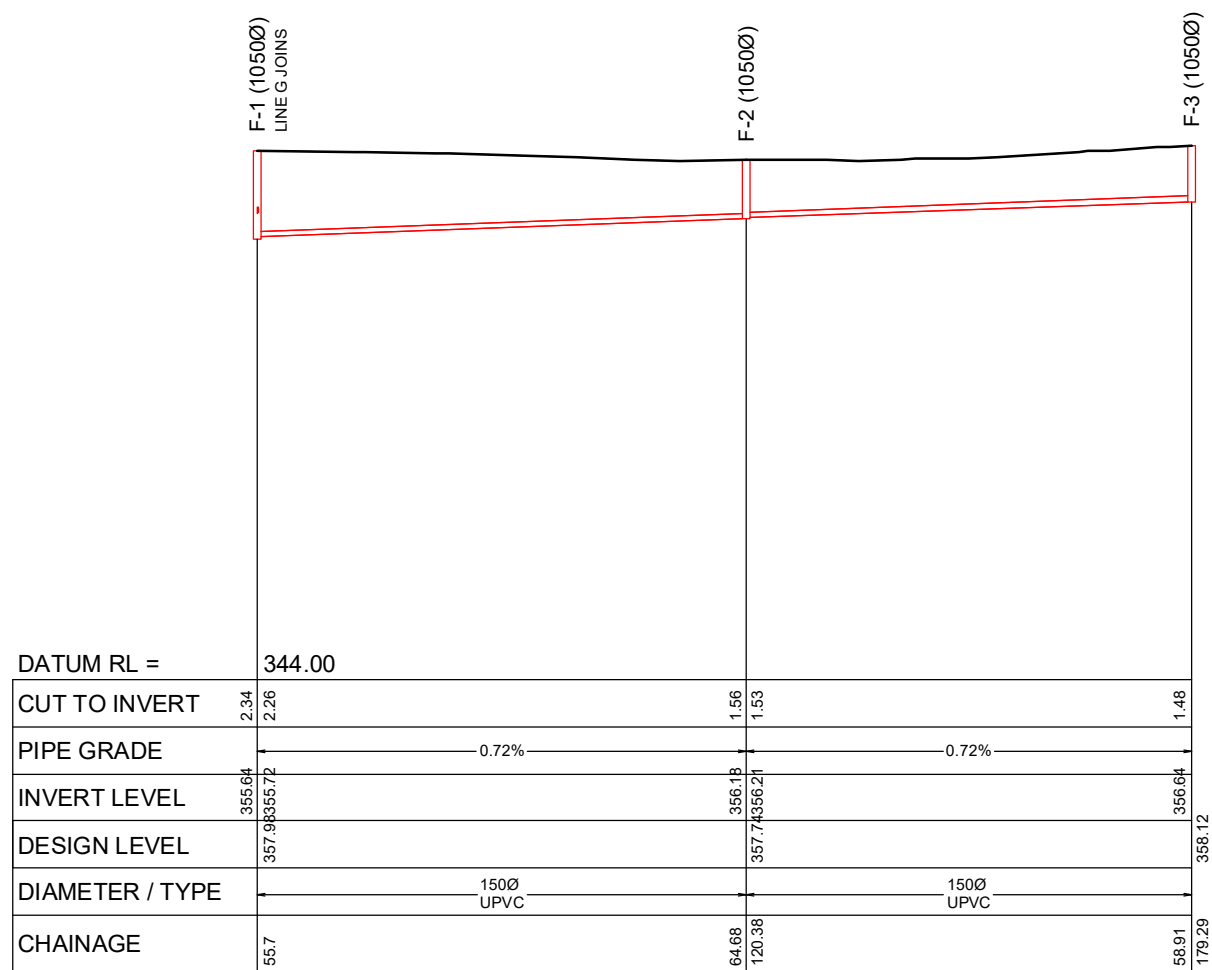
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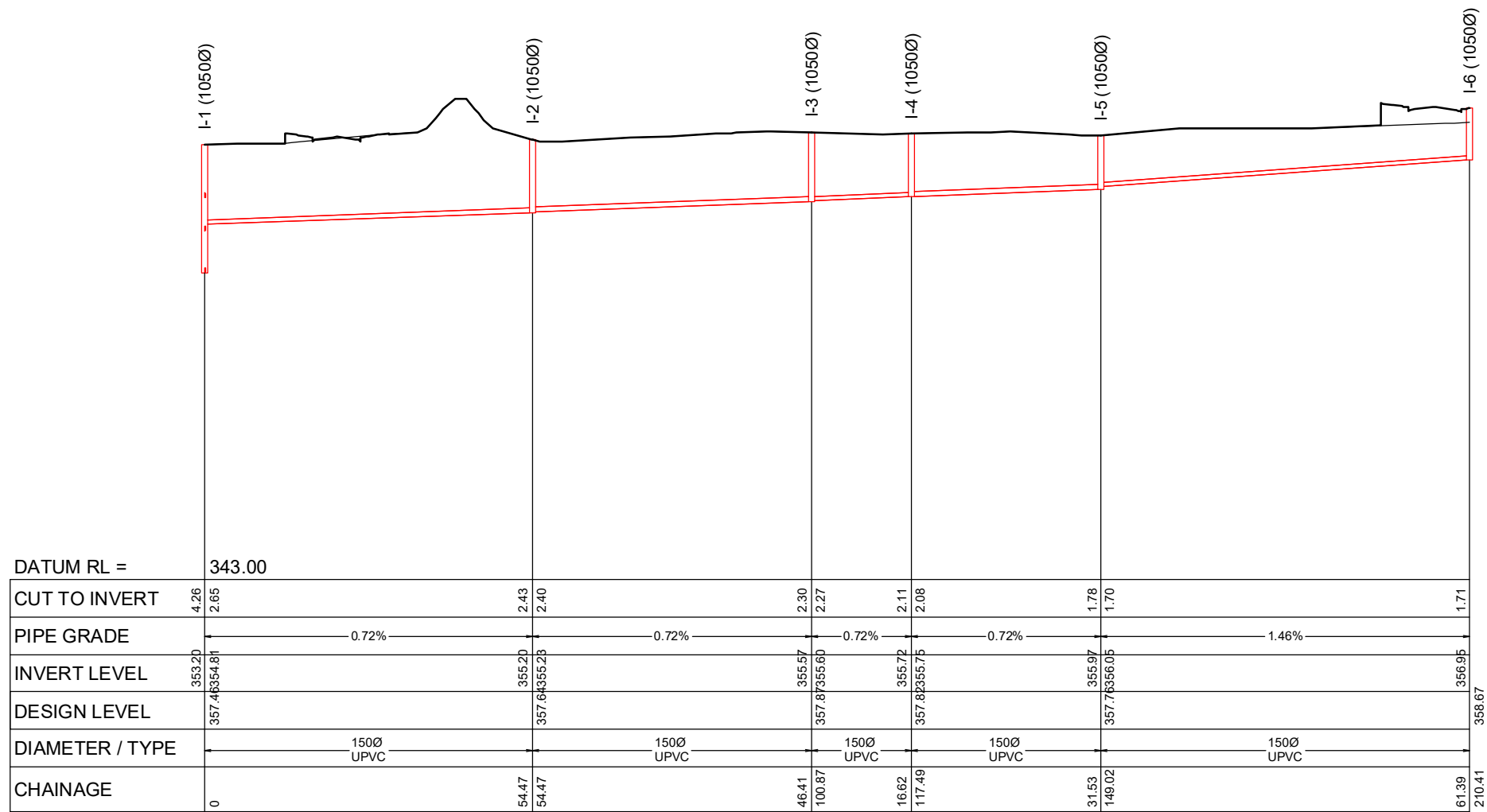
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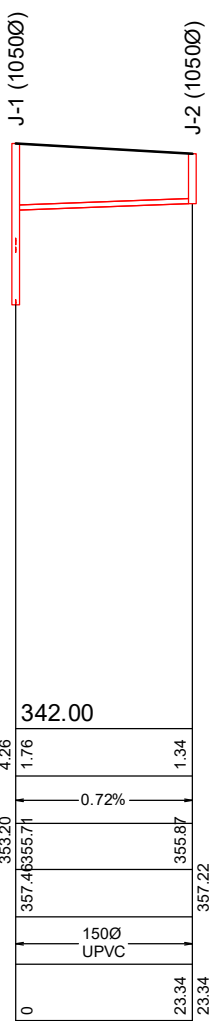
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MAR 2019

PROJECT NO. 1252B  
DRAWING NO. 05-109  
REVISION -

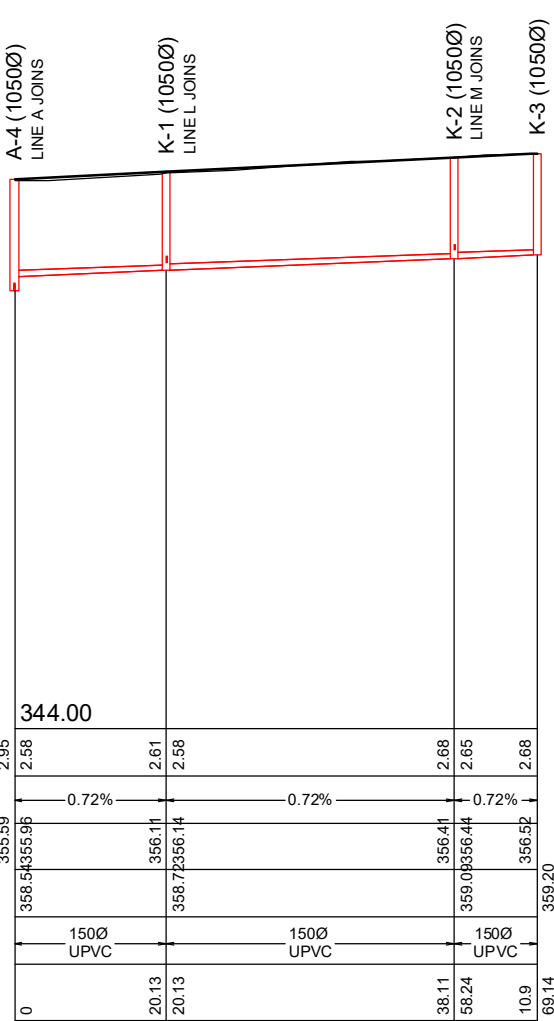




SS LINE I



SS LINE J



SS LINE K

REV DESCRIPTION APPV'D DATE



PROJECT  
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WASTEWATER  
LONGSECTIONS (SHEET 12 OF 21)

CLIENT

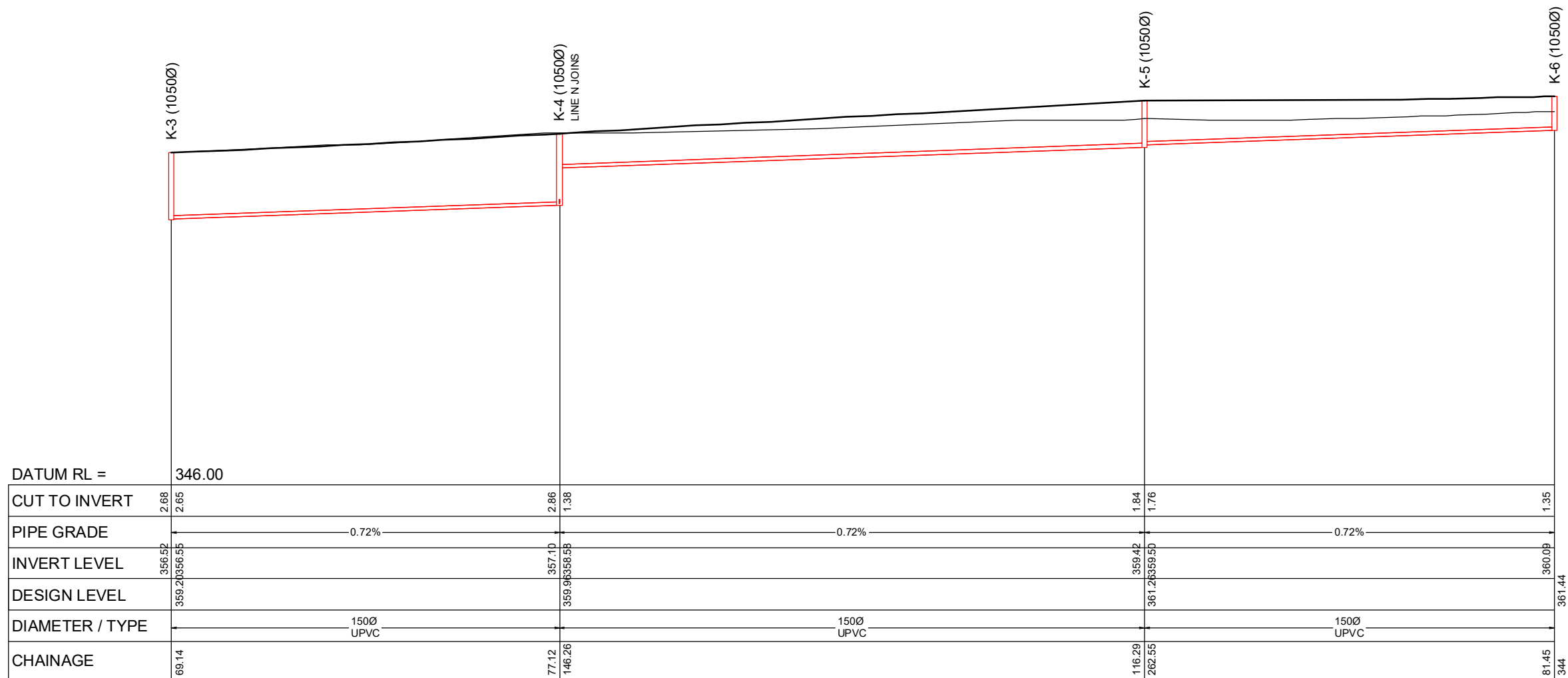
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APPV'D

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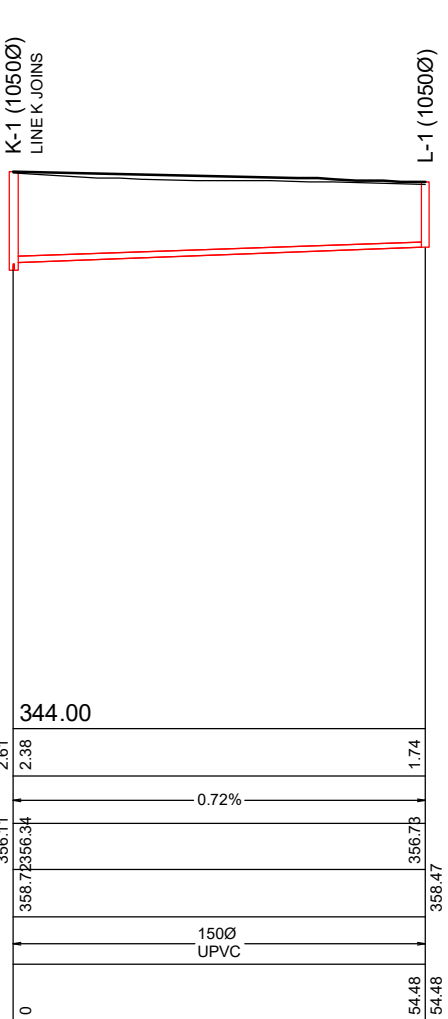
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MAR 2019

PROJECT NO. 1252B  
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REVISION -

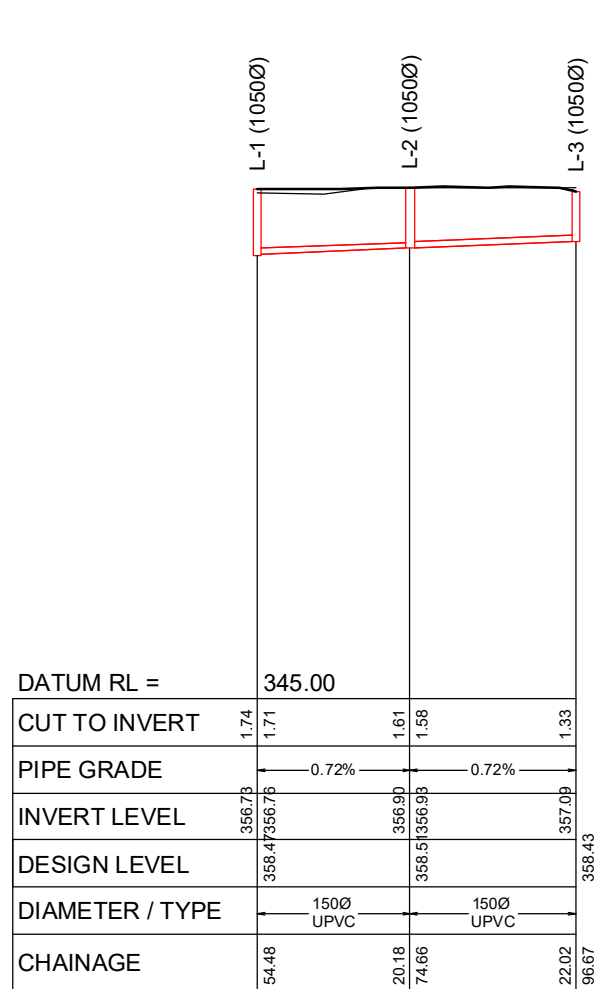




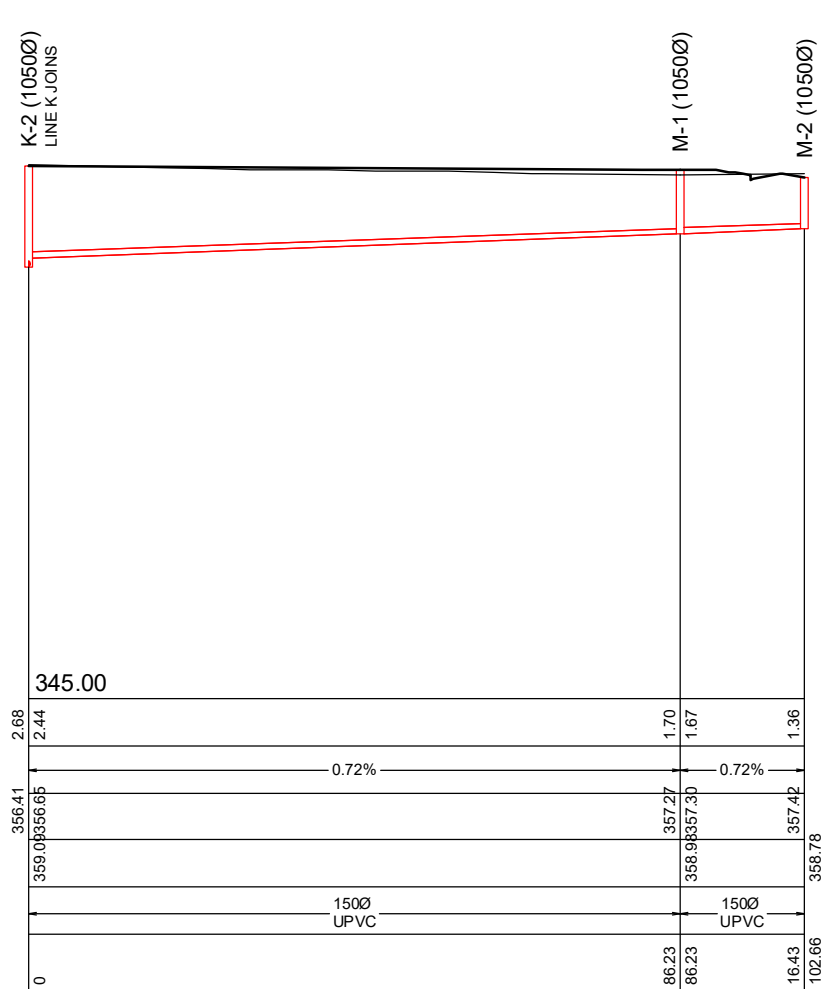
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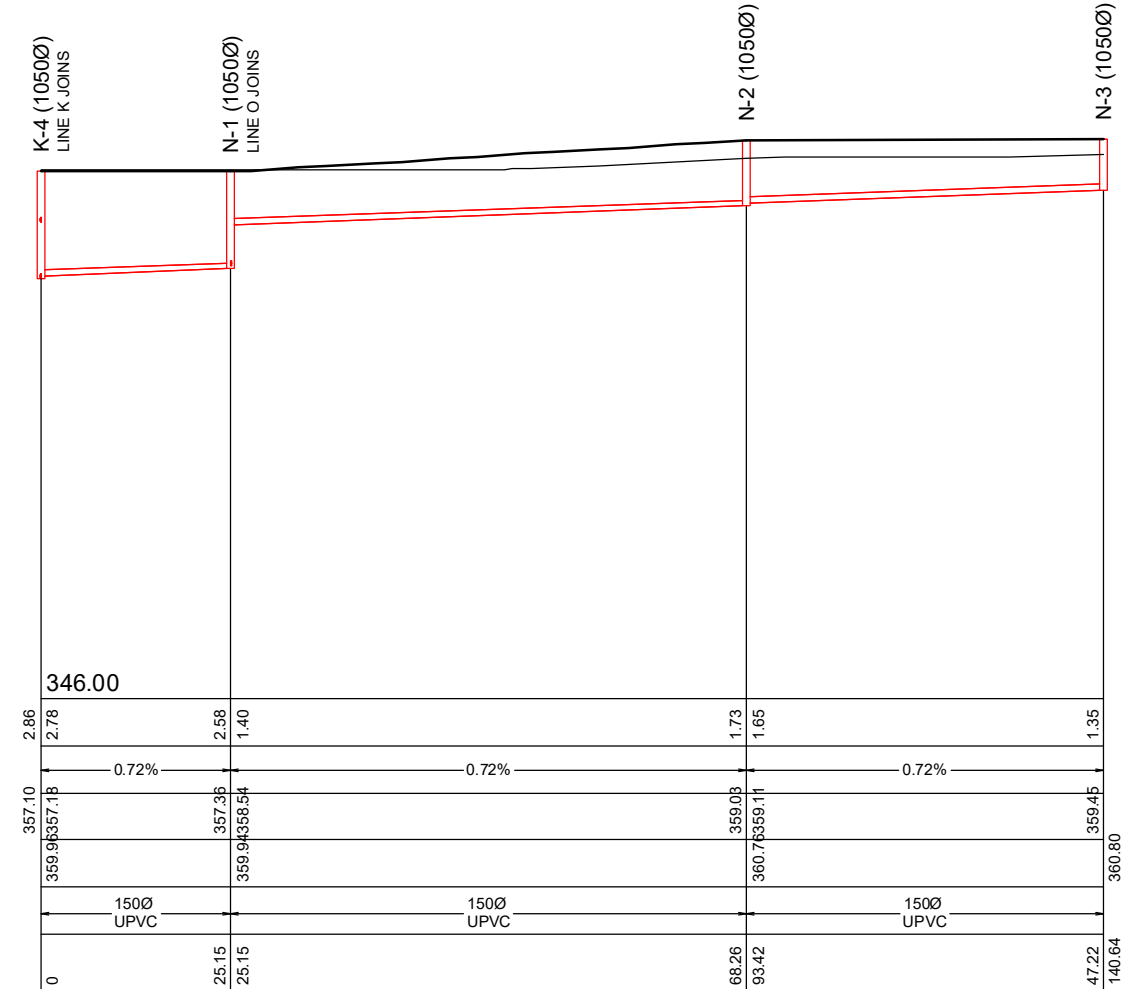
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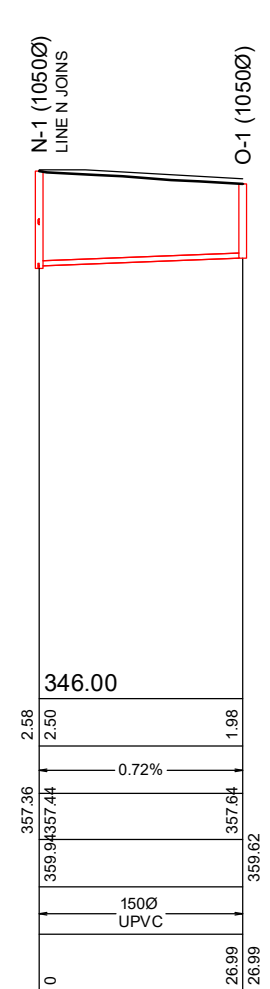
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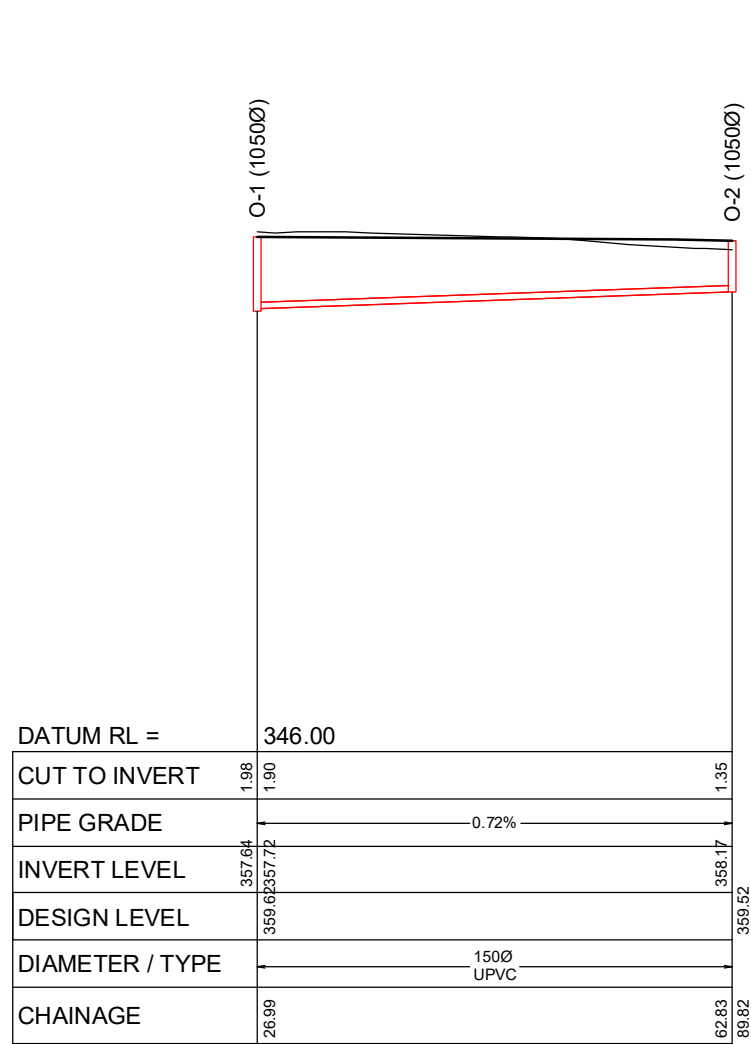
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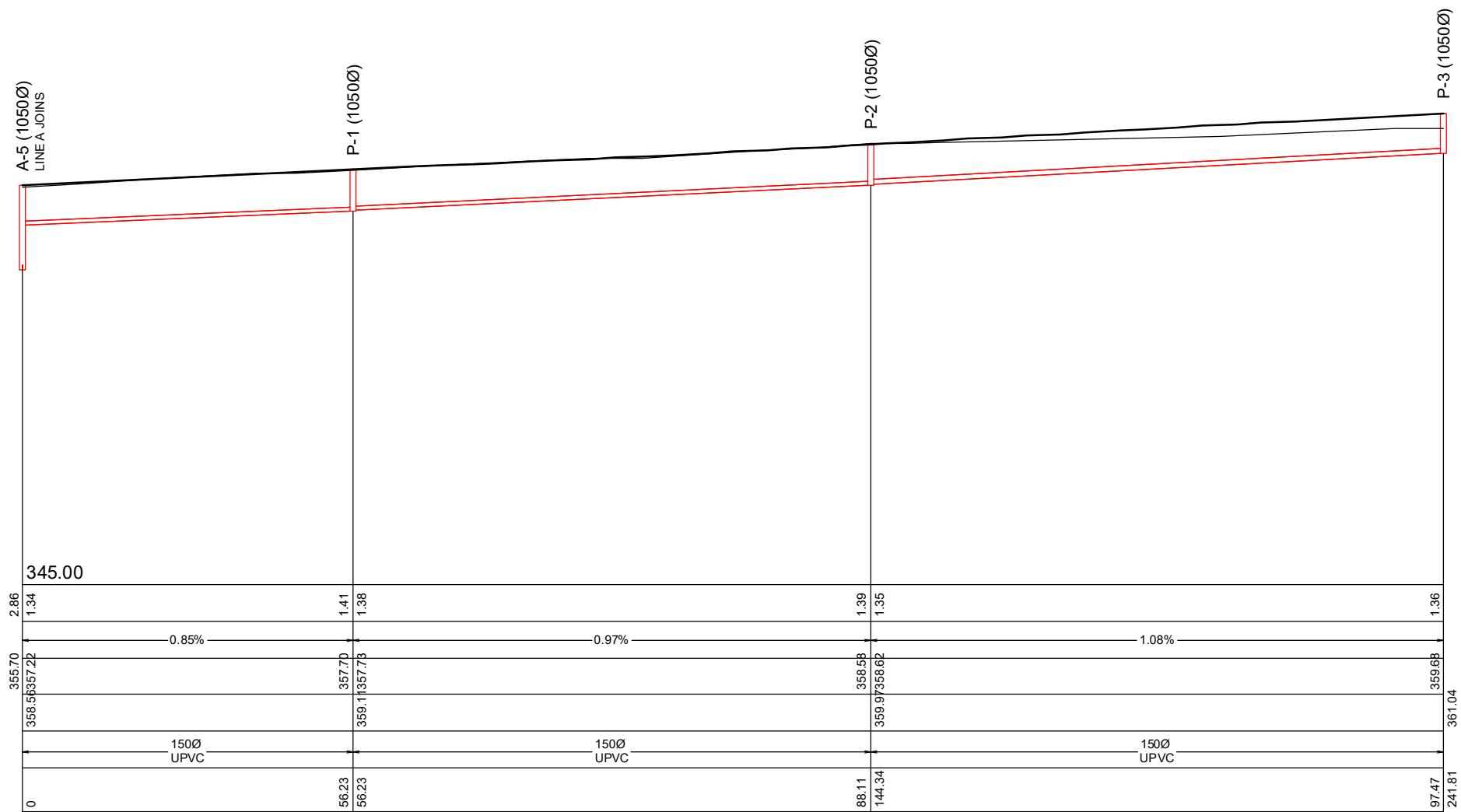
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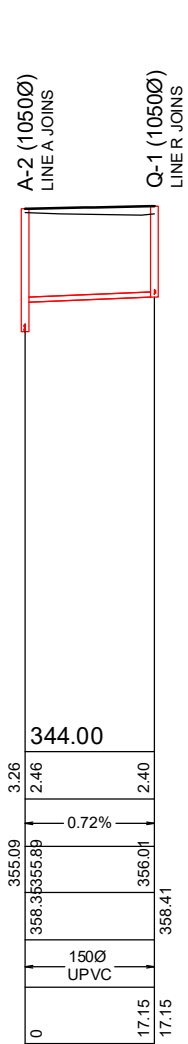
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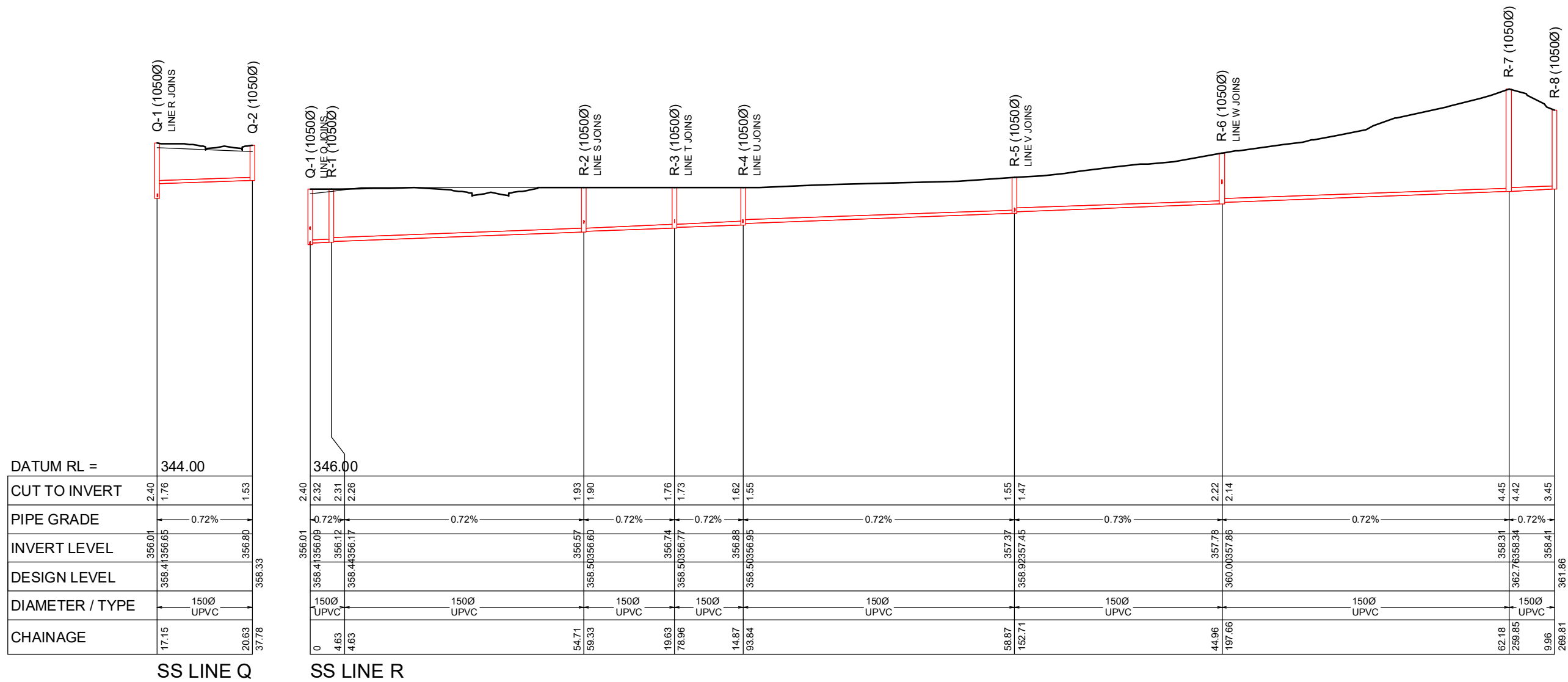
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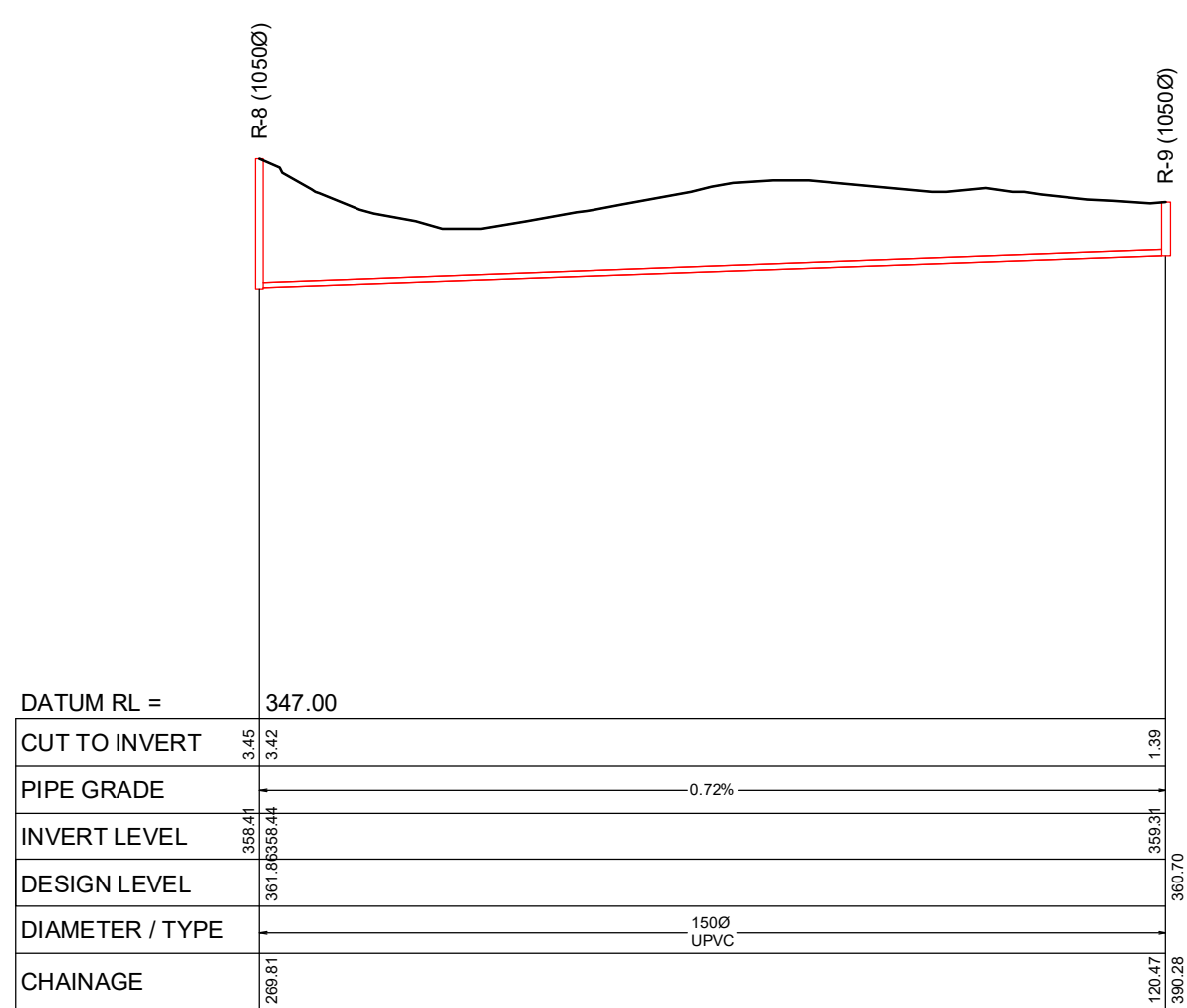
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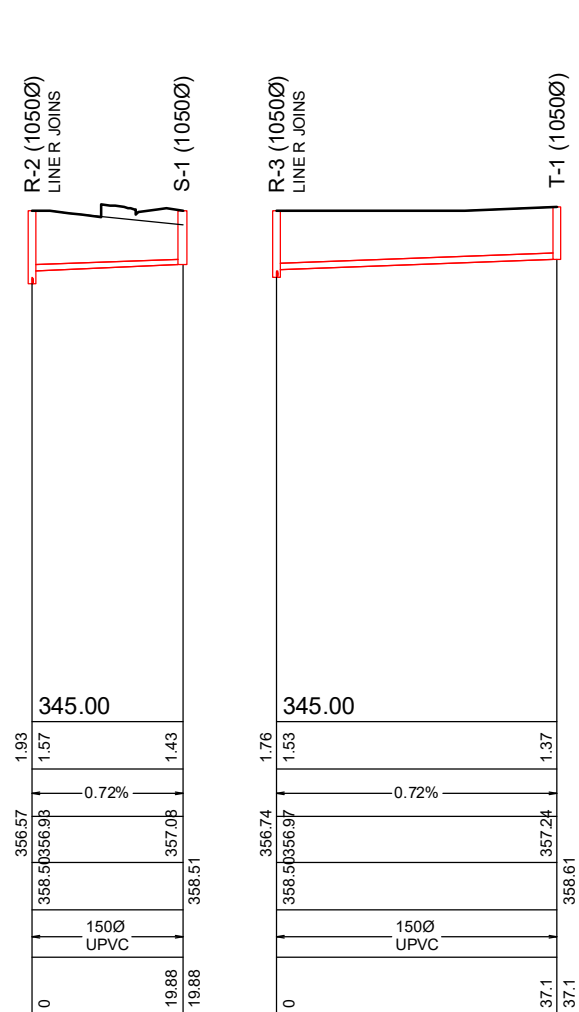
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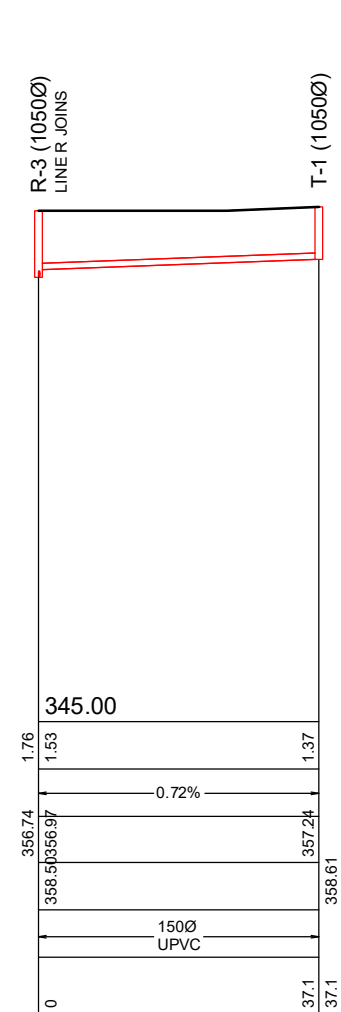




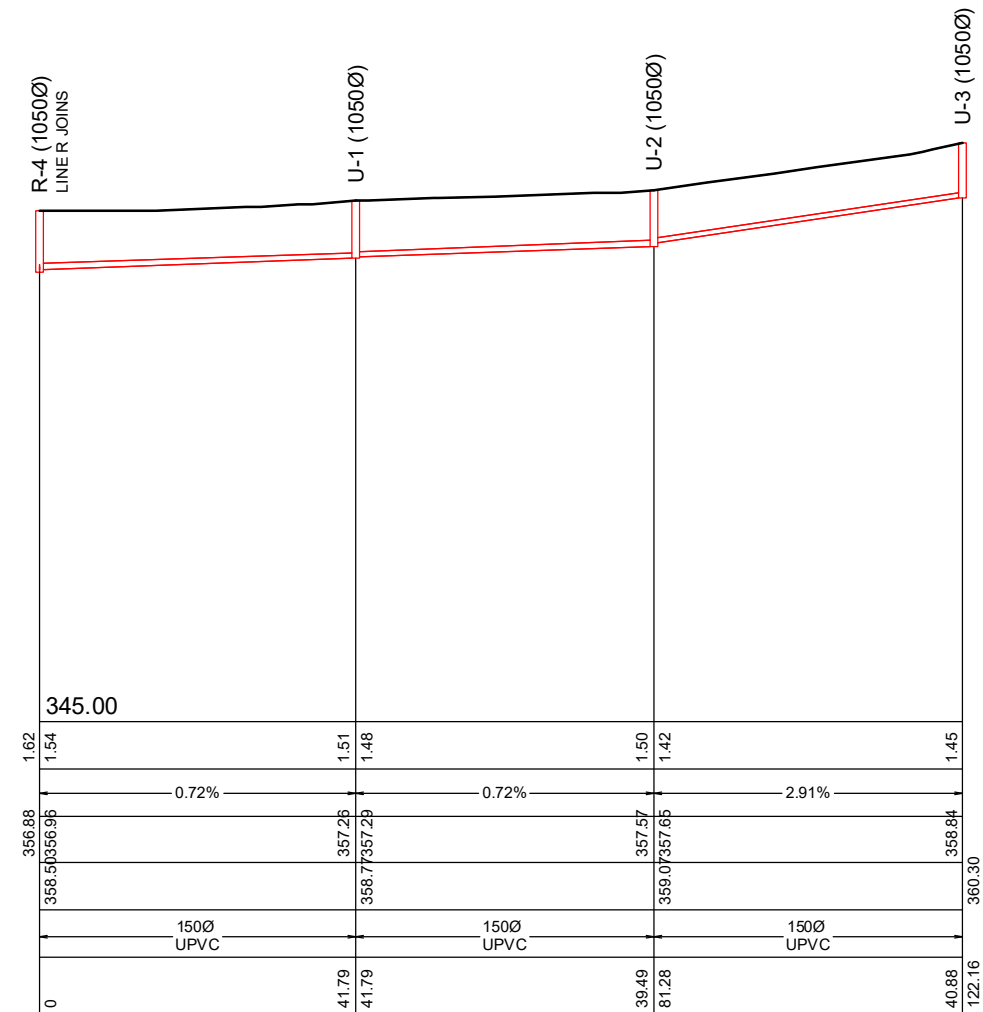
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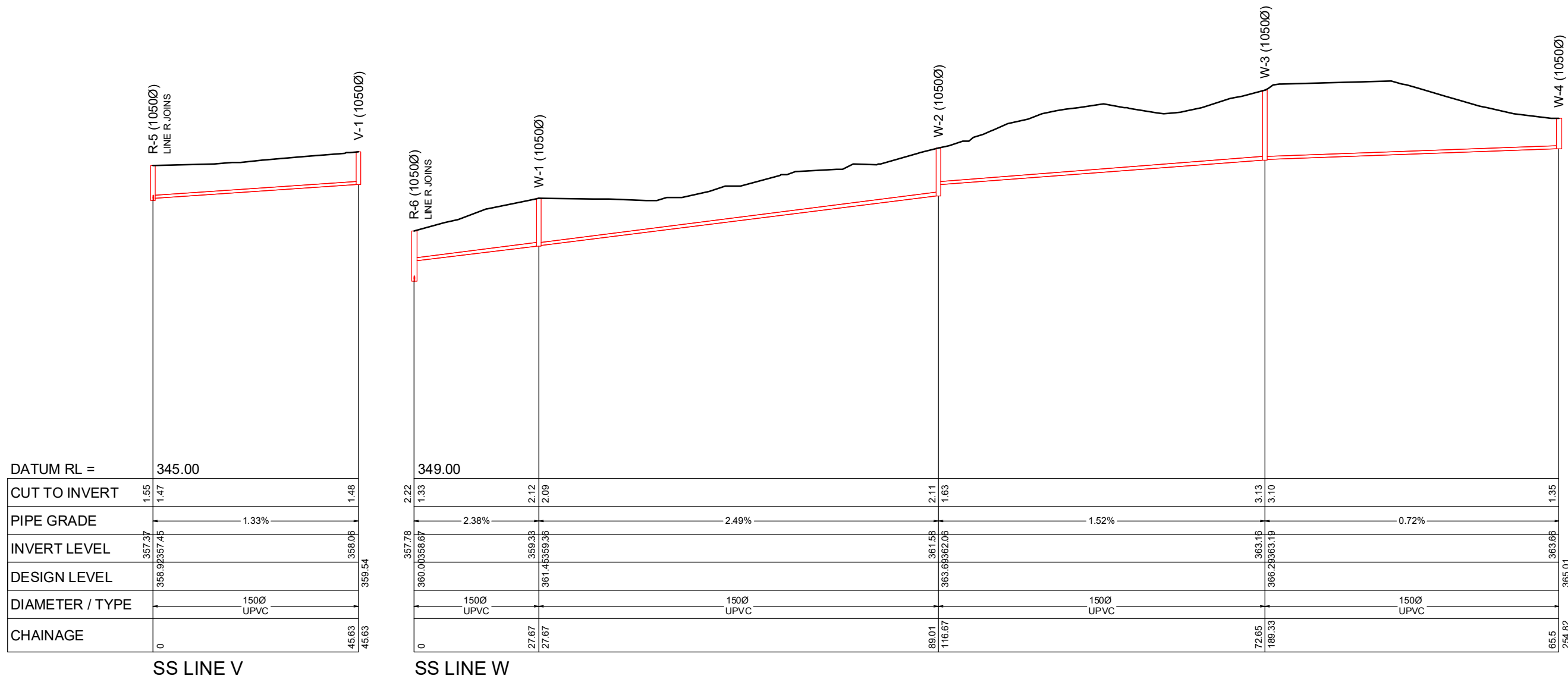
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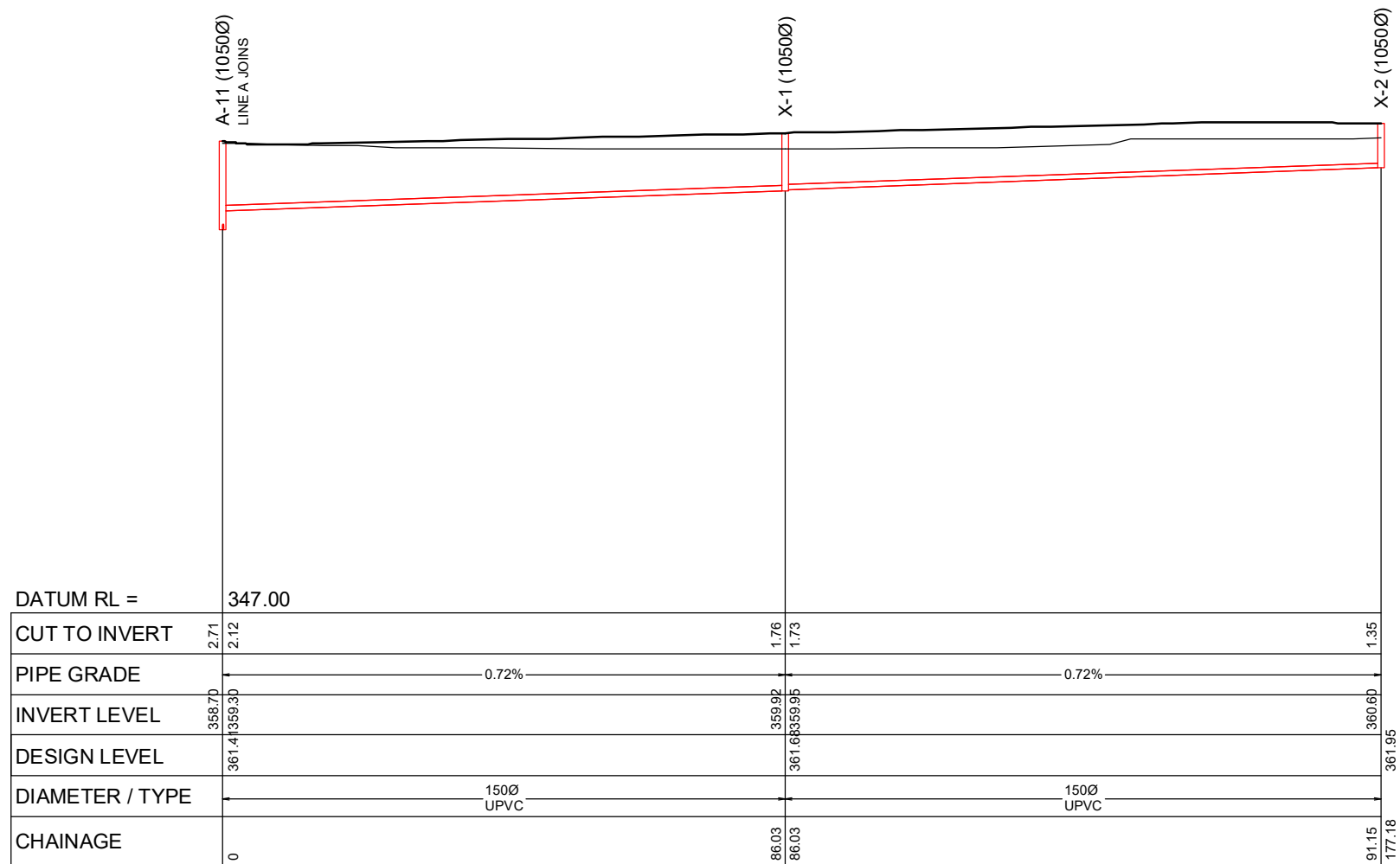


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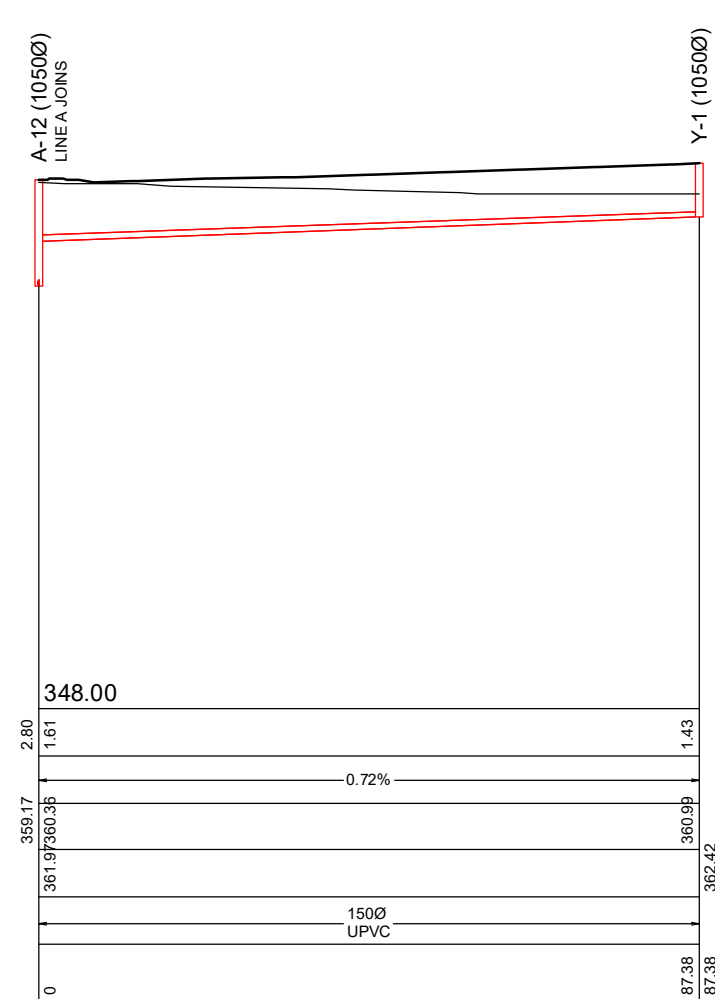


SS LINE U





SS LINE X



SS LINE Y

REV DESCRIPTION APPV'D DATE



PROJECT

FLINT'S PARK MIXED USE PRECINCT  
WASTEWATER  
LONGSECTIONS (SHEET 19 OF 21)

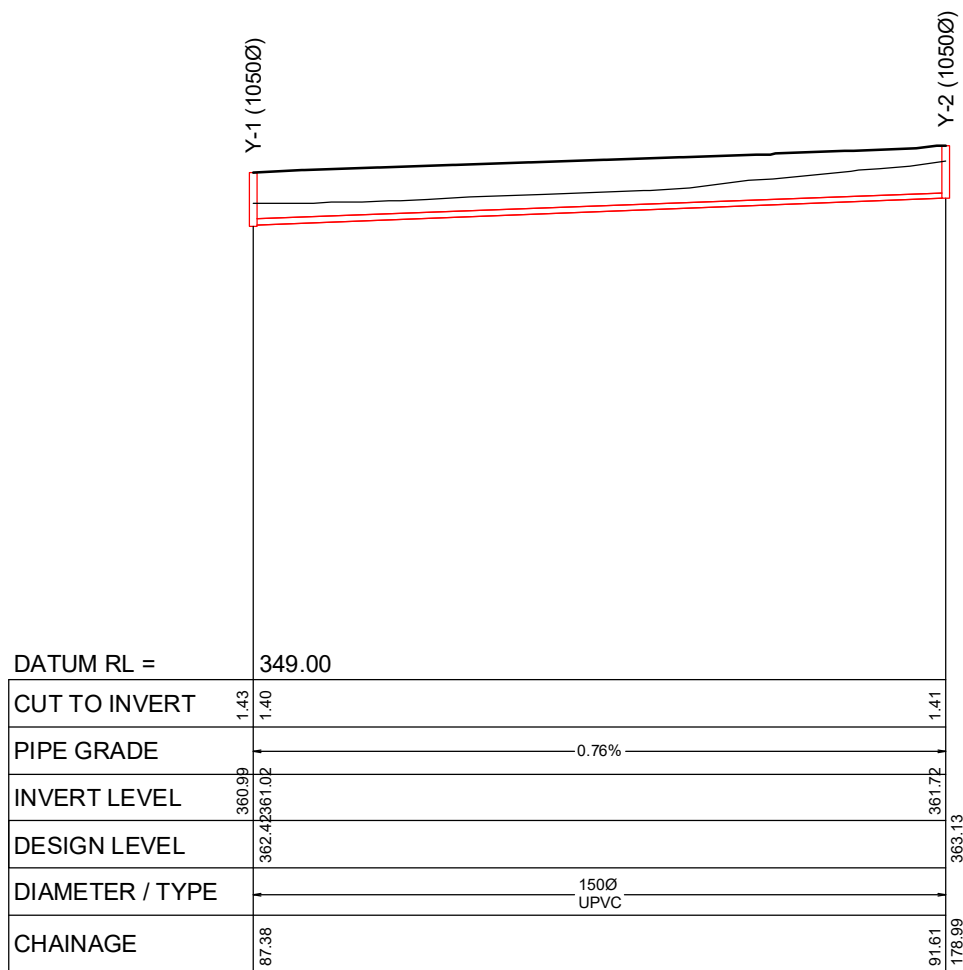
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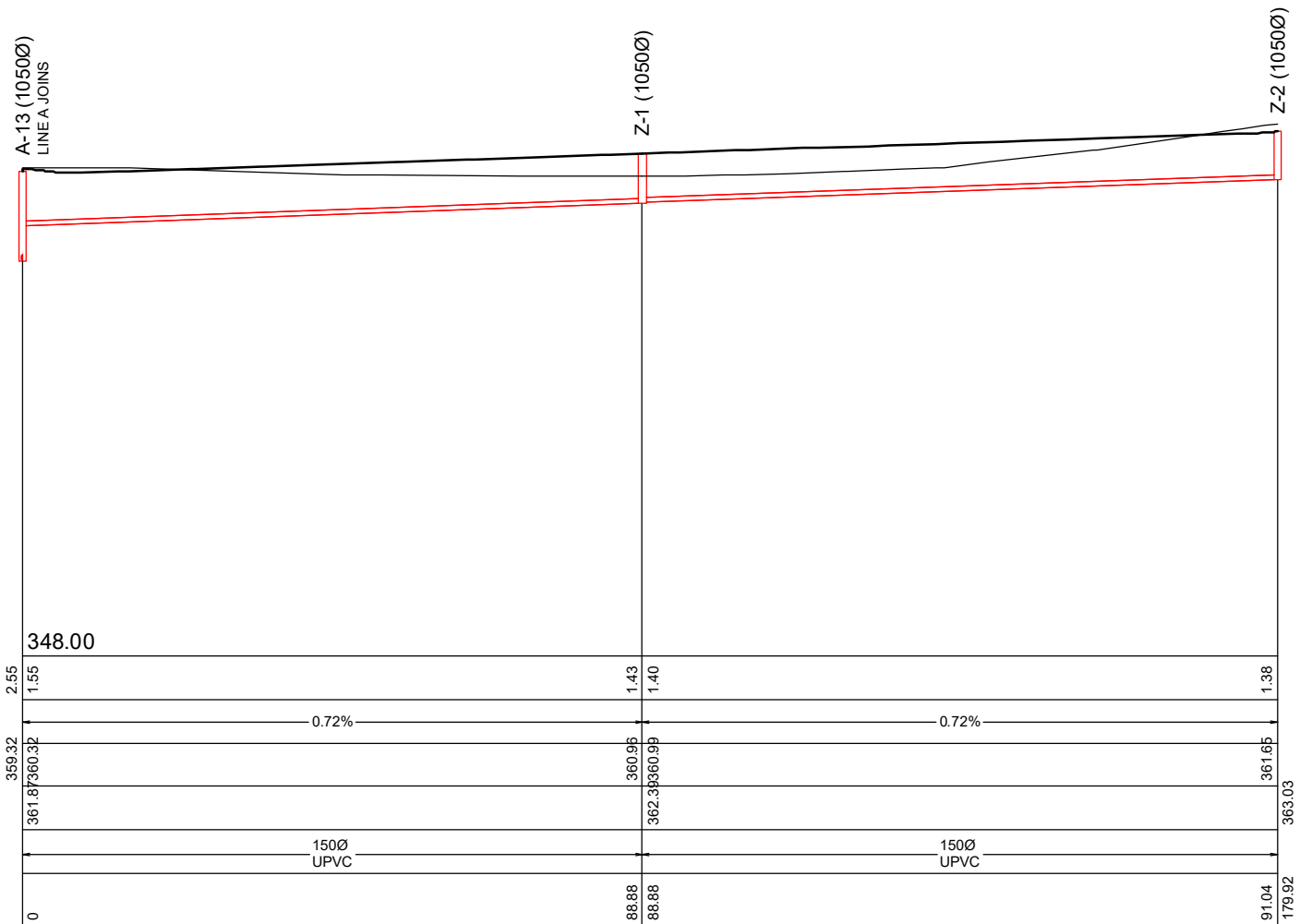
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DATE ISSUED  
MAR 2019

PROJECT NO. 1252B  
DRAWING NO. 05-118  
REVISION -



SS LINE Y



SS LINE Z

REV DESCRIPTION APPV'D DATE



PROJECT  
FLINT'S PARK MIXED USE PRECINCT  
WASTEWATER  
LONGSECTIONS (SHEET 20 OF 21)

CLIENT

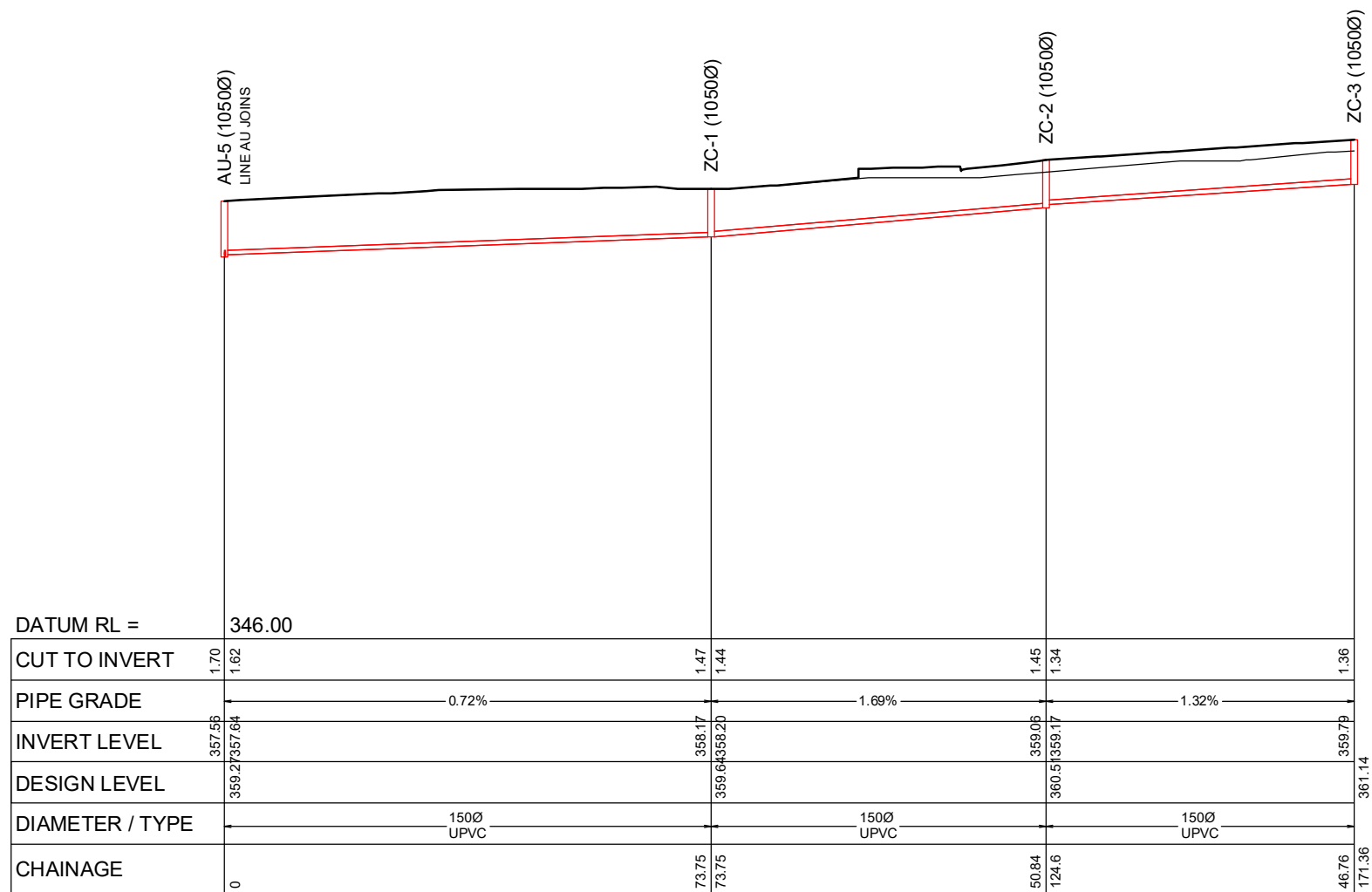
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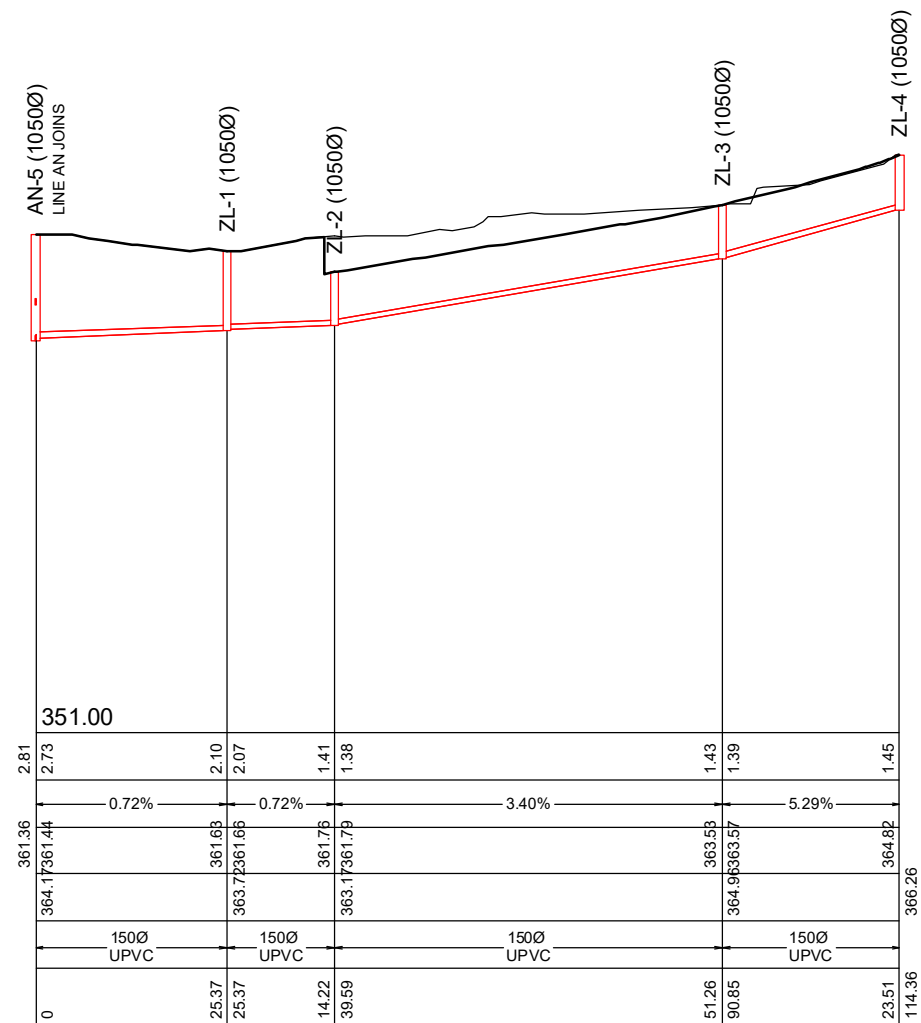
DATE ISSUED  
MAR 2019

PROJECT NO. 1252B  
DRAWING NO. 05-119  
REVISION -





SS LINE ZC



SS LINE ZL

REV DESCRIPTION APPV'D DATE



PROJECT  
FLINT'S PARK MIXED USE PRECINCT  
WASTEWATER  
LONGSECTIONS (SHEET 21 OF 21)

CLIENT  
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DATE ISSUED  
MAR 2019  
PROJECT NO.  
1252B  
DRAWING NO.  
05-120  
REVISION  
-

**APPENDIX D**  
**UTILITY PROVIDER CONFIRMATION OF SUPPLY**

**AURORA NETWORKS**  
**POWERNET**  
**CHORUS**

## John Gardiner

---

**From:** Maryam Hasanzadeh  
**Sent:** Monday, 25 February 2019 2:59 PM  
**To:** John Gardiner  
**Subject:** FW: Aurora Energy Web Enquiry

---

**From:** Richard Starkey [mailto:Richard.Starkey@auroraenergy.co.nz]  
**Sent:** Monday, 25 February 2019 2:55 PM  
**To:** Maryam Hasanzadeh <Maryam.Hasanzadeh@candor3.co.nz>  
**Subject:** RE: Aurora Energy Web Enquiry

Hi Maryam,

Yes, we can absolutely provide supply to this proposed development.

To start off the process, would you like me to supply you with a Supply Availability Letter for the purposes of Resource Consent?

In order to provide a Supply Availability Letter, we would like to obtain some information about the proposed development. Could you please populate a Network Development Application form, which is located on the Aurora website at the following link <http://www.auroraenergy.co.nz/get-connected/developers-and-consultants/>, and return to me.

Please feel free to contact me by phone or email should you wish to discuss further.

Regards

**RICHARD STARKEY**  
COMMERCIAL MANAGER



---

**EMAIL** richard.starkey@auroraenergy.co.nz  
**MOB** 021 177 5100  
**PH** 0800 22 00 05 **WEB** [www.auroraenergy.co.nz](http://www.auroraenergy.co.nz)  
Aurora Energy, 10 Halsey Street, Dunedin 9016  
PO Box 5140, Dunedin 9054



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Please consider the environment before printing this e-mail.

## John Gardiner

---

**From:** Maryam Hasanzadeh  
**Sent:** Tuesday, 26 February 2019 2:41 PM  
**To:** John Gardiner  
**Subject:** FW: Land Milles development [PNET-PowerNet.FID2844]

Hi John,

This is the confirmation email from Powernet company

Cheers

Maryam

---

**From:** Aaron Sinclair [mailto:asinclair@powernet.co.nz]  
**Sent:** Tuesday, 26 February 2019 2:37 PM  
**To:** Maryam Hasanzadeh <Maryam.Hasanzadeh@candor3.co.nz>  
**Subject:** FW: Land Milles development [PNET-PowerNet.FID2844]

Hi Maryam

Thank you for your email regarding the new development on Ladies Mile, we are most certainly very keen to work with you to reticulate the whole sub-division.

You are most likely aware that we currently supply the Shotover Country development and are currently building the electrical infrastructure for the Hanley Farms development. Our network is 100% underground, making it one of the most reliable distribution networks in the country. We have our substation on the Frankton Flats with a firm capacity of 23MW of which only 40% is utilized currently, so we therefore have plenty of capacity to supply this new development.

We would be very keen to setup a meeting with you and your client either in Queenstown or Auckland to discuss this opportunity further. In the mean-time would it be possible to send me further details of the development showing the exact location and possibly a staging plan.

I look forward to hearing back from you and working with you on this project.

Kind regards

Aaron

## Aaron Sinclair

### Commercial Manager

251 Racecourse Road, Invercargill, PO Box:1642, Invercargill 9840, New Zealand

Phone:+64 3 211 1899, DDI:+64 3 211 1874, Mobile:+64 27 683 8547

Electricity Faults (call free) 24 hours: 0800 808 587

[www.powernet.co.nz](http://www.powernet.co.nz)





Please consider the environment before printing this e-mail.

---

**From:** Maryam Hasanzadeh <[Maryam.Hasanzadeh@candor3.co.nz](mailto:Maryam.Hasanzadeh@candor3.co.nz)>  
**Sent:** Tuesday, 26 February 2019 10:45 a.m.  
**To:** 'enquiries@powernet.co.nz'  
**Subject:** RE: Land Milles development

Hi Powernet team,

I sent you an email yesterday asking about the capacity of your company to provide supplies for the Ladies Mile proposed development.

Regarding my previous email the project has an ultimate goal of 2185 lots. However, the number of dwellings for this stage of the project is 1100.

I was wondering if Powernet has the capacity to provide electrical supply for 1100 or 2185 lots. If not, what is the maximum number that you can provide the service for?

Looking forward to hearing from you,

Kind regards,

Maryam

**Maryam Hasanzadeh**  
**Civil Engineer**

**Candor<sup>3</sup>**  
ENGINEERING

Phone 09 579 5505 PO Box 28-345, Remuera, Auckland, 1541  
Fax 09 579 5506 4th Floor, Building 1, 660 Great South Road,  
Mobile 021 0808 6784 Ellerslie, Auckland, 1051

[www.candor3.co.nz](http://www.candor3.co.nz)

---

**From:** Maryam Hasanzadeh  
**Sent:** Monday, 25 February 2019 11:00 AM  
**To:** 'enquiries@powernet.co.nz' <[enquiries@powernet.co.nz](mailto:enquiries@powernet.co.nz)>  
**Subject:** Land Milles development

Dear sir/Madam,

My name is Maryam Hasanzadeh and I'm contacting you from Candor3 Company, a civil engineering consultancy located in Auckland. I'm writing this email to ask you a question about Ladies Mile development project that our company is working on at the moment.

**Regarding to the rezoning project on Ladies Mile residential development along both sides of Ladies Mile (SH6) between the Shotover River and Lake Hayes (adjacent to Lakes Hayes Estate and Shotover Country) ,** I was wondering if your company has the capacity to supply suitable underground electrical supply to the proposed development with 2185 lots.

I appreciate if you can confirm your capacity through an email.

Sincerely,

Maryam Hasanzadeh

## John Gardiner

---

**From:** Maryam Hasanzadeh  
**Sent:** Monday, 4 March 2019 10:16 AM  
**To:** John Gardiner  
**Subject:** Chorus confirmation

FYI

---

**From:** Chorus Property Developments [mailto:develop@chorus.co.nz]  
**Sent:** Monday, 4 March 2019 9:58 AM  
**To:** Maryam Hasanzadeh <Maryam.Hasanzadeh@candor3.co.nz>  
**Subject:** RE: LADIES MILE, QUEENSTOWN

Hi Maryam

We can provide service for any amount of lots that you require across the wider development.

Please note that any additional build of infrastructure (ie whatever is required to provide network to the development) would be chargeable to the developer, and this is what we would quote for.

Happy to provide an indicative cost as soon as you are ready to provide details and plans to us – the details do not have to be set in stone, we can undertake a high-level cost estimate if that is what you are interested in at this time.

Many thanks

**Nick Devoy**  
Property Development Coordinator  
C H ● R U S

**Our email address has changed** - If you have sent a message through to [TSG@chorus.co.nz](mailto:TSG@chorus.co.nz) you'll notice a reply from our new email [Develop@chorus.co.nz](mailto:Develop@chorus.co.nz). Rest assured, any and all emails sent to us will still be received. If you have our email saved in your address book, please update this to [Develop@chorus.co.nz](mailto:Develop@chorus.co.nz)

PO Box 9405  
Hamilton  
[www.chorus.co.nz](http://www.chorus.co.nz)

C H ● R U S

---

**From:** Maryam Hasanzadeh [mailto:[Maryam.Hasanzadeh@candor3.co.nz](mailto:Maryam.Hasanzadeh@candor3.co.nz)]  
**Sent:** Monday, 4 March 2019 9:45 a.m.  
**To:** Chorus Property Developments <[develop@chorus.co.nz](mailto:develop@chorus.co.nz)>  
**Subject:** RE: LADIES MILE, QUEENSTOWN

Hi Nick

Thank you for your quick reply.

As we are still in very early stages of the project, we cannot provide lots of details. We will definitely update you with more details as we progress more in the project.

What can be helpful in this stage is your primary confirmation about your capacity. We were wondering if Chorus company could be able to provide the service for 1100 lots. If not, how many lots can you provide the service for?

Kind regards

Maryam

---

**From:** Chorus Property Developments [<mailto:develop@chorus.co.nz>]

**Sent:** Monday, 4 March 2019 9:38 AM

**To:** Maryam Hasanzadeh <[Maryam.Hasanzadeh@candor3.co.nz](mailto:Maryam.Hasanzadeh@candor3.co.nz)>

**Subject:** RE: LADIES MILE, QUEENSTOWN

Hi Maryam

Yes, Chorus can certainly look into providing network infrastructure to the proposed development.

What we can do is arrange a preliminary costing for you for now – all we would need is for you to fill in our online form, attach any relevant plans of the development, and submit to us.

We then have an in-house scoping team who can investigate and price the requirements.

Here is the link to our submission form:

<https://www.chorus.co.nz/contact/subdivision>

Many thanks Maryam ☺

Nick Devoy

Property Development Coordinator

C H ● R U S

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PO Box 9405

Hamilton

[www.chorus.co.nz](http://www.chorus.co.nz)

C H ● R U S

---

**From:** Maryam Hasanzadeh [<mailto:Maryam.Hasanzadeh@candor3.co.nz>]

**Sent:** Monday, 4 March 2019 9:30 a.m.

**To:** Chorus Property Developments <[develop@chorus.co.nz](mailto:develop@chorus.co.nz)>

**Subject:** LADIES MILE, QUEENSTOWN

Hi Chorus team,

My name is Maryam Hasanzadeh and I'm contacting you from Candor3 Company, a civil engineering consultancy located in Auckland. I'm writing this email to ask you a question about Ladies Mile development project that our company is working on at the moment.

Regarding to the rezoning project on Ladies Mile residential development along both sides of Ladies Mile (SH6) between the Shotover River and Lake Hayes (adjacent to Lakes Hayes Estate and



Shotover Country), I was wondering if your company has the capacity to do necessary extensions to provide telecommunication services to the proposed development.

The ultimate goal of the project is 2185 lots, however, the project is aiming 1100 lots in this stage and Candor3 company is involved in infrastructure design of 200 lots.

I appreciate if you can confirm your capacity through an email.

Looking forward to hearing from you,

Sincerely,

Maryam Hasanzadeh

<b>Maryam Hasanzadeh</b> <b>Civil Engineer</b>		<b>Candor<sup>3</sup></b> INFRASTRUCTURE
Phone 09 579 5505	PO Box 28-345, Remuera, Auckland, 1541	<a href="http://www.candor3.co.nz">www.candor3.co.nz</a>
Fax 09 579 5506	4th Floor, Building 1, 660 Great South Road,	
Mobile 021 0808 6784	Ellerslie, Auckland, 1051	

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**APPENDIX E**  
**PRELIMINARY GEOTECHNICAL REVIEW**  
**(Geosolve)**



# Preliminary Geotechnical Report

Flint's Park Mixed Use Precinct,  
Frankton-Ladies Mile Highway,  
Queenstown

**Report prepared for:**

Glenpanel Limited Partnership

**Report prepared by:**

GeoSolve Limited

**Distribution:**

Glenpanel Limited Partnership

Candor3

GeoSolve Limited (File)

**March 2019**

**GeoSolve Ref: 190162**



**GEOTECHNICAL**



**WATER  
RESOURCES**



**PAVEMENTS**



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## 1 Introduction

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### 1.1 General

This report presents the results of a geotechnical inspection and desk top study carried out by GeoSolve Ltd to enable comment on the subsurface conditions and expected geotechnical issues for the proposed Flint's Park Mixed Use Precinct, Frankton-Ladies Mile Highway, Queenstown.



**Photograph 1 – General View of the site looking southeast**

This assessment has been completed for Glenpanel Limited Partnership in accordance with the GeoSolve Ltd proposal dated 13 March 2019, which outlines the scope of work and conditions of engagement.

The opinions and conclusions presented in this report are based on the following sources of information:

- A walkover inspection and mapping of the site by an engineering geologist;
- A review of historic information currently held on the Geosolve database for sites in the local area;
- A review of the Queenstown Lakes District Council and Otago Regional Council hazard register maps, and;
- A review of the published geological map, 'Institute of Geological & Nuclear Sciences Ltd, Geology of the Wakatipu, 1:25,000 Geological Map 18'.

### 1.2 Development

Preliminary plans of the development provided to Geosolve indicate that a mixed-use neighbourhood is proposed, involving residential houses, apartments, commercial and



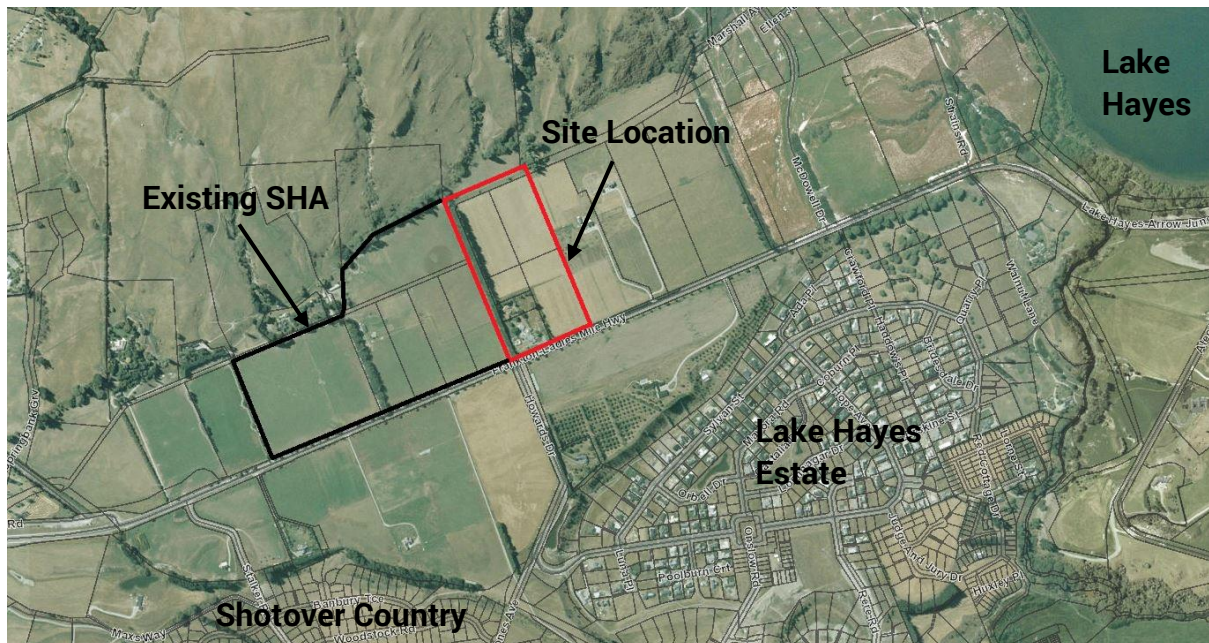


retail buildings, with provision for a school site. We understand the site is an addendum to the Flint's Park SHA Expression of Interest (EOI) already submitted to QLDC.

## 2 Site Description

### 2.1 General

The subject site is located north of State Highway 6 (Frankton-Ladies Mile Highway), opposite the Lake Hayes Estate and Shotover Country subdivisions, as shown in Figure 1 below.



**Figure 1 – Site location plan.** The proposed Flint's Park Mixed Use Precinct is marked in red. The existing Flint's Park SHA EOI site is marked in black (sourced from [maps.qldc.govt.nz/qldcviewer](https://maps.qldc.govt.nz/qldcviewer)).

There is an existing residential dwelling, a pet lounge and associated landscaping located in the southern part of the site. The remainder of the site is currently used as farm land.

The site is bounded by Frankton-Ladies Mile Highway to the south, the existing SHA EOI site to the west, Slope Hill to the north and 497 Frankton-Ladies Mile Highway to the east.

A site plan showing site boundaries and contour lines is attached in Appendix A.

### 2.2 Topography and Surface Drainage

The proposed development is situated on a sub-horizontal (gently sloping) terrace, with an altitude of approximately 360 m above sea level and gradient of 2-3° towards the south. Surface water drainage flows in a general southerly direction. Just north of the northern boundary the ground rises and steepens, with slopes of 15-35° locally. Two well-incised gullies are formed in the schist bedrock hillslope immediately north and northeast of the site. Ephemeral runoff channels were identified within the gullies, these were either dry or showed minor seepage at the time of the site visit. Both runoff channels terminate in more permeable ground prior to entering the site.



### 3 Geotechnical Investigations

---

An engineering geologist from GeoSolve Ltd conducted a site inspection on 14 March 2019 to identify prominent geological features and natural hazards.

A review of historic geotechnical investigation information held on the Geosolve database has been carried out. The following two site investigations are located in close proximity of the site and have been used to infer the likely site ground conditions.

#### Data Location 1, 50 m southwest of the site

Investigations comprised 30 excavator test pits to depths of up to 4.3 m, 22 Heavy Dynamic Probe (DPH) tests to depths of 15 m and 3 sonic boreholes to depths of 15 m with standard penetration testing (SPT). The investigations were undertaken in December 2016.

#### Data Location 2, 30 m north and 100 m west of the site

Investigations comprised 5 sonic boreholes to depths of 8 m, in the locations shown in Figure 1a, Appendix A. The investigations were undertaken in August 2016.

The location of three deep boreholes on the ORC database is shown in Figure 1a, Appendix A.

No site-specific intrusive investigations have been completed for this report and on that basis all opinions, conclusions and recommendations that are presented in this report are preliminary in nature. The geotechnical conditions will need to be confirmed by site specific investigations and engineering assessment during the detailed design phase.

### 4 Subsurface Conditions

---

#### 4.1 Geological Setting

The site is in the Wakatipu basin, a feature formed predominantly by glacial advances. Published references indicate the last glacial event occurred in the region between 10,000 and 20,000 years ago. Glaciations have left deposits of glacial till and glacial outwash over ice-scoured bedrock. Post glacial times have been dominated by the erosion of the bedrock and glacial sediment, with deposition of alluvial gravel by local watercourses and lacustrine sediment during periods of high lake levels. The site is located on the historic Shotover River Delta.

Active fault traces were not observed at the site or in the immediate vicinity, and the closest major active fault is the Nevis-Cardrona Fault system. However, significant seismic risk exists in this region from potentially strong ground shaking, associated with the rupture of the Alpine Fault, located 80 km northwest of Queenstown along the west coast of the South Island. There is a high probability that an earthquake with an expected magnitude of over M8 will occur along the Alpine Fault in the next 50 years.



## 4.2 Inferred Stratigraphy

No intrusive investigations have been completed for the purposes of this report; however, examination of local soil exposures, and information contained on the Geosolve database, indicates the stratigraphy beneath the gently sloping terrace is likely to comprise:

- **Topsoil**, overlying;
- **Loess**, overlying;
- **Deltaic sand and gravel**.

**Topsoil** was observed on the surface of adjacent sites to depths of between 0.2-0.5 m.

**Loess** was observed to underlie the topsoil to depths of between 0.6 and 2 m. The loess comprises loose to medium dense, silty SAND with trace of rootlets and firm to stiff, SILT and sandy SILT with trace of rootlets.

**Deltaic sand and gravel** was observed to the base of all investigations beneath the loess and was observed at depths of between 0.6 and 2.0 m. The deltaic sand and gravel comprise loose to medium dense, SAND and GRAVEL deposits with variable fractions of silt. At Data Location 2 the deltaic sand and gravel was interbedded with SILT layers up to 400 mm thick.

In close proximity to the hillslope on the northern boundary of the development, localised areas are expected to be underlain variably by:

- **Topsoil**, overlying;
- **Alluvial fan depositional material**, overlying;
- **Alluvial silt**, overlying;
- **Deltaic sand and gravel**.

## 4.3 Groundwater

The regional groundwater is expected to lie well below typical foundation and excavation levels. Otago Regional Council (ORC) well data from the site indicates the regional groundwater table is at a depth of approximately 39-41 m below current ground level in this area. Seepage associated with overland flow paths is possible in the north of the site.

## 4.4 Natural Hazards

### 4.4.1 Seismic

A severe seismic risk is present in the region as discussed in Section 4.1 and appropriate allowance should be made for seismic loading during detailed design of the proposed buildings, foundations, retaining and associated earthworks.



#### 4.4.2 Liquefaction

The site is identified on the Queenstown Lakes District Council (QLDC) Hazard Maps as being 'possibly susceptible' to liquefaction. Our assessment indicates there is low liquefaction risk for the proposed site due to the significant depth to the regional groundwater table (approximately 39-41 m). No further assessment is considered necessary with respect to this hazard.

#### 4.4.3 Slope Stability

The hillside north of the site is identified on the QLDC Hazard Maps as a landslide area 'susceptible to shallow debris flows or mudflows' (Opus, 2002. Hazards Register Part II Stage 2 Risk Management Study). This area does not extend onto the site, and apart from localised gully erosion upstream of the alluvial fans, no deep seated, recent or active instability of the soil slope was observed during the site walkover.

#### 4.4.4 Rock fall

Small scale rock fall associated with localised weathering and gradual fretting of the rock bluffs beyond the northern boundary was observed. This hazard is unlikely to extend within the site boundaries where there is a significant setback between the northern boundary and the rock bluffs. However, further mapping and review should be completed to confirm whether any mitigation is required. Mitigation options such as allowing a suitable setback avoidance distance from slopes, rockfall bunds or bolting in situ rock outcrops in place are available.

#### 4.4.5 Alluvial Fans

A small portion of the upper (north-eastern) extent of the site lies within an area mapped on the QLDC hazard maps as an active debris-dominated alluvial fan (GNS, 2005, regional scale mapping). A runoff channel runs along the eastern side of the gully, away from the site, and drains to permeable ground within the property to the east. The alluvial fan was observed to have a well-established topsoil horizon overlying the fan deposits, and only minor seepage was observed within the runoff channel at the time of site visit.

A second, historic alluvial fan feature which does not appear on the QLDC database, was identified to the immediate west (Figure 1b, Appendix A). No recent fan activity was noted, with an established topsoil horizon overlying the fan deposits, a dry runoff channel and large trees growing in the runoff channel.

From the available information and our site inspection and interpretations, we conclude that the risk from alluvial fan activity is low. If subsequent detailed investigations reveal any significant hazard, this is expected to be very minor and affecting small areas only, and if necessary could be readily avoided or mitigated by standard planning or engineering measures, such as raised floor levels or constructing buildings outside the affected area.





## 5 Preliminary Engineering Considerations

---

### 5.1 General

The recommendations and opinions contained in this report are based upon historical ground investigation data obtained at discrete locations which is held on the GeoSolve database. No specific intrusive investigations have been undertaken by GeoSolve for this assessment and therefore all conclusions and recommendations within this report should be considered preliminary and are to be confirmed by further investigation.

### 5.2 Slope Stability

Preliminary assessments indicate there are no deep seated or large-scale instability within the slope to the immediate north of the site.

Detailed slope stability assessments of the site should be carried out upon completion of further investigations to determine any specific mitigation requirements.

### 5.3 Rock fall

Bluffs and relatively steep slopes are present immediately beyond the northern boundary of the site. There is some natural weathering and minor fretting of the rock faces observed, but these are unlikely to impact on the site. Further investigations and assessment will be required at the resource consent stage.

### 5.4 Excavations

No earthworks plans have been provided for the site, however, it is expected minor cut and fill earthworks will be required to establish level building platforms and roads at this site. Deeper excavations may be required for services and infrastructure.

Excavations can be readily achieved in the soils observed across the site area. If deep excavations or excavations near boundaries are required, geotechnical investigation should be completed to confirm the near surface soil profile and appropriate temporary and permanent batter angles and any retaining issues.

Temporary batter slopes in silt, sand and gravel soils are predominantly cut at 1.5:1 (H: V). Slopes that are required to be steeper than this will require temporary retaining or shoring.

### 5.5 Foundations

During the earthworks operations all topsoil, organic matter, uncontrolled fill and other unsuitable materials should be removed from the construction areas in accordance with the recommendations of NZS 4431:1989.

**Loess Silt, Sandy Silt and Silty Sand Deposits** - Shallow foundations can be constructed across the site, however reduced foundation bearing capacities are likely if bearing on the near surface silt deposits. These soil materials provide low ultimate bearing capacities of approximately 120 to 180kPa on nearby sites, assuming NZS3604 footings, and are



typically subject to loss of strength due to weather and trafficking during construction. Specific engineering assessments and undercutting with granular engineered fill is generally undertaken to improve the foundation bearing capacity in these soil types.

**Deltaic Sand and Gravel** - Increased foundation bearing is expected to be available at depth on sand and gravel soil materials. These soil materials observe some variability. Good Ground as per NZS3604 may be present in some areas; however, in some nearby sites lower ultimate bearing capacities of 180-270 kPa, assuming NZS3604 foundations, are possible.

The ground is unlikely to consistently meet the minimum requirements for 'good ground' (i.e. >5 blows per 100 mm) in accordance with NZS3604:2011 within the upper soils.

Typical shallow foundation e.g. strip, pad and waffle slabs will be suitable provided they take into account local bearing capacity variations and are proportioned accordingly. Where weaker soils are present beneath foundation footprints undercutting and replacement with engineered fill compacted in accordance with NZS4431 is also expected to provide a feasible option.

Extending footings, or pile foundations, down to bear on the underlying deltaic sand and gravel, which will provide improved bearing, may be a more cost-effective solution and may be required for larger buildings.

Site specific confirmation of bearing capacity should be provided as per the QLDC guidelines once lot and building layouts are finalised.

Specific investigation and assessment should be completed to determine a cost-effective foundation solution for any proposed development, at the resource/building consent and detailed design stage.

## 5.6 Engineered Fill

All fill should be placed and compacted in accordance with the recommendations of NZS4431: 1989 and Queenstown Lakes District Council Standards. All cut and fill earthworks should be inspected and tested as appropriate during construction and certified by a Chartered Professional Engineer.

All un-retained fill slopes which are  $\leq 3.0$  m high should be constructed with a batter slope angle of 2.0H: 1.0V (horizontal to vertical) or flatter and be benched into sloping ground. If a building platform is located at the crest of a slope, then batters of 3.0H: 1.0V are recommended in the first instance with an appropriate building set-back.

Fill slopes greater than 3.0 m in height, or that require to be steeper than 2.0H:1.0V, should be subject to geotechnical review.

## 5.7 Groundwater Issues

The water table is expected to lie at considerable depth beneath the site and any proposed excavations. Dewatering or other groundwater-related construction issues are therefore unlikely to be required.



## 6 Neighbouring Structures/Hazards

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**Natural Hazards:** A risk of seismic activity has been identified for the region as a whole and appropriate allowance should be made for seismic loading during detailed design of the proposed buildings, foundations, retaining and associated earthworks.

The site is identified on the Queenstown Lakes District Council Hazard Maps as being 'possibly susceptible' to liquefaction. Our assessment indicates there is low liquefaction risk due to the significant depth to the regional groundwater table (approximately 39-41 m).

Slope stability, rock fall and debris flow hazards are outlined in sections 4.4.3 to 4.4.5.

**Distances to adjoining structures:** The site is bounded by farm land to the north and east, the existing Flint's Park SHA EOI site to the west and by Frankton Ladies Mile highway to the south. No adverse geotechnical implications apply for neighbouring developments during construction provided appropriate design measures are taken during the construction of any proposed development.

**Aquifers:** The regional ground water table is expected to lie at significant depth beneath the proposed site and no aquifer resource is expected to be adversely affected. Note, the site is located above the Wakatipu aquifer and ORC consent will be required for any drilling/boring undertaken.

**Erosion and Sediment Control:** The site presents some potential to generate silt runoff and this would naturally drain downslope. Effective systems for erosion control are runoff diversion drains and contour drains, while for sediment control, options are earth bunds, silt fences, vegetation buffer strips and sediment ponds. Only the least amount of subsoil should be exposed at any stage and surfacing established as soon as practical. Details for implementation are given within the following link: <http://esccanterbury.co.nz/>.

**Noise:** Standard excavation and compaction plant will be required. QLDC requirements should be met in regards to this issue.

**Dust:** Regular dampening of soil materials with sprinklers should be effective if required.

**Vibration:** No vibration induced settlement is expected in these soil types; however, any works that create vibrations should be subject to geotechnical advice.



## 7 Further Geotechnical Site Investigations

---

Further geotechnical site investigation is required to confirm the geological model and provide geotechnical parameters for resource and building consent application and detailed design. Further investigations should comprise:

- A test pit investigation to determine ground conditions at shallow depths;
- Undertake a detailed slope stability assessment of the slope to the immediate north of the site, to determine any specific mitigation requirements;
- Undertake a rockfall assessment to determine any mitigation requirements in the northern area of the site;
- Development of the geological model. Geological cross section model – several cross sections extending through the site;
- Heavy dynamic probe (DPH), cone penetrometer (CPT) or bore hole testing for multi-level structures;
- Review of proposed earthworks and foundation options;
- Confirmation of seismic subsoil class;
- Geotechnical assessment and reporting suitable for resource and building consent.



## 8 Conclusions and Recommendations

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- This report has been based on historic data on the GeoSolve database. The existing geotechnical information is limited to outside the site area's boundaries.
- Preliminary assessment indicates that future development at the site is feasible from a geotechnical perspective provided further investigation and assessment is undertaken. No geotechnical issues were identified which cannot be addressed by standard engineering assessment and construction practices. Specific geotechnical design input will be required for retaining design, slope stability, rock fall, foundations and construction methodology.
- The inferred site stratigraphy generally comprises: topsoil, overlying loess, overlying deltaic sand and gravel. Alluvial fan depositional material is expected to be present in close proximity to the hillslope on the northern boundary of the development.
- Further assessment with respect to liquefaction risk is not considered necessary due to the significant depth to the regional groundwater table (approximately 39-41 m).
- There is a region-wide seismic risk at the site, which should be addressed in all future engineering design.
- Further site investigation and assessment is required. The assessment should confirm the preliminary recommendations in this report and provide detailed engineering recommendations as appropriate.





## 9 Applicability

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This report has been prepared for the benefit of Glenpanel Limited Partnership with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose without our prior review and agreement.

Report prepared by:

Reviewed for GeoSolve Ltd by:

.....  
Marte Stemland  
Engineering Geologist

.....  
Fraser Wilson  
Senior Engineering Geologist

## Appendix A: Site Plans





# Key

- = Bore Hole
- = ORC Wells

Scale 1:3000  
0 50 100 150 200 250 (m)

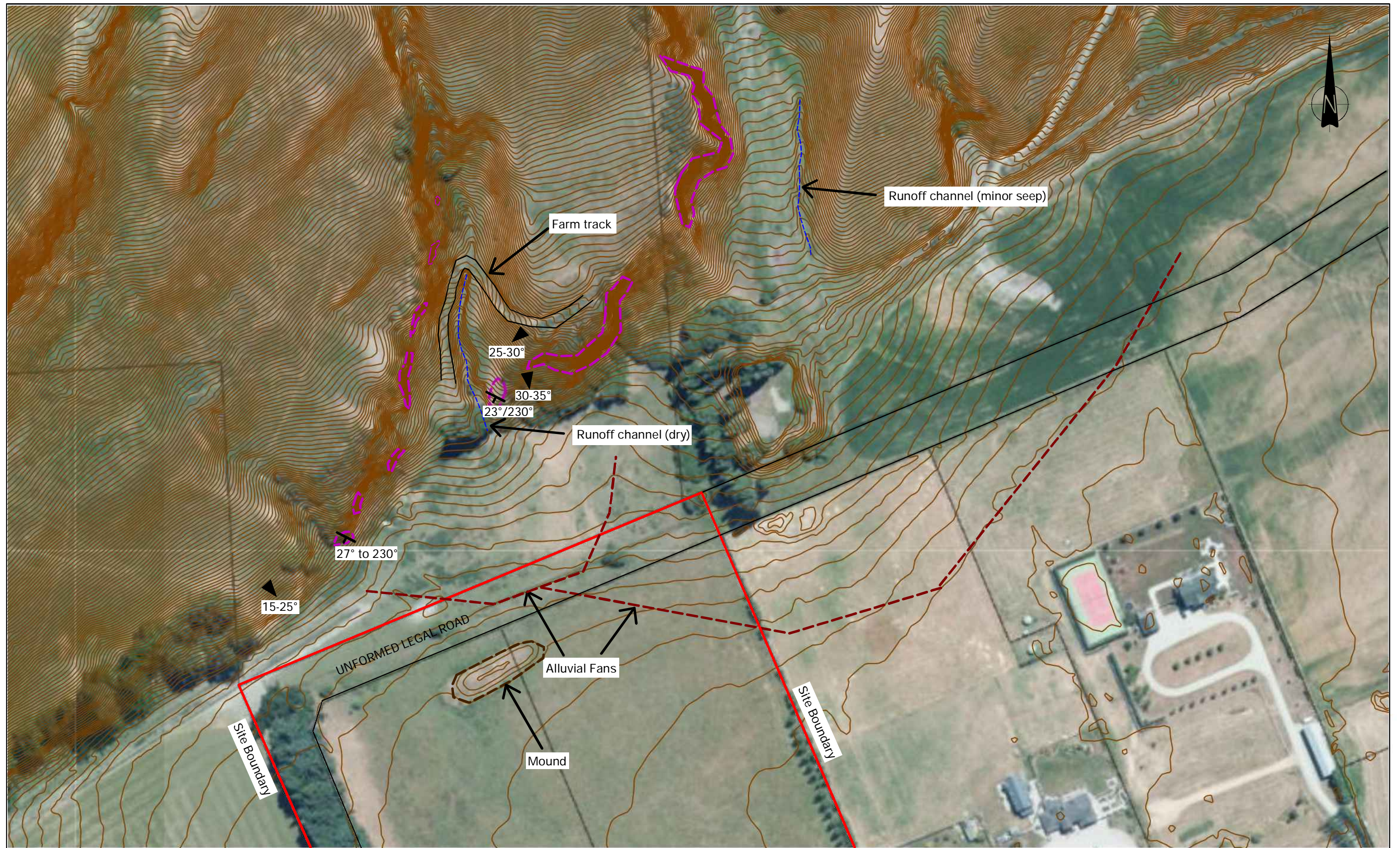
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SCALE (AT A3 SIZE):	AS SHOWN	DRAFTING CHECKED:	MBS	03/2019
PROJECT No:	190162	APPROVED:	FAW	03/2019
		GEOTECHNICAL		
		WATER RESOURCES		
		PAVEMENTS		

Glenpanel LP  
Flint's Park Mixed Use Precinct  
Frankton-Ladies Mile Highway  
Site Plan - Overview

FIG No:  
FIGURE 1a

REV.  
1





Key

 = Schist outcrops

Scale 1:1500  
0 20 40 60 80 100 (m)

CADFILE:	Sketch 1.xar	DRAWN	MBS	03/2019
SCALE (AT A3 SIZE):	AS SHOWN	DRAFTING CHECKED	MBS	03/2019
PROJECT No:	190162	APPROVED	FAW	03/2019

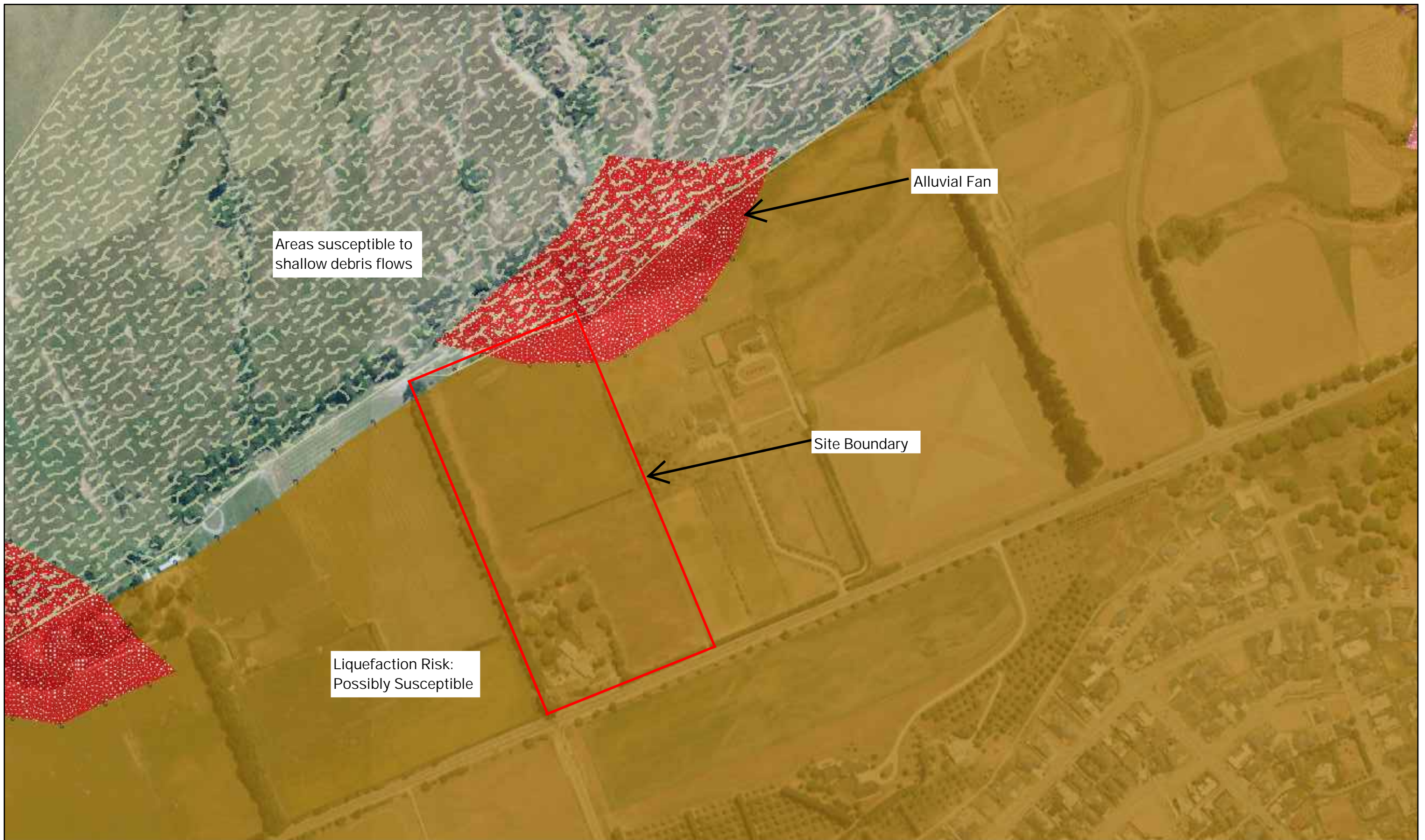


Glenpanel LP  
Flint's Park Mixed Use Precinct  
Frankton-Ladies Mile Highway  
Site Plan - Area of Enlargement

FIG No:  
FIGURE 1b

REV.  
1





The map is an approximate representation only and must not be used to determine the location or size of items shown, or to identify legal boundaries. To the extent permitted by law, the Queenstown Lakes District Council, their employees, agents and contractors will not be liable for any costs, damages or loss suffered as a result of the data or plan, and no warranty of any kind is given as to the accuracy or completeness of the information represented by the GIS data. While reasonable use is permitted and encouraged, all data is copyright reserved by Queenstown Lakes District Council. Cadastral information derived from Land Information New Zealand. CROWN COPYRIGHT RESERVED



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