APPENDIX V

DPM Water Water Supply and Sewerage Planning Report

WATERPARK, HOTEL & BEACH CLUB DEVELOPMENT
STUART DRV, WULGURU

WATER SUPPLY AND SEWERAGE PLANNING REPORT

Date: 27 July 2024 (Rev A)

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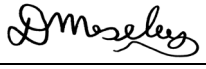
APPENDICES

REPORT AUTHORISATION

Revision	Revision Date	Details	Approved by	Signature
A	27/07/2024	Initial Report	Desmond Moseley	

1 INTRODUCTION

This report assessed the performance of the existing water & sewer infrastructure to service the proposed Waterpark, Hotel & Beach Club Development that will be located at the intersection of Stuart Drv and Racecourse Rd (Bruce Hwy) in Wulguru. The proposed site for the waterpark development is the current vacant land parcel to the west of the Townsville Turf Club and on the southern side of Racecourse Rd and opposite the Fairfield Waters shopping centre.

The proposed development is illustrated on the extract of the concept plan below. A more detailed layout of the proposed development is provided in Appendix A with it including:

- A large water fun park that is expected to include:
  - Wave pool.
  - Multiple water slides and rides.
  - Multiple pools and associated waterpark facilities.
- Multi-story accommodation.
- Various retail and fast food sites.

PRECINCT BREAKDOWN

PRECINCT 1 - RETAIL/ FASTFOOD

SITE AREAS	
- AREA	24,300m2
COMMERCIAL SITE AREAS	
- RETAIL FAST FOOD 1	3,700m2
- RETAIL FAST FOOD 2	3,600m2
- RETAIL FAST FOOD 3	3,000m2
- COMMUNITY TAVERN	3,100m2
PARKING	
- REQUIRED	x 275 (EST)
- SUPPLIED	x 240

PRECINCT 2 - UNITS OR LARGE FORMAT RETAIL

SITE AREAS	
- AREA	23,250m2
APARTMENTS A + BAS SHOWN	
- GROUND	x 170 CARS
- LEVEL 2	x 178 CARS
- LEVEL 3	x 44 UNITS
- LEVEL 4	x 44 UNITS
- LEVEL 5	x 44 UNITS
- LEVEL 6	x 44 UNITS
- LEVEL 7	x 44 UNITS
- LEVEL 8	x 10 UNITS
TOTAL	x 230 UNITS
PARKING	
- REQUIRED (1.5/UNITS)	x 173
- SUPPLIED	x 174

PRECINCT 3 - WATERPARK/ VIP/ HOTEL

SITE AREAS		
- HOTEL		2,490m2
- WATERPARK		2,3710m2
- VIP CLUB		8,900m2
- VIP EXTENDED AREA		1,630m2
FUTURE DEVELOPMENT SITE 1		11,100m2
FUTURE DEVELOPMENT SITE 2		5,950m2
HOTEL SUITES		
- LEVEL 1	SUITES	x 50
- LEVEL 2	SUITES	x 50
- LEVEL 3	SUITES	x 50
- LEVEL 4	SUITES	x 50
TOTAL		x 200
PARKING		
- REQUIRED		x 300 (EST)
- SUPPLIED		x 528

Figure 1.1 – Development Concept Plan

An extract of the refined layout of the proposed Townsville Waterpark, Hotel & Beach Club development is provided as Figure 1.2 below.

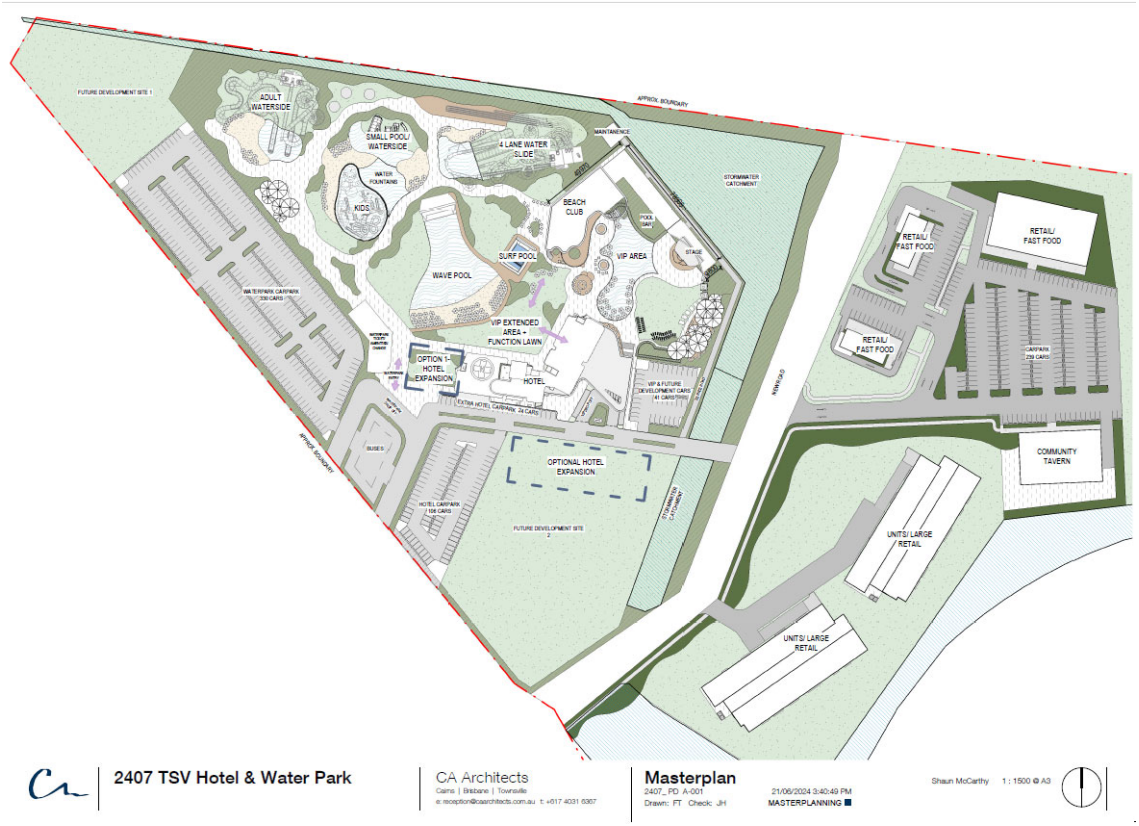


Figure 1.2 – Development Masterplan

The site is currently serviced with a reticulated water and sewer system. The capacity of the existing infrastructure and required upgrade options to service the proposed development have been assessed.

Water System Assessment

The existing water network has sufficient capacity to service the Townsville Waterpark, Hotel & Beach Club development with a potable water supply to the various residential and commercial uses including the replenishment of water for the various waterpark pools and rides.

The following water infrastructure will be required to service the proposed development off the existing water network in Wulguru:

- DN300 water main connection to the existing DN630 PE / DN450 DICL water main at the intersection of Stuart Drv and Watt St. The DN450 DICL water main is the trunk water main from the Wulguru reservoir.
- A DN300 water main from the above connection point to south east along Stuart Drv to the water offtake for the Waterpark (ie the water supply to the on-site water storage tanks that would provide the makeup water for the waterpark facilities) and hotel. It is assumed that this is around halfway along the Stuart Drv frontage of the development site. The actual location for the water supply connection will be determined as part of the developments detailed design.
- A DN200 water main would then extend to the south east along the Stuart Drv frontage of the development site to Edison St. The DN200 water main would then extend to the north along the proposed central development road through to Racecourse Rd. The DN200 main would then connect to the existing DN200 PVC water main on the Racecourse Rd frontage of the development site.

Sewer System Assessment

A number of options for the servicing of the Townsville Waterpark, Hotel & Beach Club development have been assessed. These options are:

Option 1 – Existing DN300/225 Sewer Line S8G (Turf Club Side)

- This option is unlikely to be viable as the existing sewer system has current capacity issues and would require significant upgrades to service the development flows.
- This option requires a 430m section of existing DN225 gravity sewer from MH 4A/S8G to MH 3/S8 to be upgraded to a DN300 pipe. This section of existing gravity sewer crosses under the fill embankment of the Bruce Hwy along with crossing the QR line and Abbott St. The crossings would need to be a DN400 PE pipe installed in a DN600 enveloper via trenchless methods in very poor ground conditions.
- A new standard Council sewage pump station would be required at the development site to service the western portion of the development (ie Precinct 3). A DN150 sewer pressure main from the waterpark pump station would extend to the east to discharge into MH 5/S8G over a length of around 540m.

Option 2 – Existing DN300 Sewer Line S7 (Fairfield Waters)

- This option would only be viable if the equivalent population of the development was reduced or if the section of existing DN300 gravity sewer from MH2/S7 to MH 1/S7 (located under the existing lake and Lakeside Drv bridge) was upgraded to a DN375 pipe.
- A new standard Council sewage pump station would be required at the development site with a DN200 pressure main under Racecourse Rd to discharge into the existing DN300 gravity sewer at MH 10/S7. The new DN200 pressure main would be around 420m long.

Option 3 – Pumped to Southern Suburbs Pressure Main (Stuart Drv)

- This option was shown as being viable and capable of servicing the full development sewage flows. Higher density development (higher EP) could also be serviced for this option.
- A new standard Council sewage pump station would be required at the development site along with a DN200 pressure main would to the north along Stuart Drv to discharge into the existing DN750 PE common pressure main at the intersection with Kokoda St. The DN200 pressure main would be around 1,800m long.

Option 4 – Pumped to Major PS S6 (Cluden)

- This option was shown as being viable and capable of servicing the full development sewage flows. Higher density development (higher EP) could also be serviced for this option.
- A new standard Council sewage pump station would be required at the development site along with a DN200 pressure main to the east along Racecourse Rd, north along Lakeside Drv and east along the edge of the existing lake to discharge into major PS S6 (Cluden). The pressure main would be around 1,250m long.

The water & sewer assessment detailed in this report shows that there are viable options for the servicing of the Townsville Waterpark, Hotel & Beach Club development with a water & sewer system. Further details of the water & sewer infrastructure assessment is provided in the following report sections.

2 POPULATION ASSESSMENT

The following section provides the population assessment for the Townsville Waterpark, Hotel & Beach Club development. The equivalent population for the commercial and residential uses has been developed based on the unit rates detailed in "Table 8.1 – Infrastructure Demand Unit Rates" of the Local Government Infrastructure Plan – DSS, Definitions & Demands (April 2017) that is extrinsic referenced material to the Townsville CityPlan.

The details of the equivalent population estimate for the development is provided in the following tables. This is a conservative (upper) estimate based on the initial overall Concept Plan (refer Appendix A) for the full development site and concurrent full capacity of the accommodation, retail areas and attendees to the waterpark.

The revised Masterplan (refer Appendix A) for the Waterpark component of the development has revised the likely size of the hotel from 200 rooms in the Concept Plan to 49 rooms in the refined Masterplan. The Masterplan drawings also indicate the potential for the expansion of the hotel. The equivalent population assessment below is based on the higher (200) potential number of rooms for the waterpark hotel.

Table 2.1 – Water Equivalent Population Assessment

	Area	Loading Rate	EP
Precinct 1 (Retail/Fast Food)	Combined Area 1 to 4 – 13,400 m^2 GFA	2.11 EP/100m^2	282.7 EP
Precinct 2 (Either Large Format Retail or Residential Units)	230 units (upper estimate)	1.8 EP/room	414 EP
Precinct 3 • **Waterpark Attendees** • **Hotel**	 3,000 people/day 200 rooms	 0.2 EP/person 1.8 EP/room	 600 EP 360 EP
Future Development Sites	9,000 m^2 (Site 1 total area) 4,000 m^2 (Site 2 total area) Assume 6,500 m^2 GFA based on 50% coverage	2.11 EP/100m^2	137.2 EP
Total			**1,793.9 EP**

The above water equivalent population estimate would be reduced to 1,522.1 EP if the number of hotel rooms at the waterpark are reduced to 49 rooms as per the Masterplan drawings.

Table 2.2 – Sewage Equivalent Population Assessment

	Area	Rate	EP
Precinct 1 (Retail/Fast Food)	Combined Area 1 to 4 – 13,400 m^2 GFA	2.74 EP/100m^2	367.2 EP
Precinct 2 (Either Large Format Retail or Residential Units)	230 units (upper estimate)	1.8 EP/room	414 EP
Precinct 3 • **Waterpark Attendees** • **Hotel**	 3,000 people/day 200 rooms	 0.2 EP/person 1.8 EP/room	 600 EP 360 EP
Future Development Sites	9,000 m^2 (Site 1 total area) 4,000 m^2 (Site 2 total area) Assume 6,500 m^2 GFA based on 50% coverage	2.74 EP/100m^2	178.1 EP
Total			**1,919.3 EP**

The above sewer equivalent population estimate would be reduced to 1,647.5 EP if the number of hotel rooms at the waterpark are reduced to 49 rooms as per the Masterplan drawings

The 0.2 EP/attendee is an upper estimate of the potential for each attendee to place demands on the water & sewer facilities of the site. The previous sewer planning for the Townsville Entertainment Centre was based on 0.15 EP/seat so the 0.2 EP/attendee for the waterpark provides a higher/more conservative estimate. The assessment is also based on the upper estimate of the number of concurrent attendees to the waterpark, with the normal daily attendee number being around 1,800 people/day.

The equivalent population assessment is also based on concurrent use at the waterpark along with the adjacent hotels/units being fully occupied and the commercial/retail areas also fully utilised. This again presents an upper (conservative) assessment of the equivalent persons for the site.

Additional Non-EP Demands

In addition to the above, the proposed development will have additional water demands and potential sewage generation associated with the operational water use of the waterpark facilities. This water demand will be due to the evaporation and other wastage/backwash of water as follows:

- Annual average Townsville pan evaporation of 2,588 mm.
- Daily Townsville pan evaporation of up to 12mm.
- Approximate surface area of water pools/rides (including the hard surfaces of the rides and paths etc that would have water from users dripped onto them) of around 20,000 $m^{2.}$ This is a high estimate of the area that would have evaporation occurring from it.
- Total daily potential pan evaporation from the water facilities of 0.012m x 20,000 m^2 = 240 m^3.
- Assume the replenishment of the water is to occur over an 8 hour period of use during the day (which is when the evaporation would be the highest as well) would require a flow rate of 8.3 l/s.
- Replenishment of backwash volume of 5 l/s (refer below).

There will also likely be additional sewage generation from the backwashing of the pool/waterpark facilities. The exact backwash rate and volume is uncertain at this concept stage as it is dependent on the type/detail of the backwash unit. The preliminary assessment of the backwash volume that would need to be disposed to sewer would be:

- Previous advice from the proponent indicates that a filter system with a capacity of 182.2 m^3/hr (refer Appendix B), is needed for the waterpark. It is assumed that two of these filter units would be required. The filter has a capacity of 50.6 l/s per filter and would be assumed to run around 24 hours per day.
- The backwash of the filter systems will occur intermittently throughout the day (or overnight) with the backwash volume being directed to a local storage tank. The backwash water would then be either directed to sewer (at a low constant rate) or potentially further treated for on-site irrigation to reduce the volume that would need to go to sewer.
- It is estimated that approximately 5% of the filtered water volume would need to be backwashed. With a filter rate of 101.2 l/s for the two filters this would have a constant backwash rate that would need to be directed to sewer of around 5 l/s.
- It is noted that the actual instantaneous backwash rate will be higher than 5 l/s to have the filters backwashed over a short time with this directed to a local storage tank as noted above.
- It is again noted that the actual volume of backwash water is dependent on the type of filter system and the potential for re-use of the backwash water for site irrigation etc. The backwash volume will be determined as part of the detailed design process and the sizing of the sewer system to cater for this volume adjusted accordingly.

The above equivalent populations and additional waterpark water use and sewage generation have been used in the capacity assessment for the site.

3 WATER SUPPLY PLANNING

The Townsville Waterpark, Hotel & Beach Club development site is currently serviced with a potable water supply as follows:

- Water is supplied from the Douglas No 1A/B reservoirs that are located on the northern foothills of Mt Stuart in Douglas. The Dougals No 1A/B reservoirs are 2 x 41 ML tanks.
- Water is delivered from the two reservoirs along a DN900 MSCL pipe on University Drv and Stuart Drv. The DN900 MSCL is located along the Stuart Drv frontage of the waterpark development site. The DN900 MSCL pipe is a bulk water main that delivers water to Sun Metals & Alligator Ck. This bulk water main is NOT able to be connected to.
- Water is also delivered from the Douglas reservoirs along a DN600 MSCL pipe on University Drv and Stuart Drv through to the intersection with Hynch St. The DN600 MSCL pipe is located on the opposite side of Stuart Drv to the development and is the bulk supply main to deliver water into the Wulguru reservoir. This water main is NOT able to be connected to.
- There are a couple of trunk outlet water mains from the Wulguru reservoir that is located on the north/eastern foothills of Mt Stuart. There is a DN450 DICL outlet main that generally runs along Powell St, Jenner St, Pasteur St and Watt St through to Stuart Drv. The DN450 DICL main then becomes a DN630 PE pipe (internal diameter of 500mm) that runs along the Stuart Drv frontage of the waterpark site from Watt St to Racecourse Rd. The DN630 PE main becomes a DN500 DICL main and continues to the north along Stuart Drv. This trunk main IS able to be connected to for the provision of potable water to the waterpark development.
- A DN200 PVC water main is located along the Racecourse Rd frontage of the development site. This water main is connected to the above DN630 PE water main at the intersection of Stuart Drv and Racecourse Rd and runs to the east along Racecourse Rd to opposite the intersection with Lakeside Drv. The DN200 main crossing under Racecourse Rd and extends to the north along Lakeside Drv to service the Fairfield Waters development area.

The image below from Council's GIS illustrates the existing water mains along the Stuart Drv and Racecourse Rd frontages of the waterpark development site, including the DN630 PE trunk main on Stuart Drv frontage and DN200 PVC on Racecourse Rd frontage.

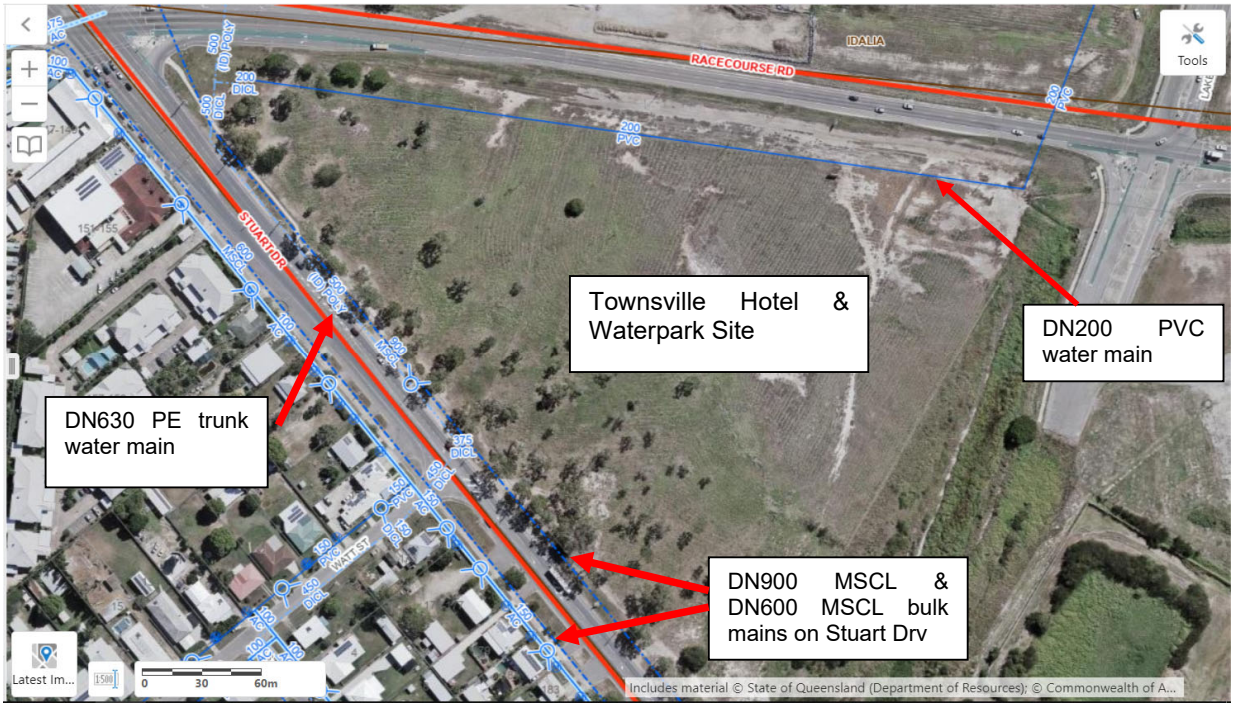


Figure 3.1 – Existing Water Network

To assess the capacity of the existing water system to adequately supply the Townsville Waterpark, Hotel & Beach Club development with a reticulated water supply, water network modelling has been undertaken. Details of the water network modelling is provided in the following report sections.

3.1 Water Demand

Water demands have been calculated in accordance with Townsville City Council planning scheme and its latest amendments. The following table provides the water demand parameters for the Townsville Planning Scheme which have been used in the water infrastructure assessment.

Residential Water Demands

Table SC6.4.3.21.2 Water supply unit demand parameters

Parameter	Unit Demand	Peaking Factor
Average Day (AD)	600 L/day/EP	
Mean Day Max Month (MDMM)	900 L/day/EP	1.5 AD
Peak Day (PD)	1125 L/day/EP	1.25 MDMM
Peak Hour (PH) (Residential Demands)	0.033 L/s/EP	2.56 PD

The above water demand and peaking factor have been applied to the residential unit/accommodation equivalent population for the waterpark development.

With the 774 EP for the residential/hotel uses (based on the upper 200 rooms for the Waterpark hotel) on the site, the peak residential demand is 25.5 l/s with this peak occurring at 7pm.

Backwash Water & Pool Replenishment Demand

The replenishment of the pool/waterpark water due to evaporation and other losses is based on the assumption of providing the required volume over an 8 hour period (ie during the day when the waterpark is in use and when the evaporation would be the highest). The assessment detailed in Section 2 shows a replenishment flow rate of 8.3 l/s from 9am to 5pm every day. It is expected that the water used for the replenishment of the waterpark pool etc would be delivered into an on-site balance tank that would likely require extra chlorine added prior to being directed to the pools.

In addition to this, the replenishment of the backwash water is required (refer Section 2). It is assumed that the 5 l/s replenishment of the backwash water would also be directed to an on-site pool balance tank over a 24 hour period.

These two water demands for the waterpark facilities are included in the WaterGEMS network model.

Commercial & Park Attendees

Townsville City Council also has a diurnal water demand pattern that is applied to retail/commercial type uses. This diurnal pattern has a 1.5 peaking factor at 12 noon. This diurnal pattern is considered applicable to the operation of the waterpark and its attendees as the expected peak use would be in the middle of the day, with lower uses in the morning and afternoon. The commercial pattern is illustrated on Figure 3.2 below and has been applied to both the waterpark attendees and the commercial/fast-food/retail uses.

Based on an equivalent population of 1,019.9 EP for the attendees and commercial uses, the peak commercial water demand that occurs at 12 noon is:

= 1,019.9 EP x 1125 L/day/EP x 1.5 (commercial peaking factor)

= 1,019.9 x (1125 / (24*3600)) x 1.5

= 19.9 l/s

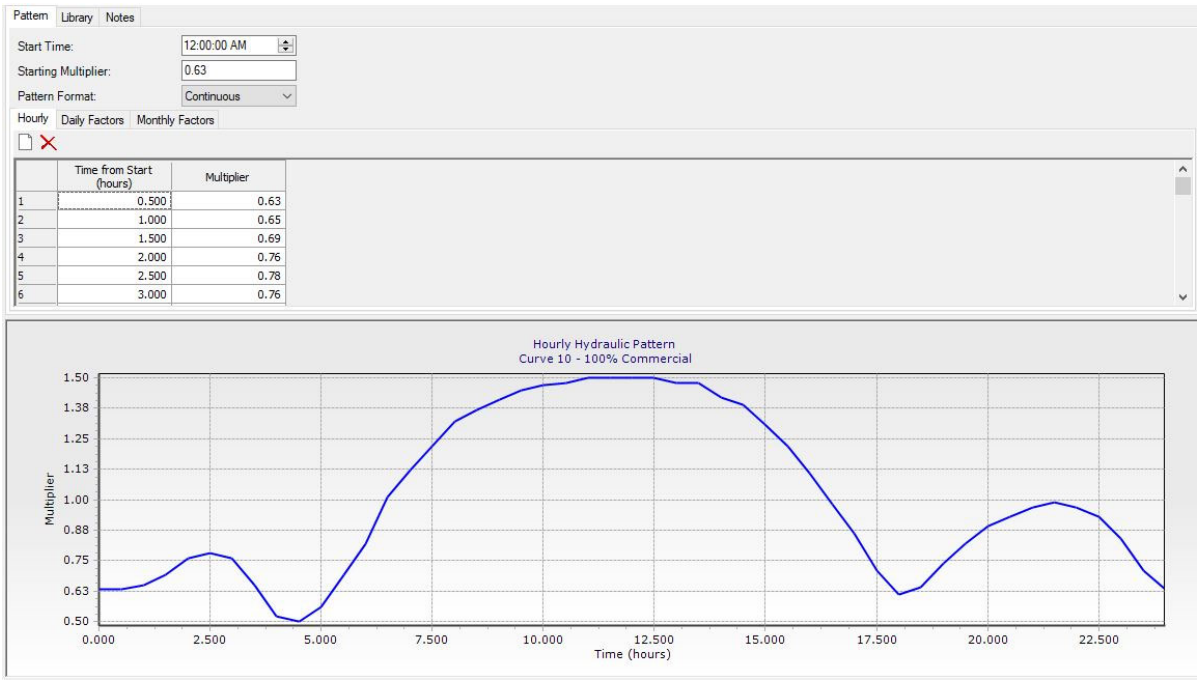


Figure 3.2 – Commercial/Attendee Diurnal Curve

In addition to the above, as the development is commercial a 30 l/s fire flow is required in accordance with Council's design standards. The actual building code requirements for the development will need to be determined as part of the detailed design and incorporated into the development accordingly. This may require a higher fire flow rate and/or pressure to what Council require so fire storage tanks and booster pumps may be required.

3.2 Water Supply Assessment

The various water demands and their associated diurnal patters (as noted in Section 3.1) have been applied to the existing water supply network to assess its capacity to service the development. The following water infrastructure works will be required to service the development:

- DN300 water main connection to the existing DN630 PE water main. This connection would be at the eastern end of the DN630 PE water main where it connects to the DN450 DICL crossing of Stuart Drv at the Watt St intersection. As per the extract below (Figure 3.3) from Council's GIS, there is an existing DN375 DICL pipe stub and valve at the eastern end of the DN630 PE pipe. The connection for the development would be off this existing DN375 DICL valve.
- A section of DN300 water main from the above connection point to the offtake for the Waterpark service water (ie the water supply to the on-site water storage tanks that would provide the makeup water for the waterpark facilities) and hotel. It is assumed that this is around halfway along the Stuart Drv frontage of the development site. The actual location for the water supply connection will be determined as part of the developments detailed design.
- A DN200 water main would then extend to the south east along the Stuart Drv frontage of the development site to Edison St. The DN200 water main would then extend to the north along the proposed central development road through to Racecourse Rd. The DN200 main would then connect to the existing DN200 PVC water main on the Racecourse Rd frontage of the development site.
- The water demands for the commercial (fast food) sites and the residential units on the eastern side of the central development road will be serviced off the proposed DN200 water main.

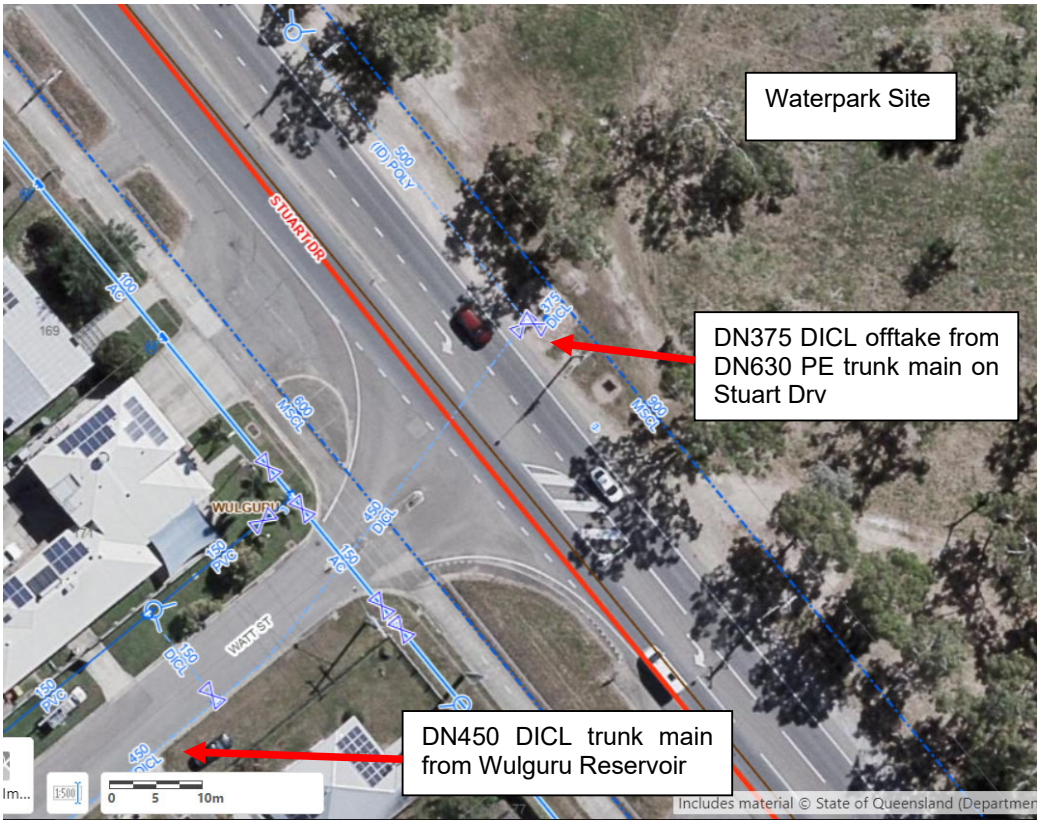


Figure 3.3 – Existing DN375 Pipe & Valve on Stuart Drv

The extract from the WaterGEMS network model below illustrates the required water infrastructure to service the Townsville Waterpark, Hotel & Beach Club development. The extract also shows the equivalent population loadings and water demands in the WaterGEMS network model.

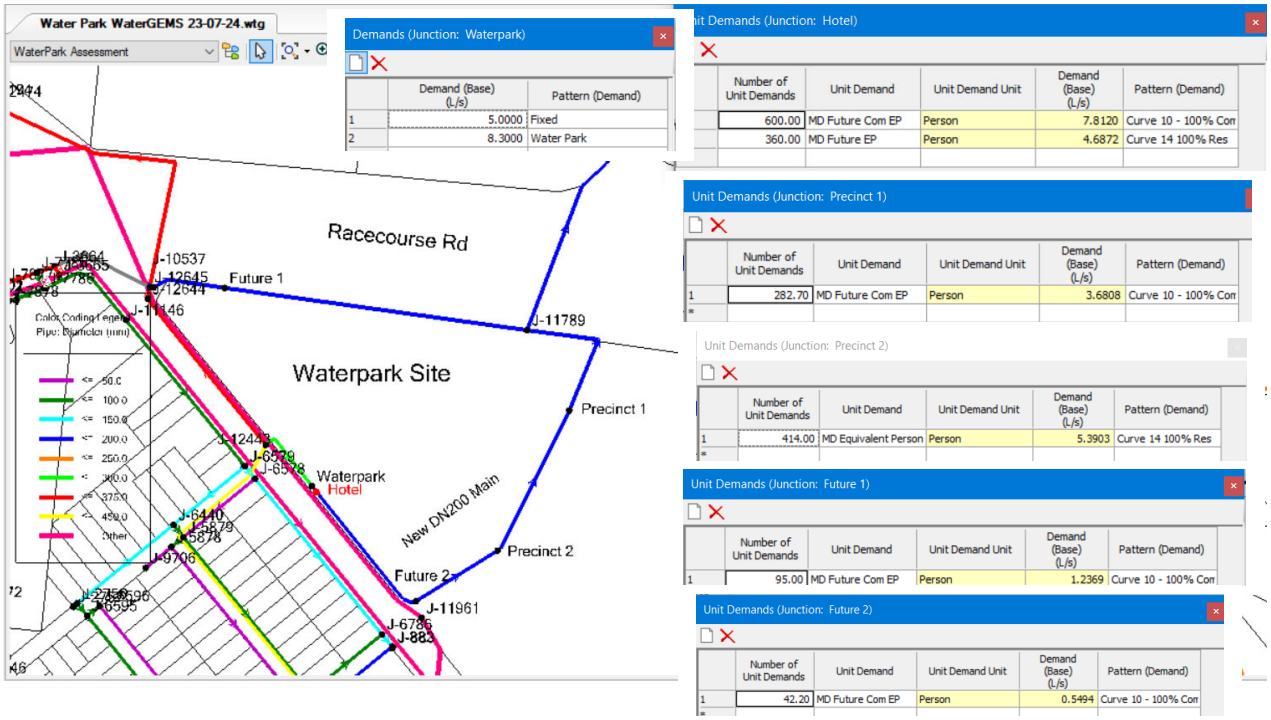


Figure 3.4 – WATERGEMS Model Water Demands

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Version: 1, Version Date: 24/10/2024

With the inclusion of the new DN300 and DN200 water mains along with the inclusion of the water demands, the WaterGEMS network modelling has illustrated the following:

- The existing DN450 DICL trunk water main from the Wulguru Reservoir that services the western area of Wulguru and the proposed waterpark site is adequately sized. The peak flows at 7pm along this trunk water main are 187 l/s with the inclusion of the waterpark demands.
- The proposed DN300 and DN200 water mains along Stuart Drv and through the proposed central development road will be adequately sized to service the development with peak water demands and fire flows.
- The inclusion of the additional water demands along with the proposed DN300 and DN200 water mains to service the waterpark development, there is minimal impact on the water pressures in the adjacent residential and commercial areas. The peak hour water pressures at 7pm are reduced from 423 kPa to 422 kPa on the existing DN200 water main at the intersection of Racecourse Rd and Lakeside Drv. This is only a minor reduction in water pressures with the pressures still being well above the Council minimum standard of 220 kPa.
- The water pressures for the peak residential demand period of 7pm on the proposed DN200 water main through the central development road is 432 kPa.
- The water pressure for the peak commercial demand period of 12noon on the proposed DN200 water main through the central development road is 534 kPa. The water pressure during the day is higher due to the large residential areas of Wulguru and Fairfield Waters that are supplied from the Wulguru reservoir (which have a high water demand in the evenings).
- The flow, velocity and headloss gradient along the proposed DN300 water main is 49 l/s, 0.69 m/s & 0.002 m/m respectively. The flow, velocity and headloss gradient along the proposed DN200 water main is 26 l/s, 0.83 m/s & 0.004 m/m respectively. These values are all within Council standards.
- With the inclusion of the 30 l/s fire flows in accordance with Council's standards for commercial areas the water pressure is reduced to 403 kPa at 7pm (concurrent with peak residential demands) as is reduced to 509 kPa at 12noon (concurrent with the peak commercial demands).
- It is noted the above water pressures are the residual pressures within the water main and do not specifically account for pressure losses through fire hydrants, standpipes, RPZD's and/or fire booster pump assemblies.
- The existing Wulguru reservoir is able to service the water demands from the proposed waterpark development with the reservoir only dropping to around 45% full in the evenings during the peak residential demand period in its supply area and then re-filling overnight.

The assessment illustrates the Townsville Waterpark, Hotel & Beach Club development is able to be serviced with its various water demands from the existing DN450 DICL trunk main from the Wulguru reservoir (that connects to the DN630 PE water main on Stuart Drv at Watt St). The new DN300 and DN200 water mains along Stuart Drv and the central development road to Racecourse Rd are also required to service the development with peak hour and fire flows.

Additional WaterGEMS modelling sensitivity assessment was undertaken to determine if additional water demands could be supplied to the proposed development site. This was undertaken to see if future higher density developments could be undertaken at the site or to account for potential higher water demands for the waterpark makeup water. The modelling illustrated that around an additional 25 l/s (being around 750 EP) could potentially be delivered to the development site without adversely affecting the water network performance or requiring an increase in the proposed DN300 and DN200 development water mains.

The WaterGEMS modelling results and figures are provided in Appendix C to show the performance of the existing water network and the applied water demands for the development.

4 SEWAGE SYSTEM PLANNING

The proposed Townsville Waterpark, Hotel & Beach Club development site has a couple of options to be serviced with a sewer system. Figure 4.1 below from the Council GIS illustrates the existing gravity sewer systems in the general vicinity of the development site.

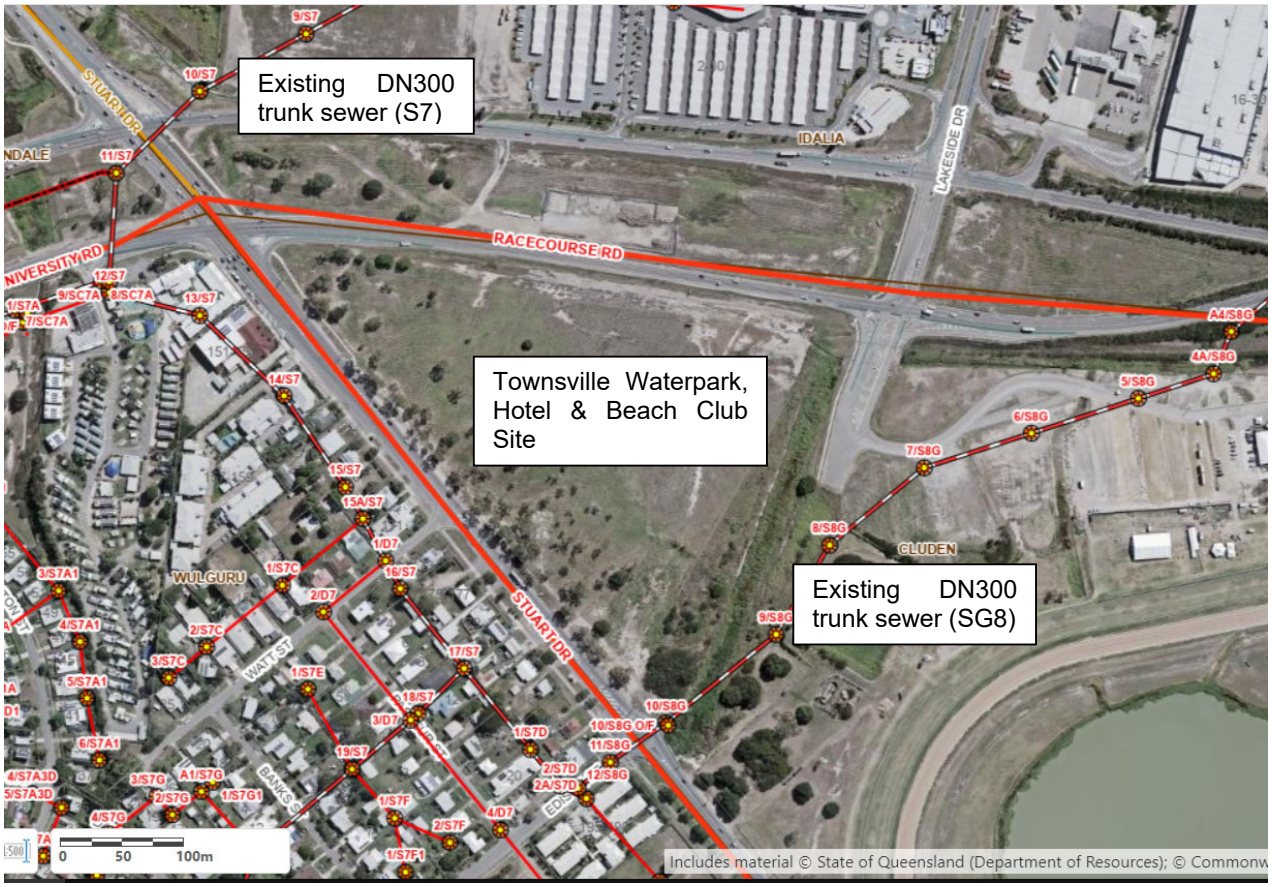


Figure 4.1 – Existing Sewer System

Four main options have been identified for the servicing of the Townsville Waterpark, Hotel & Beach Club development site with a sewer system. These options are:

- Option 1 - Existing DN300 Sewer Line S8G (Turf Club Side)
- Option 2 – Existing DN300 Sewer Line S7 (Fairfield Waters)
- Option 3 – Pumped to Southern Suburbs Pressure Main (Stuart Drv)
- Option 4 – Pumped to Major PS S6 (Abbott St)

The following report sections detail the above four sewer servicing options for the site.

4.1 Sewage Flows

The estimated sewage flows that will need to be serviced for the proposed Townsville Waterpark, Hotel & Beach Club development are summarised in Table 4.1 below. The table details the Average Dry Weather Flows (ADWF) which is based on Council standard of 230 l/EP/day for the sewage generation. The Peak Wet Weather Flows (PWWF) are also included in the table with these based on Council standard of 5 x ADWF. The existing sewer capacity assessment and preliminary sizing of the sewer infrastructure to service the development is based on the PWWF.

Table 4.1 – Townsville Hotel, Waterpark & Beach Club Sewer Flows

	EP	ADWF	PWWF
Precinct 1 (Retail/Fast Food)	367.2 EP	0.98 l/s	4.89 l/s
Precinct 2 (Either Large Format Retail or Residential Units)	414 EP	1.10 l/s	5.51 l/s
Precinct 3 • **Waterpark Attendees** • **Hotel**	 600 EP 360 EP	 1.60 l/s 0.96 l/s	 7.99 l/s 4.79 l/s
Future Development Sites	178.1 EP	0.47 l/s	2.37 l/s
Total	1,919.3 EP	5.11 l/s	**25.55 l/s**

As detailed in Section 2, there is likely to be additional flows directed to the sewer system from the backwashing of the pool/waterpark facilities. The exact backwash rate and volume is uncertain at this concept stage but has been estimated as 5 l/s.

The above sewage flows have been used in the initial sewer option assessment.

4.2 Option 1 – Existing DN300 Sewer Line S8G (Turf Club Side)

An existing DN300 gravity sewer is located along the eastern side of the proposed development site. Details of this sewer system are as follows and shown on Figure 4.2 below.

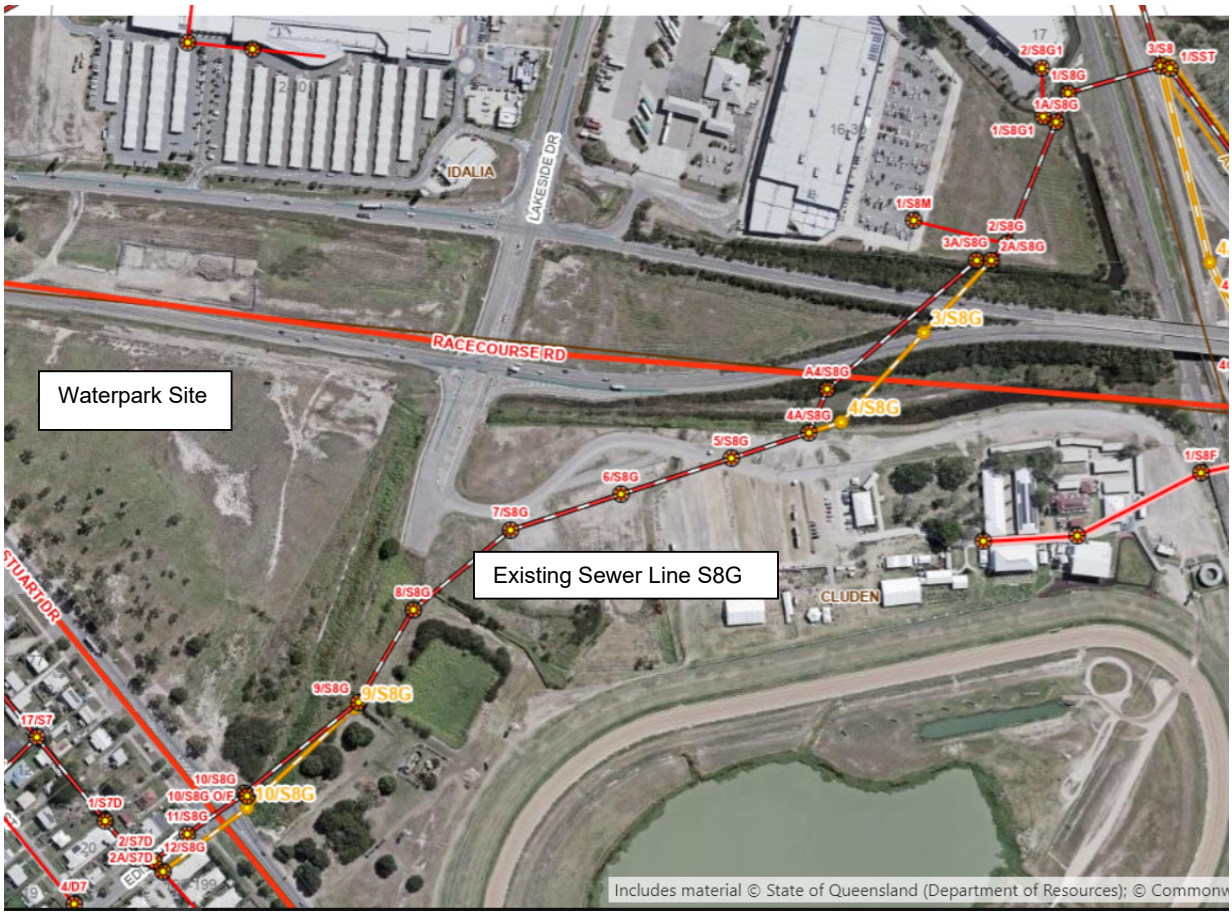


Figure 4.2 – DN300 S8G Sewer Line Option

- This DN300 gravity sewer runs from Stuart Drv (at the Edison St intersection) to the north east and onto Racecourse Rd. The sewer generally runs through the eastern side of the development site from MH 10/S8G to MH 4/S8G. This sewer line used to be a DN225 pipe but was replaced with a DN300 PVC pipe in 2023.
- The sewer crossing of Racecourse Rd through to Abbott St is only DN225. This sewer is from MH 4A/S8G to MH 3/S8 over a length of 430m and also includes a crossing of the QR line on the western side of Abbott St.
- The above DN225/300 sewer line services the central portion of the Wulguru sewer area.
- The sewer from MH 3/S8 to the north is DN600 and extends to major PS S6 (Cluden) that is located on the eastern side of Abbott St. Major PS S6 pumps sewage to the Cleveland Bay STP via a DN500 pressure main generally to the north along Abbott St and then the dual DN900 common pressure main to the east.

It is noted that this existing DN300 gravity sewer that is located along the eastern side of the development site is only around 1.0m to 3.0m deep. The existing sewer is not deep enough to service the full Townsville Waterpark, Hotel & Beach Club site via gravity. Only some of the Precinct 1 and Precinct 2 development areas would be able to gravitate directly to this DN300 sewer line, with this subject to the location of the buildings and the site filling works. For the full development to be serviced from this sewer line, a new sewage pump station would need to be constructed to service Precinct 3 and the future development sites.

Existing Sewer System Capacity

The capacity of the existing gravity sewer system has shown:

- The existing connected EP on the DN300 sewer through the development site is 1,010 EP.
- The SewerGEMS network modelling of the existing sewer system has shown:
    - The existing DN300 sewer through the development site flows up to 32% full.
    - The existing sections of DN225 sewer under the Bruce Hwy and QR line (MH 4A/S8G to MH 3/S8 over a length of 430m) flow up to 62% full. This is a PVC relined sewer that has an internal diameter of approximately 205mm.
    - The Council standard is for sewers to flow a maximum of 75% full for wet weather flows.
- The actual performance of this existing gravity sewer during the recent wet seasons was that sewage overflows occurred. This is understood to be due to higher stormwater infiltration/inflows occurring in the existing upstream gravity sewer network and the pumping capacity of major PS S6 (Cluden).

The SewerGEMS network modelling indicates that the existing DN225/300 sewer S8G line has some theoretical spare capacity but in practice it has no spare capacity due to it overflowing in the past number of wet seasons. The theoretical spare capacity would also not be sufficient to cater for the additional sewage flows from the proposed full Waterpark, Hotel & Beach Club development and Council would be unlikely to allow any further development on this sewer line without upgrades being undertaken.

Upgrade Options

To allow additional sewage flows along the existing S8G sewer line on the eastern side of the development site the following sewer works would be required:

- Construct a new DN300 sewer crossing under the Bruce Hwy to replace the existing DN225 sewer. The existing DN225 DICL sewer crossing was constructed in 2015 as part of the Bruce Hwy upgrade project and involved significant ground treatment (rock mattress wrapped in geofabric under the sewer etc) due to the poor ground conditions and the new road embankment that was constructed for the railway line overpass.

Due to the large DTMR road overpass at this location, trenched construction of a larger sewer would not be viable. A replacement sewer would need to be constructed by trenchless methods in accordance with DTMR standards. This would require a DN600 RCP enveloper pipe with a DN400 PE sewer carrier pipe. Due to the poor ground conditions in this area and the various treatments that DTMR undertook as part of the overpass embankment, there would be a high risk that installing the enveloper would not be viable.

- Construct a new DN300 sewer crossing under the QR railway line, Abbott St and open drain/lake from the northern side of the Bruce Hwy (MH 3A/S8G) to the existing DN600 trunk sewer on the eastern side of Abbott St (MH 3/S8). This would be to replace the existing DN225 sewer that is PVC relined. This sewer line has an invert of below 0mAHD and would be in ASS/PASS soils.

  The crossing of the open drain, QR line and Abbott St would also need to be undertaken by trenchless construction methods to meet QR requirements. The sewer crossing would need to be a DN400 PE pipe in a DN600 enveloper to meet QR requirements. Due to the soil conditions and depth of the sewer (below sea level) it would be difficult to construct.

Figure 4.3 – DN225 Sewer between Bruce Hwy and Abbott St

- Upgrade the pumps in PS S6 (Cluden). The SewerGEMS modelling shows that the existing pumps in PS S6 can only just pump the existing theoretical peak wet weather flows from their large sewage catchment. To cater for the additional flows from the Townsville Waterpark, Hotel & Beach Club development, the existing pumps would need to be upgraded. As PS S6 trunk infrastructure and the pumps will need to be upgraded to cater for the ongoing expansion of its catchment, the cost/responsibility for the pump upgrade would be Council's (funded via infrastructure charges). The actual pump duty upgrade for the 4 x existing pumps would be determined by Council to suit the wider sewer catchment to the major pump station.
- A new sewage pump station would be required to service Precinct 3 and the future development sites. The sewage pump station would be a standard Council submersible station with an internal diameter of 2.4m and two submersible sewage pumps. The sewage would be pumped

to the east to discharge into the S8G sewer line at MH 5/S8G. The pressure main from the new waterpark pump station would be a DN150 pipe over a length of around 540m.

Notwithstanding the above, SewerGEMS network modelling was undertaken to assess the capacity of the above upgrade option. The modelling results are provided in Appendix D. The modelling showed:

- The existing DN225 sewer was modelled as a DN300 pipe on the same grade as the existing DN225 sewer.
- The full 1,919.3 EP along with the 5 l/s estimated backwash flow could be directed along the upgraded DN300 gravity sewer line.
- With the additional EP from the Townsville Waterpark, Hotel & Beach Club site the upgraded DN300 sewer flows up to 71% full. This meets the Councl standards of flowing up to 75% full.

This assessment has not taken into consideration the higher levels of infiltration/inflow that occurs in the existing sewer catchment so Council may not allow this amount of additional equivalent population/flows to the S8G sewer line even if it is upgraded to a DN300 pipe.

This option has been shown as potentially viable but would require the construction of 430m of replacement DN300 sewer under the Bruce Hwy, QR line and in very poor soil conditions.

4.3 Option 2 – Existing DN300 Sewer Line S7 (Fairfield Water)

An existing DN300 gravity sewer is located from the Stuart Drv/Racecourse Rd intersection (north east side) and extends to the north west through to Abbott St. This sewer is to the north of the development site. Details of this sewer system is as follows and shown on Figure 4.4 below.

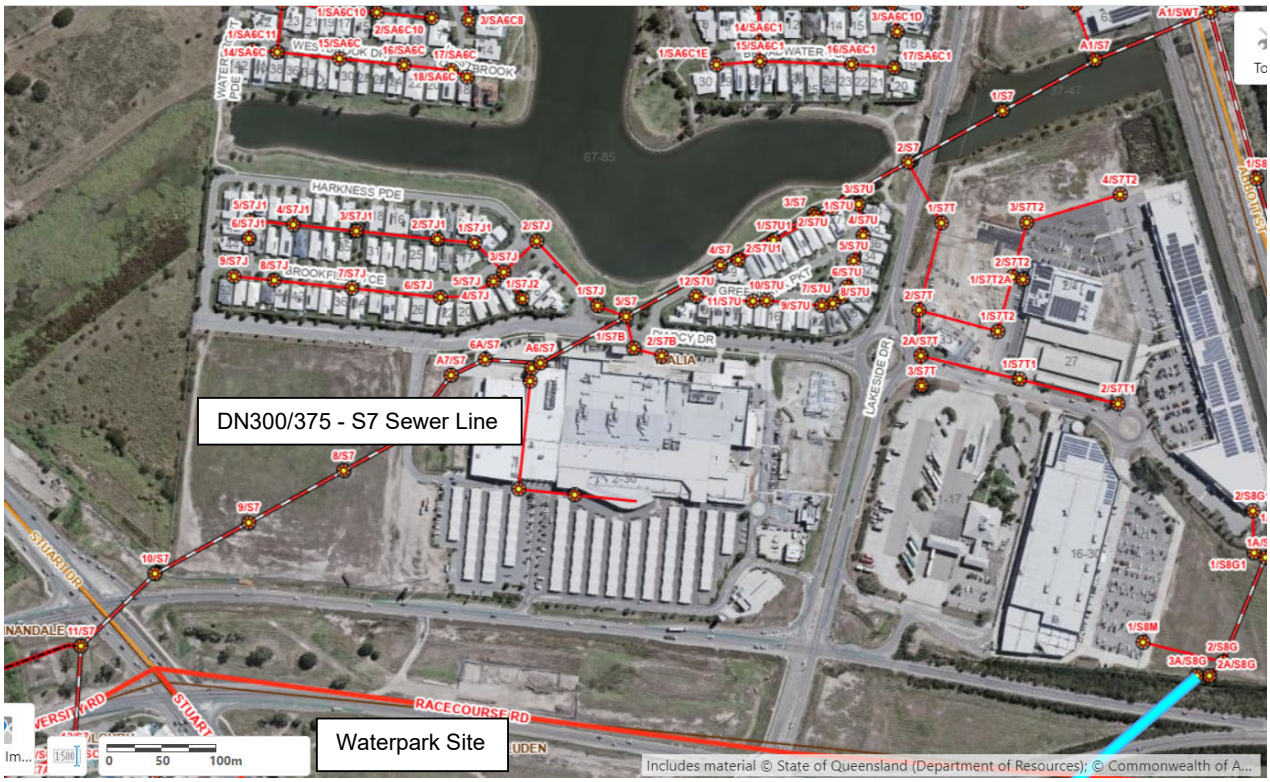


Figure 4.4 – DN300 S7 Sewer Line Option

- This DN300/375 gravity sewer runs from MH 10/S7 (located on the north east side of the Stuart Drv/Racecourse Rd intersection) to the north east and onto MH A1/SWT on Abbott St. MH A1/SWT is on the DN750 trunk sewer into major PS S6 (Cluden).
- There is an existing DN300 sewer crossing under the Stuart Drv/Racecourse Rd intersection from MH 12/S7 to MH 10/S7. This sewer line used to service the western third of Wulguru

however in 2023 Council constructed new PS SC7 on the northern side of University Drv and a diversion DN375 sewer from MH 12/S7 to the new pump station. Sewage from Wulguru does not flow along this sewer so there are no sewage flows along the existing DN300 sewer from MH10/S7 to MHA6/S7 which is where sewage from the Fairfield Waters shopping centre connects to the sewer. There is an inter-area overflow at MH 12/S7.

- As part of the expansion of the Fairfield Waters shopping centre a short diversion of the existing DN300 sewer was constructed so that the sewer was not located under the building expansion. Due to the flatter grades of the diversion sewer, it was constructed as a DN375 pipe.
- The existing DN300/375 sewer services the Fairfield Waters shopping centre along with the small adjacent residential areas and the commercial developments on the eastern side of Lakeside Drv.
- The final section of sewer from MH A1/S7 to MH A1SWT is a DN375 pipe before increasing to a DN750 inlet sewer to major PS S6 (Cluden). Major PS S6 pumps sewage to the Cleveland Bay STP via a DN500 pressure main generally to the north along Abbott St and then the dual DN900 common pressure main to the east.

For the full development to be serviced from this sewer line, a new sewage pump station would need to be constructed to service all of the Townsville Waterpark, Hotel & Beach Club site.

Existing Sewer System Capacity

The capacity of the existing S7 gravity sewer system from the SewerGEMS modelling has shown:

- There is no existing connected population/flows on the DN300/375 sewer from MH 10/S7 to MH A6/S7. The modelling has included an additional 310 EP connected to MH 7A/S7 to allow for the expansion of the Fairfield Waters shopping centre.
- Sewage flows connect to the existing DN300 sewer at MH A6/S7 from the existing Fairfield Waters shopping. The downstream maintenance holes then have sewage from the residential area and the commercial area on the eastern side of Lakeside Drv directed to it. The equivalent population on the eastern end of the DN300/375 sewer is around 1,863 EP. This includes the proposed multi-story residential development on the eastern side of Lakeside Drv.
- The SewerGEMS network modelling of the existing sewer system has shown:
    - The existing DN300/375 sewer from MH 10/S7 to MH 7A/S7 flows 0% full as there are no sewage flows directed to this section of sewer.
    - The existing DN300/375 sewer line from MH 7A/S7 to MH A1/S7 flows up to 48% full. This is a PVC relined sewer that has an internal diameter of approximately 280mm.
    - The final section of DN375 sewer from MH A1/S7 to MH A1/SWT flows up to 61% full.
    - The Council standard is for sewers to flow a maximum of 75% full for wet weather flows.
- The actual performance of this existing gravity sewer during the recent wet seasons is unclear. It is understood that the sewer flowed full but this was likely due to major PS S6 (Cluden) not being able to pump the high wet weather incoming flows which resulted in the backing up of sewage in the network.

The SewerGEMS network modelling indicates that the existing DN300 and DN375 sewers have some theoretical spare capacity to service the Waterpark, Hotel & Beach Club development.

Sewer System Performance

To direct sewage from the Townsville Waterpark, Hotel & Beach Club development to the existing S7 DN300/375 gravity sewer system the following sewer works would be required:

- A new sewage pump station would be required to service the development site. Due to the depth of the existing MH 10/S7 of only 2.2m, it is not deep enough to service the development site via a gravity sewer extension.
- The sewage pump station would be a standard Council submersible station with an internal diameter of 2.4m and two submersible sewage pumps. The sewage would be pumped to the north under Racecourse Rd to existing MH 10/S7.
- The pressure main from the new waterpark pump station would be a DN200 pipe over a length of around 420m.The crossing of Racecourse Rd would need to be installed in an enveloper in accordance with DTMR standards. The enveloper would be a DN375 pipe.
- Upgrade the pumps in PS S6 (Cluden). The existing pumps in PS S6 only just pump the theoretical peak wet weather flows from their large sewage catchment. To cater for the additional flows from the Townsville Waterpark, Hotel & Beach Club development, the existing pumps would need to be upgraded. As PS S6 trunk infrastructure and the pumps will need to be upgraded to cater for the ongoing expansion of its catchment, the cost/responsibility for the pump upgrade would be Council's (funded via infrastructure charges). The actual pump duty upgrade for the 4 x existing pumps would be determined by Council.

SewerGEMS network modelling was undertaken to assess the capacity of this sewer option and the existing DN300/375 sewer line S7 to cater for the pumped flows from the waterpark development. The modelling results are provided in Appendix D. The modelling showed:

- The waterpark pump station would have a pump capacity of 30.5 l/s at 10m head. This is the full development peak wet weather flows plus the estimated 5 l/s water treatment backwash flows.
- The proposed DN200 pressure main would have a velocity of 0.97 m/s which achieves the Council minimum requirement of 0.75 m/s. The pressure main diameter could be reduced but that would increase the required pump head. The final pump and pressure main sizing would be determined as part of the pump station detailed design if this option was selected.
- The existing DN300 PVC lined sewer from MH 10/S7 to MH 7A/S7 flows up to 61% full. This meets TCC standards of flowing less than 75% full.
- The existing DN300/375 sewer from MH 7A/S7 to MH A1/S7 flows up to 87% full. This theoretical capacity exceeds the TCC standards of flowing up to 75% full.
- The final section of DN375 sewer from MH A1/S7 to A1/SWT flows up to 72% full.

The section of DN300 sewer from MH 2/S7 to 1/S7 flows over the allowable maximum flow depth. This sewer is located under the Lakeside Drv bridge and through the existing lake system as per the GIS extract Figure 4.4 below. Replacing or duplicating this sewer line would be problematic.

The SewerGEMS modelling showed that around an additional 23 l/s can be directed along the S7 sewer line (from MH 10/S7 to MH A1/S7) before it theoretically exceeds the 75% maximum flow depth. The 23 l/s flow equates to around 1,350 EP plus the 5 l/s backwash flow rate from the proposed waterpark development. The 1,350 EP would not be sufficient to cater for the current proposed development even if the waterpark hotel only had the 49 rooms as detailed in the Masterplan.

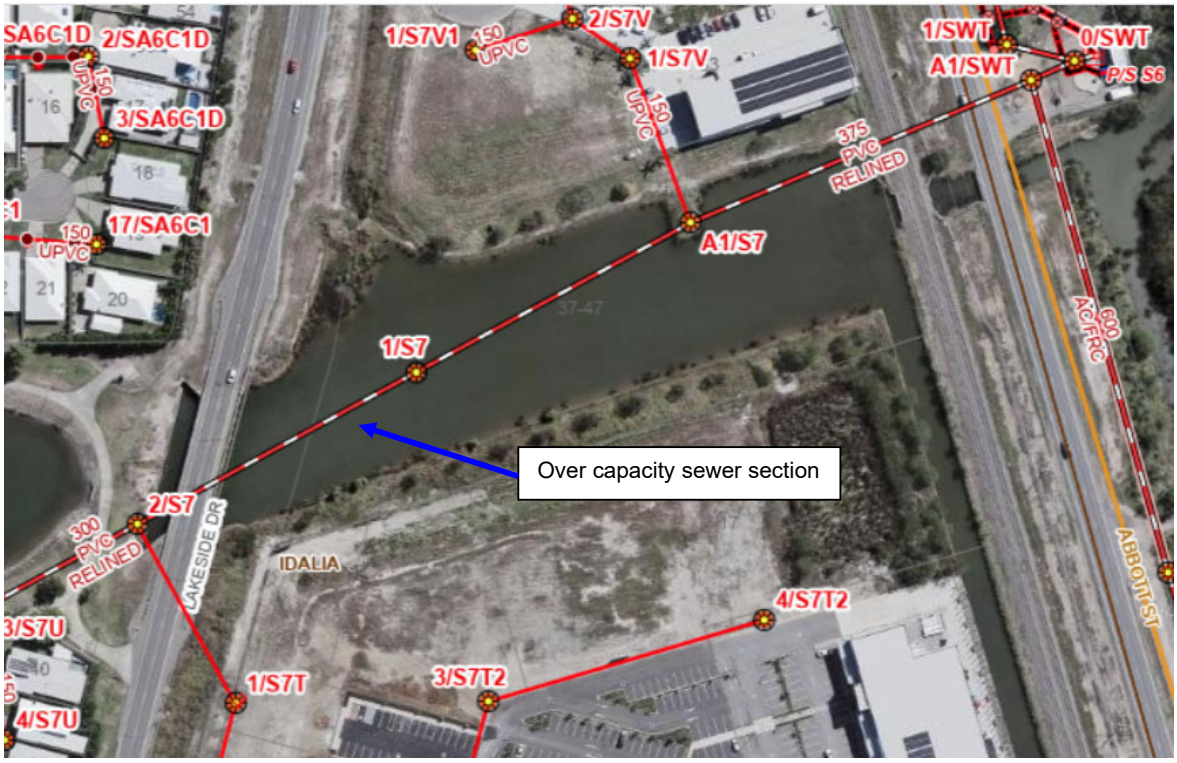


Figure 4.5 – DN300 Sewer from MH 2/S7 to MH 1/S7

Additional SewerGEMS modelling was undertaken to assess the sewer system performance if the DN300 PVC lined sewer from MH 2/S7 to A1/S7 was replaced with a DN375 sewer. This is the two final DN300 sewer sections over a length of 197m that are located within the lake system (refer Figure 4.5 above). The modelling showed:

- The existing DN300 PVC lined sewer from MH 10/S7 to MH 7A/S7 flows up to 61% full. This meets TCC standards of flowing less than 75% full.
- The existing DN300/375 sewer from MH 7A/S7 to MH 2/S7 flows up to 74% full.
- The proposed upgraded DN375 sewer from MH 2/S7 to MH A1/S7 flow up to 49% full.
- The final section of DN375 sewer from MH A1/S7 to A1/SWT flows up to 72% full.

The additional SewerGEMS modelling shows that if the existing DN300 PVC lined sewer from MH 2/S7 to A1/S7 was replaced with a DN375 sewer then sewage from the proposed waterpark development could be pumped to MH 10/S7.

4.4 Option 3 – Sewage Pumped to Southern Suburbs Pressure Main

This option would have a new sewage pump station servicing the Townsville Waterpark, Hotel & Beach Club development site. Sewage from the pump station would be pumped to the north and along Stuart Drv to discharge into the existing DN750 PE Southern Suburbs Pressure Main (SSPM) at the intersection of Stuart Drv and Kokoda St.

This option would not have sewage directed into an existing gravity sewer system but pumped into the existing common pressure main network that directs sewage to the Cleveland Bay STP. Figure 4.6 below shows the approximate location of the connection into the DN750 PE SSPM.

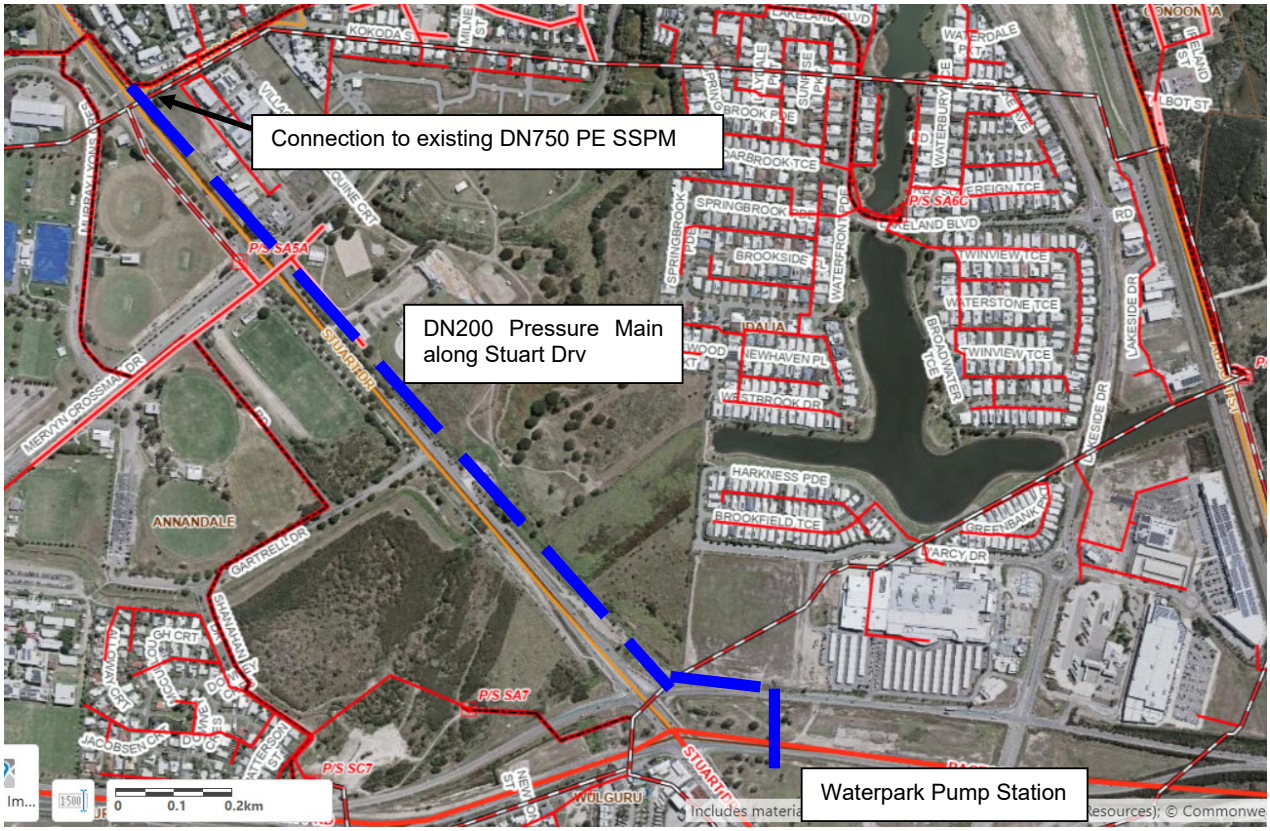


Figure 4.6 – Option 3 SSPM Connection

Initial SewerGEMS network modelling has been undertaken to assess the sizing of the sewage pumps and pressure main for this option. The required sewer infrastructure would involve:

- A new sewage pump station would be required to service the development site. The sewage pump station would be a standard Council submersible station with an internal diameter of 2.4m and two submersible sewage pumps.
- Sewage would be pumped via a new DN200 pressure main to the north under Racecourse Rd and then along Stuart Drv to the intersection with Kokoda St where it would connect to the existing DN750 PE common pressure main. The DN200 pressure main would be around 1,800 m long. The crossing of Racecourse Rd would need to be installed in an enveloper in accordance with DTMR standards. The enveloper would be a DN375 pipe.
- The waterpark pump station would have a pump capacity of 30.5 l/s at 37m head. This is the full development peak wet weather flows plus the estimated 5 l/s water treatment backwash flows. The SewerGEMS modelling results for this option are provided in Appendix D.
- The proposed DN200 pressure main would have a velocity of 0.97 m/s which achieves the Council minimum requirement of 0.75 m/s.

For this option, there is the potential for the Townsville Waterpark, Hotel & Beach Club development to have a higher density development (higher equivalent population) and therefore higher sewage flows. As this option is just pumping into the existing DN750 PE common pressure main it is not reliant on the capacity of existing gravity sewer networks. The equivalent population for this option could be up to around 3,000 EP plus backwash water flows without adversely impacting on the hydraulic performance of the DN750 PE common pressure main system.

4.5 Option 4 – Sewage Pumped to Major PS S6 (Cluden)

This option would have a new sewage pump station servicing the Townsville Waterpark, Hotel & Beach Club development site. Sewage from the pump station would be pumped to the east along Racecourse

Rd and then north along Lakeside Drv to the existing lake. The sewage pressure main would then extend to the east adjacent to the lake, cross under the QR line and Abbott St to discharge into major PS S6 (Cluden).

This option would not have sewage directed into an existing gravity sewer system but pumped into the existing major PS S6 (Cluden) that directs sewage to the Cleveland Bay STP. Figure 4.7 below shows the approximate of the pressure main and connection to major PS S6.

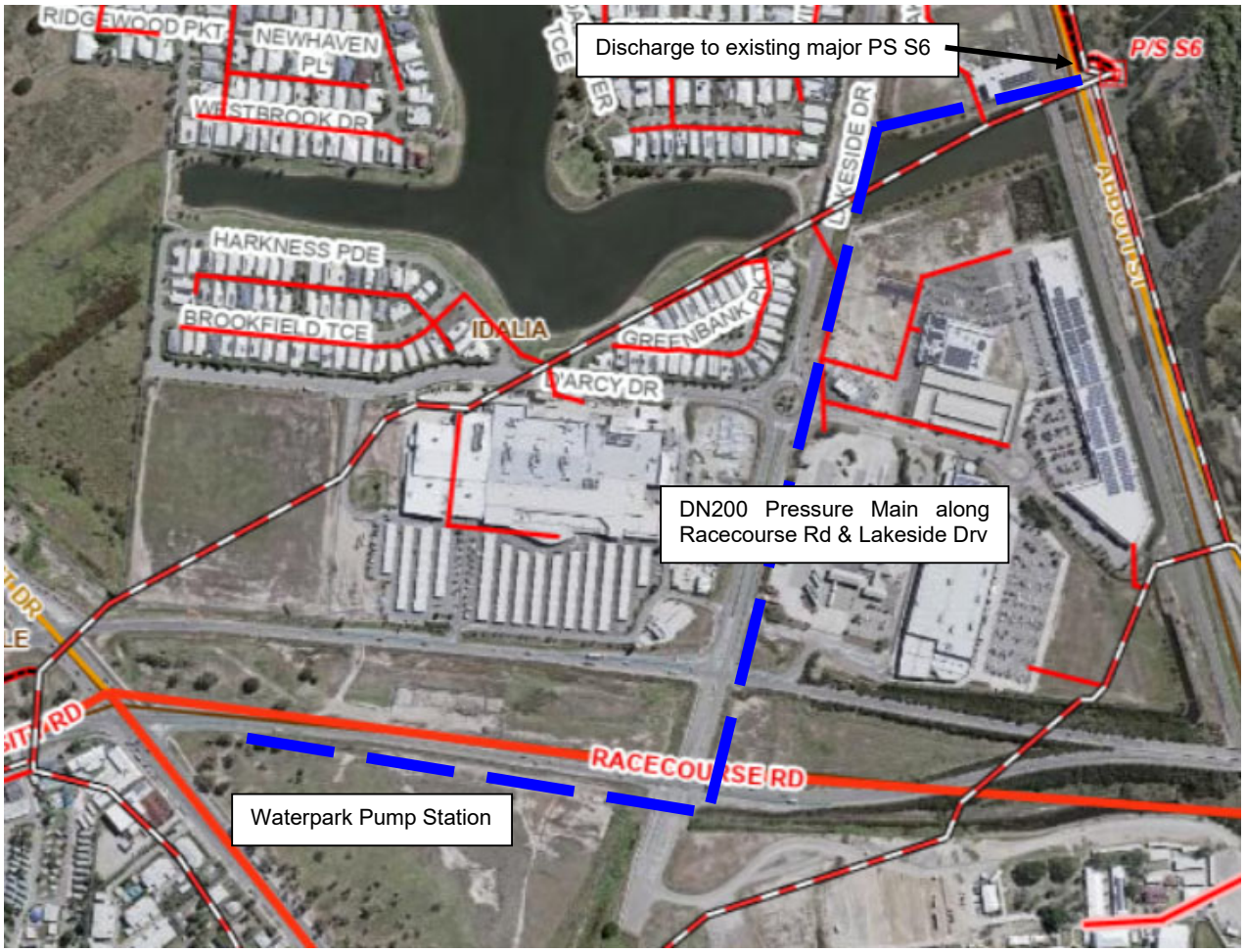


Figure 4.7 – Option 4 Major PS S6 (Cluden) Connection

Initial SewerGEMS network modelling has been undertaken to assess the sizing of the sewage pumps and pressure main for this option. The required sewer infrastructure would involve:

- A new sewage pump station would be required to service the development site. The sewage pump station would be a standard Council submersible station with an internal diameter of 2.4m and two submersible sewage pumps.
- Sewage would be pumped via a new DN200 pressure main to the east along Racecourse Rd through to the intersection with Lakeside Drv. The pressure main would then extend to the north along Lakeside Drv to the existing lake system and then to the east (along the edge of the lake) to the QR line & Abbott St. The pressure main would discharge into major PS S6 (Cluden) on the eastern side of Abbott St. The DN200 pressure main would be around 1,250 m long. The crossing of Racecourse Rd, QR line/Abbott St would need to be installed in an enveloper in accordance with DTMR & QR standards. The enveloper would be a DN375 pipe.
- The waterpark pump station would have a pump capacity of 30.5 l/s at 12m head. This is the full development peak wet weather flows plus the estimated 5 l/s water treatment backwash flows. The SewerGEMS modelling results for this option are provided in Appendix D.

- The proposed DN200 pressure main would have a velocity of 0.97 m/s which achieves the Council minimum requirement of 0.75 m/s.
- Upgrade the pumps in PS S6 (Cluden). The SewerGEMS modelling shows that the existing pumps in PS S6 can only just pump the existing theoretical peak wet weather flows from their large sewage catchment. To cater for the additional flows from the Townsville Waterpark, Hotel & Beach Club development, the existing pumps would need to be upgraded. As PS S6 trunk infrastructure and the pumps will need to be upgraded to cater for the ongoing expansion of its catchment, the cost/responsibility for the pump upgrade would be Council's (funded via infrastructure charges). The actual pump duty upgrade for the 4 x existing pumps would be determined by Council to suit the wider sewer catchment to the major pump station.

For this option, there is the potential for the Townsville Waterpark, Hotel & Beach Club development to have a higher density development (higher equivalent population) and therefore higher sewage flows. As this option is just pumping into the existing major PS S6, it is not reliant on the capacity of existing gravity sewer networks. The equivalent population for this option could be increased with the only impact being the upgrade sizing of the existing pumps in major PS S6 (Cluden).

5 SUMMARY AND CONCLUSIONS

This report assessed the performance of the existing water & sewer infrastructure to service the proposed Townsville Waterpark, Hotel & Beach Club development at the intersection of Stuart Drv and Racecourse Rd in Wulguru. The assessment has illustrated:

Water System Assessment

The existing water network has sufficient capacity to service the Townsville Waterpark, Hotel & Beach Club development with a potable water supply to the various residential and commercial uses including the replenishment of water for the various waterpark pools and rides.

The following water infrastructure will be required to service the proposed development off the existing water network in Wulguru:

- DN300 water main connection to the existing DN630 PE / DN450 DICL water main at the intersection of Stuart Drv and Watt St. The DN450 DICL water main is the trunk water main from the Wulguru reservoir.
- A DN300 water main from the above connection point to south east along Stuart Drv to the water offtake for the Waterpark (ie the water supply to the on-site water storage tanks that would provide the makeup water for the waterpark facilities) and hotel. It is assumed that this is around halfway along the Stuart Drv frontage of the development site. The actual location for the water supply connection will be determined as part of the developments detailed design.
- A DN200 water main would then extend to the south east along the Stuart Drv frontage of the development site to Edison St. The DN200 water main would then extend to the north along the proposed central development road through to Racecourse Rd. The DN200 main would then connect to the existing DN200 PVC water main on the Racecourse Rd frontage of the development site.

Sewer System Assessment

A number of options for the servicing of the Townsville Waterpark, Hotel & Beach Club development have been assessed. These options are:

Option 1 – Existing DN300 Sewer Line S8G (Turf Club Side)

- This option is unlikely to be viable as the existing sewer system has current capacity issues and would require significant upgrades to service the development flows.
- This option requires a 430m section of existing DN225 gravity sewer from MH 4A/S8G to MH 3/S8 to be upgraded to a DN300 pipe. This section of existing gravity sewer crosses under the fill embankment of the Bruce Hwy along with crossing the QR line and Abbott St.
- Upgrading the above sewer line to a DN300 pipe is considered problematic/risky due to the poor ground conditions in the area, high groundwater, ASS/PASS etc. The replacement sewer would need to be constructed by trenchless methods and would be a DN400 PE pipe (internal diameter of 300mm) installed in a DN600 enveloper pipe.
- This existing sewer system has current capacity issues which are understood to be from high levels of stormwater infiltration/inflow from the upstream gravity sewer system in Wulguru.
- A new standard Council sewage pump station would be required at the development site to service the western portion of the development (ie Precinct 3). This is because the existing DN300 sewer line in shallow and would not be able to service the waterpark development via a gravity sewer extension. A DN150 sewer pressure main from the waterpark pump station would extend to the east to discharge into MH 5/S8G over a length of around 540m.

- The pumps in existing major PS S6 would need to be upgraded. The pumps are already at their capacity limit and need to be upgraded by Council to service the expanding development in its large sewer catchment area.

Option 2 – Existing DN300 Sewer Line S7 (Fairfield Waters)

- This option would only be viable if the equivalent population of the development was reduced or if the section of existing DN300 gravity sewer from MH2/S7 to MH A1/S7 (located under the existing lake and Lakeside Drv bridge and over 197m long) was upgraded to a DN375 pipe.
- A new standard Council sewage pump station would be required at the development site.
- A new DN200 pressure main would extend to the north under Racecourse Rd to discharge into the existing DN300 gravity sewer at MH 10/S7 (located at the eastern side of Stuart Drv/Racecourse Rd intersection). The new DN200 pressure main would be around 420m long.
- The majority of the existing DN300/375 sewer from MH 10/S7 to MH 1A/SWT has sufficient capacity for the estimated equivalent population and sewer flows from the development. There is only one section of sewer that has capacity issues being the DN300 gravity sewer from MH2/S7 to MH 1/S7 (located under the existing lake and Lakeside Drv bridge).
- The pumps in existing major PS S6 would need to be upgraded. The pumps are already at their capacity limit and need to be upgraded by Council to service the expanding development in its large sewer catchment area.

Option 3 – Pumped to Southern Suburbs Pressure Main (Stuart Drv)

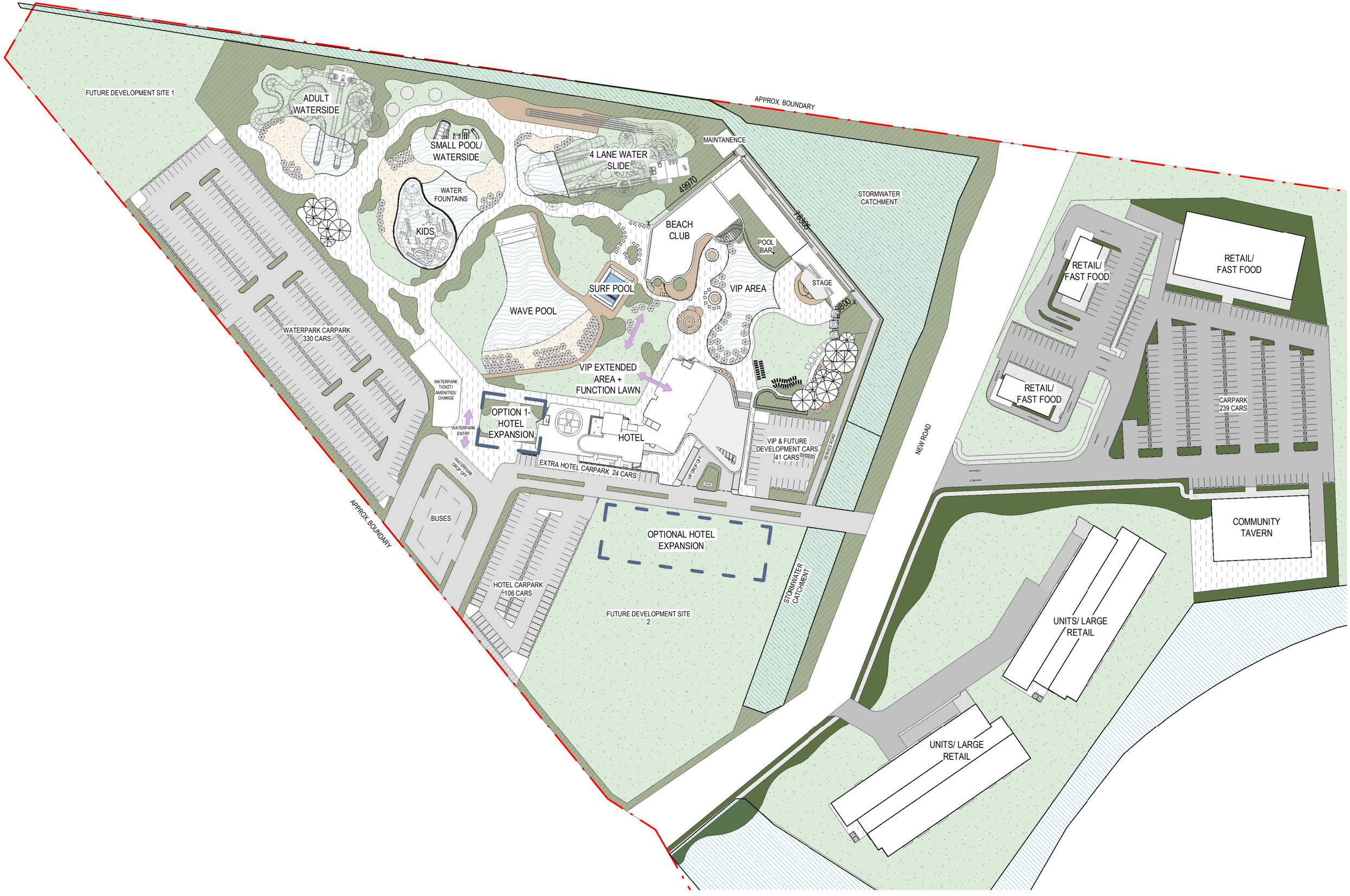
- This option was shown as being viable and capable of servicing the full development sewage flows. Higher density development (higher EP) could also be serviced for this option.
- A new standard Council sewage pump station would be required at the development site.
- A new DN200 pressure main would extend to the north along Stuart Drv to discharge into the existing DN750 PE common pressure main at the intersection with Kokoda St. The new DN200 pressure main would be around 1,800m long.

Option 4 – Pumped to Major PS S6 (Cluden)

- This option was shown as being viable and capable of servicing the full development sewage flows. Higher density development (higher EP) could also be serviced for this option.
- A new standard Council sewage pump station would be required at the development site.
- A new DN200 pressure main would extend to the east along Racecourse Rd, north along Lakeside Drv and east along the edge of the existing lake to discharge into major PS S6 (Cluden). The pressure main would be around 1,250m long.
- The pumps in existing major PS S6 would need to be upgraded. The pumps are already at their capacity limit and need to be upgraded by Council to service the expanding development in its large sewer catchment area.

The water & sewer assessment detailed in this report shows that there are viable options for the servicing of the Townsville Waterpark, Hotel & Beach Club development with a water & sewer system.

APPENDIX A
TOWNSVILLE WATERPARK, HOTEL & BEACH CLUB DEVELOPMENT - CONCEPT PLANS



2407 TSV Hotel & Water Park

CA Architects
Cairns | Brisbane | Townsville
e: reception@caarchitects.com.au t: +617 4031 6367

Masterplan

2407_ PD A-001
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MASTERPLANNING

Shaun McCarthy 1 : 1500 @ A3

SUITE YEILD	
SUITE TYPE 1 (SML)	x27
SUITE TYPE 1 (LARGE)	x5
TOTAL	**x32**

GFA	
SUITES	930m²
BALCONIES	317m²
COMMON AREAS	250m²
TOTAL	**1,497m²**

TSV Hotel + Waterpark

CA Architects
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e: reception@caarchitects.com.au t: +617 4031 6367

Typical Plan

0000_ PD A-104 Rev 1
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21/06/2024 3:28:35 PM
CONCEPT DESIGN

Shaun Mccarthy

0 2 5 10m 12.5m
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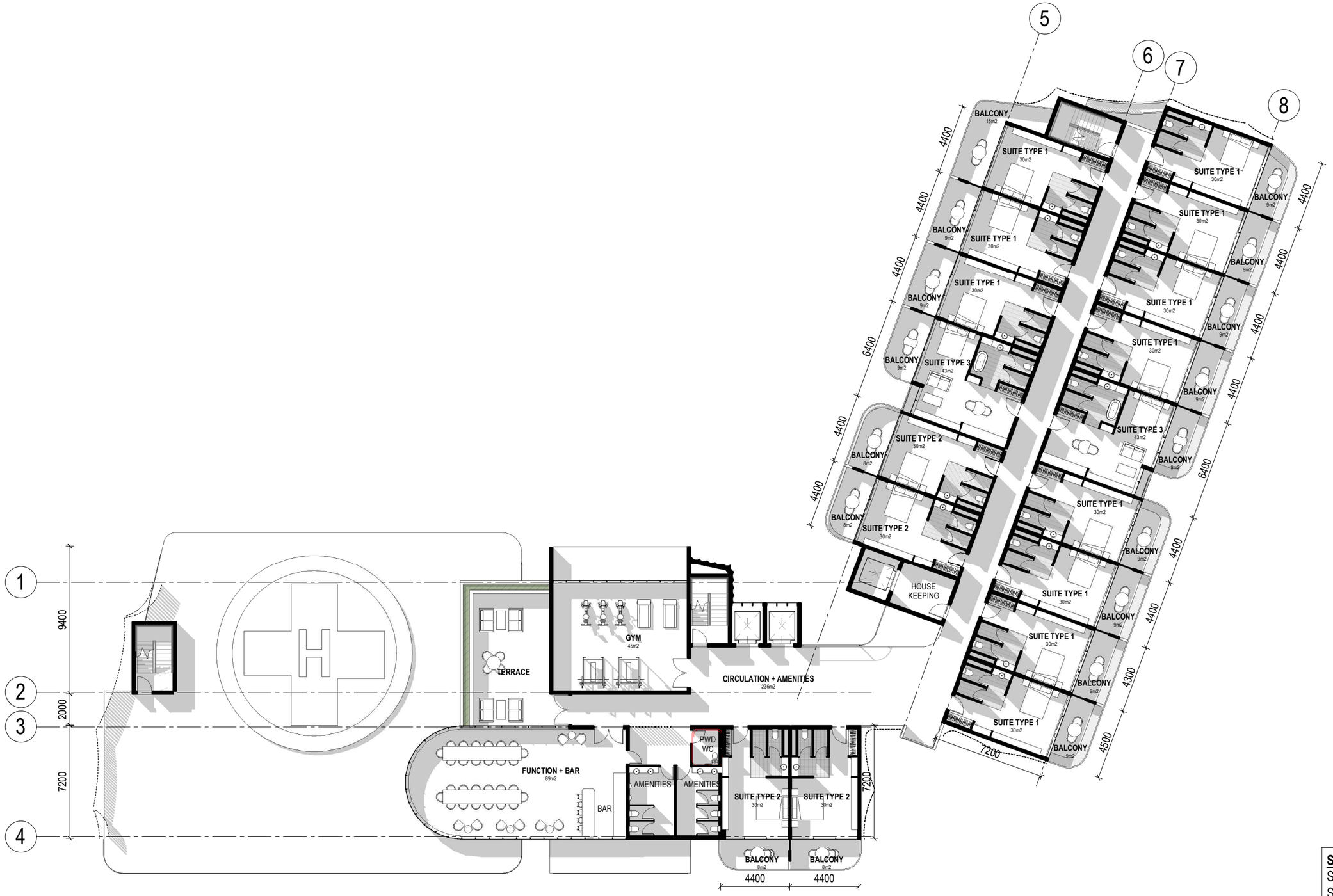

SUITE YEILD	
SUITE TYPE 1 (SML)	x15
SUITE TYPE 1 (LARGE)	x2
TOTAL	**x17**

GFA	
SUITES	536m^2
BALCONIES	155m^2
COMMON AREAS	370m^2
TOTAL	**1,061m^2**

TSV Hotel + Waterpark

CA Architects
Cairns | Brisbane | Townsville
e: reception@caarchitects.com.au t: +617 4031 6367

Roof Terrace Plan

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Shaun Mccarthy 1 : 250 @ A3

0 2 5 10m 12.5m
Scale 1:250

VISUALISATION
AERIAL VIEW

MASTERPLAN
BUBBLE DIAGRAM

Located in a Greenfield site in Cluden, Townsville, the Circuit Breaker masterplan proposes a multi faced development comprising of large format retail, community tavern, multi residential units and a hotel, which are all anchored by a water park with dedicated VIP club.

As a sunny coastal city where the vibrant community thrives amidst the tropical climate, the addition of a waterpark and VIP club serves as a fitting oasis for locals and tourists alike. The facility would serve not just as recreational facility; but as a testament to the city's commitment to leisure, entertainment, and embracing its natural surroundings.
Townsville's warm climate provides the perfect backdrop for a waterpark adventure. This is bolstered by Townsville's strong emphasis on community and outdoor recreation, with a waterpark catering to a diverse range of age groups and interests, fostering a sense of unity and camaraderie among residents.

Likewise, the VIP Beach Club aligns with the city's lifestyle and love for entertainment, and is further reinforced through Townsville's thriving tourism industry and affluent demographic making it an ideal location to create a popular destination for both domestic and international travellers. By hosting curated events and live performances, the beach club becomes a focal point for entertainment, and leisure in the city.

Further supported by units, hotel, and large format retail, the development has the potential to become a hub of entertainment and social activity, further enhancing the city's vibrant waterfront scene and adding to the depth and dynamism to the city's social fabric, attracting a diverse audience and fostering a sense of community pride and belonging.

PRECINCT BREAKDOWN

PRECINCT 1 - RETAIL/ FASTFOOD

SITE AREAS	
- AREA	24,300m2
COMMERCIAL SITE AREAS	
- RETAIL FAST FOOD 1	3,700m2
- RETAIL FAST FOOD 2	3,600m2
- RETAIL FAST FOOD 3	3,000m2
- COMMUNITY TAVERN	3,100m2
PARKING	
- REQUIRED	x 275 (EST)
- SUPPLIED	x 240

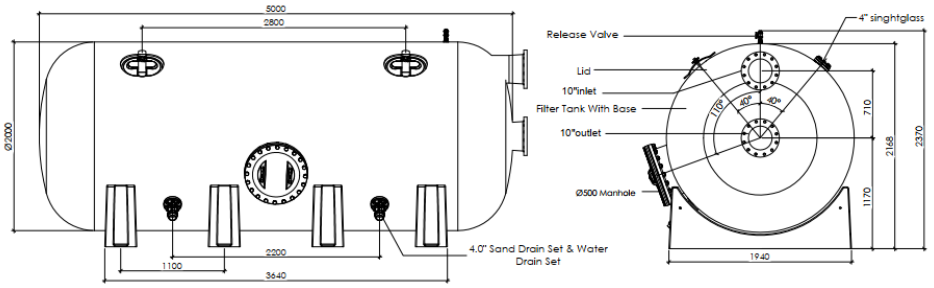
PRECINCT 2 - UNITS OR LARGE FORMAT RETAIL

SITE AREAS	
- AREA	23,250m2
APARTMENTS A + B AS SHOWN	
- GROUND	x 170 CARS
- LEVEL 2	x 178 CARS
- LEVEL 3	x 44 UNITS
- LEVEL 4	x 44 UNITS
- LEVEL 5	x 44 UNITS
- LEVEL 6	x 44 UNITS
- LEVEL 7	x 44 UNITS
- LEVEL 8	x 10 UNITS
TOTAL	x 230 UNITS
PARKING	
- REQUIRED (1.5/UNITS)	x 173
- SUPPLIED	x 174

PRECINCT 3 - WATERPARK/ VIP/ HOTEL

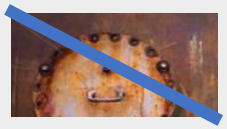
SITE AREAS		
- HOTEL		2,490m2
- WATERPARK		2,3710m2
- VIP CLUB		8,900m2
- VIP EXTENDED AREA		1,630m2
FUTURE DEVELOPMENT SITE 1		11,100m2
FUTURE DEVELOPMENT SITE 2		5,950m2
HOTEL SUITES		
- LEVEL 1	SUITES	x 50
- LEVEL 2	SUITES	x 50
- LEVEL 3	SUITES	x 50
- LEVEL 4	SUITES	x 50
TOTAL		x 200
PARKING		
- REQUIRED		x 300 (EST)
- SUPPLIED		x 528

APPENDIX B
BACKWASH FILTER SYSTEM PRELIMINARY DATA



The perfect water filtration solution for Aquatic Centers, Aquatic Parks , Olympic pools

Emaux GRP commercial fiberglass bobbin wound filter specially designed for AFM®ng catalytic and hydrophobic glass media developed by Dryden Aqua, offers the perfect match to meet high level of water quality standards.



No corrosion.
Sea water resistant.

↓ Low operation cost compared to regenerative media filters with hazardous media waste disposal.

Fully prevents bacterial growth, biofouling and channeling of filter bed for most reliable filtration.

↓ Cl Significantly lowers chlorine oxidation demand.

↓ DBPs Prevents the formation of harmful disinfection by-products (THMs, NCl3).

Filter model : **Horizontal 2000-5000 – 10" (250)**
Ø 2000 mm – Length 5000 mm.
Flanges : 10" (250)
Lateral manhole: 500 mm.
Sight-glass, air release valve, bottom water drains.

Easy logistics
Fits 2 units in standard 40' HC container

↓ NTU

1 micron

PERFORMANCE

Filtration area: **9.11** m^2
Working pressure: **4** bar
Test pressure: 6 bar
Flow : **182.2** m^3/h at 20 $m^3/h/m^2$

Media load (top to bottom):

9.53 m^3 **AFM® ng Grade 1 (0.4-0.8mm)** 12000 Kg

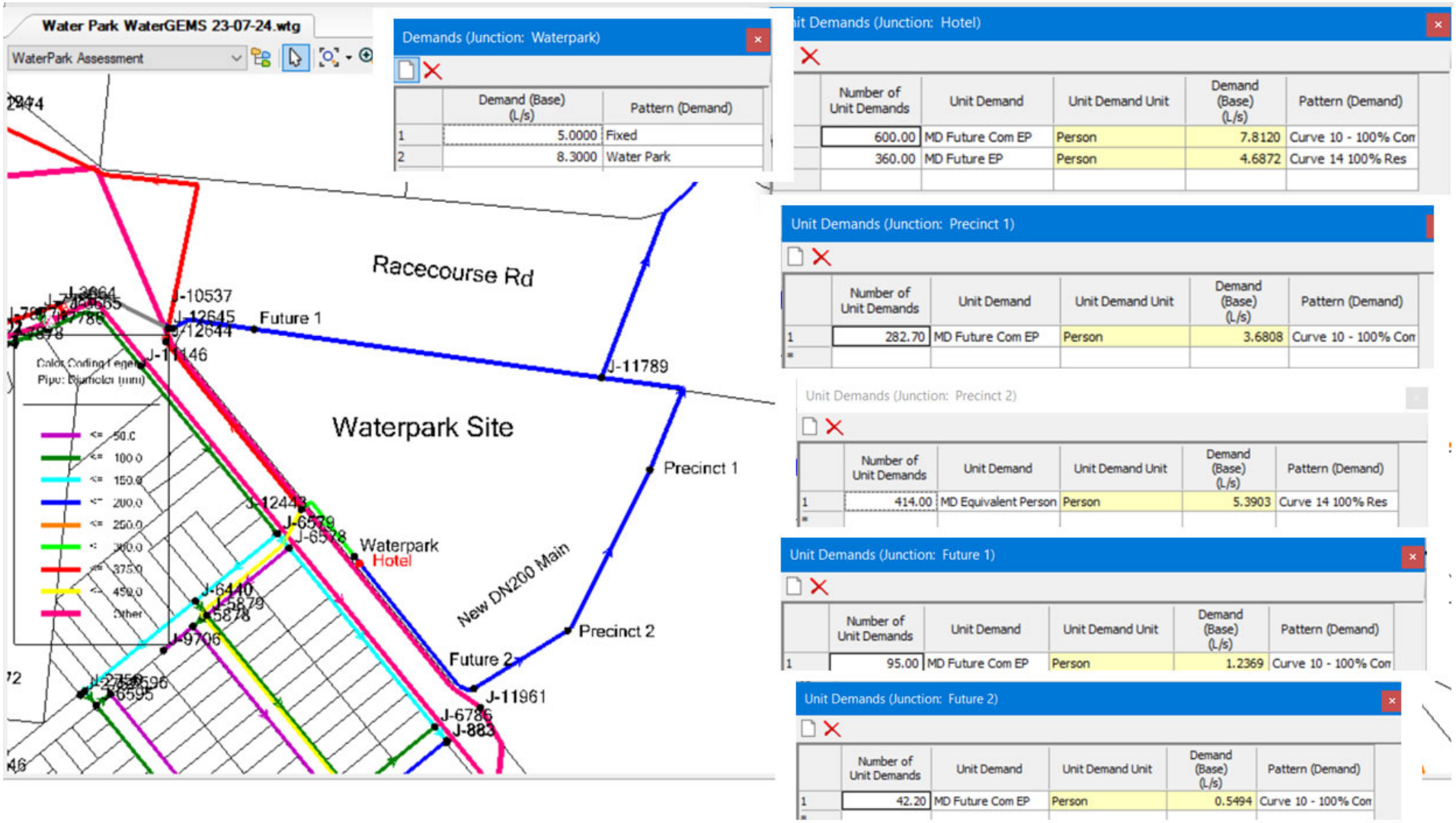
0.62 m^3 **AFM® ng Grade 2 (0.7-2mm)** 775 Kg

1.00 m^3 **AFM® Grade 3 (2-4mm)** 1250 Kg

Further information:
Emaux
E xavier@emaux.com.hk
www.emauxgroup.com

DrydenAqua
sales@drydenaqua.com
www.drydenaqua.com

APPENDIX C
WATER MODELLING FIGURES & RESULTS



Demands (Junction: Waterpark)

	Demand (Base) (L/s)	Pattern (Demand)
1	5.0000	Fixed
2	8.3000	Water Park

Unit Demands (Junction: Hotel)

	Number of Unit Demands	Unit Demand	Unit Demand Unit	Demand (Base) (L/s)	Pattern (Demand)
	600.00	MD Future Com EP	Person	7.8120	Curve 10 - 100% Com
	360.00	MD Future EP	Person	4.6872	Curve 14 100% Res

Unit Demands (Junction: Precinct 1)

	Number of Unit Demands	Unit Demand	Unit Demand Unit	Demand (Base) (L/s)	Pattern (Demand)
1	282.70	MD Future Com EP	Person	3.6808	Curve 10 - 100% Com

Unit Demands (Junction: Precinct 2)

	Number of Unit Demands	Unit Demand	Unit Demand Unit	Demand (Base) (L/s)	Pattern (Demand)
1	414.00	MD Equivalent Person	Person	5.3903	Curve 14 100% Res

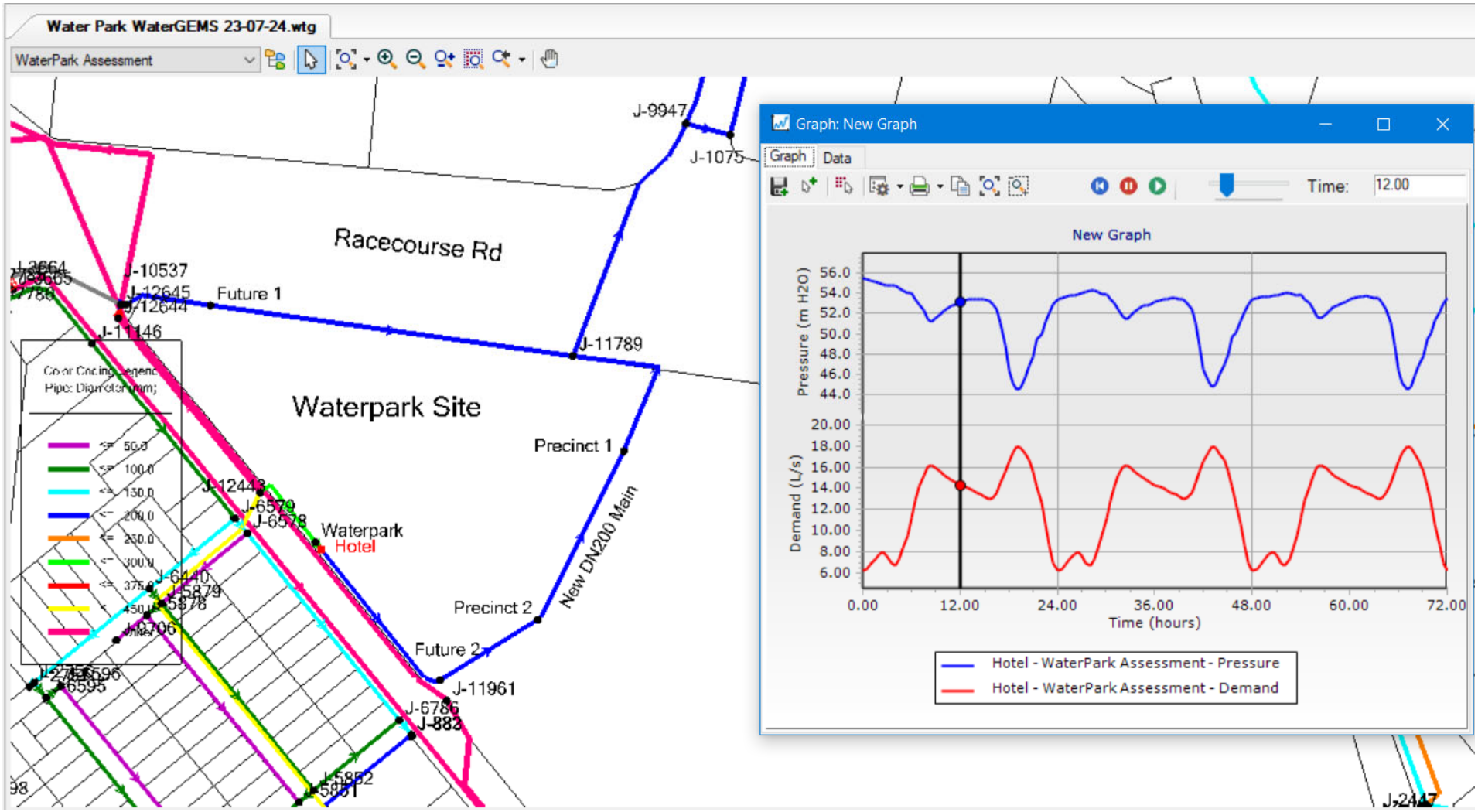
Unit Demands (Junction: Future 1)

	Number of Unit Demands	Unit Demand	Unit Demand Unit	Demand (Base) (L/s)	Pattern (Demand)
1	95.00	MD Future Com EP	Person	1.2369	Curve 10 - 100% Com

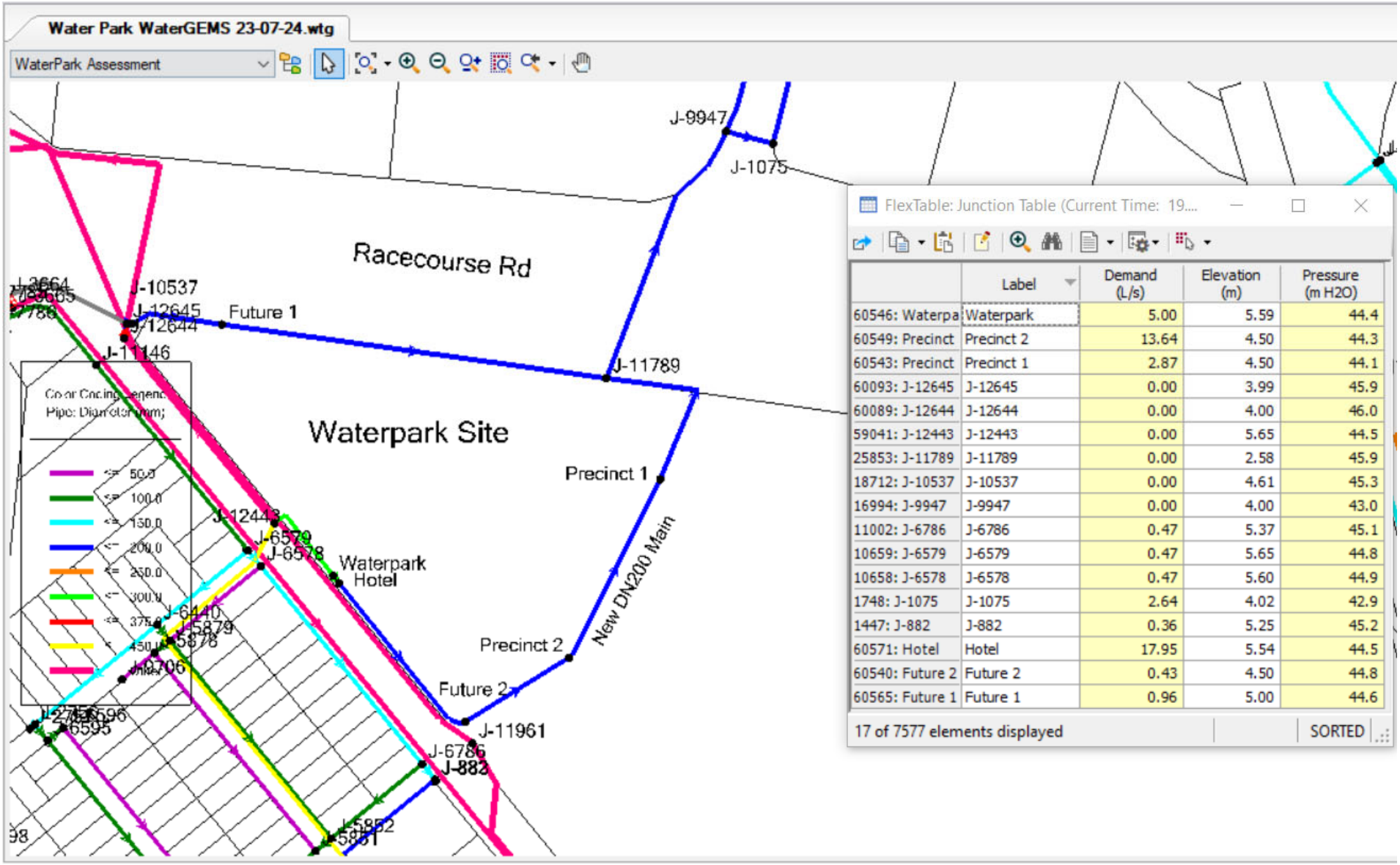
Unit Demands (Junction: Future 2)

	Number of Unit Demands	Unit Demand	Unit Demand Unit	Demand (Base) (L/s)	Pattern (Demand)
1	42.20	MD Future Com EP	Person	0.5494	Curve 10 - 100% Com

WATERPARK - WATER DEMANDS

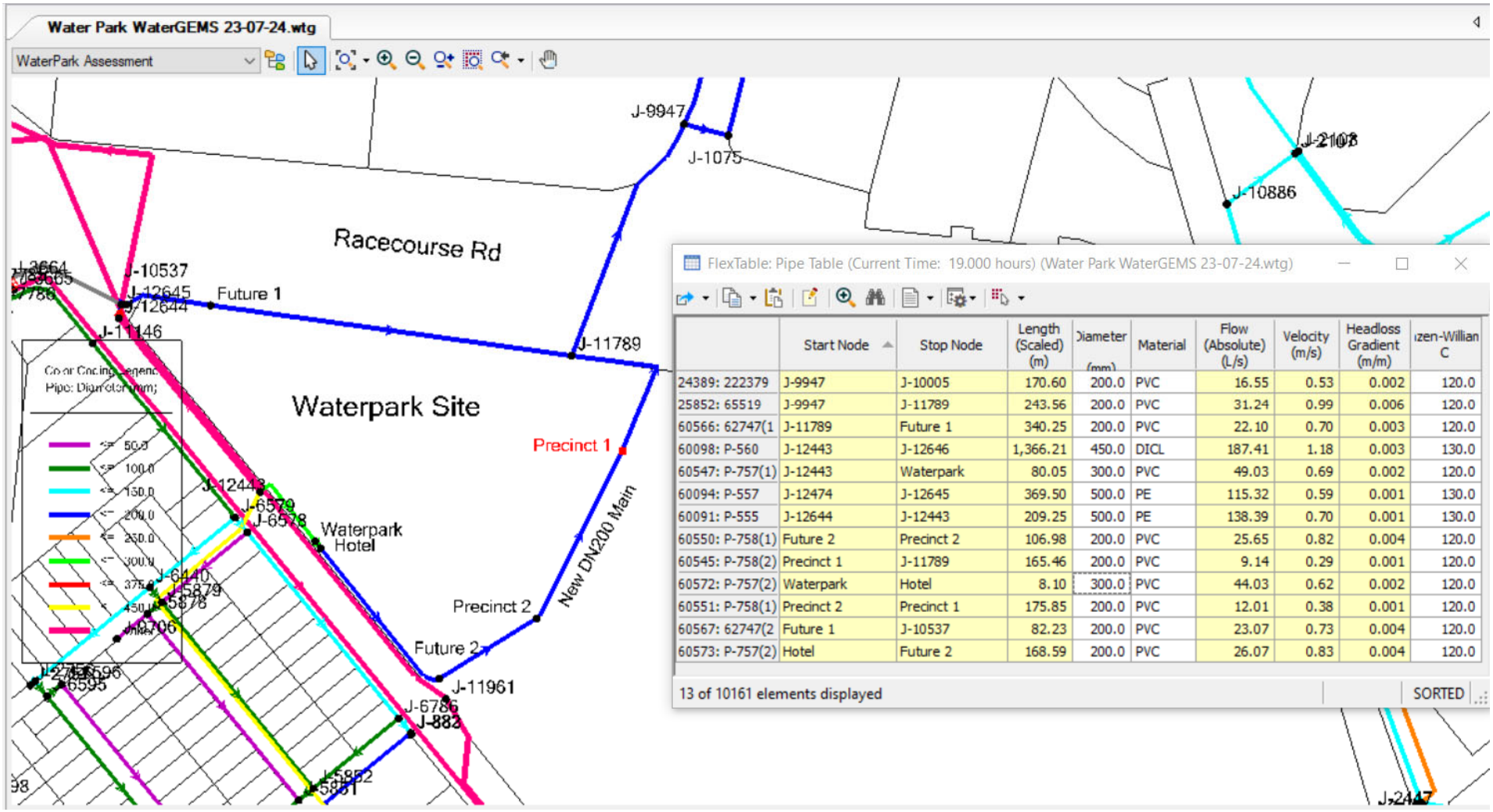


WATERPARK HOTEL & VISITORS – PEAK HOUR DIURNAL WATER DEMANDS



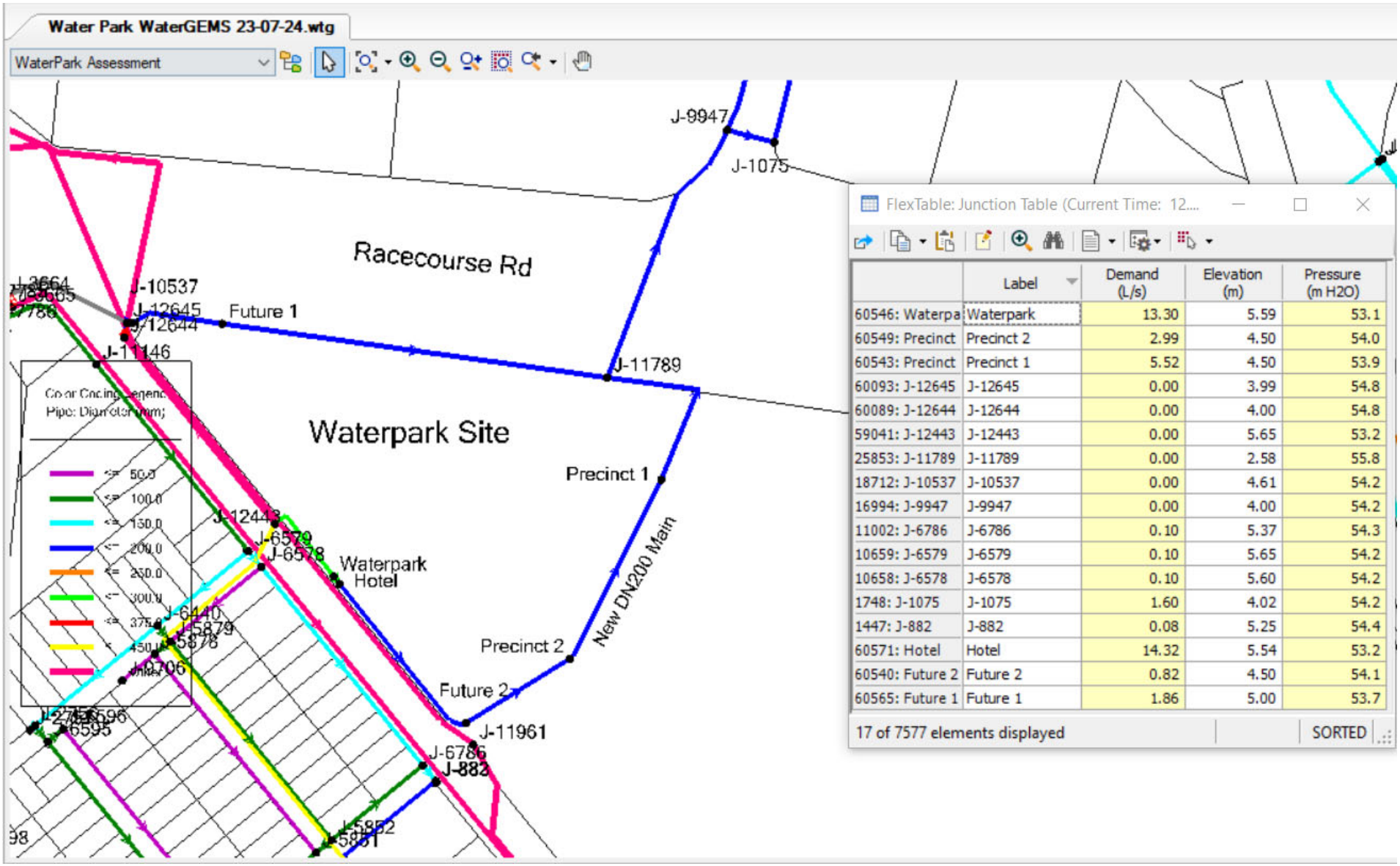
	Label	Demand (L/s)	Elevation (m)	Pressure (m H2O)
60546: Waterpa	Waterpark	5.00	5.59	44.4
60549: Precinct	Precinct 2	13.64	4.50	44.3
60543: Precinct	Precinct 1	2.87	4.50	44.1
60093: J-12645	J-12645	0.00	3.99	45.9
60089: J-12644	J-12644	0.00	4.00	46.0
59041: J-12443	J-12443	0.00	5.65	44.5
25853: J-11789	J-11789	0.00	2.58	45.9
18712: J-10537	J-10537	0.00	4.61	45.3
16994: J-9947	J-9947	0.00	4.00	43.0
11002: J-6786	J-6786	0.47	5.37	45.1
10659: J-6579	J-6579	0.47	5.65	44.8
10658: J-6578	J-6578	0.47	5.60	44.9
1748: J-1075	J-1075	2.64	4.02	42.9
1447: J-882	J-882	0.36	5.25	45.2
60571: Hotel	Hotel	17.95	5.54	44.5
60540: Future 2	Future 2	0.43	4.50	44.8
60565: Future 1	Future 1	0.96	5.00	44.6

PEAK HOUR - WATER DEMAND & PRESSURES (19hr)



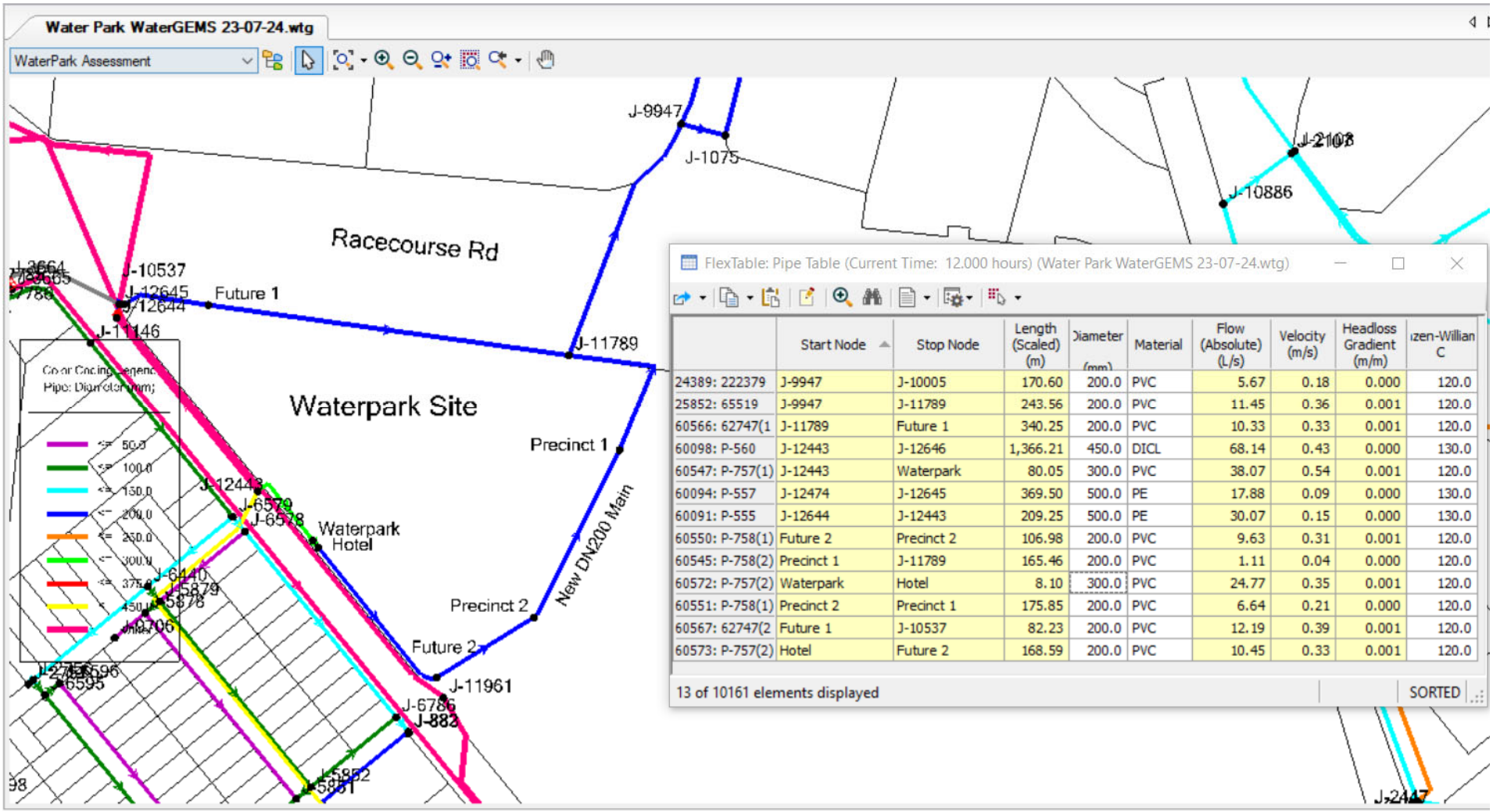
	Start Node	Stop Node	Length (Scaled) (m)	Diameter (mm)	Material	Flow (Absolute) (L/s)	Velocity (m/s)	Headloss Gradient (m/m)	Hazen-Williams C
24389: 222379	J-9947	J-10005	170.60	200.0	PVC	16.55	0.53	0.002	120.0
25852: 65519	J-9947	J-11789	243.56	200.0	PVC	31.24	0.99	0.006	120.0
60566: 62747(1	J-11789	Future 1	340.25	200.0	PVC	22.10	0.70	0.003	120.0
60098: P-560	J-12443	J-12646	1,366.21	450.0	DICL	187.41	1.18	0.003	130.0
60547: P-757(1)	J-12443	Waterpark	80.05	300.0	PVC	49.03	0.69	0.002	120.0
60094: P-557	J-12474	J-12645	369.50	500.0	PE	115.32	0.59	0.001	130.0
60091: P-555	J-12644	J-12443	209.25	500.0	PE	138.39	0.70	0.001	130.0
60550: P-758(1)	Future 2	Precinct 2	106.98	200.0	PVC	25.65	0.82	0.004	120.0
60545: P-758(2)	Precinct 1	J-11789	165.46	200.0	PVC	9.14	0.29	0.001	120.0
60572: P-757(2)	Waterpark	Hotel	8.10	300.0	PVC	44.03	0.62	0.002	120.0
60551: P-758(1)	Precinct 2	Precinct 1	175.85	200.0	PVC	12.01	0.38	0.001	120.0
60567: 62747(2	Future 1	J-10537	82.23	200.0	PVC	23.07	0.73	0.004	120.0
60573: P-757(2)	Hotel	Future 2	168.59	200.0	PVC	26.07	0.83	0.004	120.0

PEAK HOUR - WATER MAIN FLOWS (19hr)



	Label	Demand (L/s)	Elevation (m)	Pressure (m H2O)
60546: Waterpa	Waterpark	13.30	5.59	53.1
60549: Precinct	Precinct 2	2.99	4.50	54.0
60543: Precinct	Precinct 1	5.52	4.50	53.9
60093: J-12645	J-12645	0.00	3.99	54.8
60089: J-12644	J-12644	0.00	4.00	54.8
59041: J-12443	J-12443	0.00	5.65	53.2
25853: J-11789	J-11789	0.00	2.58	55.8
18712: J-10537	J-10537	0.00	4.61	54.2
16994: J-9947	J-9947	0.00	4.00	54.2
11002: J-6786	J-6786	0.10	5.37	54.3
10659: J-6579	J-6579	0.10	5.65	54.2
10658: J-6578	J-6578	0.10	5.60	54.2
1748: J-1075	J-1075	1.60	4.02	54.2
1447: J-882	J-882	0.08	5.25	54.4
60571: Hotel	Hotel	14.32	5.54	53.2
60540: Future 2	Future 2	0.82	4.50	54.1
60565: Future 1	Future 1	1.86	5.00	53.7

PEAK HOUR - WATER DEMAND & PRESSURES (12 noon)

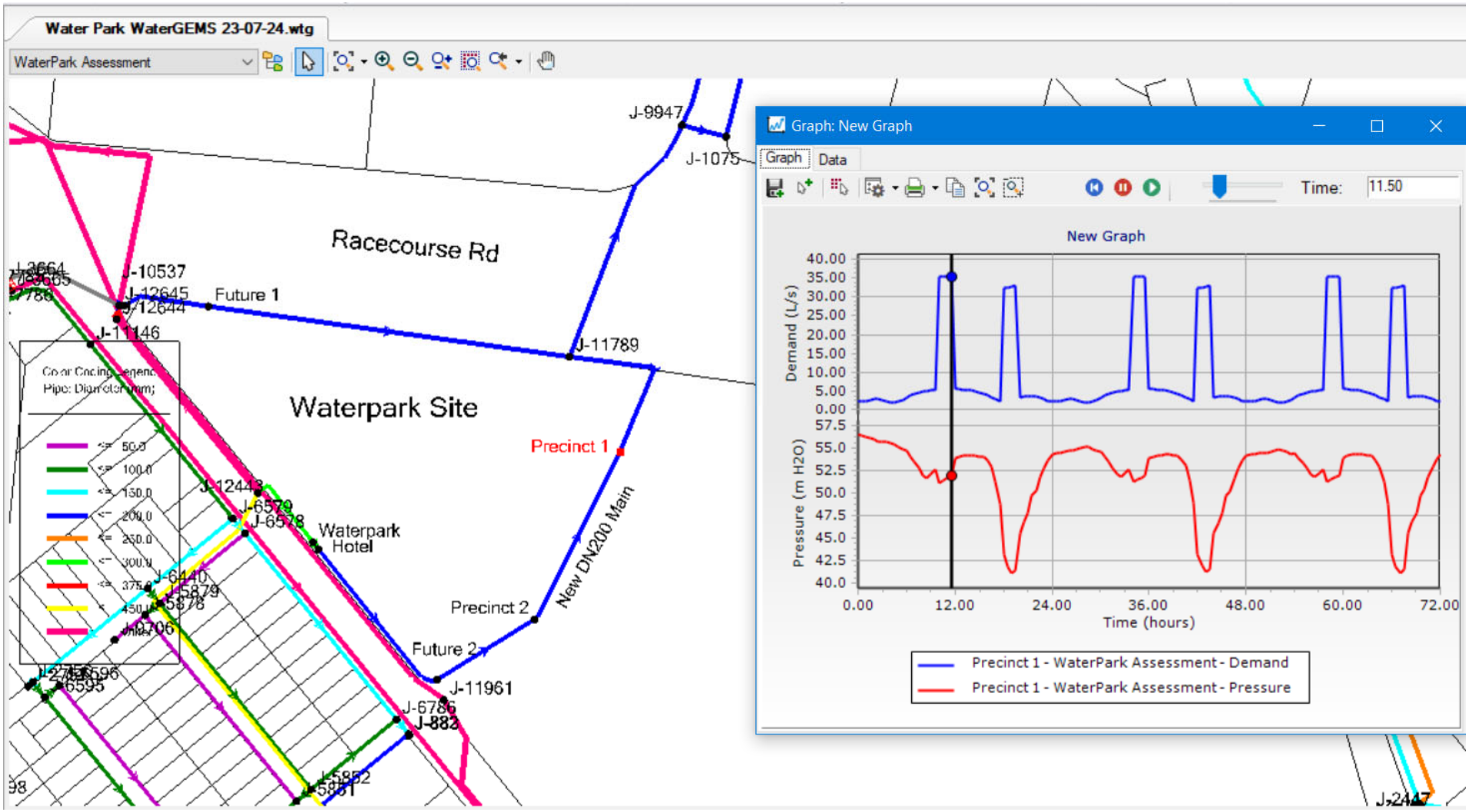


FlexTable: Pipe Table (Current Time: 12.000 hours) (Water Park WaterGEMS 23-07-24.wtg)

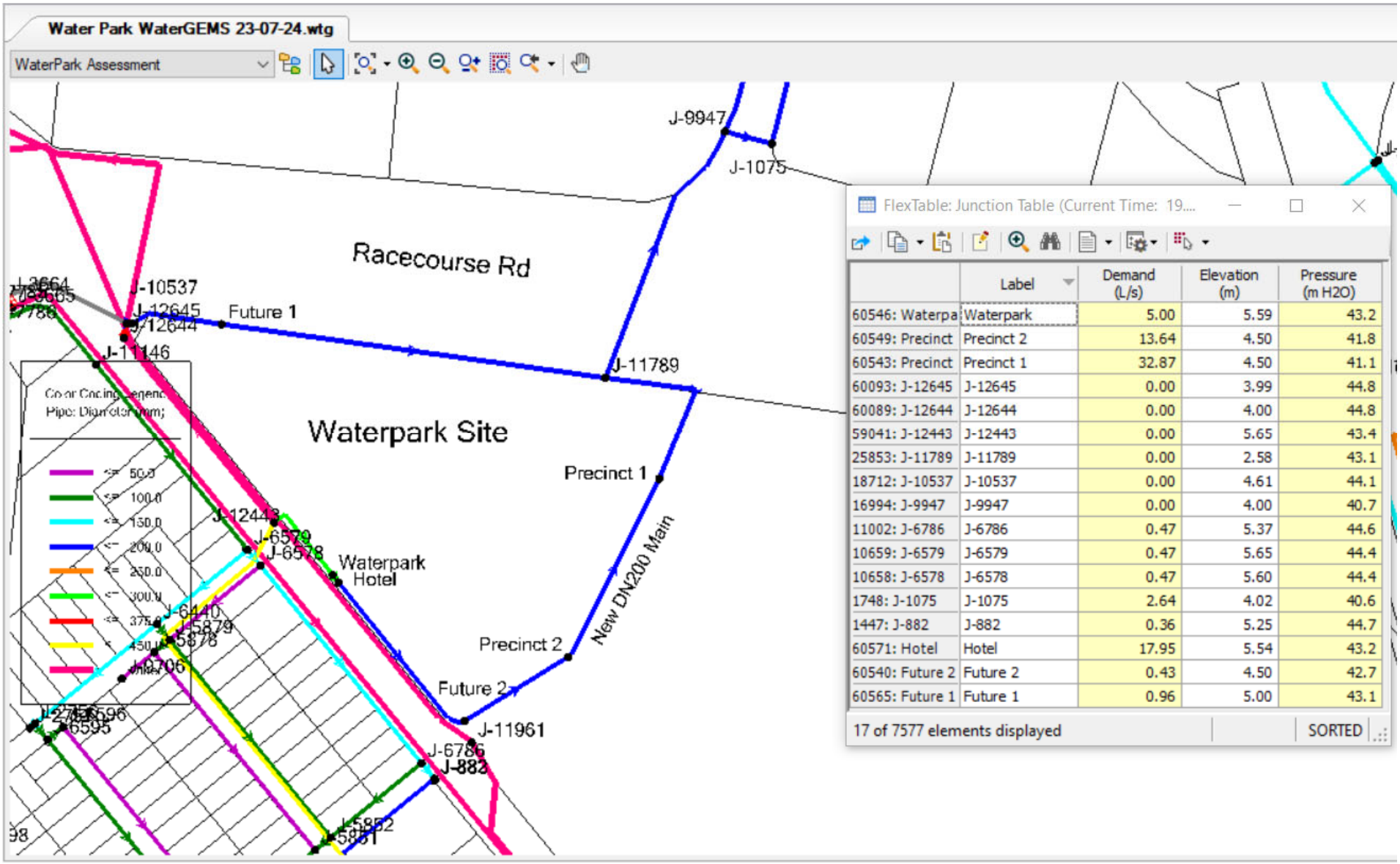
	Start Node	Stop Node	Length (Scaled) (m)	Diameter (mm)	Material	Flow (Absolute) (L/s)	Velocity (m/s)	Headloss Gradient (m/m)	Hazen-Willian C
24389: 222379	J-9947	J-10005	170.60	200.0	PVC	5.67	0.18	0.000	120.0
25852: 65519	J-9947	J-11789	243.56	200.0	PVC	11.45	0.36	0.001	120.0
60566: 62747(1	J-11789	Future 1	340.25	200.0	PVC	10.33	0.33	0.001	120.0
60098: P-560	J-12443	J-12646	1,366.21	450.0	DICL	68.14	0.43	0.000	130.0
60547: P-757(1)	J-12443	Waterpark	80.05	300.0	PVC	38.07	0.54	0.001	120.0
60094: P-557	J-12474	J-12645	369.50	500.0	PE	17.88	0.09	0.000	130.0
60091: P-555	J-12644	J-12443	209.25	500.0	PE	30.07	0.15	0.000	130.0
60550: P-758(1)	Future 2	Precinct 2	106.98	200.0	PVC	9.63	0.31	0.001	120.0
60545: P-758(2)	Precinct 1	J-11789	165.46	200.0	PVC	1.11	0.04	0.000	120.0
60572: P-757(2)	Waterpark	Hotel	8.10	300.0	PVC	24.77	0.35	0.001	120.0
60551: P-758(1)	Precinct 2	Precinct 1	175.85	200.0	PVC	6.64	0.21	0.000	120.0
60567: 62747(2	Future 1	J-10537	82.23	200.0	PVC	12.19	0.39	0.001	120.0
60573: P-757(2)	Hotel	Future 2	168.59	200.0	PVC	10.45	0.33	0.001	120.0

13 of 10161 elements displayed | SORTED

PEAK HOUR – WATER MAIN FLOWS (12 noon)

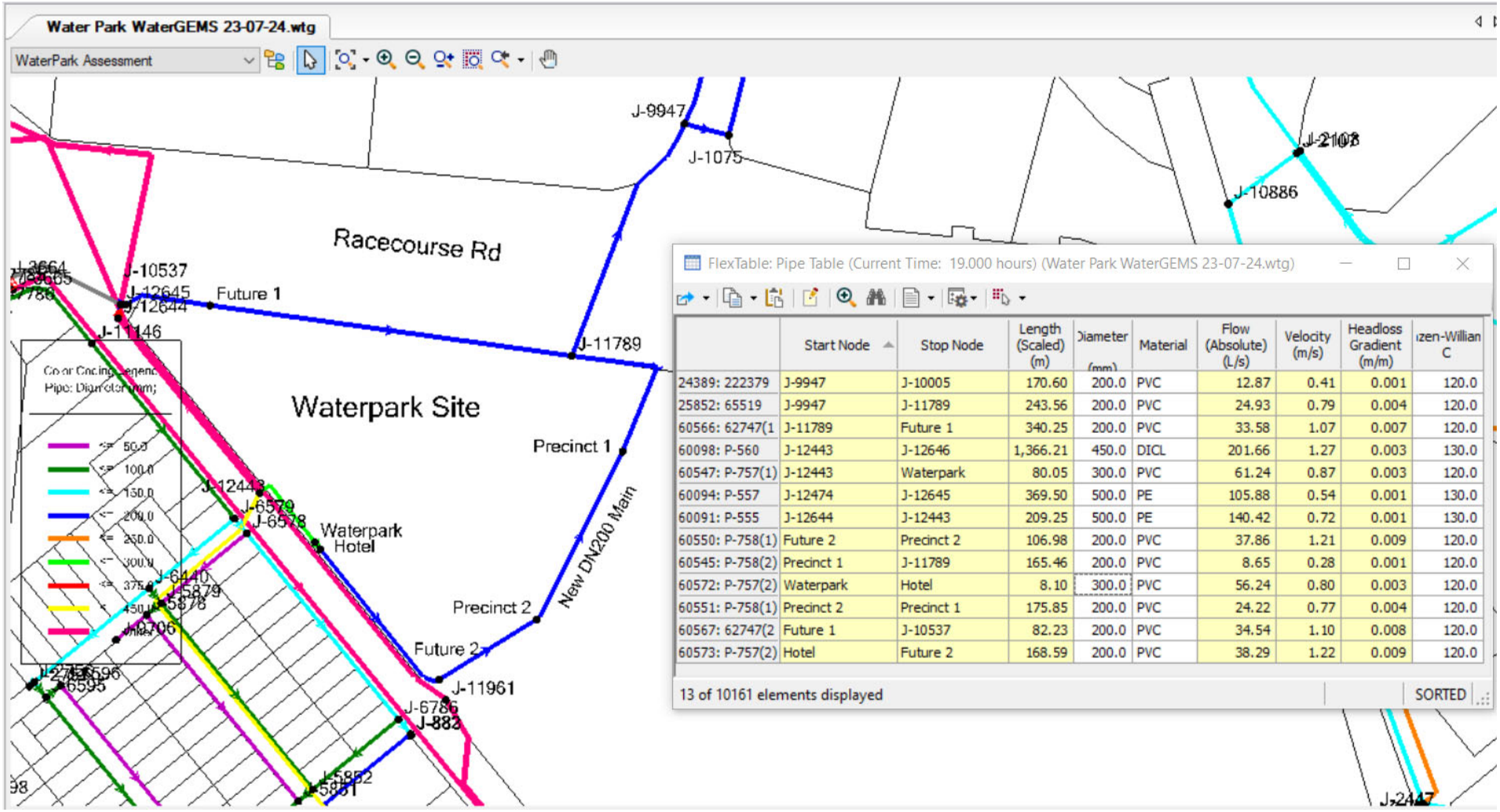


FIRE FLOW WATER DEMAND & PRESSURE FIGURE



	Label	Demand (L/s)	Elevation (m)	Pressure (m H2O)
60546: Waterpa	Waterpark	5.00	5.59	43.2
60549: Precinct	Precinct 2	13.64	4.50	41.8
60543: Precinct	Precinct 1	32.87	4.50	41.1
60093: J-12645	J-12645	0.00	3.99	44.8
60089: J-12644	J-12644	0.00	4.00	44.8
59041: J-12443	J-12443	0.00	5.65	43.4
25853: J-11789	J-11789	0.00	2.58	43.1
18712: J-10537	J-10537	0.00	4.61	44.1
16994: J-9947	J-9947	0.00	4.00	40.7
11002: J-6786	J-6786	0.47	5.37	44.6
10659: J-6579	J-6579	0.47	5.65	44.4
10658: J-6578	J-6578	0.47	5.60	44.4
1748: J-1075	J-1075	2.64	4.02	40.6
1447: J-882	J-882	0.36	5.25	44.7
60571: Hotel	Hotel	17.95	5.54	43.2
60540: Future 2	Future 2	0.43	4.50	42.7
60565: Future 1	Future 1	0.96	5.00	43.1

FIRE FLOW - WATER DEMAND & PRESSURES (19hr)

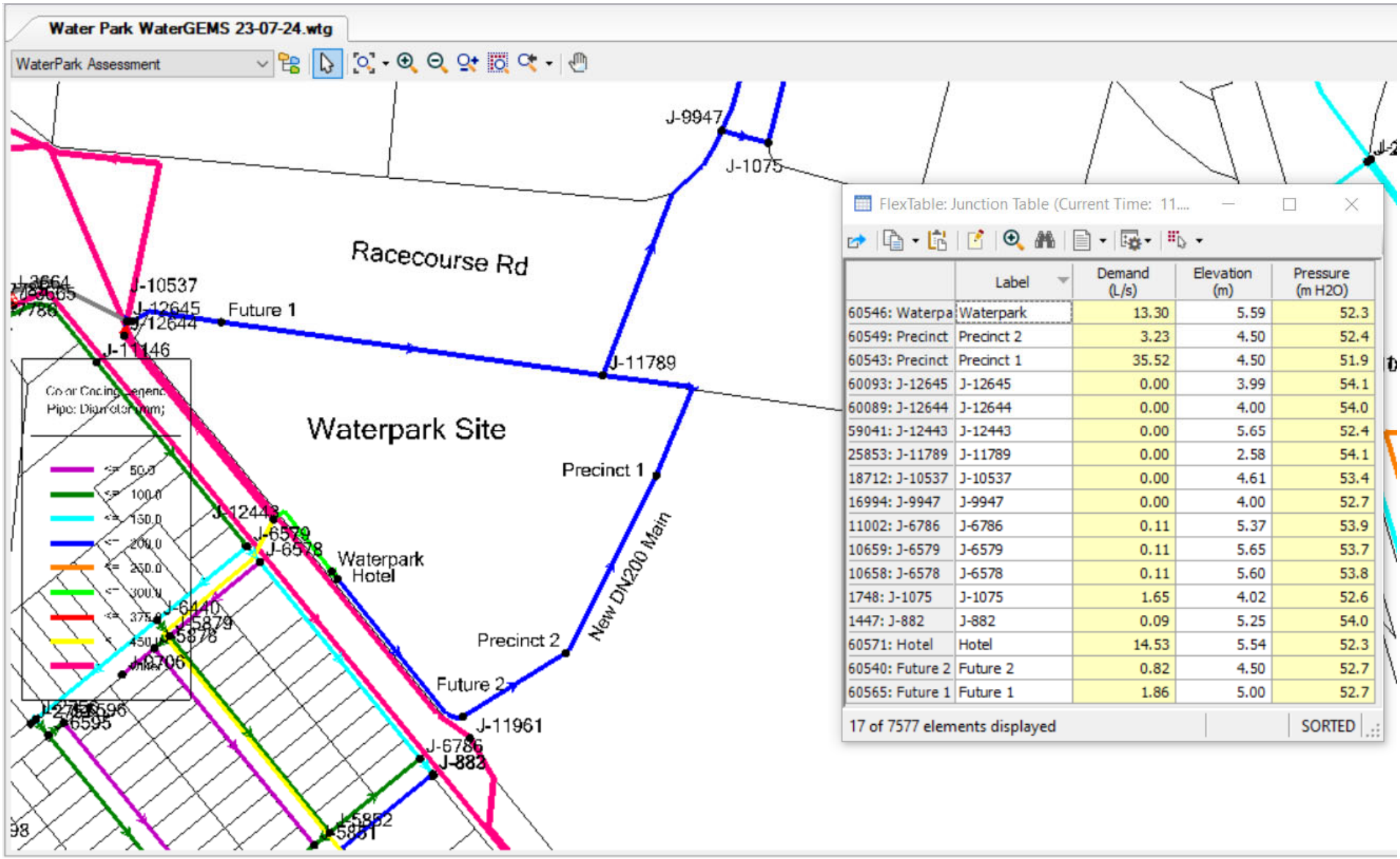


FlexTable: Pipe Table (Current Time: 19.000 hours) (Water Park WaterGEMS 23-07-24.wtg)

	Start Node	Stop Node	Length (Scaled) (m)	Diameter (mm)	Material	Flow (Absolute) (L/s)	Velocity (m/s)	Headloss Gradient (m/m)	Hazen-Williams C
24389: 222379	J-9947	J-10005	170.60	200.0	PVC	12.87	0.41	0.001	120.0
25852: 65519	J-9947	J-11789	243.56	200.0	PVC	24.93	0.79	0.004	120.0
60566: 62747(1	J-11789	Future 1	340.25	200.0	PVC	33.58	1.07	0.007	120.0
60098: P-560	J-12443	J-12646	1,366.21	450.0	DICL	201.66	1.27	0.003	130.0
60547: P-757(1)	J-12443	Waterpark	80.05	300.0	PVC	61.24	0.87	0.003	120.0
60094: P-557	J-12474	J-12645	369.50	500.0	PE	105.88	0.54	0.001	130.0
60091: P-555	J-12644	J-12443	209.25	500.0	PE	140.42	0.72	0.001	130.0
60550: P-758(1)	Future 2	Precinct 2	106.98	200.0	PVC	37.86	1.21	0.009	120.0
60545: P-758(2)	Precinct 1	J-11789	165.46	200.0	PVC	8.65	0.28	0.001	120.0
60572: P-757(2)	Waterpark	Hotel	8.10	300.0	PVC	56.24	0.80	0.003	120.0
60551: P-758(1)	Precinct 2	Precinct 1	175.85	200.0	PVC	24.22	0.77	0.004	120.0
60567: 62747(2	Future 1	J-10537	82.23	200.0	PVC	34.54	1.10	0.008	120.0
60573: P-757(2)	Hotel	Future 2	168.59	200.0	PVC	38.29	1.22	0.009	120.0

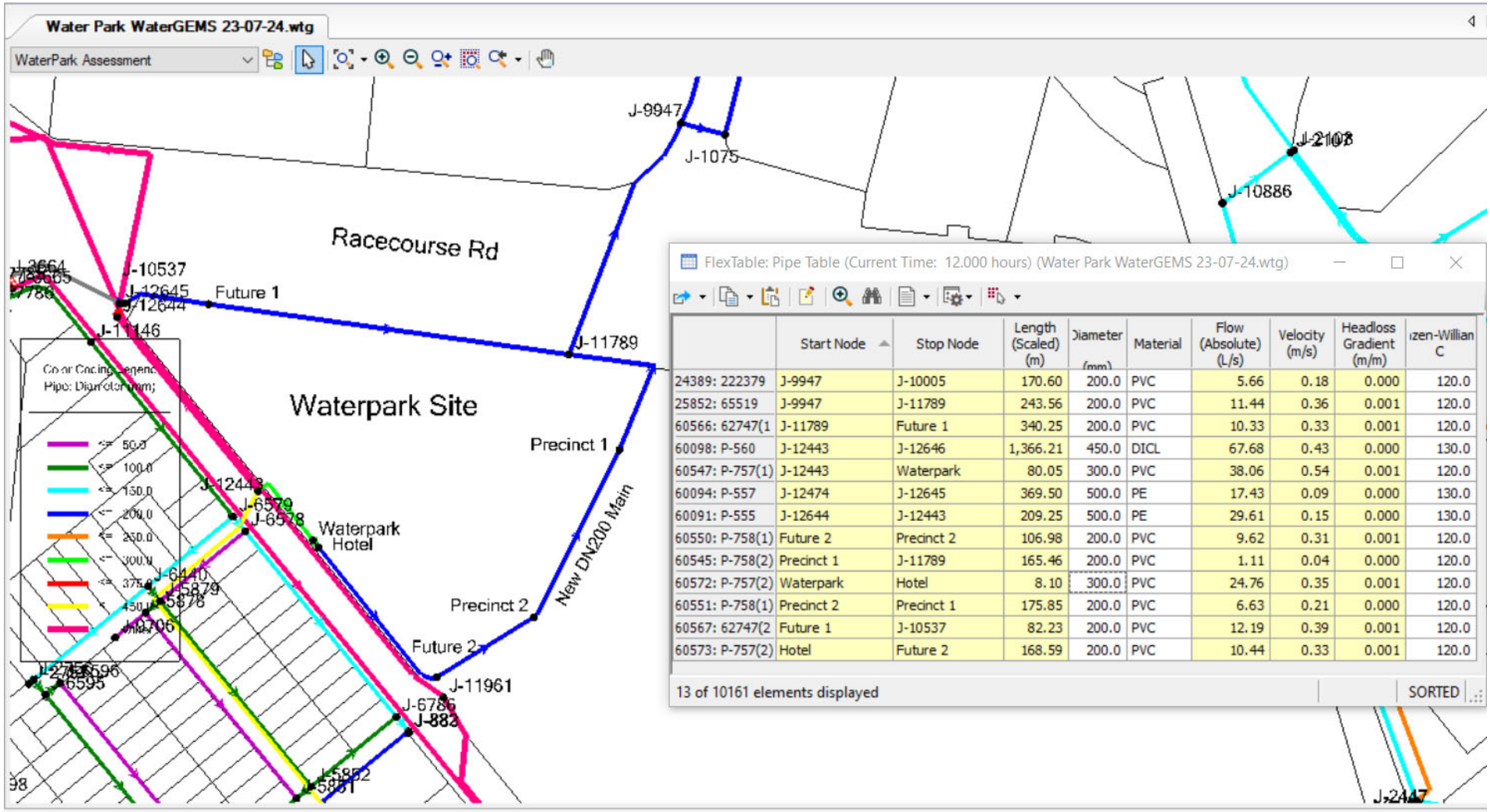
13 of 10161 elements displayed | SORTED

FIRE FLOW - WATER MAIN FLOWS (19hr)



	Label	Demand (L/s)	Elevation (m)	Pressure (m H2O)
60546: Waterpa	Waterpark	13.30	5.59	52.3
60549: Precinct	Precinct 2	3.23	4.50	52.4
60543: Precinct	Precinct 1	35.52	4.50	51.9
60093: J-12645	J-12645	0.00	3.99	54.1
60089: J-12644	J-12644	0.00	4.00	54.0
59041: J-12443	J-12443	0.00	5.65	52.4
25853: J-11789	J-11789	0.00	2.58	54.1
18712: J-10537	J-10537	0.00	4.61	53.4
16994: J-9947	J-9947	0.00	4.00	52.7
11002: J-6786	J-6786	0.11	5.37	53.9
10659: J-6579	J-6579	0.11	5.65	53.7
10658: J-6578	J-6578	0.11	5.60	53.8
1748: J-1075	J-1075	1.65	4.02	52.6
1447: J-882	J-882	0.09	5.25	54.0
60571: Hotel	Hotel	14.53	5.54	52.3
60540: Future 2	Future 2	0.82	4.50	52.7
60565: Future 1	Future 1	1.86	5.00	52.7

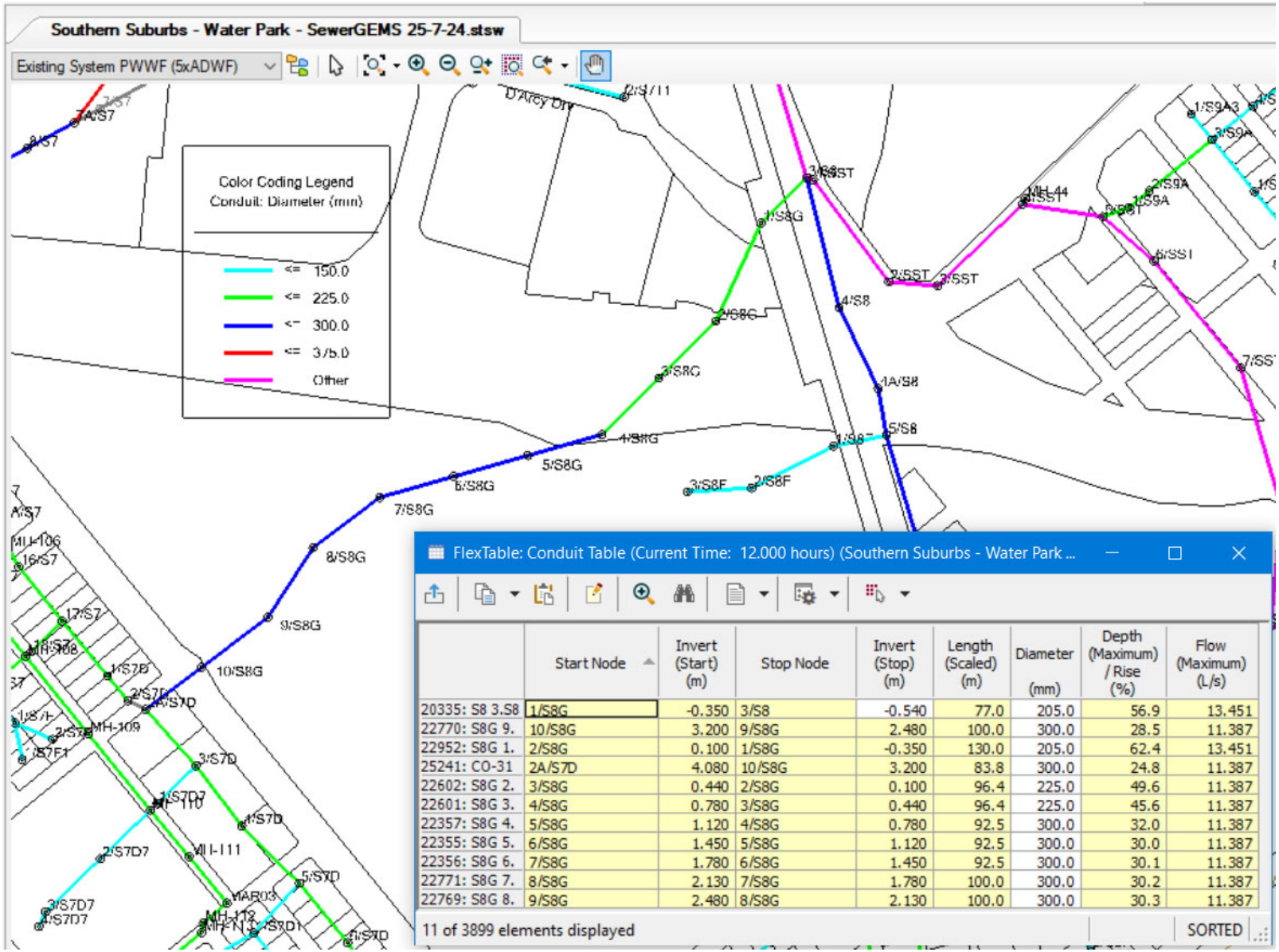
FIRE FLOW - WATER DEMAND & PRESSURES (12 noon)



	Start Node	Stop Node	Length (Scaled) (m)	Diameter (mm)	Material	Flow (Absolute) (L/s)	Velocity (m/s)	Headloss Gradient (m/m)	Hazen-Williams C
24389: 222379	J-9947	J-10005	170.60	200.0	PVC	5.66	0.18	0.000	120.0
25852: 65519	J-9947	J-11789	243.56	200.0	PVC	11.44	0.36	0.001	120.0
60566: 62747(1	J-11789	Future 1	340.25	200.0	PVC	10.33	0.33	0.001	120.0
60098: P-560	J-12443	J-12646	1,366.21	450.0	DICL	67.68	0.43	0.000	130.0
60547: P-757(1)	J-12443	Waterpark	80.05	300.0	PVC	38.06	0.54	0.001	120.0
60094: P-557	J-12474	J-12645	369.50	500.0	PE	17.43	0.09	0.000	130.0
60091: P-555	J-12644	J-12443	209.25	500.0	PE	29.61	0.15	0.000	130.0
60550: P-758(1)	Future 2	Precinct 2	106.98	200.0	PVC	9.62	0.31	0.001	120.0
60545: P-758(2)	Precinct 1	J-11789	165.46	200.0	PVC	1.11	0.04	0.000	120.0
60572: P-757(2)	Waterpark	Hotel	8.10	300.0	PVC	24.76	0.35	0.001	120.0
60551: P-758(1)	Precinct 2	Precinct 1	175.85	200.0	PVC	6.63	0.21	0.000	120.0
60567: 62747(2	Future 1	J-10537	82.23	200.0	PVC	12.19	0.39	0.001	120.0
60573: P-757(2)	Hotel	Future 2	168.59	200.0	PVC	10.44	0.33	0.001	120.0

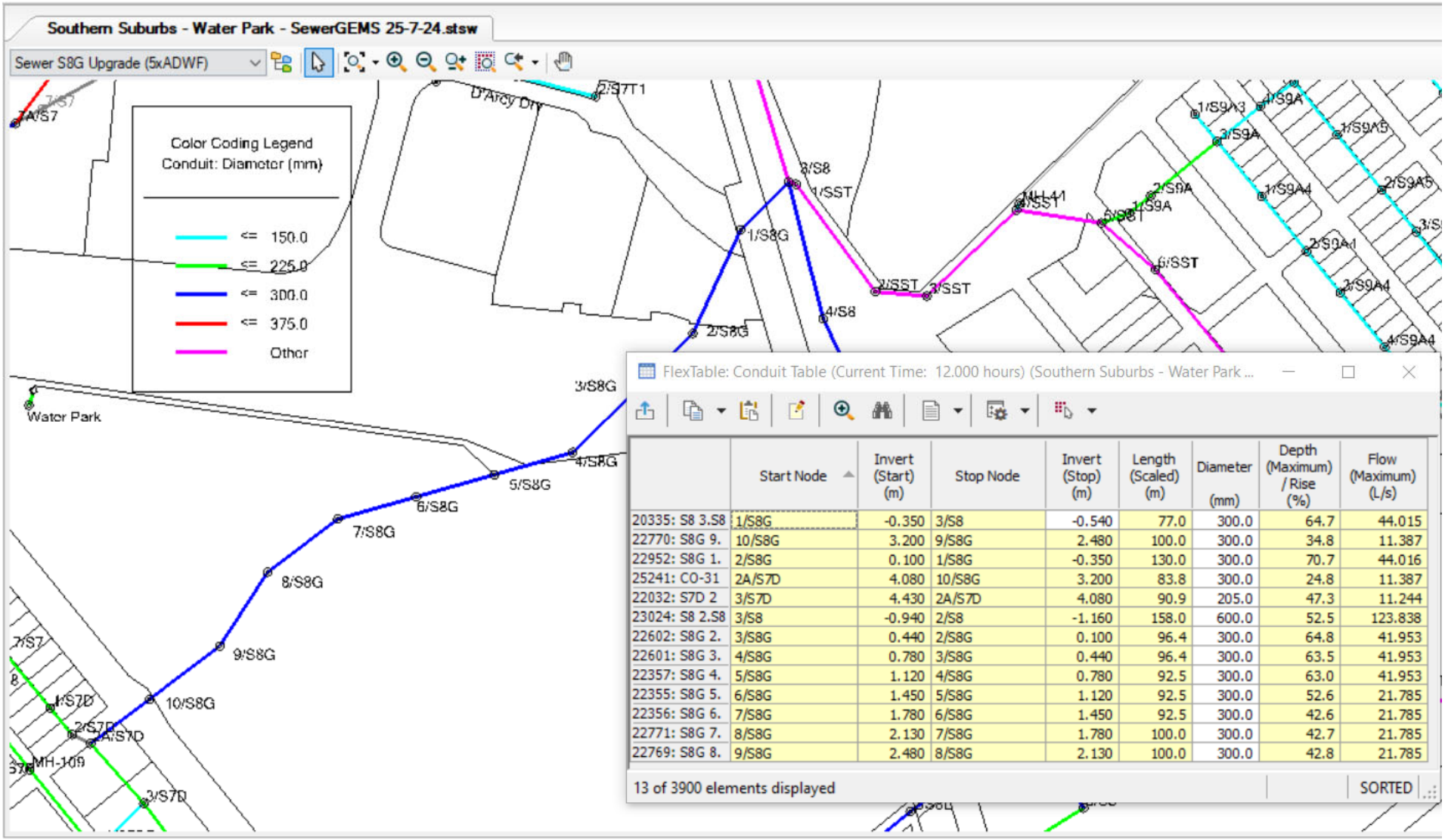
FIRE FLOW - WATER MAIN FLOWS (12 noon)

APPENDIX D
SEWER MODELLING FIGURES & RESULTS



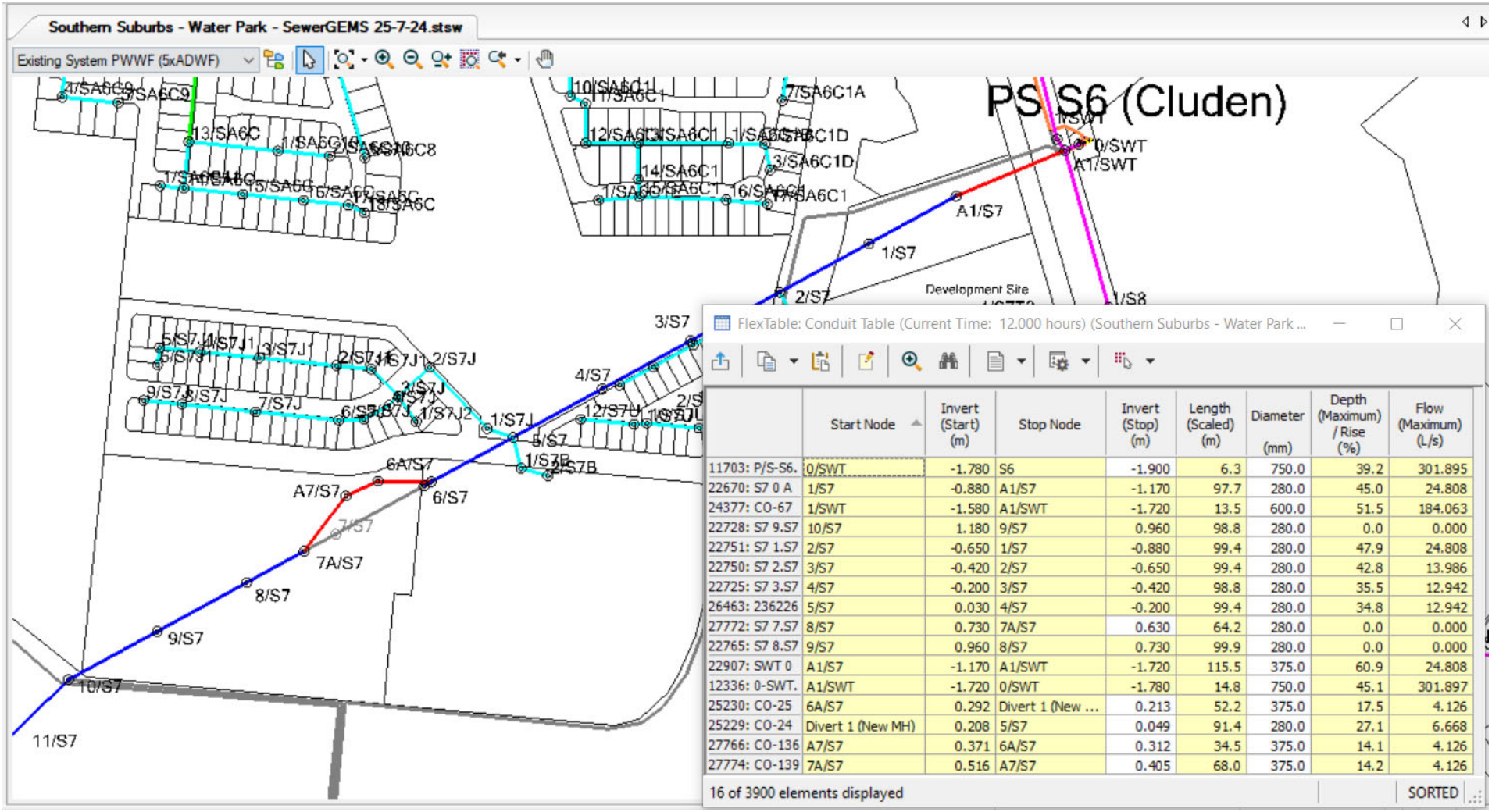
	Start Node	Invert (Start) (m)	Stop Node	Invert (Stop) (m)	Length (Scaled) (m)	Diameter (mm)	Depth (Maximum) / Rise (%)	Flow (Maximum) (L/s)
20335: S8 3.S8	1/S8G	-0.350	3/S8	-0.540	77.0	205.0	56.9	13.451
22770: S8G 9.	10/S8G	3.200	9/S8G	2.480	100.0	300.0	28.5	11.387
22952: S8G 1.	2/S8G	0.100	1/S8G	-0.350	130.0	205.0	62.4	13.451
25241: CO-31	2A/S7D	4.080	10/S8G	3.200	83.8	300.0	24.8	11.387
22602: S8G 2.	3/S8G	0.440	2/S8G	0.100	96.4	225.0	49.6	11.387
22601: S8G 3.	4/S8G	0.780	3/S8G	0.440	96.4	225.0	45.6	11.387
22357: S8G 4.	5/S8G	1.120	4/S8G	0.780	92.5	300.0	32.0	11.387
22355: S8G 5.	6/S8G	1.450	5/S8G	1.120	92.5	300.0	30.0	11.387
22356: S8G 6.	7/S8G	1.780	6/S8G	1.450	92.5	300.0	30.1	11.387
22771: S8G 7.	8/S8G	2.130	7/S8G	1.780	100.0	300.0	30.2	11.387
22769: S8G 8.	9/S8G	2.480	8/S8G	2.130	100.0	300.0	30.3	11.387

Option 1 – Existing S8G Sewer System Capacity



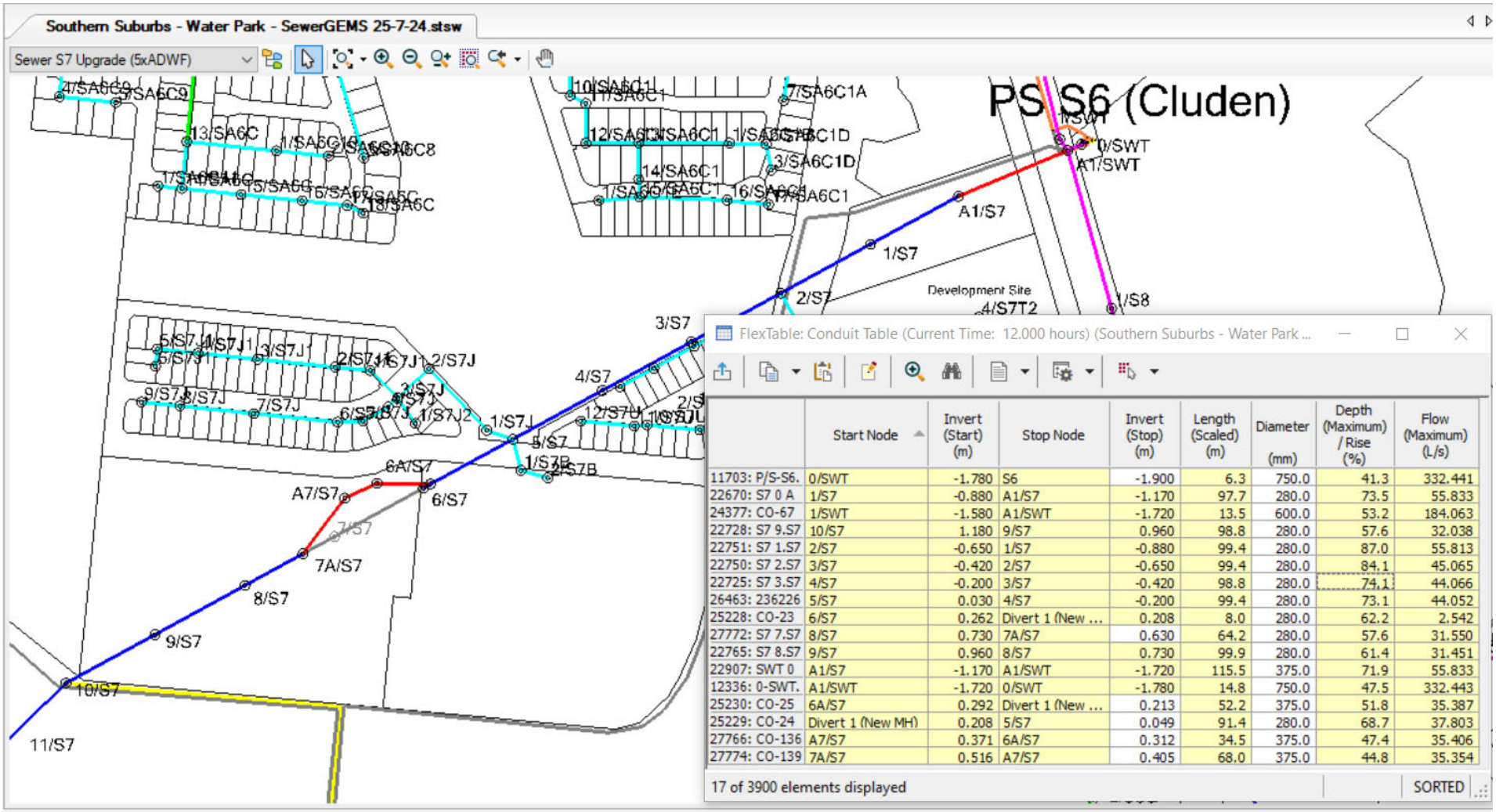
	Start Node	Invert (Start) (m)	Stop Node	Invert (Stop) (m)	Length (Scaled) (m)	Diameter (mm)	Depth (Maximum) / Rise (%)	Flow (Maximum) (L/s)
20335: S8 3.S8	1/S8G	-0.350	3/S8	-0.540	77.0	300.0	64.7	44.015
22770: S8G 9.	10/S8G	3.200	9/S8G	2.480	100.0	300.0	34.8	11.387
22952: S8G 1.	2/S8G	0.100	1/S8G	-0.350	130.0	300.0	70.7	44.016
25241: CO-31	2A/S7D	4.080	10/S8G	3.200	83.8	300.0	24.8	11.387
22032: S7D 2	3/S7D	4.430	2A/S7D	4.080	90.9	205.0	47.3	11.244
23024: S8 2.S8	3/S8	-0.940	2/S8	-1.160	158.0	600.0	52.5	123.838
22602: S8G 2.	3/S8G	0.440	2/S8G	0.100	96.4	300.0	64.8	41.953
22601: S8G 3.	4/S8G	0.780	3/S8G	0.440	96.4	300.0	63.5	41.953
22357: S8G 4.	5/S8G	1.120	4/S8G	0.780	92.5	300.0	63.0	41.953
22355: S8G 5.	6/S8G	1.450	5/S8G	1.120	92.5	300.0	52.6	21.785
22356: S8G 6.	7/S8G	1.780	6/S8G	1.450	92.5	300.0	42.6	21.785
22771: S8G 7.	8/S8G	2.130	7/S8G	1.780	100.0	300.0	42.7	21.785
22769: S8G 8.	9/S8G	2.480	8/S8G	2.130	100.0	300.0	42.8	21.785

Option 1 – Upgraded (DN300) S8G Sewer System Capacity



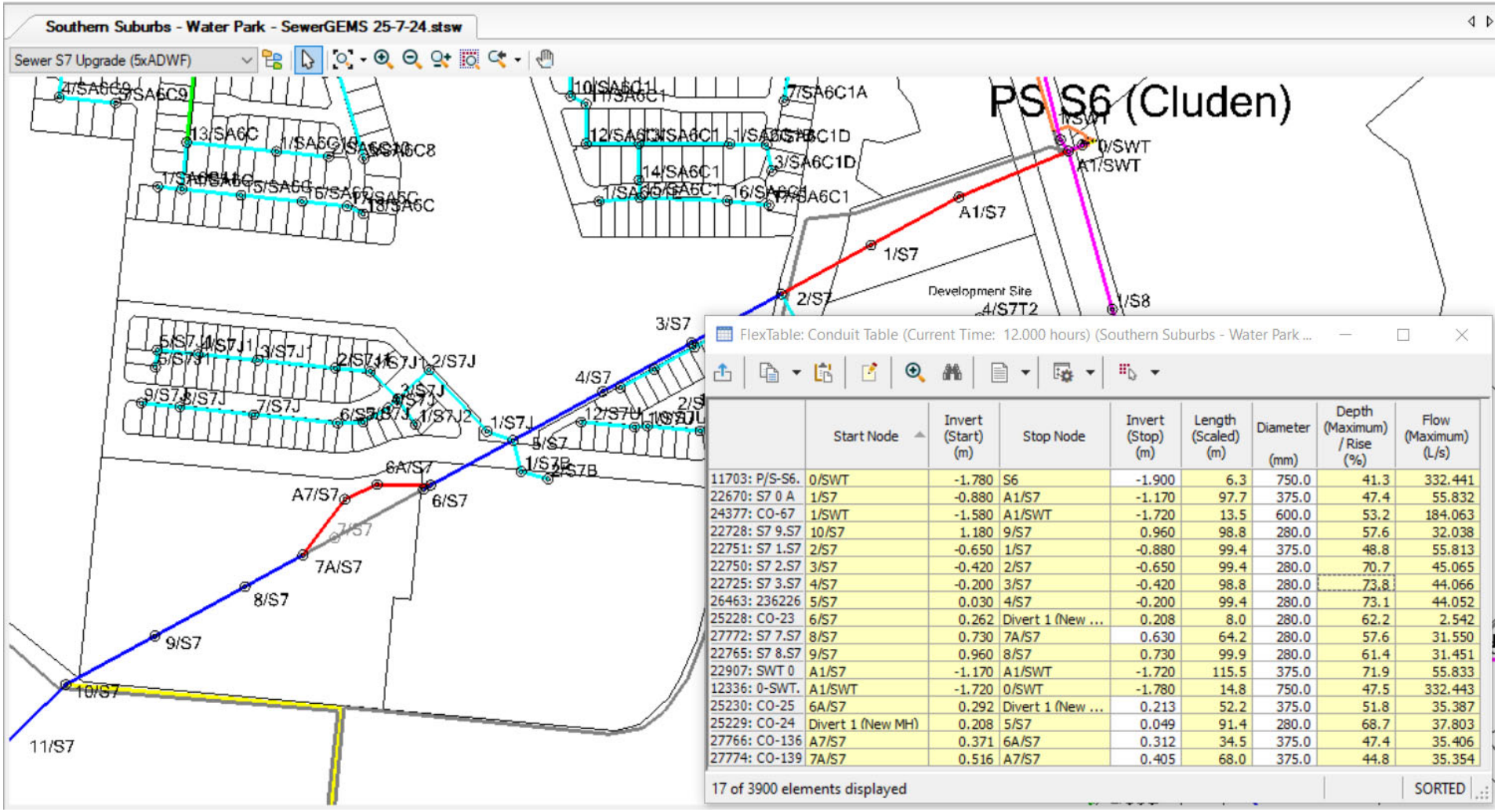
	Start Node	Invert (Start) (m)	Stop Node	Invert (Stop) (m)	Length (Scaled) (m)	Diameter (mm)	Depth (Maximum) / Rise (%)	Flow (Maximum) (L/s)
11703: P/S-S6.	0/SWT	-1.780	S6	-1.900	6.3	750.0	39.2	301.895
22670: S7 0 A	1/S7	-0.880	A1/S7	-1.170	97.7	280.0	45.0	24.808
24377: CO-67	1/SWT	-1.580	A1/SWT	-1.720	13.5	600.0	51.5	184.063
22728: S7 9.S7	10/S7	1.180	9/S7	0.960	98.8	280.0	0.0	0.000
22751: S7 1.S7	2/S7	-0.650	1/S7	-0.880	99.4	280.0	47.9	24.808
22750: S7 2.S7	3/S7	-0.420	2/S7	-0.650	99.4	280.0	42.8	13.986
22725: S7 3.S7	4/S7	-0.200	3/S7	-0.420	98.8	280.0	35.5	12.942
26463: 236226	5/S7	0.030	4/S7	-0.200	99.4	280.0	34.8	12.942
27772: S7 7.S7	8/S7	0.730	7A/S7	0.630	64.2	280.0	0.0	0.000
22765: S7 8.S7	9/S7	0.960	8/S7	0.730	99.9	280.0	0.0	0.000
22907: SWT 0	A1/S7	-1.170	A1/SWT	-1.720	115.5	375.0	60.9	24.808
12336: 0-SWT.	A1/SWT	-1.720	0/SWT	-1.780	14.8	750.0	45.1	301.897
25230: CO-25	6A/S7	0.292	Divert 1 (New ...	0.213	52.2	375.0	17.5	4.126
25229: CO-24	Divert 1 (New MH)	0.208	5/S7	0.049	91.4	280.0	27.1	6.668
27766: CO-136	A7/S7	0.371	6A/S7	0.312	34.5	375.0	14.1	4.126
27774: CO-139	7A/S7	0.516	A7/S7	0.405	68.0	375.0	14.2	4.126

Option 2 – Existing S7 (Fairfield Waters) Sewer System Capacity



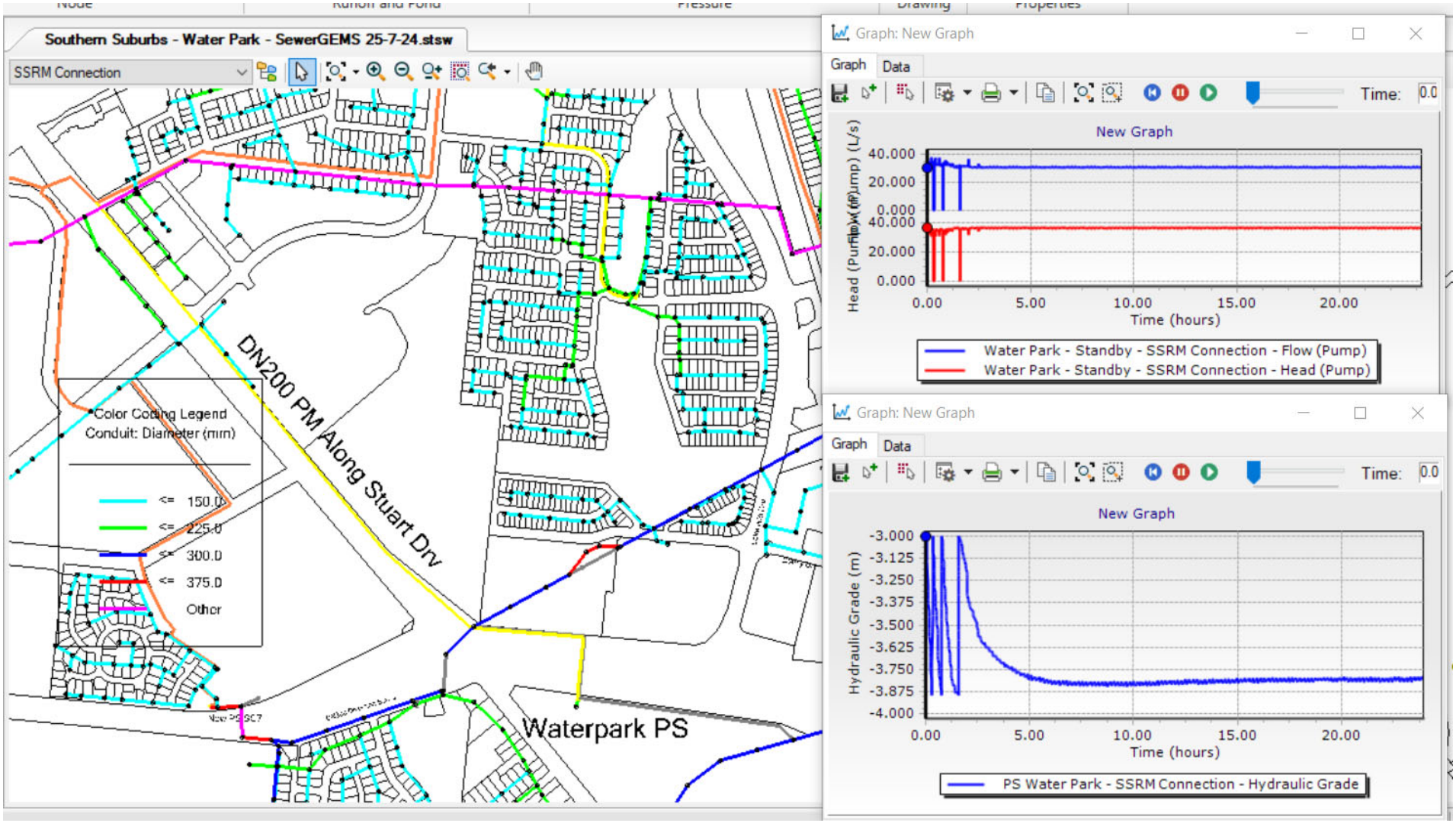
	Start Node	Invert (Start) (m)	Stop Node	Invert (Stop) (m)	Length (Scaled) (m)	Diameter (mm)	Depth (Maximum) / Rise (%)	Flow (Maximum) (L/s)
11703: P/S-S6.	0/SWT	-1.780	S6	-1.900	6.3	750.0	41.3	332.441
22670: S7 0 A	1/S7	-0.880	A1/S7	-1.170	97.7	280.0	73.5	55.833
24377: CO-67	1/SWT	-1.580	A1/SWT	-1.720	13.5	600.0	53.2	184.063
22728: S7 9.S7	10/S7	1.180	9/S7	0.960	98.8	280.0	57.6	32.038
22751: S7 1.S7	2/S7	-0.650	1/S7	-0.880	99.4	280.0	87.0	55.813
22750: S7 2.S7	3/S7	-0.420	2/S7	-0.650	99.4	280.0	84.1	45.065
22725: S7 3.S7	4/S7	-0.200	3/S7	-0.420	98.8	280.0	74.1	44.066
26463: 236226	5/S7	0.030	4/S7	-0.200	99.4	280.0	73.1	44.052
25228: CO-23	6/S7	0.262	Divert 1 (New ...	0.208	8.0	280.0	62.2	2.542
27772: S7 7.S7	8/S7	0.730	7A/S7	0.630	64.2	280.0	57.6	31.550
22765: S7 8.S7	9/S7	0.960	8/S7	0.730	99.9	280.0	61.4	31.451
22907: SWT 0	A1/S7	-1.170	A1/SWT	-1.720	115.5	375.0	71.9	55.833
12336: 0-SWT.	A1/SWT	-1.720	0/SWT	-1.780	14.8	750.0	47.5	332.443
25230: CO-25	6A/S7	0.292	Divert 1 (New ...	0.213	52.2	375.0	51.8	35.387
25229: CO-24	Divert 1 (New MH)	0.208	5/S7	0.049	91.4	280.0	68.7	37.803
27766: CO-136	A7/S7	0.371	6A/S7	0.312	34.5	375.0	47.4	35.406
27774: CO-139	7A/S7	0.516	A7/S7	0.405	68.0	375.0	44.8	35.354

Option 2 – Waterpark Flows Pumped to Sewer S7

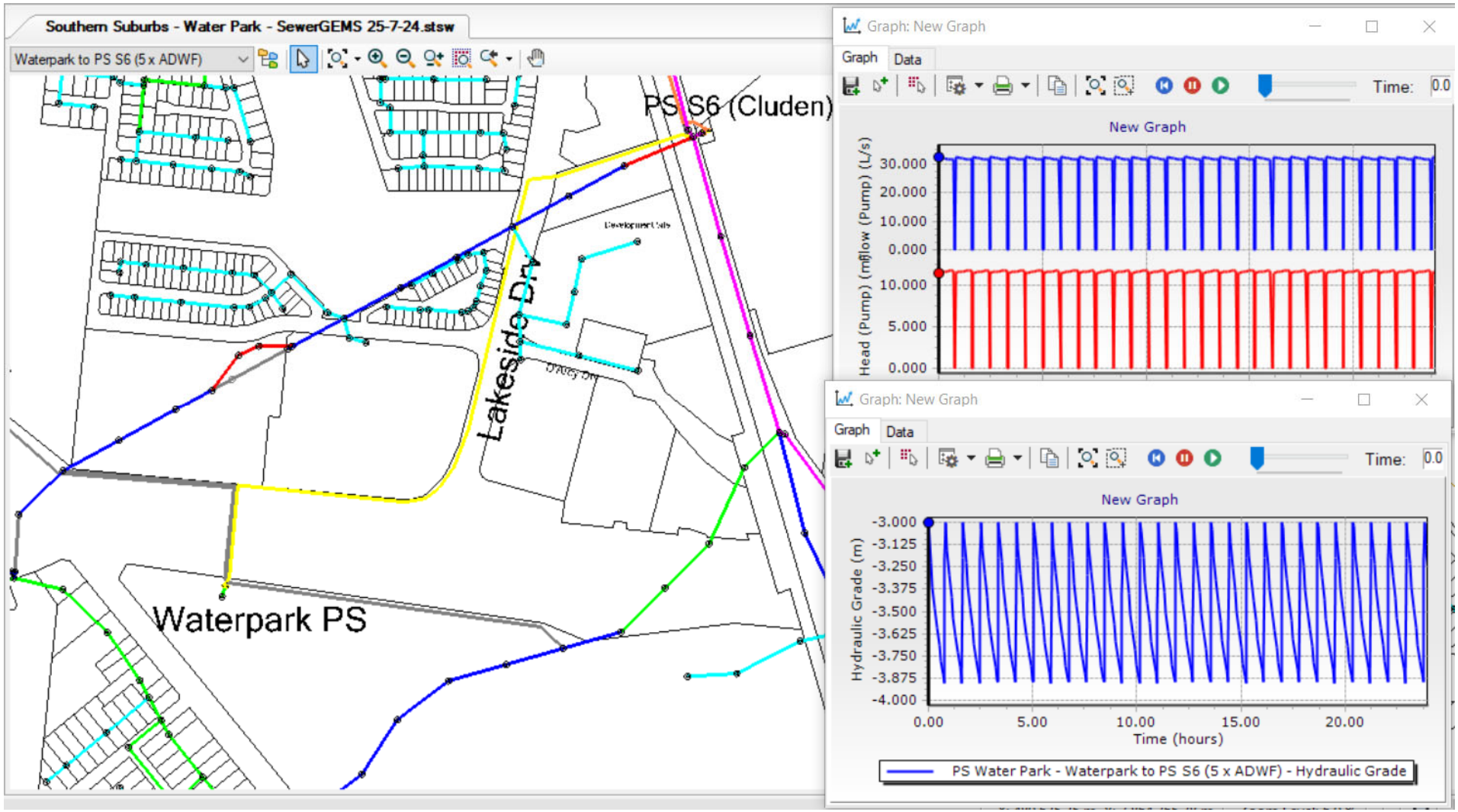


	Start Node	Invert (Start) (m)	Stop Node	Invert (Stop) (m)	Length (Scaled) (m)	Diameter (mm)	Depth (Maximum) / Rise (%)	Flow (Maximum) (L/s)
11703: P/S-S6.	0/SWT	-1.780	S6	-1.900	6.3	750.0	41.3	332.441
22670: S7 0 A	1/S7	-0.880	A1/S7	-1.170	97.7	375.0	47.4	55.832
24377: CO-67	1/SWT	-1.580	A1/SWT	-1.720	13.5	600.0	53.2	184.063
22728: S7 9.S7	10/S7	1.180	9/S7	0.960	98.8	280.0	57.6	32.038
22751: S7 1.S7	2/S7	-0.650	1/S7	-0.880	99.4	375.0	48.8	55.813
22750: S7 2.S7	3/S7	-0.420	2/S7	-0.650	99.4	280.0	70.7	45.065
22725: S7 3.S7	4/S7	-0.200	3/S7	-0.420	98.8	280.0	73.8	44.066
26463: 236226	5/S7	0.030	4/S7	-0.200	99.4	280.0	73.1	44.052
25228: CO-23	6/S7	0.262	Divert 1 (New ...	0.208	8.0	280.0	62.2	2.542
27772: S7 7.S7	8/S7	0.730	7A/S7	0.630	64.2	280.0	57.6	31.550
22765: S7 8.S7	9/S7	0.960	8/S7	0.730	99.9	280.0	61.4	31.451
22907: SWT 0	A1/S7	-1.170	A1/SWT	-1.720	115.5	375.0	71.9	55.833
12336: 0-SWT.	A1/SWT	-1.720	0/SWT	-1.780	14.8	750.0	47.5	332.443
25230: CO-25	6A/S7	0.292	Divert 1 (New ...	0.213	52.2	375.0	51.8	35.387
25229: CO-24	Divert 1 (New MH)	0.208	5/S7	0.049	91.4	280.0	68.7	37.803
27766: CO-136	A7/S7	0.371	6A/S7	0.312	34.5	375.0	47.4	35.406
27774: CO-139	7A/S7	0.516	A7/S7	0.405	68.0	375.0	44.8	35.354

Option 2 – Waterpark Flows Pumped to Sewer S7 & DN375 Upgrade



Option 3 – Waterpark PS to Southern Suburbs Pressure Main



Option 4 – Waterpark PS to Major PS S6 (Cluden)