H2ONE

67 to 69 Shore St East
Cleveland QLD 4163

Water Supply and Sewerage Network Capacity Assessment

FINAL Report V1 - 21 June, 2024

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Version	Date	Author	Reviewer
DRAFT - V1	21 June, 2024	D Colledge	J May
FINAL - V1	21 June, 2024	D Colledge	J May

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1 INTRODUCTION

1.1 Background

A mid-rise residential tower development is currently in the planning phase of the Development Application (DA) process, located at 67 to 69 Shore Street East, Cleveland QLD 4163; Lots 12 and 13 on C14563. The land-use type and density is planned for 30 x 3+ bedroom apartments. Refer to Appendix 1 for the preliminary development layout plan.

H2One Pty Ltd was engaged to undertake a water supply and sewerage network capacity assessment to determine if the site's additional loading will impact system performance and trigger the need for infrastructure upgrades. This assessment has been prepared in accordance with Redland City Council's (RCC) minimum Design Standards; "*South East Queensland Water Supply and Sewerage Design and Construction Code*" (2020). The results of the study are presented in this report.

1.2 Objectives

The objectives of the project were as follows.

1. Assess the capacity of existing gravity mains, pressure mains, pumps, wet wells and emergency storage for the relevant sewer catchment; Sewer Pump Station (SPS) 002.
2. Assess standard flow and fire flow capacity of the relevant water supply network; Alexandra Hills Low Level Zone (LLZ).
3. Determine infrastructure upgrades necessary to achieve RCC's minimum Design Standards, where system performance failures have occurred due to the additional loadings of the new development.
4. Prepare a network capacity assessment report.

1.3 Sewer Catchment System

The development site is located within the SPS 002 sub-catchment and larger catchment area of the Cleveland Sewage Treatment Plant (STP). The proposed service connection will be located on the DN150 gravity main along Shore Street East, adjacent to the northern property boundary.

The development's sewage outfall will be conveyed west to SPS 002, via a 350 m, DN150 gravity pipe system. SPS 002 has duty-assist pumps that transfer sewage west to the downstream catchment (SPS 004), ultimately discharging to the Cleveland STP via a number of catchments.

As per RCC's 2022 Netserv model, the catchment demand is estimated at 1,295 EP and 6,094 EP, at the 2021 and Ultimate planning horizons, respectively. Refer to Appendices 1 and 2 for an overview of site location and the relevant service strategy.

1.4 Water Supply Zone

The development site is located within the Alexandra Hills LLZ, which is supplied by a series of water tanks located at the top of Alexandra Hills (RL 65 m). A network of DN600, DN500 and DN450 trunk mains distribute water east to the network surrounding the development site. The proposed service strategy is to service the development from a single connection to the existing DN100 water pipe along Shore Street East.

As per RCC's 2022 Netserv model, the Alexandra Hills LLZ currently services 98,600 EP and is projected to increase to 117,213 EP, at the Ultimate planning horizon. Refer to Appendices 1 and 3 for an overview of site location and relevant service strategy.

1.5 Demand Assessment

A water supply and sewage demand assessment was undertaken on the proposed development, to determine the approximate loading attributed to the land-use type and density. This was calculated using RCC's Equivalent Persons (EP) unit rates and average "per capita" demands for potable water and sewage; 230 L/EP/day and 210 L/EP/day, respectively. Refer to Table 1 below for a summary of the relevant demand estimate.

Table 1. Estimated water supply and sewage demands for the proposed development

Site Land-use and Density	Demand Rate	EP	Water Peak Hour Flow (L/s)	Sewage PWWF (L/s)
30 x 3 bedroom apt.	2.51 EP/Apt.	75.3	0.80	0.92

Note 1: For water demands, peak flow rates were based on the "residential" AD/PH peaking factor (4.0).

Note 2: For sewage demands, the PWWF flow rates were based on 5 x ADWF.

For the post-development scenarios, RCC's existing Netserv planning demands were removed from the hydraulic models and replaced with the demands presented in Table 1 above. The planning demands were sourced from RCC's 2022 Netserv IDM and are presented in Table 2 below.

Table 2. RCC's IDM water and sewer demands (EP) removed from the hydraulic models @ post-development

Address	Water Node ID	Sewer Node ID	2021 to Ultimate (EP)
67-69 Shore St E, Cleveland	J13223	43066	5.4

2 METHODOLOGY

2.1 Desired Standards of Service

The design standards adopted for the hydraulic assessment were based on the "*South East Queensland Water Supply and Sewerage Design and Construction Code*" (2020), with exception to the maximum depth of gravity pipe flow at 1.0 m freeboard. This requirement is merely a standard industry practice adopted by water authorities in South-east Queensland, and is not a specific design standard from either the SEQ Code or Water Service Association of Australia (WSAA) Sewerage Code.

A summary of the relevant design provisions utilised for the project is as follows.

Table 3. Design provisions adopted for the hydraulic assessment

	Provision	Specification
Sewerage	ET to EP conversion factor	2.7
	Average Dry Weather Flow (ADWF)	210 L/EP/day
	Peak Wet Weather Flow (PWWF)	5 x ADWF
	Single pump capacity	C1 x ADWF (L/s) where; C1 = 3.5 to 5.0 $C1 = 15 \times (EP)^{-0.1587}$
	Pump station operational storage (m^3)	0.9 x Q / N where; Q = Single pump capacity (L/s) N = Number of pump starts per hour, where N = 12 for duty pump motor < 100 kW N = 8 for duty pump motor 100 – 200 kW N = 5 for duty pump motor > 200 kW
	Pump station emergency storage (m^3)	4 hours ADWF
	Total pump station capacity (L/s)	PWWF
	Maximum depth of gravity flow (proposed system)	75% pipe diameter
	Maximum depth of gravity flow (existing system)	1.0 m below manhole level
	Maximum pressure main flow velocity	3.0 m/s
Water Supply	ET to EP conversion factor	2.7
	Average Day (AD) Demand	230 L/EP/day
	Maximum pipe velocity (m/s)	2.5 m/s
	Standard flow minimum network pressure and background demand	22m at the property boundary at PH demand
	Residential fire flow minimum network pressure and background demand	12m at 2/3 PH demand Positive pressure at PH demand Reservoir at Minimum Operating Level (15%)
	Commercial fire flow minimum network pressure and background demand	12m at PH demand
	Fire flows	Residential - 15 L/s Residential (> 3 storey) - 30 L/s Commercial/industrial - 30 L/s

2.2 Sewerage Network Assessment

The methodology adopted for the hydraulic analysis of the sewer network is as follows.

1. RCC's latest LGIP MIKE+ sewer network model was adopted for the hydraulic analysis ("*Clev722P_(Netserv_Model)_v3_2023")*, which incorporates the 2022 Netserv planning demands and infrastructure upgrades. For the post development scenarios, the site's total estimated sewage loading was placed onto manhole "43067", and RCC's existing Netserv demands removed from the hydraulic model as per Section 1.5 of this report.
2. The pump capacity of SPS 002 was assessed by comparing the PWWF required to service the catchment, pre- and post-development, to the available combined pump capacity presented in RCC's hydraulic model.

   If the combined pump capacity was above the catchment's PWWF, relevant design standards were achieved. If it was below the PWWF, pump and pressure main upgrades were investigated until compliance was attained.
3. The operational storage of the SPS 002 wet well was subsequently evaluated by comparing the required storage capacity, post-development, against wet well volumes between the duty pump start/stop levels.

   If the wet well's operational storage volume was above the minimum requirement, compliance was achieved. If it was below the minimum requirement, upgrades were investigated until design standards were achieved.
4. The flow depth of gravity mains was assessed from the proposed connection point to SPS 002, pre- and post-development. To avoid surcharging from potential deficiencies downstream, the relevant pump station was deactivated and the gravity mains discharged directly to an outlet.

   If flow depths could not be maintained within RCC's specifications, pipe augmentations were investigated until Design Standards were achieved.
5. The emergency storage of the SPS 002 catchment was assessed by determining the available storage volume between the overflow level (RL 1.95 m - 0.3 m) and the duty pump start level (RL -3.07 m), including upstream gravity mains and manholes. The overflow level was sourced from the manhole with the lowest surface level ("43077"), as per RCC's hydraulic model.

   The available emergency storage was compared against the 4 hour ADWF requirement. If the available storage was above the minimum requirement, compliance was achieved. If it was below the minimum requirement, compliance was not achieved and storage augmentations were investigated.
6. Modelling results were verified and findings reported.

2.3 Water Supply Network Assessment

The methodology adopted for the water supply network analysis is as follows.

1. RCC's latest MIKE+ LGIP hydraulic model was adopted for the water supply analysis ("*RCC WD LGIP Model_2021 FINAL v3*"). For the post-development scenarios, the site's estimated demand and diurnal patterns were placed onto node "Junction_115", and RCC's existing Netserv demands removed from the hydraulic model as per Section 1.5 of this report.
2. For all planning horizons, a 1 x Maximum Day (MD) demand standard flow hydraulic analysis was undertaken on the property connection point/s and local network, at both pre- and post-

development. Any deficiencies in the network were investigated and appropriate solutions determined.

Note: An assessment on the capacity of the water supply tanks (Alexandra Hills LLZ) was not undertaken, as the development's additional loading was considered negligible for the existing storage capacity.

3. Residential (15 L/s) and commercial (30 L/s) fire flow allocation was applied to the surrounding network as per RCC's Netserv model. For the post-development scenarios, hydrants directly servicing the subject site were allocated 30 L/s fire flow @ 2/3 PH demand, as the proposed development will exceed 3 storeys in height.
4. For all planning horizons, a fire flow hydraulic analysis was undertaken on all hydrants servicing the local network, at pre- and post-development. Any deficiencies in the network were investigated and appropriate solutions determined.
5. Modelling results were verified and findings reported.

3 RESULTS

3.1 Sewerage Network Assessment

3.1.1 Pumps

A pump capacity assessment was undertaken on SPS 002 as per the methodology described in Section 2.2 of this report. Refer to Table 4 below for a summary of results.

Table 4. Combined pump flow capacity results (post-development)

Planning Horizon	Capacity Available (L/s)	Capacity Required (L/s)	Difference (L/s)
2021	35.9	16.6	+19.3
2026	35.9	28.0	+7.9
2031	74.1	42.0	+32.1
2051	74.1	71.7	+2.4
Ultimate	74.1	74.9	-0.8

Note 1: Above figures were sourced from RCC's hydraulic model.

Note 2: RCC has a combined pump upgrade projected for the 2031 planning horizon, hence the significant increase in flow capacity from 35.9 L/s to 74.1 L./s.

The above results demonstrate that there is sufficient combined pump capacity, at SPS 002, to service the proposed development, up to the 2051 planning horizon. The Ultimate planning horizon resulted in a minor 0.8 L/s pump capacity shortfall, which can be readily rectified via RCC's LGIP pump capacity upgrade projected for the 2031 planning horizon.

However, as the minor deficiency is a projection of a 40 year+ planning horizon, it is recommended the pump capacity shortfall is disregarded and relevant development conditions are not applied to the application process.

Refer to Appendix 4 for the detailed pump modelling results.

3.1.2 Wet Wells

An assessment on the operational storage capacity of the SPS 002 wet well was undertaken with the inclusion of the development's estimated loading. Table 5 below shows a summary of results and Appendix 5 provides detailed calculations.

Table 5. Operational storage capacity results (post-development)

Planning Horizon	Storage Available (kL)	Storage Required (kL)	Difference (kL)
2021	0.47	1.19	-0.72
Ultimate	0.47	4.22	-3.75

The above table demonstrates there is insufficient operational storage capacity to incorporate the additional site loading, across all planning horizons. This result however, was determined to be a pre-existing deficiency that was not triggered by the development site, as it only accounted for 0.06 kL of the storage requirement.

Further investigation determined that the duty pump start level can be increased to the invert level of the discharging gravity main (RL -2.66 m), to provide adequate capacity up to the 2031 planning horizon. From 2036 however, a wet well storage capacity upgrade (3.75 kL) will likely be required to comply with RCC's minimum Design Standards.

Since the operation storage deficiency is a pre-existing issue, and was negligibly impacted by the development's additional loading, it is recommended the resolution of the storage capacity is undertaken by RCC, via standard LGIP processes.

3.1.3 Gravity Mains

As per the methodology described in Section 2.2, gravity main pipe flow depths were assessed against RCC's minimum requirement, from site connections to SPS 002. The analysis identified that there was sufficient capacity within the existing gravity main system to incorporate the site's loading across all planning horizons. No gravity main capacity upgrades are therefore required to service the development.

Refer to Appendix 6 for detailed modelling results and gravity main profiles.

3.1.4 Emergency Storage

An emergency storage capacity assessment was undertaken on the SPS 002 catchment, with the inclusion of the additional ADWF attributed to the proposed development. Refer to Table 6 below for a summary of outcomes and Appendix 7 for detailed calculations.

Table 6. Emergency storage capacity results (post-development)

Planning Horizon	Storage Available (kL)	Storage Required (kL)	Difference (kL)
2021	57.9	35.1	+22.8
2026	72.2	66.1	+6.1
2031	72.2	104.9	-32.7
Ultimate	72.2	190.9	-118.8

Note 1: Above figures were based on 300 mm below the overflow level (RL 1.95 m – 0.3 m) as per RCC's hydraulic model.

Note 2: RCC has a gravity main upgrade projected for the 2026 planning horizon, hence the significant increase in available storage capacity from 57.9 kL to 72.2 kL.

Note 3: Above results can be considered an estimate only as it does not consider ADWF already present within the manholes and gravity mains.

The results in Table 6 show that the SPS 002 catchment has sufficient emergency storage up to the 2026 planning horizon, with all subsequent planning horizons presenting insufficient capacity. This outcome however, was determined to be a pre-existing deficiency that was not triggered by the development site, as it only accounted for 2.45 kL of the storage requirement.

Further investigation determined that a storage capacity upgrade (118.8 kL) will likely be required, at the 2031 planning horizon, in order to comply with RCC's minimum Design Standards. However, since the emergency storage deficiency is a pre-existing issue, and the development site only had a minor contribution, it is recommended the resolution of the storage capacity is undertaken by RCC, via standard LGIP processes.

3.2 Water Supply Network Assessment

3.2.1 Standard Flow

As per the methodology described in Section 2.3 of this report, a detailed standard flow network analysis was undertaken on all planning horizons with the inclusion of the estimated development demands. A summary of results is presented below in Table 7.

Table 7. Standard flow network modelling results (pre- and post-development)

Provision	2021		Ultimate	
	Pre-develop.	Post-develop.	Pre-develop.	Post-develop.
Conn. point (Junction_115) min. pressure (m)	54.3	54.1	43.8	43.5
Network min. pressure (m)	42.5	42.4	33.0	32.9
Network min. pressure node ID	J9330		J9328	
Network no. pressure failures	0	0	0	0
Max. pipe velocity (m/s)	1.1	1.1	1.9	1.9
Network max. pipe velocity ID	9668			
Network no. velocity failures	0	0	0	0

Note 1: Peak hour was 9 am within the local network.

Note 2: Modelling with the supply reservoir at MOL was not considered, as the Capalaba Water Treatment Plant (WTP) pump station is required to operate over peak demand events.

The above results demonstrate that the network performed within RCC's Design Standards across all planning horizons. No infrastructure upgrades are therefore required to service the development for standard flow.

3.2.2 Fire Flow

As per the methodology described in Section 2.3 of this report, a detailed fire flow network analysis was undertaken on all planning horizons with the inclusion of estimated development demands. A summary of results is presented below in Table 8.

Table 8. Fire flow network modelling results (pre- and post-development)

Provision		2021		Ultimate	
		Pre-develop.	Post-develop.	Pre-develop.	Post-develop.
2/3 PH FF	Site hydrant (Junction_115) min. pressure (m) @ 15 L/s pre-develop. and 30 L/s post-develop.	48.9	29.8	40.8	22.9
	Network hydrants min. pressure (m)	22.4	22.3	16.2	16.2
	Network hydrant min. pressure node ID	J9286		J10012	
	Network hydrants no. failures	0	0	0	0
PH FF	Network hydrants min. pressure (m) @ 30 L/s	16.3	16.0	13.6	13.5
	Network hydrant min. pressure node ID	J13190		J9464	
	Network hydrants no. failures	0	0	0	0

Note 1: Within the local network, 2/3 peak hour and peak hour was 4 pm and 9 am, respectively.

Note 2: Modelling with the supply reservoir at MOL was not considered, as the Capalaba Water Treatment Plant (WTP) pump station is required to operate over peak demand events.

The above results demonstrate that the network performed within RCC's Design Standards across all planning horizons. No infrastructure upgrades are therefore required to service the development for fire flow.

4 CONCLUSION

A mid-rise residential tower development is currently in the planning phase of the Development Application (DA) process, located at 67 to 69 Shore Street East, Cleveland QLD 4163; Lots 12 and 13 on C14563. The land-use type and density is planned for 30 x 3+ bedroom apartments. Refer to Appendix 1 for the preliminary development layout plan.

H2One Pty Ltd was engaged to undertake a water supply and sewerage network capacity assessment to determine if the site's additional loading (75.3 EP) will impact system performance and trigger the need for infrastructure upgrades. The assessment was prepared in accordance with Redland City Council's (RCC) minimum Design Standards; "*South East Queensland Water Supply and Sewerage Design and Construction Code*" (2020).

The hydraulic analysis determined that, theoretically, there was sufficient capacity in the water supply and sewerage networks to incorporate the site's additional loading, across all planning horizons, without the need for infrastructure upgrades prior to development connection.

The downstream Sewer Pump Station (SPS) 002 presented minor pump, operational storage and emergency storage capacity deficiencies. However, these were determined to be either negligible, or pre-existing shortfalls that were not triggered by the development site. Refer to body of the report for more details.

In summary, it is recommended that RCC reviews the findings presented in this report and approves the relevant service connections for the development at 67 to 69 Shore Street East, Cleveland QLD.

Detailed modelling results, calculations and system plan can be observed in Appendices 1 through 7.

5 REFERENCE LIST

RCC. (2020). *SEQ Water Supply and Sewerage Design and Construction Code*. Cleveland, QLD

6 APPENDICES

Appendix 1. Preliminary development layout plan

LEGEND

- SITE BOUNDARY
- EXISTING PROPERTY BOUNDARY
- XX.XX — EXISTING CONTOURS (AT 0.25m INTERVALS)
- EXISTING KERB
- EXISTING EDGE OF BITUMEN
- E(OH) — EXISTING OVERHEAD ELECTRICAL (OH)
- G — EXISTING GAS
- NBN — EXISTING NBN
- SWD — EXISTING STORMWATER DRAINAGE
- SE — EXISTING SEWER
- W — EXISTING WATER
- XX.XX — DESIGN CONTOURS (AT 0.10m INTERVALS)
- PROPOSED BUILDING OVER LINE
- PROPOSED CHANGE OF GRADE
- PROPOSED PAVEMENT SAW CUT
- PROPOSED M1 MOUNTABLE KERB AND CHANNEL
- PROPOSED EDGE OF BITUMEN
- SWD — PROPOSED STORMWATER DRAINAGE
- SE — PROPOSED SEWER
- W — PROPOSED WATER
- 90m FIRE HYDRANT COVERAGE
- PROPOSED BUILDING BY OTHERS
- CONCRETE PAVEMENT EXTENT
- PROPOSED CONCRETE FOOTPATH
- PROPOSED LANDSCAPING
- PROPOSED ROAD PAVEMENT WIDENING

NOTES:
1. OCEANGUARDS OR SIMILAR TO BE FITTED WITHIN ALL INTERNAL FIELD INLETS
2. ALL GUTTERS AND DOWNPIPES TO BE SIZED TO CATER FOR THE 1% AEP EVENT

PAVEMENT WIDENING TO SUIT NEW KERB AND CHANNEL AND 7m ROAD CARRIAGEWAY WIDTH. DETAILS TO BE CONFIRMED UPON RECEIPT OF FURTHER SURVEY. MINIMUM PAVEMENT RECONSTRUCTION WIDTH OF 1.2m REQUIRED.

CONSTRUCT NEW 2.5m WIDE SHARED FOOTPATH ALONG SITE FRONTAGE

CONSTRUCT NEW M1 MOUNTABLE KERB AND CHANNEL ALONG SITE FRONTAGE TO PROVIDE 7m WIDE ROAD CARRIAGEWAY. DETAILS TO BE CONFIRMED UPON RECEIPT OF FURTHER SURVEY AND ACCURATE LOCATION OF OPPOSITE KERB AND CHANNEL. TURNOUTS TO BE PROVIDED AT EITHER END OF KERB AND CHANNEL WITH 1in10 TAPER BACK TO EXISTING EDGE OF BITUMEN.

FIRE HYDRANT POSITION AND COVERAGE TO BE CONFIRMED WITH FURTHER SURVEY DETAILING ACCURATE HYDRANT LOCATION

EXISTING SEWER CONNECTION TO BE CAPPED AT MAIN, BROKEN OUT AND REMOVED

PROVIDE NEW WATER METER AND CONNECTION TO SERVICE THE PROPOSED DEVELOPMENT. ALLOW 1.5mX0.5m SPATIAL AREA FOR WATER METER LOCATION WITHIN PROPERTY BOUNDARY AS SHOWN.

PROPOSED uPVC PROPRIETARY STORMWATER BENDS. DETAILS TO BE CONFIRMED.

EXISTING SEWER CONNECTION TO BE CAPPED AT MAIN, BROKEN OUT AND REMOVED

PROVIDE NEW DN150 SEWER PROPERTY CONNECTION TO SERVICE THE DEVELOPMENT

PROPOSED LIP IN LINE GULLY PIT IN ACCORDANCE WITH IPWEA STD DRG No. DS-063

INTERNAL STORMWATER TO OUTLET TO EXISTING 525Ø RCP WITHIN STREET. CONSTRUCT NEW 1050Ø MANHOLE OVER EXISTING LINE IN ACCORDANCE WITH IPWEA STD DRG No. DS-010 APPROX. IL 1.45m

PROPOSED STORMWATER TO CROSS ABOVE EXISTING SEWER WITH MINIMUM 300mm VERTICAL CLEARANCE APPROX. SEWER IL 1.170m

VERGE TO BE RE-GRADED AS REQUIRED TO SUIT NEW KERB AND CHANNEL AND GULLY PIT. DETAILS TO BE CONFIRMED.

PROPOSED PMT TO ACHIEVE FLOOD IMMUNITY TO 1% AEP EVENT (1% AEP EVENT IS 3.16m AHD)

FFL3.650m

FFL3.160m

FFL3.650m

EXISTING DN100 AC WATER MAIN

EXISTING DN150 AC SEWER MAIN

EXISTING 525Ø RCP STORMWATER MAIN

EXISTING DN150 AC SEWER MAIN

SHORE STREET EAST

EXISTING DN150 AC SEWER MAIN

USIL 1.15m

USIL 1.10m

USIL 1.52m

DSIL 0.60m

USIL 0.55m

DSIL 0.07m

DSIL 1.39m

90.00m

NOT FOR CONSTRUCTION

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REV	REVISION DETAILS	DRWN	APP'D	DATE
B	FOR APPROVAL	JB	NG	01.02.24
A	PRELIMINARY ISSUE	IE	NG	19.01.24

DESIGNED	I.ERNST
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CHECKED	N.GREEN
APPROVED	

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DISCIPLINE	CIVIL

STATUS	*PRELIMINARY ISSUE*
SHEET TITLE	CONCEPT SERVICES LAYOUT
PROJECT NUMBER	23191
DRAWING NUMBER	23191-DWG-CV-CV-SK001
REV	B

LEGEND

- SITE BOUNDARY
- EXISTING PROPERTY BOUNDARY
- XX.XX EXISTING CONTOURS (AT 0.25m INTERVALS)
- EXISTING KERB
- EXISTING EDGE OF BITUMEN
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- SE EXISTING SEWER
- NBN EXISTING NBN
- W EXISTING WATER
- XX.XX DESIGN CONTOURS (AT 0.10m INTERVALS)
- PROPOSED BUILDING OVER LINE
- PROPOSED CHANGE OF GRADE
- PROPOSED PAVEMENT SAW CUT
- TREE PROTECTION ZONE
- PROPOSED M1 MOUNTABLE KERB AND CHANNEL
- PROPOSED EDGE OF BITUMEN
- SWD PROPOSED STORMWATER DRAINAGE
- SE PROPOSED SEWER
- W PROPOSED WATER
- PROPOSED RETAINING WALL
- XX.XXXm FINISHED SURFACE ELEVATION LABEL
- XX.XXXm EXISTING SURFACE ELEVATION LABEL
- XX.XXXm PROPOSED RETAINING WALL HEIGHT
- X.X% PROPOSED SURFACE SLOPE

EARTHWORKS LEVELS

1. EARTHWORKS VOLUMES AND LEVELS BASED ON DRIVEWAY THICKNESS OF 150mm AND BUILDING SLAB THICKNESS OF 150mm. REFER STRUCTURAL DESIGN DRAWINGS AT DETAILED DESIGN STAGE FOR FINAL PAD THICKNESS.
2. ALL RETAINING WALL HEIGHTS ARE GIVEN FROM EXISTING SURFACE TO DESIGN (FINISHED) SURFACE.

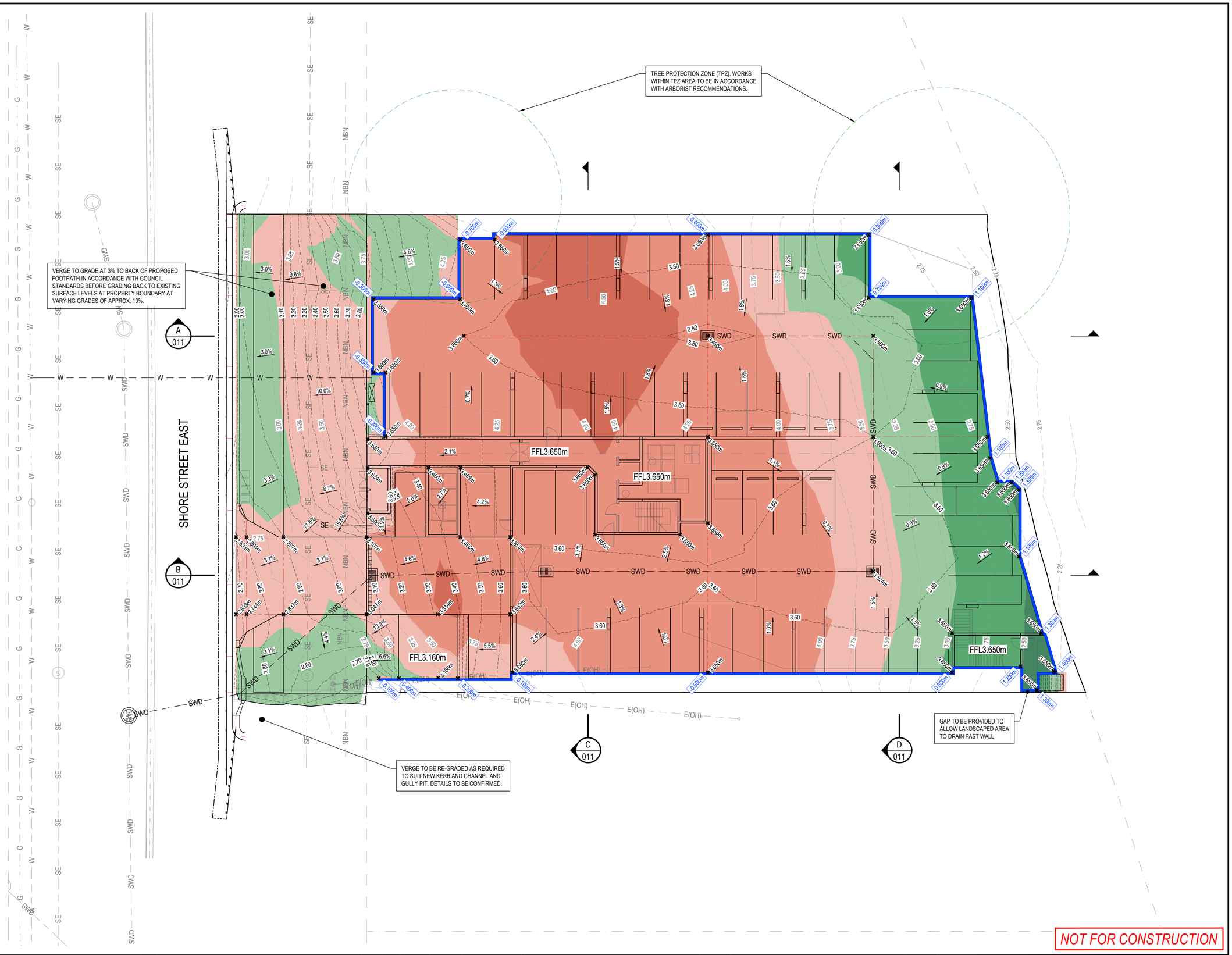
EARTHWORKS VOLUMES

(EXISTING SURFACE TO EARTHWORKS SURFACE)

TOTAL CUT	1015m³
TOTAL FILL	230m³
TOTAL BALANCE (CUT TO EXPORT)	785m³

CUT & FILL LEGEND

MINIMUM ELEVATION	MAXIMUM ELEVATION	COLOUR
-1.500m	-1.000m	
-1.000m	-0.500m	
-0.500m	0.000m	
0.000m	0.500m	
0.500m	1.000m	
1.000m	1.500m	



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PITCH BLACK GROUP

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CHECKED	N.GREEN
APPROVED	

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PROJECT NUMBER	23191
DRAWING NUMBER	23191-DWG-CV-CV-SK010
REV	B

LEGEND

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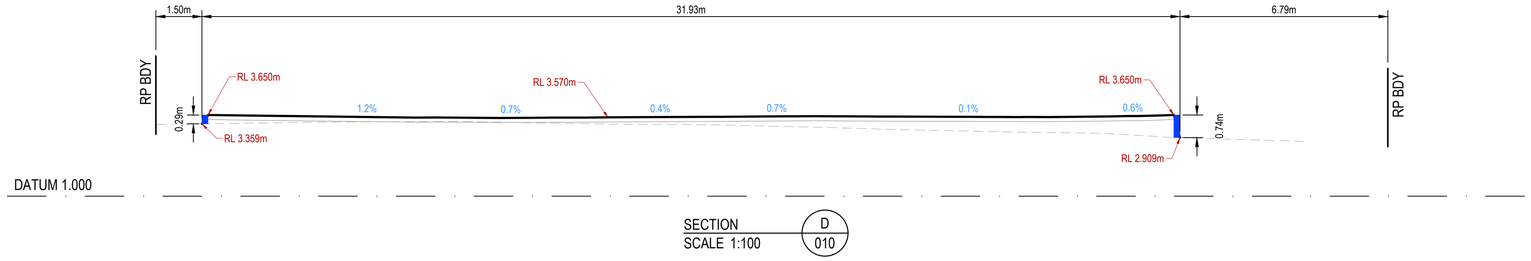
- BULK EARTHWORKS SURFACE
- DATUM LINE
- EXISTING SURFACE
- PROPOSED RETAINING WALL
- X.X% PROPOSED SURFACE SLOPE



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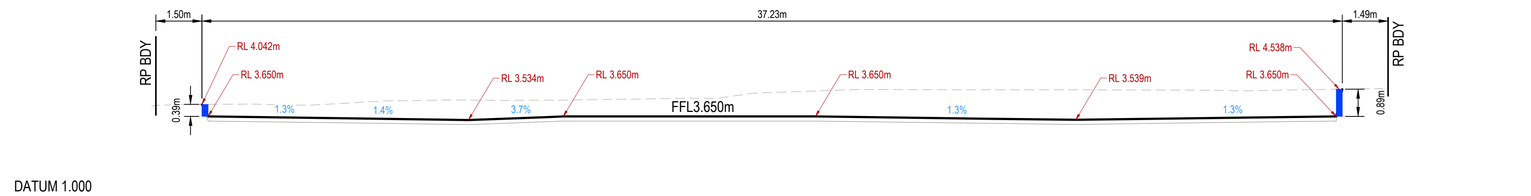

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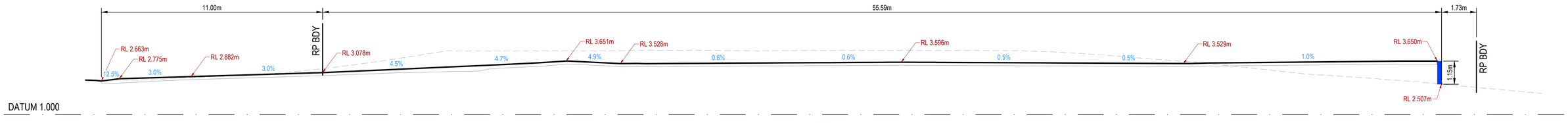

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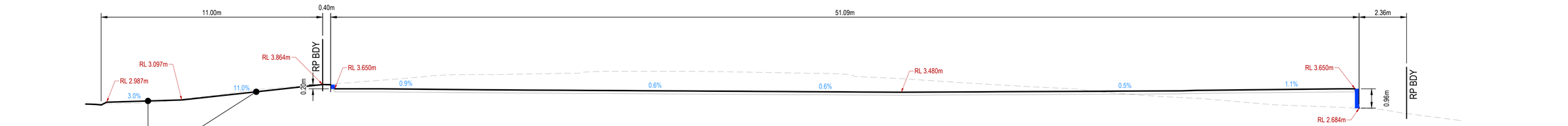


SECTION A
SCALE 1:100 010

VERGE TO GRADE AT 3% TO BACK OF PROPOSED FOOTPATH IN ACCORDANCE WITH COUNCIL STANDARDS BEFORE GRADING BACK TO EXISTING SURFACE LEVELS AT PROPERTY BOUNDARY AT VARYING GRADES OF APPROX. 10%.

NOT FOR CONSTRUCTION

PITCH BLACK GROUP

REV	REVISION DETAILS	DRWN	APP'D	DATE
B	FOR APPROVAL	JB	NG	01.02.24
A	PRELIMINARY ISSUE	IE	NG	19.01.24

DESIGNED	I.ERNST
DRAWN	I.ERNST
CHECKED	N.GREEN
APPROVED	

THIS DRAWING INCLUDES COLOURED INFORMATION
COPIES OF THIS DRAWING MUST BE PRODUCED IN COLOUR

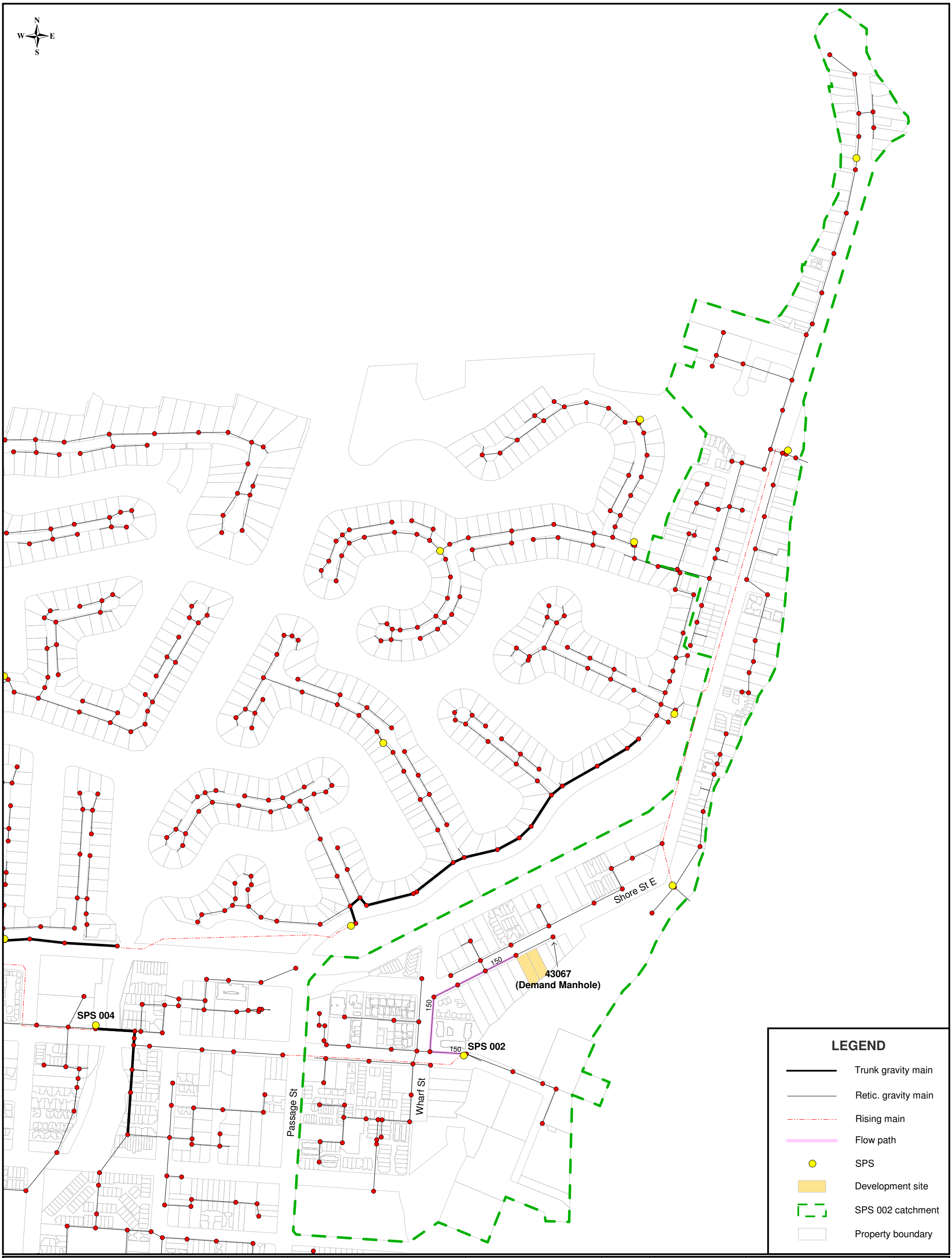
DO NOT SCALE FROM DRAWING

0 2 4 6 8
SCALE 1: 100 SCALE IN m

PROJECT	PROPOSED DEVELOPMENT 67 & 69 SHORE STREET EAST CLEVELAND, QLD, 4163.
DISCIPLINE	CIVIL

STATUS	*PRELIMINARY ISSUE*
SHEET TITLE	CONCEPT EARTHWORKS SITE SECTIONS
PROJECT NUMBER	23191
DRAWING NUMBER	23191-DWG-CV-CV-SK011
REV	B

Appendix 2. Development site and SPS 002 sewer catchment



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APPROVED:	J May
CLIENT PM:	
H2ONE PM:	J May

NOTE: DESIGN NOT TO BE AMENDED WITHOUT H2ONE PTY LTD ACCEPTANCE

No.	REVISION	APPROVED
A	ORIGINAL ISSUE - 21 JUN, 2024	

DATUM:
HORIZ: MGA94 (ZONE 56)
HEIGHT: AHD

SCALE:
0 100 200
Metres

SURVEYED BY / DATE:
SURVEY CHECKED:

PROJECT NO: 2405622
FILE REF:
CAD FILE:

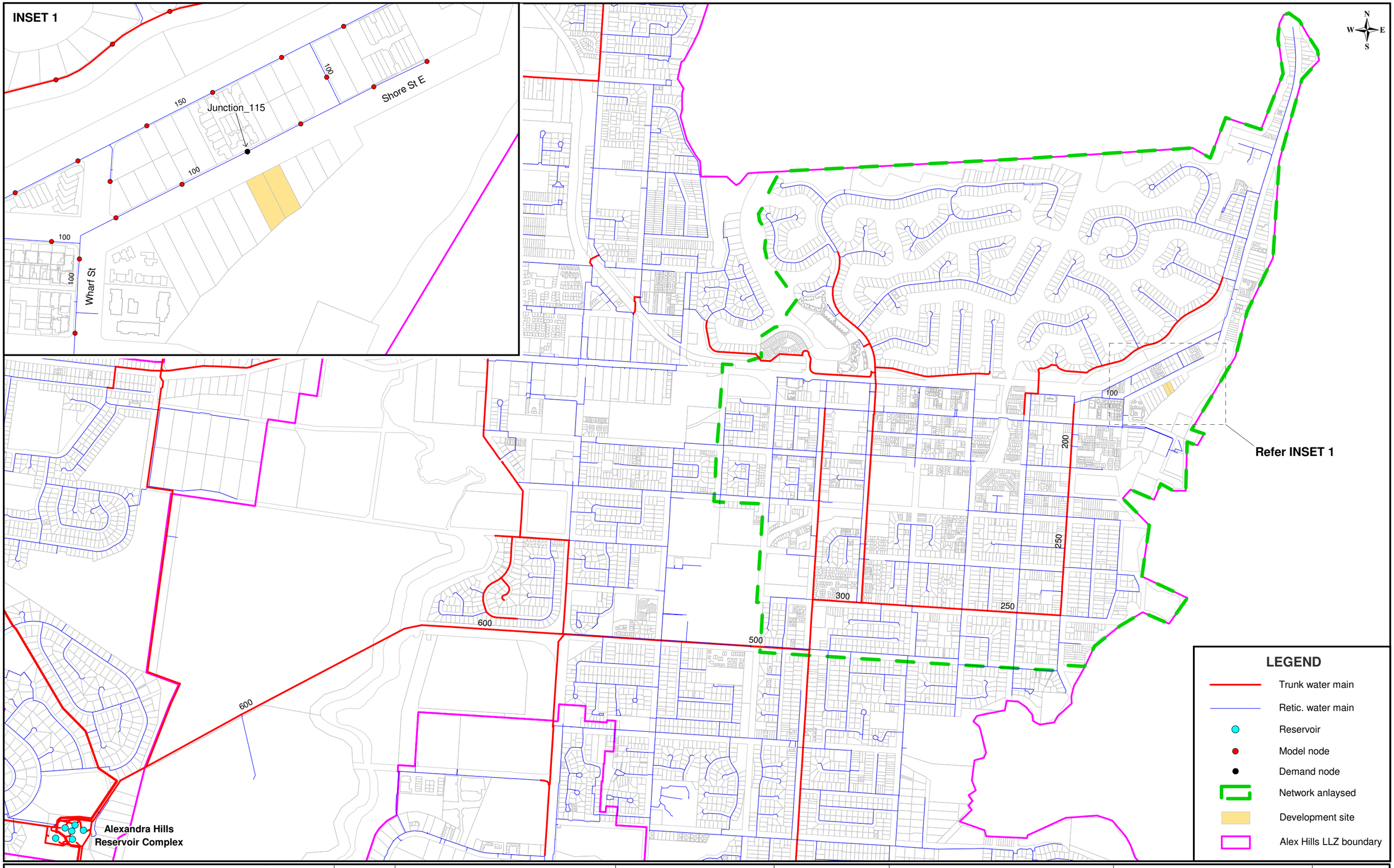
Redland CITY COUNCIL
REDLAND CITY COUNCIL
PO BOX 21
CLEVELAND QLD 4163

67-69 Shore St E Cleveland QLD 4163 Water Supply and Sewerage Network Capacity Assessment

Appendix 2. Development site and SPS 002 sewer catchment

JUN, 2024
DATE SCANNED:
DRG No:
REV:

Appendix 3. Development site and Alexandra Hills water supply system



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H2ONE PM:	J May

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No.	REVISION	APPROVED
A	ORIGINAL ISSUE - 21 JUN, 2024	

DATUM:
HORIZ: MGA94 (ZONE 56)
HEIGHT: AHD

SCALE:
0 325 650
Metres

SURVEYED BY / DATE: | SURVEY CHECKED:

H2ONE REFERENCES

PROJECT NO: 2405622

FILE REFERENCE:

CAD FILE:

Redland CITY COUNCIL

REDLAND CITY COUNCIL
PO BOX 21, CLEVELAND QLD 4163

67-69 Shore St E
Cleveland QLD 4163
Water Supply and Sewerage Network Capacity Assessment

Appendix 3. Development site and Alex. Hills LLZ water supply system

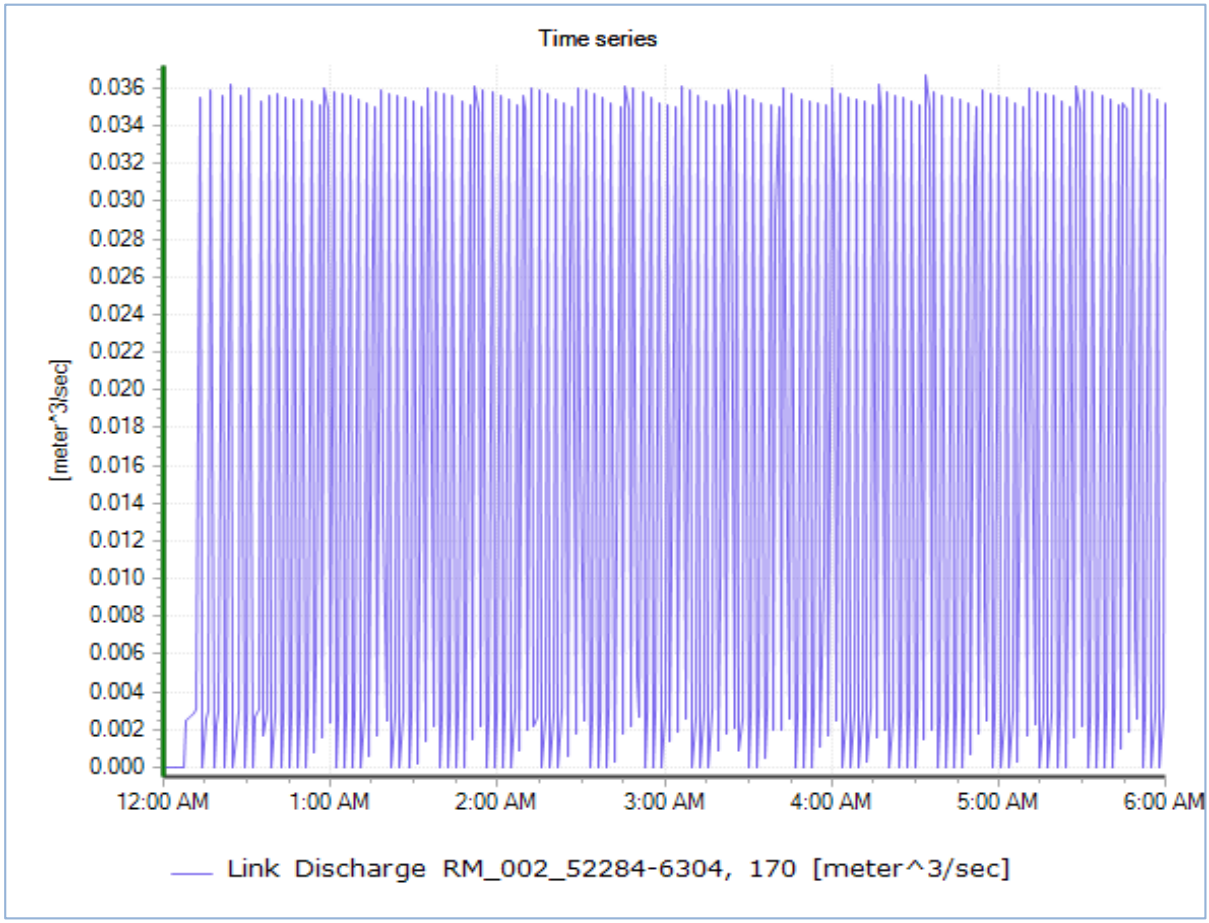
ORIGINAL ISSUE DATE: JUN, 2024

DATE SCANNED:

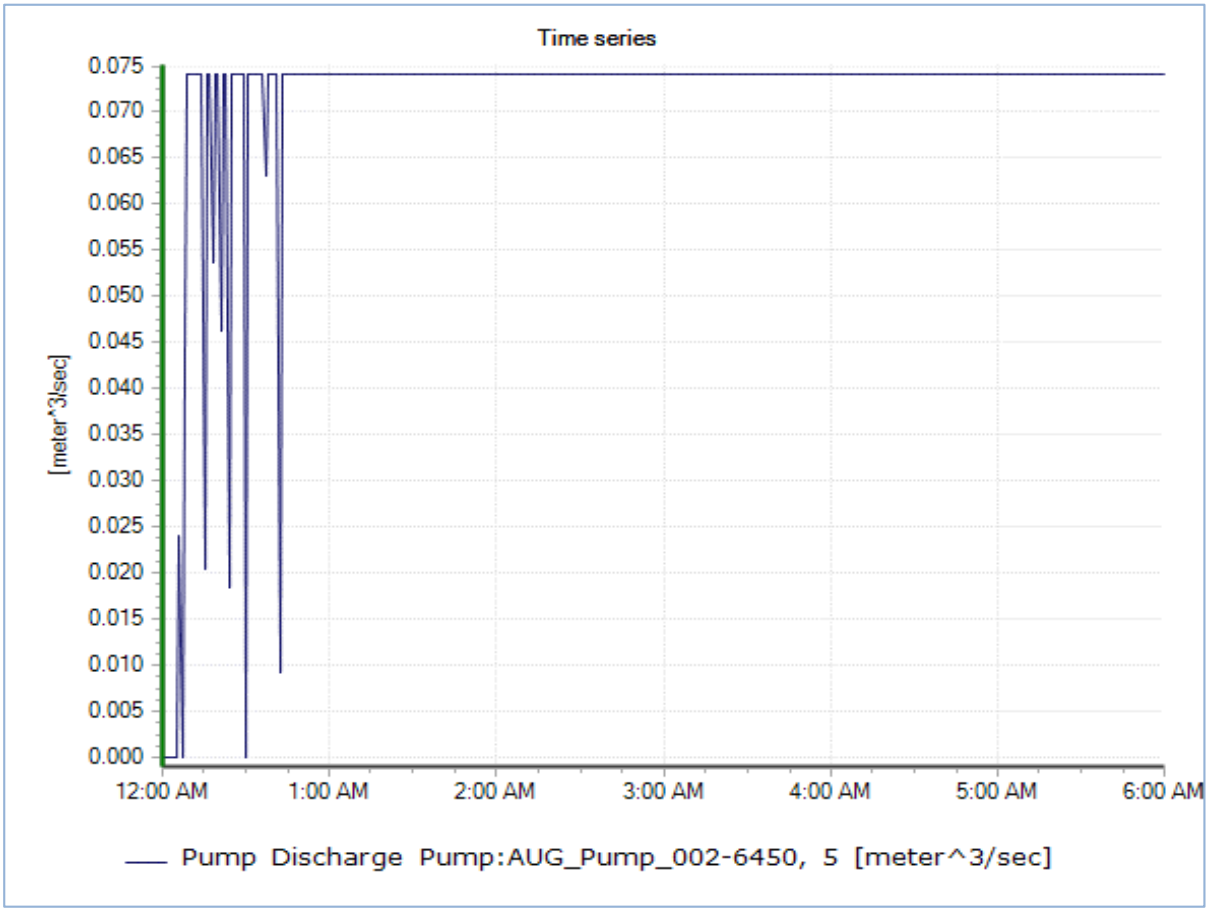
DRG No: | REV:

Appendix 4. Pump capacity assessment results

SPS 002 @ 2021



SPS 002 @ Ultimate



Appendix 5. Operational storage capacity assessment results

		2021	Ultimate
Single Pump Capacity Required	C1	4.77	3.76
	ADWF (L/s)	3.32	14.98
	Q (L/s)	15.83	56.26
Storage Capacity Required	Pump Setup	Duty-assist	Duty-assist
	Duty Head (m)	NA	NA
	Pump Efficiency (%)	NA	NA
	Duty Power (kW)	<100.00	<100.00
	No. pump starts (n)	12.00	12.00
	Volume (kL)	1.19	4.22
Storage Capacity Available	Duty Start (RL m)	-3.07	-3.07
	Duty Stop (RL m)	-3.22	-3.22
	Duty Height (m)	0.15	0.15
	WW Diam. (m)	2.00	2.00
	Volume (kL)	0.47	0.47
OUTCOME	**Difference (kL)**	-0.72	-3.75
	Pass / Fail	**FAIL**	**FAIL**

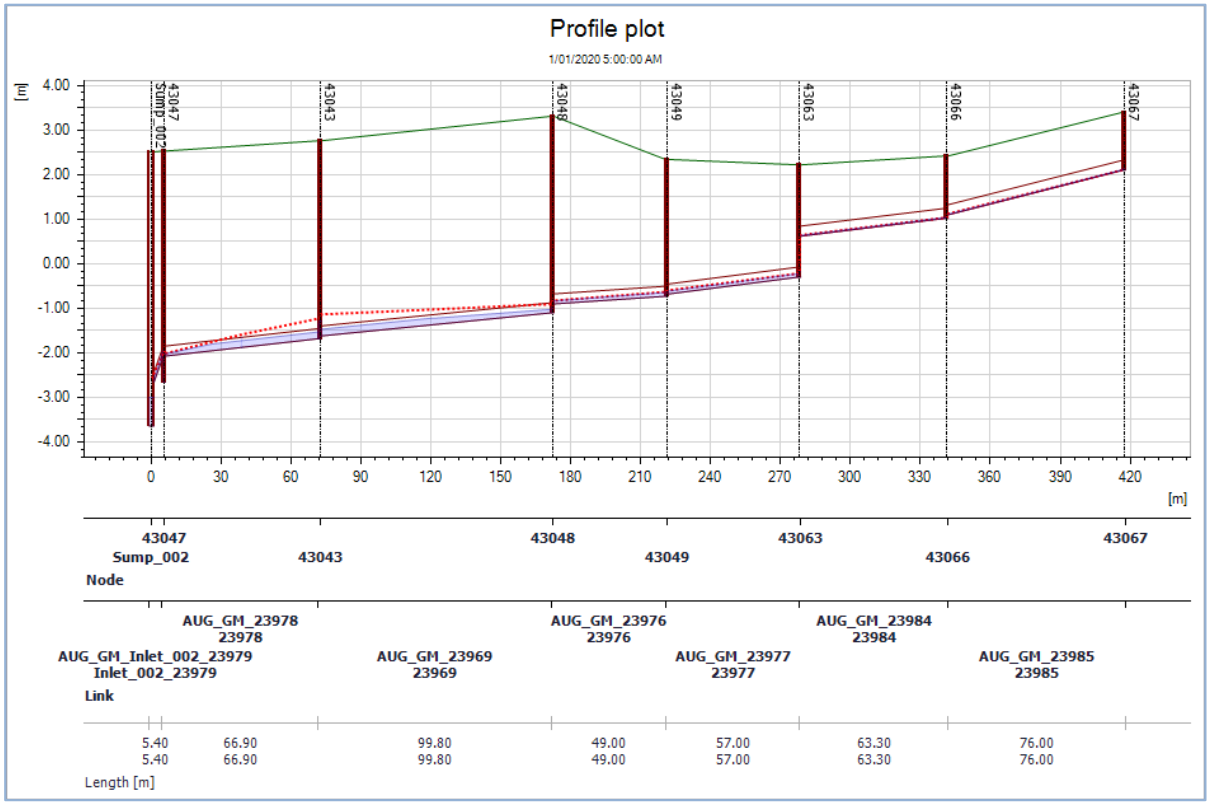
Note 1: Wet well and pump details were sourced from the RCC's hydraulic model.

Note 2: The above table shows results at post-development.

Note 3: The storage deficiencies can be resolved, up to the 2031 planning horizon, by increasing the duty pump start level to the invert level of the discharging gravity main (RL -2.66 m). Subsequent planning horizons may require a storage upgrade.

Appendix 6. Gravity main capacity assessment results

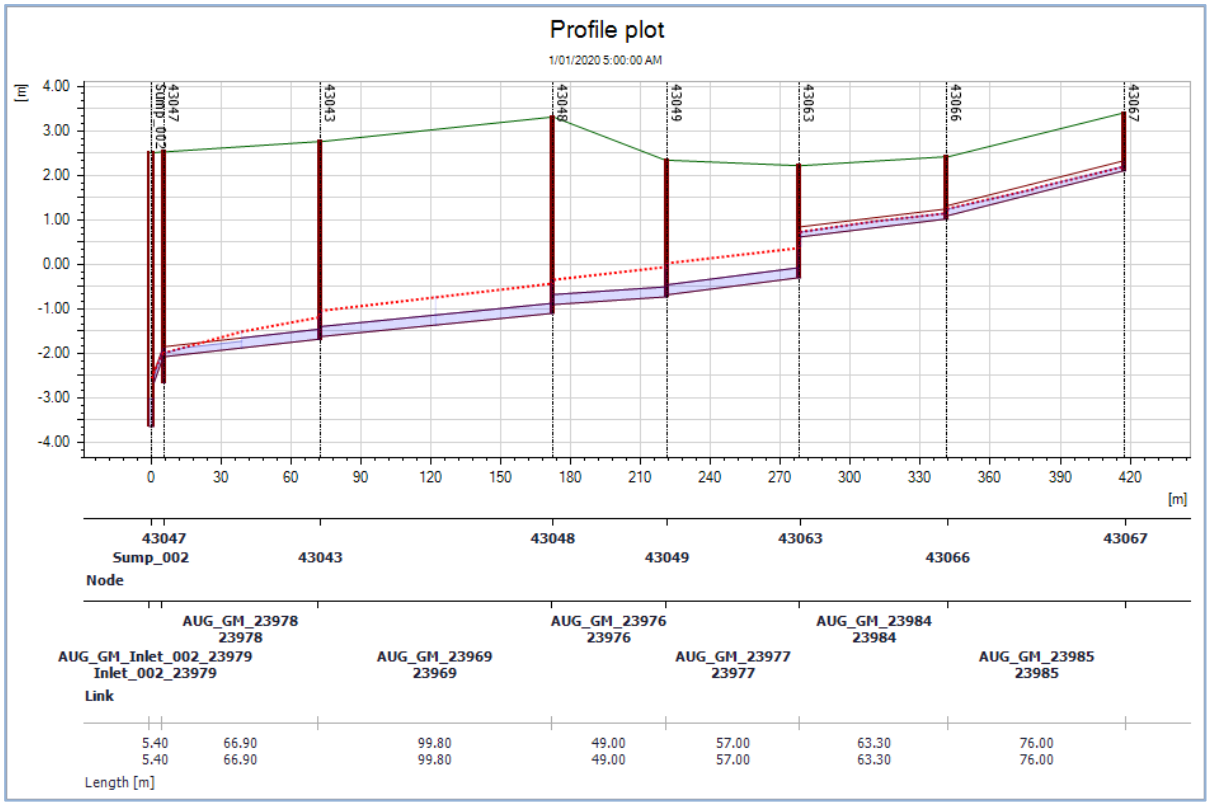
SPS 002 @ 2021, Pre-development



SPS 002 @ 2021, Post-development

SPS 002 @ Ultimate, Pre-development

SPS 002 @ Ultimate, Post-development



Appendix 7. Emergency storage capacity assessment results

SPS 002 Overflow RL: RL 1.95 m @ node 43077 - 0.3 m = RL 1.65 m

MH Volume Below RL 1.65 m @ 1.05 m Diameter: 24.5 kL

Wet Well Volume Between Duty Start (RL -3.07 m) and Overflow @ 2.0 m Diameter: 14.8 kL

Gravity Main Volume Below RL 1.65 m: 18.5 kL (2021) and 32.9 kL (2026-Ultimate)

Total Available Volume (2021): 24.5 + 14.8 + 18.5 = 57.9 kL

Total Available Volume (Ultimate): 24.5 + 14.8 + 32.9 = 72.2 kL

Total Volume Required @ 4 hours ADWF (2021): 1,002.7 EP (post-develop.) x 210 L/EP/day = 35.1 kL

Total Volume Required @ 4 hours ADWF (2026): 1,889.3 EP (post-develop.) x 210 L/EP/day = 66.1 kL

Total Volume Required @ 4 hours ADWF (2031): 2,997.7 EP (post-develop.) x 210 L/EP/day = 104.9 kL

Total Volume Required @ 4 hours ADWF (ULT): 5,455.7 EP (post-develop.) x 210 L/EP/day = 190.9 kL

In summary, compliance is achieved for 2021 and 2026 only, i.e. 35.1 kL versus 57.9 kL, and 66.1 kL versus 72.2 kL, respectively. A storage upgrade (total of 190.9 kL) will likely be required to achieve 4 hours ADWF.

Note the available catchment storage does not consider existing ADWF already within the pipe/MH network. Results should therefore be considered an estimate only.