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11273

Without Prejudice

25 Nov 2024

Victorian Planning Authority

[redacted]

Dear [redacted],

Re - Submission to Further Information Request
Croskell PSP - 585 Berwick - Cranbourne Road, Clyde North
Planning Application

In response to your email dated 17 October 2024, in which Melbourne Water requested Functional Layout Plans demonstrating the infrastructure within the drainage reserve, we are pleased to submit the following plans and supporting documents prepared by Incitus:

1. Incitus Function Design Report dated 25/11/2024
2. Incitus Plan Ref SK01 – Overall Drainage Layout
3. Incitus Plan Ref SK02 – Nominal Major Pipe Network
4. Incitus Plan Ref SK03 – Wetland / Retarding Basin WLRB4 Layout
5. Incitus Plan Ref SK04 – Wetland / Retarding Basin WLRB4 Sections
6. RORB Model

The location and configuration of the drainage reserve have been refined from the previously proposed design to improve site articulation and functionality.

This information is provided without prejudice, and we remain committed to resolving this matter collaboratively. We welcome the opportunity to continue working closely with Melbourne Water and the Victorian Planning Authority (VPA) to achieve a satisfactory outcome.

Please do not hesitate to contact the project team if you require further clarification or additional information.

Yours sincerely,

Damien Rivalland
KLM Spatial

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To	**Victorian Planning Authority**	From	**Nina Barich**
Copy	**Galileo Clyde North Nominee Pty Ltd atf Galileo Clyde North Trust, C/- KLM Spatial**	Reference	**2402**
Date	**25 November 2024**	Pages (including this page)	**9**
Subject	**585 Berwick Cranbourne Road, Clyde North Functional Design – Without Prejudice**		

The site at 585 Berwick Cranbourne Road, Clyde North is located in the future Croskell Precinct Structure Plan (PSP) and Melbourne Water's Ti Tree Creek Development Services Scheme (DSS).

The site is 53.3 ha and is located on the corner of Berwick Cranbourne Road and Thompsons Road. The site has an external catchment of approximately 7.9 ha contributing from the south, from which it must convey the stormwater runoff.

The site drains from south-west to east, with the discharge location for the site the existing 2 x 1350 mm diameter RCP culverts crossing Berwick Cranbourne Road at Selenium Way, approximately 190 m south of Thompsons Road.

The runoff from the catchment will continue through Selenium Way and into the existing wetland / retarding basin, WLRB1, on Thompsons Road, located approximately 200 m east of the intersection of Thompsons Road and Berwick Cranbourne Road. The existing WLRB1 asset has been designed for runoff from the site as well as the external catchment to the south, however the design was based on a residential land-use for this site and not an employment land-use. Therefore, the average impervious coverage will be higher than anticipated in the deign of the WLRB1 asset and hence will have a greater stormwater runoff than what the downstream infrastructure can convey, what the retarding basin can hold and what the wetland has been sized to treat.

The allowable discharge from the site is the capacity of the existing culvert crossing of Berwick Cranbourne Road for the 1% Annual Exceedance Probability (AEP) storm event at 2100 including climate change. The existing capacity of the culvert crossing is 6.62 m^3/s. The site must also ensure that the peak 1% AEP discharge from WLRB1 does not exceed the planned 1% AEP design flow for the catchment from when the asset was designed and constructed. The 1% AEP design discharge for WLRB1 at Thompsons Road is 2.95 m^3/s.

The site must also ensure that the current best practice pollutant reduction objectives for stormwater are achieved for the existing WLRB1 asset with the increased imperviousness of the catchment contributing from the Croskell PSP.

1 Hydrologic Modelling

Incitus has created an extract of the Melbourne Water RORB model encompassing the eastern catchment of the Croskell PSP and the catchment contributing east of Berwick Cranbourne Road to the existing WLRB1 asset, with a revised subarea breakdown for the eastern catchment in the Croskell PSP to ensure there is a minimum of 5 subareas upstream of Berwick Cranbourne Road.

The same modelling parameters were applied as those adopted in the Melbourne Water model; however, the kc value was altered to reflect the revised Dav of the model excerpt and a kc of 2.20 is used. **Figure 1.1** illustrates the revised RORB subareas within the Croskell PSP.

The stage / storage for the WLRB4 asset within the RORB model has been updated to reflect the proposed Incitus functional design.

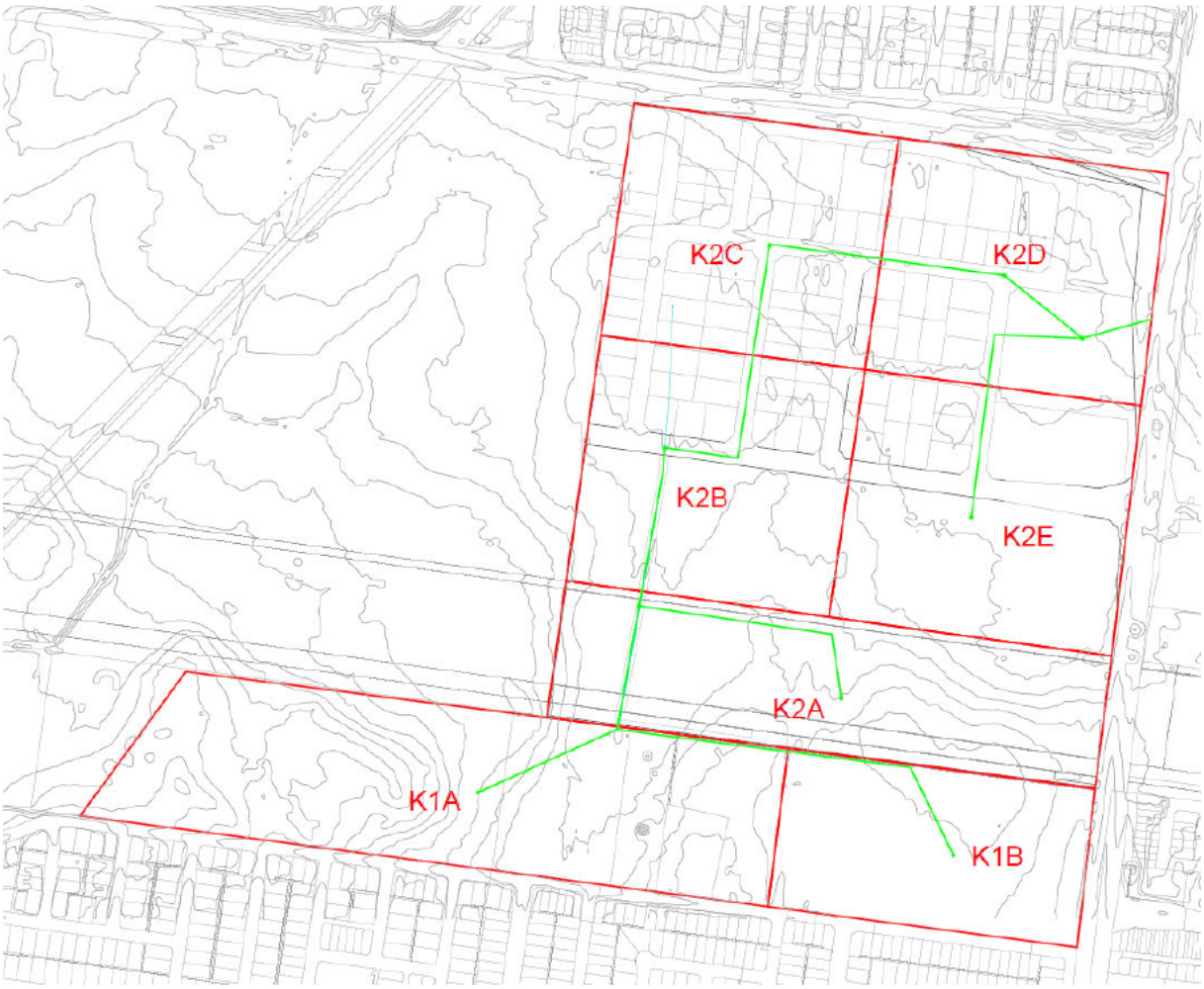


Figure 1.1 – Revised RORB Subareas

Table 1.1 outlines the proposed peak flows extracted from the Incitus revised RORB model.

Table 1.1: Revised Retarding Basin

Location	Target 1% AEP Peak Flow (m^3/s)	Target 1% AEP Peak Flow with CC (m^3/s)	Post Development 1% AEP Peak Flow (m^3/s)	Post Development 1% AEP Peak Flow with CC (m^3/s)
Berwick Cranbourne Road at WLRB4	6.6*	6.6*	1.79 (4.5h)	2.00 (4.5h)
Thompsons Road at WLRB1	2.95 (12h)	3.84 (9h)	2.95 (12h)	3.52 (12h)

*Note: Target at Berwick Cranbourne Road is the capacity of the existing culvert crossing

Table 1.2 outlines the peak parameters associated with the Incitus WLRB4 retarding basin functional design.

Table 1.2: Incitus WLRB4 Design

Parameter	10% AEP	1% AEP	1% AEP + CC
Base level	25.55	25.55	25.55
Peak Inflow (m^3/s)	6.00 (15m)	7.35 (45m)	9.03 (20m)
Peak Outflow (m^3/s)	1.38 (4.5h)	1.79 (4.5h)	2.00 (4.5h)
Peak Volume (m^3)	13,200	20,700	27,000
Flood Level (m AHD)	26.52	27.22	27.60

*Base level is the TEDD of the proposed wetland

The design has demonstrated that the peak discharges are with the allowable limits, and the flood levels are contained within the basin with flood immunity provided to Berwick Cranbourne Road and freeboard maintained to the surrounding properties. The dryout area and maintenance path will be set above the 10% AEP flood level.

A check of the flood levels has also been undertaken for the existing WLRB1 asset. The design of the asset has a 1% AEP flood level of 25.46 m AHD. The proposed peak 1% AEP flood level in WLBR1 will be 25.37 m AHD, which is lower than the existing. The proposed peak 1% AEP + CC flood level in WLRB1 will be 25.55 m AHD, which is below the low point in Thompsons Road of approximately 26.0 m AHD, and therefore flood immunity for the road carriageway is maintained. The allotments adjacent to Thompsons Road to the north have level above 26.4 m AHD, and therefore will still have over 600 mm freeboard in the 1% AEP + CC event.

2 Hydraulic Modelling

Nominal pipe diameters and grades have been selected throughout the development based on the requirement to convey peak 10% AEP design flows in a subsurface drainage network system. The gap flows are the 1% AEP design flow less the capacity of the nominated pipe.

The bypass channel in the drainage reserve has been sized to convey the peak 10% AEP design flow less the peak 4 Event per Year (EY) design flow which will be diverted through the constructed wetland system.

The design has used the mannings formula with a normal depth and is based on a longitudinal grade of 1 in 1000, with a base width of 5 m and side slopes at a 20% grade. The depth of the bypass channel is anticipated to be approximately 700 mm.

At present, the proposed drainage outfall for the retarding basin will result in a backwater for the 10% AEP design flow over the constructed wetland system. The design has the capacity to be further refined to prevent this, through moving the sediment pond further south, moving the macrophyte zone further south and potentially reducing the macrophyte zone of the wetland marginally.

Should these design modifications be adopted, the 1% AEP flood level and the 1% AEP plus climate change flood level will marginally increase due to a slight reduction in storage capacity, however the

design has capacity for an increase in these flood levels whilst still containing the flows and providing flood immunity.

The current macrophyte zone has the capacity to reduce whilst still meeting current best practice pollutant reduction objectives. The current slope along the southern boundary of the drainage reserve between the path and the macrophyte zone does not exceed 1 in 6.2, and therefore there is the ability to shift the asset approximately 3.5 m south without exceeding a 1 in 5 batter.

The current slope above the bypass channel along the northern boundary does not exceed 1 in 7.4. Therefore, the bypass channel can also be shifted slightly north to increase the capacity of the channel and maintain maximum batters of 1 in 5.

The current drainage reserve size has the capacity to contain the 10% AEP design flow in the bypass channel with alterations. Due to the iterative nature of the design of the bypass channel to fully contain the 10% AEP design flow with a tailwater control at the outlet, the current functional design has not considered this. However, the design can be further finessed after gazettal of the PSP if required.

3 Stormwater Quality Modelling

The Incitus functional design has included a sediment pond and macrophyte zone to provide additional treatment to the catchment prior to discharging towards the existing WLRB1 asset.

The sediment pond has been sized using the Fair and Geyer method in accordance with Melbourne Water requirements. The size adopted has an area at normal water level of 2,075m^2, and a permanent pool volume of 2,145 m^3.

The macrophyte zone included has an area at normal water level of 3,370 m^2. Both the wetland and sediment pond have adopted 350 mm operating depths, and the normal water level of the sediment pond is set 100 mm above the normal water level of the macrophyte zone. A 48 hour detention time has been adopted for WLRB4 as it is online to the existing WLRB1 asset, which is also online to the downstream wetlands.

Table 3.1 outlines the treatment performance achieved at WLRB4 of the proposed Incitus design, and **Table 3.2** outlines the treatment performance achieved at WLRB1 of the proposed Incitus design.

Table 3.1: WLRB4

Pollutant	Source	Residual	% Reduction
Total Suspended Solids (kg/yr)	72,000	31,600	26.2%
Total Nitrogen (kg/yr)	153	83.9	45.2%
Total Nitrogen (kg/yr)	1,090	813	25.5%
Gross Pollutants (kg/yr)	14,700	0	100%

Table 3.2: WLRB1 with Croskell and WLRB4 Treatment

Pollutant	Source	Residual	% Reduction
Total Suspended Solids (kg/yr)	187,000	34,800	81.4%
Total Nitrogen (kg/yr)	392	119	69.6%
Total Nitrogen (kg/yr)	2,770	1,480	46.6%
Gross Pollutants (kg/yr)	38,400	0	100%

The results have demonstrated that the current best practice pollutant reduction objectives have been met at Thompsons Road.

An inundation analysis of WLRB4 with a 350 mm extended detention depth and a 48 hour nominal detention time results in the normal water level being exceeded by 272 mm for 20% of the time, and by 91 mm for 50% of the time. This is illustrated in **Figure 3.1**.

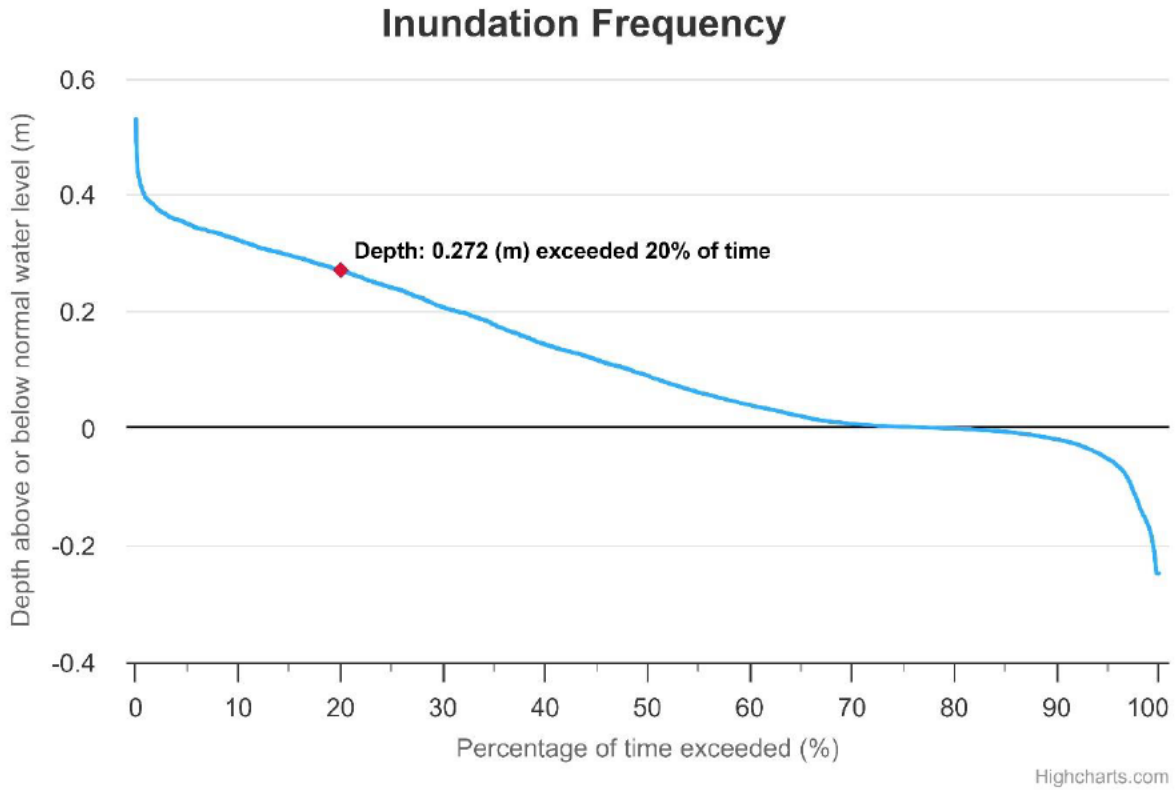


Figure 3.1 – Inundation Frequency for WLRB4 with 350 mm EDD and 48 Hour Detention Time

To reduce the possibility of drowning of the plants within the wetland and in accordance with the Melbourne Water guidelines, the asset must either:

- Reduce the detention time by opening the penstock winder
- Adopt an effective normal water level (ENWL)

A reduction in the nominal detention time within WLRB4 to 24 hours will reduce the depth the wetland exceeds normal water level to 175 mm for 20% of the time and 15 mm for 50% of the time. This

inundation frequency is illustrated in **Figure 3.2**. The system still exceeds the current best practice pollutant reduction objectives at Thompsons Road, with a marginal improvement from those stated in Table 3.2, by adopting a 24 hour notional detention time for WLRB4.

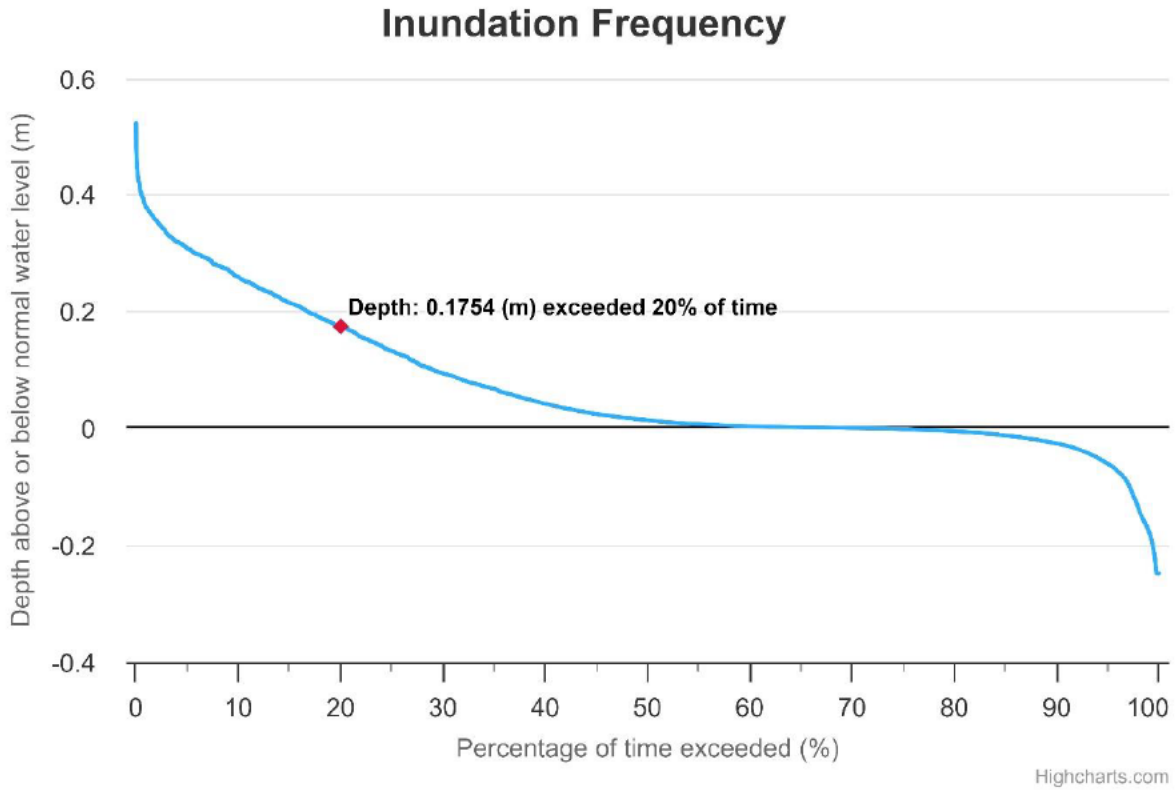


Figure 3.2 – Inundation Frequency for WLRB4 with 350 mm EDD and 24 Hour Detention Time

Alternatively, the wetland can adopt an effective normal water level of 25.3 m AHD. This will reduce the operating depth to 250 mm. The treatment performance at Thompsons Road with the adoption of the effective normal water level for WLRB4 with a 250 mm operating depth is outlined in **Table 3.3**.

Table 3.3: WLRB1 with Croskell and WLRB4 Treatment Using a 250 mm EDD

Pollutant	Source	Residual	% Reduction
Total Suspended Solids (kg/yr)	187,000	35,700	80.9%
Total Nitrogen (kg/yr)	392	121	69.1%
Total Nitrogen (kg/yr)	2,770	1,500	46.1%
Gross Pollutants (kg/yr)	38,400	0	100%

Both options stated above will meet the required pollutant reduction objectives and neither will compromise the function of the retarding basin. It should be noted that the reduction in the operating time for WLRB4 results in a slightly reduced inundation frequency of WLRB1 and a marginal increase in pollutant reductions at Thompsons Road. The functional design has currently adopted a 350 mm operating depth.

4 WLRB4 Drainage Reserve and Design

To accommodate the retardation and treatment requirements stated above, as well as comply with Melbourne Water's requirements for constructed wetlands, a drainage reserve of 2.44 ha has been adopted for WLRB4 within the site at 585 Berwick Cranbourne Road, Clyde North.

The design has given consideration to the connection to the existing culvert crossing and has adopted a NWL for the sediment pond of 25.3 m AHD and a NWL for the macrophyte zone of 25.2 m AHD. A bypass channel is provided across the northern portion of the drainage reserve, sized to convey the regular design flows not entering the constructed wetland system.

The outlet pit and pipe connection will control the discharge from the drainage reserve across Berwick Cranbourne Road. The design has included paths, a dry-out area above the 10% AEP flood level, and batters not steeper than 1 V : 5 H. **Figure 4.1** illustrates the proposed design of the WLRB4 asset.

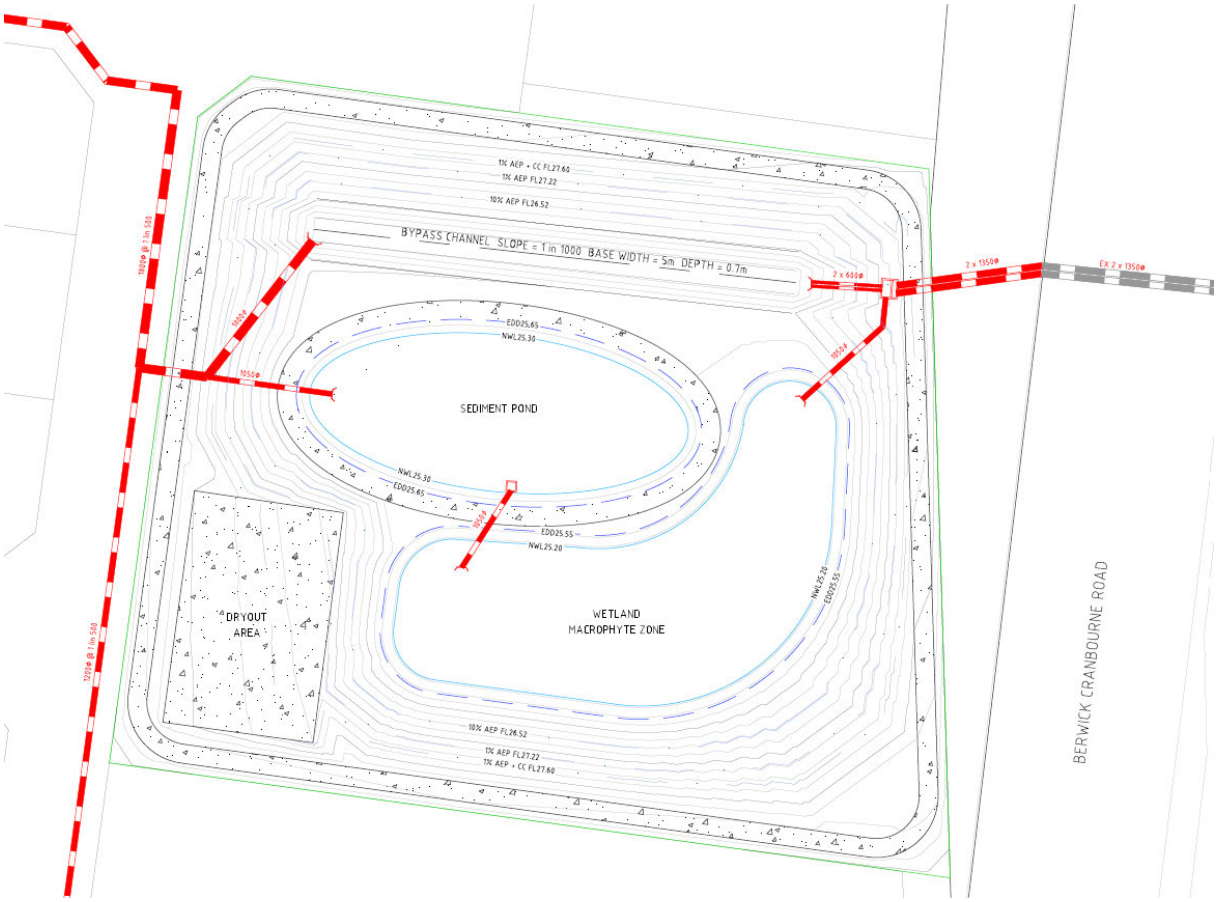


Figure 4.1 – WLRB4 Asset with 2.44 ha Drainage Reserve

5 Response to Melbourne Water Design Matters for WLRB4

Part A

- Use of WLRB1: Current design utilises the existing WLRB1 asset for treatment based on exhibited land-use types for the Croskell Employment PSP.
- Climate Change Approach: The post development 1% AEP design flows at 2100 are mitigated to the existing 2100 peak 1% AEP design flows.
- Extended Detention Depths: Inundation analysis has been undertaken, refer to Section 4 of this memorandum.
- Flow Constraints: The system mitigates the 1% AEP design flows (current day) to 2.95 m^3/s at Thompsons Road, less than the capacity of the downstream pipe infrastructure.
- Groundwater: Should groundwater be encountered in the proposed drainage reserve location, appropriate engineering design measures will be applied to the asset.
- Invert / Base of Wetland: The invert level has been set to facilitate a free draining outfall for the DSS pipeline G1 – G2 and match with the existing outfall levels.

Part B

- Design matters discussed in Part A are addressed above.
- Groundwater: Should this be encountered, engineering options will need to be incorporated into the design as the normal water level is dictated by the ability to obtain a free draining outfall for the upstream properties.
- Longitudinal section over the VDP: Nominal culvert sizes have been indicated on the plans, however the design over the VDP cannot be determined at this time as Incitus does not have the existing levels of the VDP. It should be noted that this will not alter the levels within WLRB4 or the drainage reserve size of WLRB4. The levels for WLRB4 have been based on the pipe size required to convey the 10% AEP design flow from the VDP to the WLRB4 asset, with minimal cover.
- Detailed information on adopted design water levels: Refer to this memorandum and the functional design plans.
- Proposed pipe inlet points and overland flow paths: Refer to the functional design plans.
- Outfall culverts: Refer to the functional design plans.
- Sections through WLRB4: Refer to the functional design plans, design is / can be compliant with Melbourne Water guidelines.
- Land-take ensures design safety and maintainability: Refer to the functional design plans. Batters do not exceed 1 in 5, access is provided, dryout area meets Melbourne Water requirements.
- Road access around drainage reserve: Refer to development layout and functional design plans.

6 Conclusion

The Melbourne Water drainage strategy for the eastern catchment within the Croskell PSP has significantly overestimated the drainage reserve size required to manage the stormwater runoff from the development of the catchment, nominating a 10.2 ha reserve.

The Incitus functional design has outlined how the stormwater runoff from the development of the eastern catchment within the Croskell PSP can be managed within a 2.44 ha drainage reserve, whilst meeting the requirements for the stormwater including:

- Retarding to the existing, or the original Ti Tree Creek DSS, 1% AEP design flow at Thompsons Road, discharging from the existing WLRB1 asset
- Ensuring the 1% AEP design flow plus climate change at the year 2100 can be conveyed and contained
- Ensuring freeboard to existing properties surrounding the Croskell PSP
- Ensuring treatment to current best practice pollutant reduction objectives at Thompsons Road from the existing WLRB1 asset for the contributing catchment
- Complying with the current Melbourne Water guidelines

Adoption of the Incitus functional design for the eastern catchment within the site at 585 Berwick Cranbourne Road will unlock required employment land within the site without compromising the function of the proposed and existing Ti Tree Creek DSS assets.

THOMPSONS ROAD

THOMPSONS ROAD

EXISTING WLRB1

SELENIUM WAY

BERWICK CRANBOURNE ROAD

WLRB4

VDP CROSSING
LIKELY 3 x 1200 x 600 BCs

0 20 40 60 80 100m
SCALE 1:2000 (A1)
SCALE BEFORE REDUCTION

No.	BY	DATE	REVISION	APPD
A	NB	22.11.24	FOR INFORMATION ONLY	

DOC. NUMBER	DOCUMENT TITLE
REFERENCE DOCUMENTS	

INCITUS

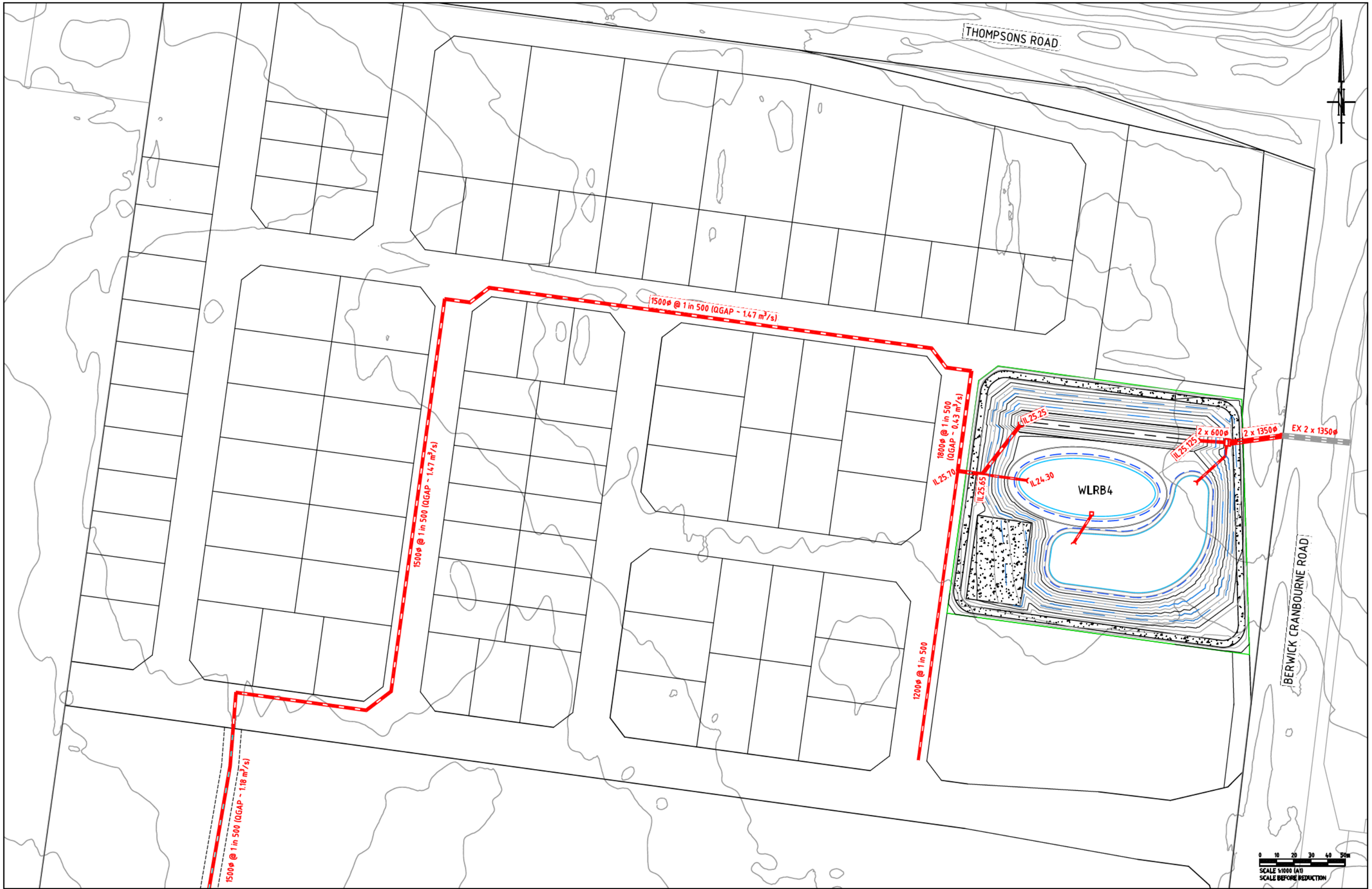
Status: WITHOUT PREJUDICE

DESIGNED		CHECKED	
DRAWN	NB	CHECKED	
APPROVED		DATE	

585 BERWICK CRANBOURNE ROAD CLYDE NORTH

OVERALL DRAINAGE LAYOUT

Original Size: A1 | Dwg No.: 2402-SK01 | Rev.: A



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585 BERWICK CRANBOURNE ROAD CLYDE NORTH

NOMINAL MAJOR PIPE NETWORK

Original Size	Dwg No.	Rev.
A1	2402-SK02	A

1650ø @ 1 in 500

1800ø @ 1 in 500

1200ø @ 1 in 500

1% AEP + CC FL27.60

1% AEP FL27.22

10% AEP FL26.52

BYPASS CHANNEL SLOPE = 1 in 1000 BASE WIDTH = 5m DEPTH = 0.7m

2 x 600ø

2 x 1350ø

EX 2 x 1350ø

1050ø

EDD25.65

NWL25.30

SEDIMENT POND

1050ø

NWL25.30

EDD25.65

1050ø

EDD25.55

NWL25.20

DRYOUT AREA

WETLAND MACROPHYTE ZONE

NWL25.20

EDD25.55

10% AEP FL26.52

1% AEP FL27.22

1% AEP + CC FL27.60

A SK04

B SK04

C SK04

SELENIUM WAY

BERWICK CRANBOURNE ROAD

N

0 5 10 15 20 25m

SCALE 1:500 (A1)
SCALE BEFORE REDUCTION

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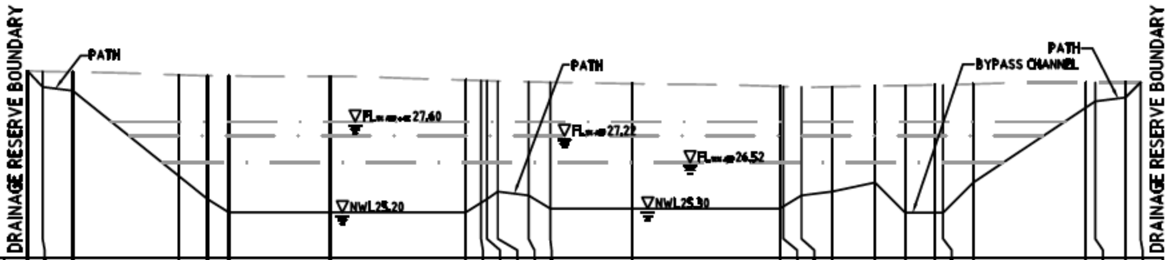
585 BERWICK CRANBOURNE ROAD CLYDE NORTH

WETLAND / RETARDING BASIN WLRB4
LAYOUT

Original Size	Dwg No.	Rev.
A1	2402-SK03	A

DATUM 24.0



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62.22	25.750	28.674
66.29	25.650	28.655
69.15	25.300	28.644
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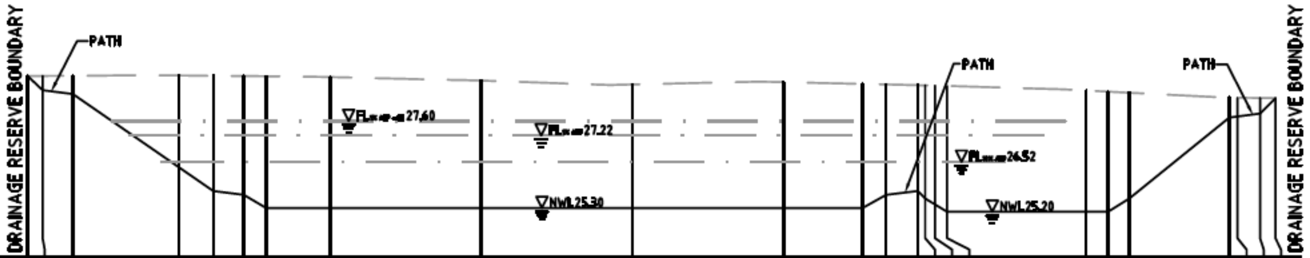

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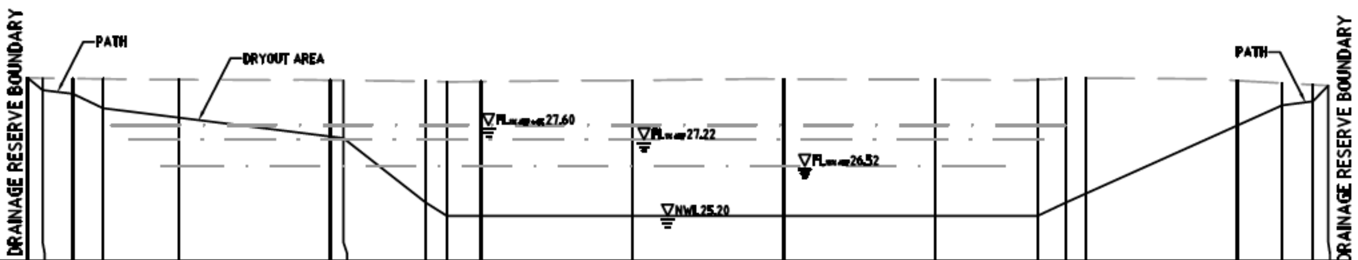

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55.46	25.200	28.746
60.00	25.200	28.751
80.00	25.200	28.783
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SECTION C

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SCALE BEFORE REDUCTION

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SCALE 1:100 (A1)
SCALE BEFORE REDUCTION

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WETLAND / RETARDING BASIN WLRB4
SECTIONS

Original Size: A1 | Drg No. 2402-SK04 | Rev. A