



ENGINEERING REPORT

TOWNSVILLE WATER PARK AND HOTEL
DEVELOPMENT
TOWNSVILLE TURF CLUB SITE

FOR
MCK TSV PTY LTD

JOB No: BNC0084
Doc Ref: BNC0084-ENG
COUNCIL REF:

Phone: 07 4725 5550
Fax: 07 4725 5850
Email: mail@nceng.com.au
50 Punari Street Currajong Qld 4812
Milton Messer & Associates Pty Ltd
ACN 100 817 356 ABN 34 100 817 356

DOCUMENT CONTROL

Rev	Author	Reviewed	Approved		Date	Issued To:	Purpose
A	Andrew Wallace / Brendan Blair	Andrew Wallace	Andrew Wallace (RPEQ 6743)		16/08/2024	BNC Planning	Support for development applications

EXECUTIVE SUMMARY

MCK Pty Ltd is proposing the Townsville Water Park and Hotel development at the Townsville Turf Club (TTC) site. The land parcels include Lot 1 on SP101275, Lot 2 on RP748152 and Lot 1 on EP1477. The site is proposed to be developed as depicted on the CA Architects layout plan and involves a bulk earthworks application.

This engineering report is prepared in support of the development and outlines the proposal including the infrastructure and engineering requirements demonstrating the site is suitable for the proposed uses.

The findings of this assessment are summarised below:

- An extensive flood impact assessment has been carried out using a fine scale mini TUFLOW model based on inputs and boundary conditions derived from Townsville City Council's new Ross River Flood Study. This extensive assessment which includes a series of low maintenance, free draining flood mitigation measures has demonstrated that the proposed development footprint can comply with the flood hazard overlay code. Refer to the attached NCE flood impact assessment report.
- The initial bulk earthworks to be carried out on the site also does not result in impacts off site. The bulk earthworks proposed align with the proposed development layout.
- Local run-off will be conveyed to legal points of discharge via an underground pit and pipe network. Stormwater quantity and mitigation of post-development flows is addressed utilising the detention storage and flow mitigation measures within the development extents.
- Stormwater quality is demonstrated to be mitigated through a treatment train and utilising best practice stormwater quality improvement devices, including proprietary devices.
- Existing water infrastructure surrounding the site has capacity to service the development for peak demands and fire flows. A DN300 connection is proposed to the DN450 DICL trunk main on Stuart Dr opposite Watt St. The DN300 and reducing to a DN200 water main is proposed through the site is adequately sized to service the development. Refer to the DPM Water report for details of the assessment.
- The sewerage planning assessment has demonstrated that the existing system requires upgrade in order to accommodate the proposed development. A number of options are nominated. Refer to the DPM Water report for details of the assessment and the various options.
- The site is proposed to be accessed via a new internal road extension of Lakeside Drive through to Stuart Drive at Edison St. The road category proposed is a TCC major collector.
- The Geleon Traffic Assessment report demonstrates that a new 4-leg, signalised intersection is proposed at the Stuart Drive / Edison St intersection. A new 4-way, single lane roundabout is proposed to access either side of the development site. The roundabout is proposed as the only access to either side of the site with direct property access restricted along the Lakeside Drive extension. Refer to the Geleon traffic assessment report.
- The electrical supply is being assessed separately by specialist firm Ashburner Francis.

TABLE OF CONTENTS

EXECUTIVE SUMMARY	i
1.0 INTRODUCTION	1
1.1 Background	1
1.2 Supplementary Reports	1
1.3 Proposed Development	2
2.0 FLOODING.....	3
3.0 STORMWATER DRAINAGE.....	7
3.1 Quantity	8
3.1.1 Stormwater Modelling	9
3.2 Quality	11
3.2.1 Stormwater Quality Objectives.....	11
3.2.2 MUSIC Modelling.....	12
4.0 WATER NETWORK	14
5.0 SEWERAGE PLANNING	15
6.0 TRAFFIC ASSESSMENT.....	16
7.0 ELECTRICAL AND COMMUNICATIONS.....	16
8.0 CONCLUSION.....	17

LIST OF FIGURES

Figure 1-1 CA Architects Concept Masterplan – 2407_PD A-001.....	3
Figure 2-1 TownsvilleMaps Flooding Web Map Service extract and flood levels.....	4
Figure 2-2 1% AEP 9 hour event Depth and Flood Extent.....	5
Figure 2-3 Proposed development configuration and site drainage	6
Figure 2-4 Hazard Assessment – 1% AEP 9 hour VD Product.....	7
Figure 3-1 Existing development aerial imagery	8
Figure 3-2 TUFLOW time-series reporting location.....	9
Figure 3-3 1% AEP outflow hydrographs	10
Figure 3-4 20% AEP outflow hydrographs	11
Figure 3-5 MUSIC Model Catchments	12
Figure 3-6 MUSIC model set-up	14
Figure 4-1 (DPM Water Appendix C) Water Modelling Figure	15

LIST OF TABLES

Table 3-1 Stormwater peak flows	9
Table 3-2 MUSIC source nodes	13
Table 3-3 Stormwater quality improvement devices	13
Table 3-4 Swale parameters	13
Table 3-5 Detention basin parameters	13
Table 3-6 MUSIC treatment train effectiveness	14

APPENDICES

APPENDIX I

CA Architects Concept Plan

APPENDIX II

Northern Consulting Engineers Concept Drawing

APPENDIX III

Northern Consulting Engineers Bulk Earthworks Drawings

APPENDIX IV

NCE Flood Impact Assessment

APPENDIX V

DPM Water Water Supply and Sewerage Planning Report

APPENDIX VI

Geleon Traffic Assessment

1.0 INTRODUCTION

1.1 Background

Northern Consulting Engineers (NCE) has been commissioned by BNC Planning (BNC), on behalf of MCK TSV Pty Ltd to undertake an engineering report to support the proposed Townsville Water Park and Hotel at the existing vacant portion of the Townsville Turf Club site. The site is described as Lot 1 on SP101275, Lot 2 on RP748152 and Lot 1 on EP1477 which is located approximately 7km south of Townsville's CBD in between Stuart Drive and Racecourse Road. The client is in the process of preparing and finalising development applications associated with the proposal.

The existing site is currently occupied by Townsville Turf Club's Cluden Racecourse. The earthworks and development are proposed on the vacant portion of the site generally at the west of the Townsville Turf Club facilities and at the existing gravel carpark.

The proposal includes the water park, hotel as well as other retail, commercial, residential uses complementary with the overall master planning concept.

This engineering report demonstrates how the proposed development can be achieved by addressing:

- Flooding
- Stormwater management
- Water and sewer infrastructure
- Traffic and roadways
- General commentary also provided relating to the electrical and communications supply.

The information provided in this report is based on the following layout plans which are provided in Appendix I of this report:

- CA Architects – 2407_PD A-001 and 2407_PD A-100

Also included for reference are the supporting concept engineering plans in Appendix II.

- Northern Consulting Engineers - Conceptual Overall Layout Plan BNC0084/C01 P1

NCE is an established consulting firm providing services in the land development and infrastructure sector and has been involved in the strategic planning of various developments within the Townsville region. NCE have carried out a number of flood impact assessments and engineering services relating to the Townsville Turf Club site.

1.2 Supplementary Reports

The information in this report is supplemented by a number of supporting engineering investigations. Summaries of these reports are provided under the appropriate sections as noted below:

- **Section 2.0** Flooding – *Flood Impact Assessment, Doc Ref: BNC0084-FIA Revision A dated 16/8/2024, prepared by NCE.*

- **Section 0** Water Network – *Water Supply and Sewerage Planning Report, Revision A dated 27/07/2024, prepared by DPM Water.*
- **Section 5.0** Sewerage Network – *Water Supply and Sewerage Planning Report, Revision A dated 27/07/2024, prepared by DPM Water.*
- **Section 6.0** Traffic -Traffic Impact Assessment Report, prepared by Geleon.

1.3 Proposed Development

The site is proposed to be developed into a Water Park and Hotel with associated uses as shown on CA Architects concept plans in **Figure 1-1**. The proposal has been presented as concept layouts as shown in this figure. The final layout will be subject to refinement, however the assessments carried out are considered to address the engineering matters pertinent to the site and proposal. The proposed development will include the include the following:

- Water park site indicatively shown in the figures.
- Hotel site.
- Supporting retail, commercial and multi-storey residential uses.
- Carparks.

The existing site is subjected to inundated during flood events. In reference to Townsville Maps Flooding Townsville City Plan, flood overlay map, the site is within the medium and high hazard areas. As a result of the filling, some areas currently subject to inundation and due to the change in impervious area, increase in run-off is experienced which required mitigation as addressed as part of flood impacts assessment. A series of detention basins and flow mitigation measures has resulted in no actionable afflux. In fact, the mitigation measures have resulted in a reduction in flood levels in both the major and minor events. Further discussion on this is provided in Section 2.0.

Stormwater quality runoff will also be impacted by the development. Best practice solutions to run-off treatment is proposed. Further discussions on these elements are provided in Section 3.0.

The development is to be connected to Townsville City Council's (TCC) water and sewerage network. Connection to the water network will be carried out to the existing trunk network at the site frontage. Connection to the sewer network will be via the existing system in the vicinity of the site with a number of options available as discussed in the Water Supply and Sewerage Planning Report. Further details are discussed in Sections 0 and 5.0.

Assessment of the post development traffic is discussed Section 6.0.

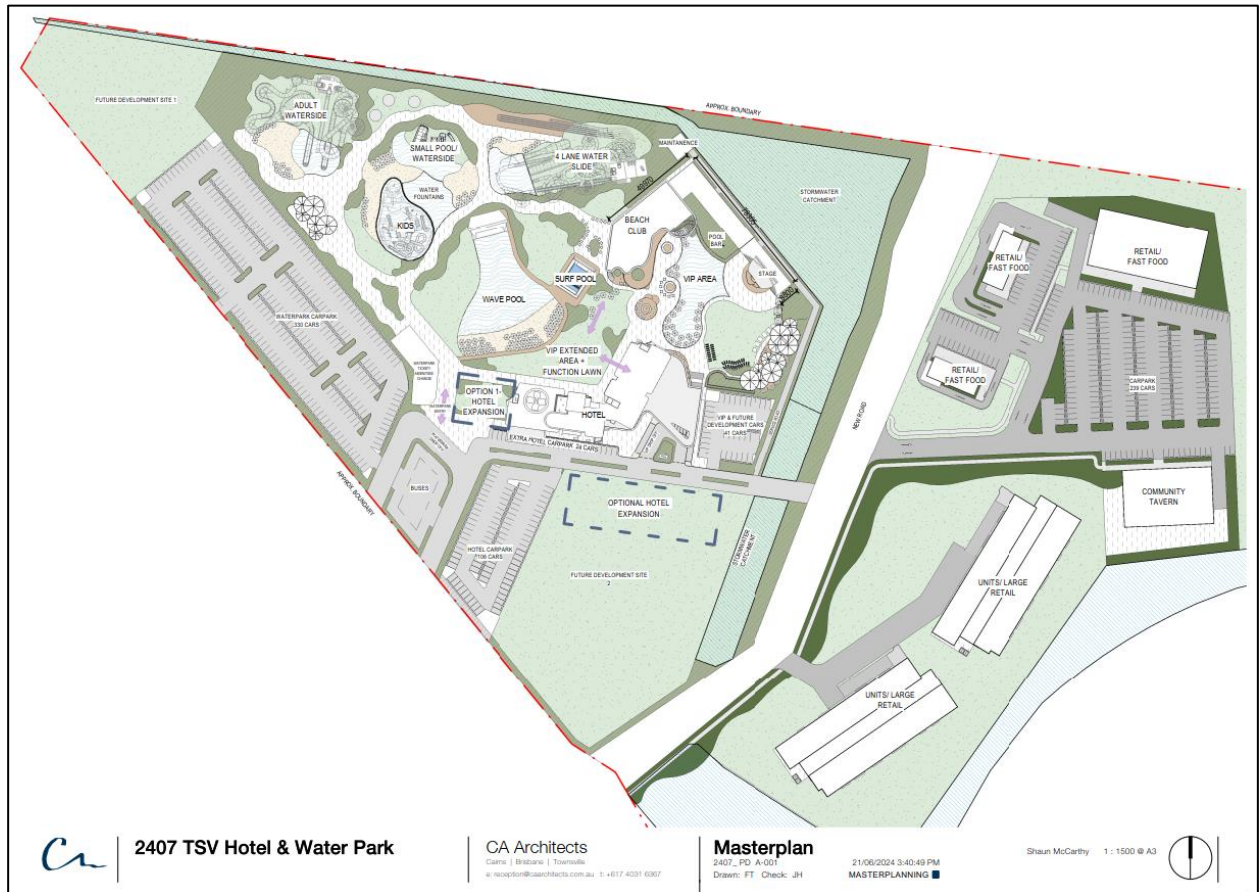


Figure 1-1 CA Architects Concept Masterplan – 2407_PD A-001

2.0 FLOODING

In reference to the Flood Hazard Overlay OM-6.1 of the Townsville City Council (TCC) Planning Scheme shown and TownsvilleMAPS mapping services in **Figure 2-1**, it has been identified that the proposed development site is located within the medium and high hazard areas. In addition, the hydrological processes and stormwater drainage components of the Healthy Water Code 9.3.2 requires demonstration of compliance, in particular with the Performance Outcomes.

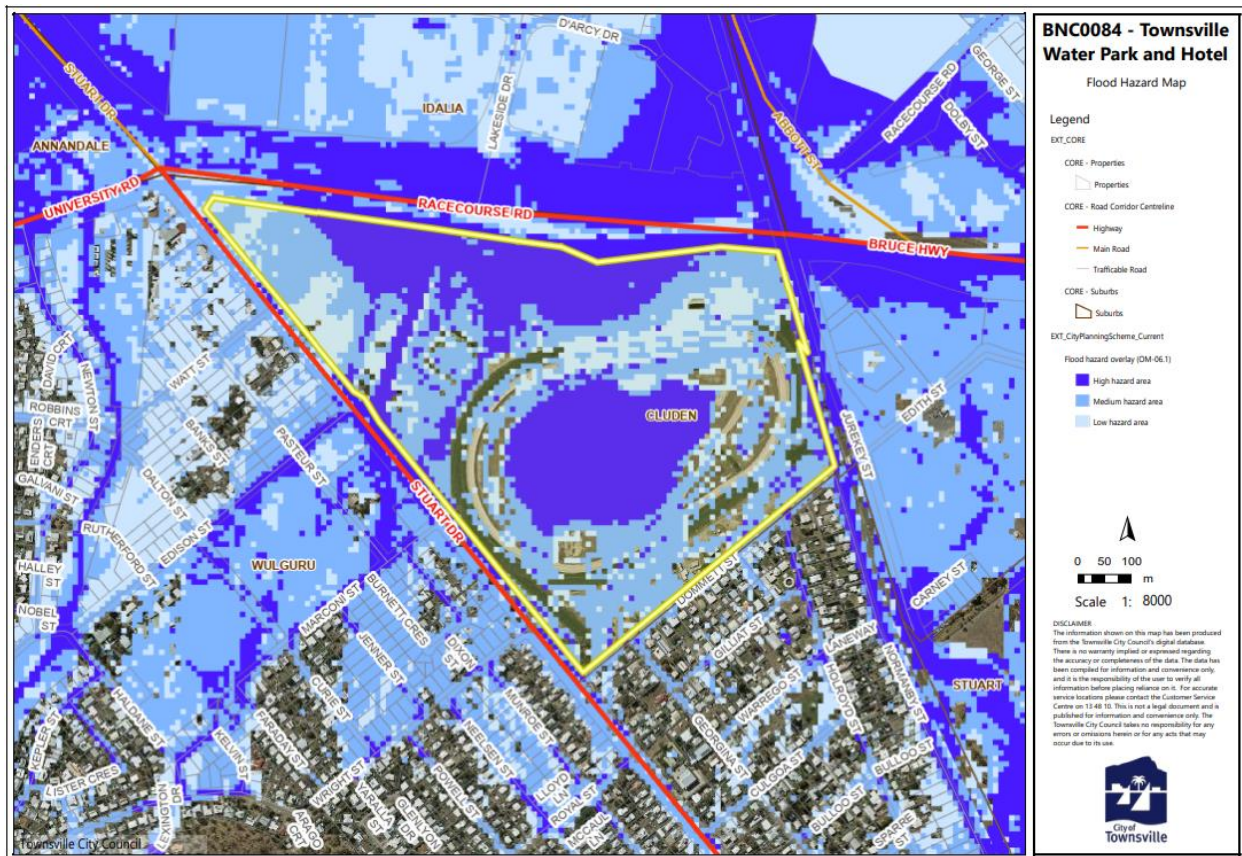


Figure 2-1 TownsvilleMaps Flooding Web Map Service extract and flood levels

To undertake this study, a new fine scale 2D TUFLOW model has been developed to assess the potential impact associated with the proposed development. As this site is located within a broader catchment, external flows and downstream tailwater levels were adopted from the TCC flood models. This model had been developed based on inputs from the former (but current formal) TCC flood model. However, as the updated 2021 TCC Ross River Flood Study model became available, the model was updated with flows extracted and incorporated into the fine scale model. Anomalies were found with the new critical duration map and it was found that the new critical duration resulted in flood levels that were significantly higher than the former modelling and TCC mapping.

Peak defined flood event (DFE), 1% AEP as well as the minor event 20% AEP flood levels have been identified in the model. Further detailed information of the flood modelling, including discussion of non-worsening and mapping of all these events is provided in the flood impact assessment (FIA) report.

The development will generally be carried out based on the following.

- All building finished floor levels (FFL) are at or above the 1% AEP DFE.
- Pools and coping are located at or above the 1% AEP flood level.
- The entire water park and hotel site throughout is shown to be located above the 1% AEP flood levels, however as part of the detailed design, shallow flooding may be experienced across the development site such as in roads, carparks and pedestrian access areas and account for suitable safe hazard limits in accordance with the QUDM / TCC guidelines.
- Any carparks are at or above the 20% AEP flood level.

- Any critical infrastructure and hazardous storages areas can be located at suitable freeboard above a nominated rare event in accordance with SC6.7 flood hazard planning scheme policy. Details of this will be confirmed at the detailed design stage.

Refer to **Figure 2-2** for the depth and flood extent during a 1% AEP 9 hour event.

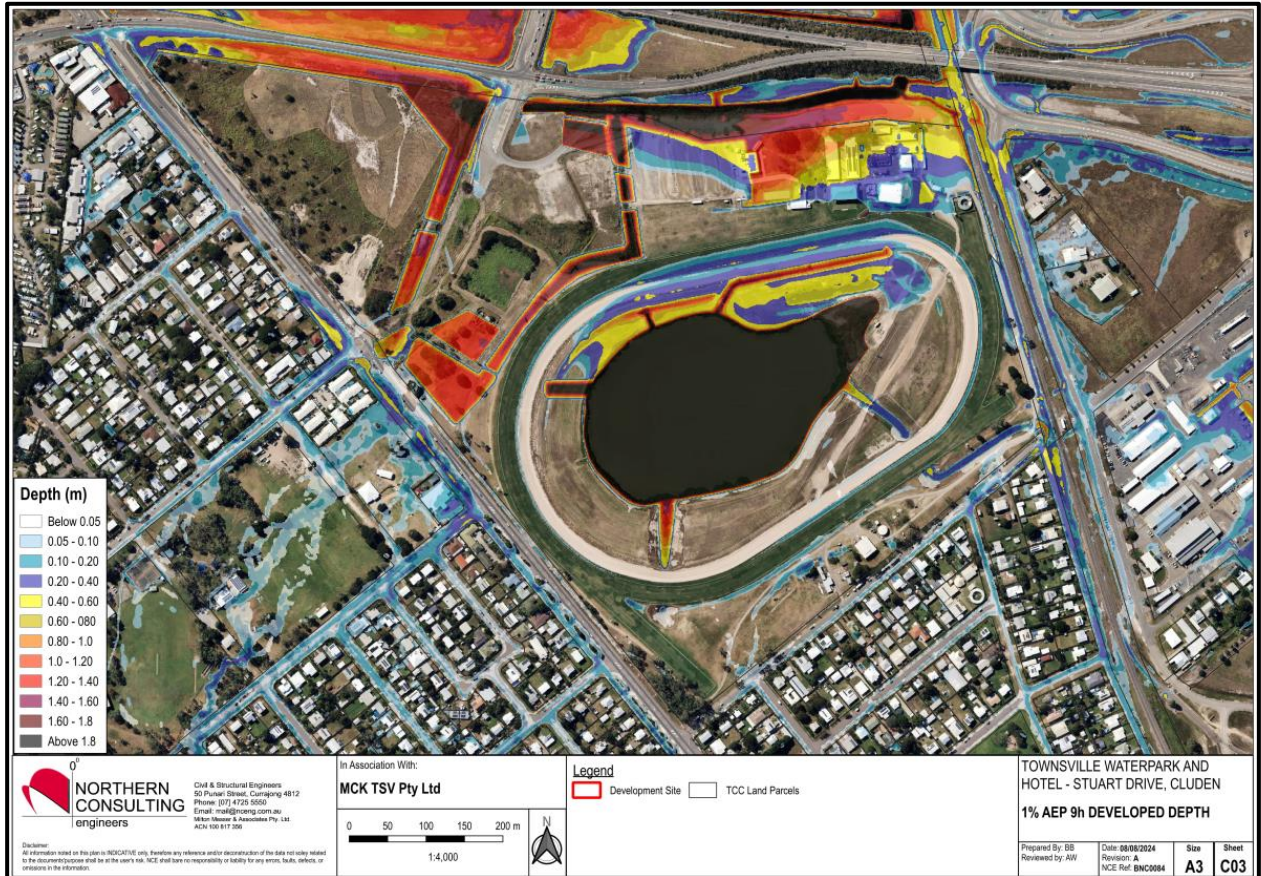


Figure 2-2 1% AEP 9 hour event Depth and Flood Extent

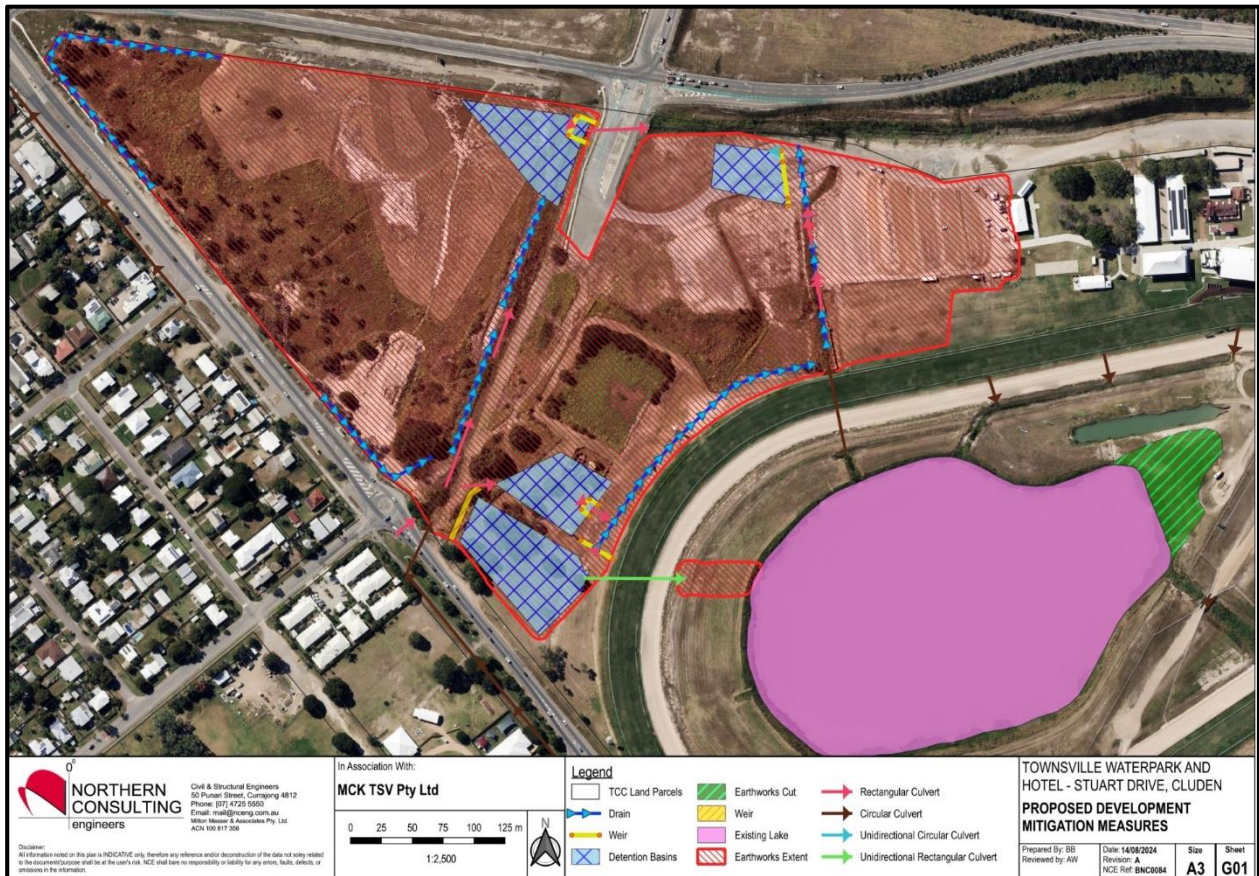


Figure 2-3 Proposed development configuration and site drainage

The map G01 depicted in **Figure 2-3** should be read in conjunction with the rest of **Appendix IV** contained in the FIA for descriptions and naming conventions of the mitigation measures. Based on Concept 1 and as shown in **Figure 2-3**, a summary of the final outcome to demonstrate non-worsening for all the events and durations analysed included the following:

- Detention basin south
 - o High level inflow weir from the west
 - o Culvert C05 outflow to racetrack lake and overflow weir to Open Drain 2 which includes a backflow prevention device
- Detention basin central
 - o Culvert C04 inflow from west
 - o Low flow outlet culvert C07
 - o Mid-level overflow weir to downstream culvert
 - o High flow outlet culvert C08 to Open Drain 2
- Split level culverts C09 and C10 to regulate flows through Open Drain 3
- Detention Basin North
 - o Inflow weir on east side
 - o Low flow outlet culvert C11
- Culvert C01 and C02
- Detention Basin West

- o Mid flow culverts C03
- o Low level weir controlling outflow
- o Major outflow controlled by existing Lakeside Drive culverts
- Carpark areas are anticipated to include shallow minor flooding in the south and south-east to relatively flood free in the north-west in order to allow flood storage in the eastern carpark pad during a 1% AEP event.
- Hazards in areas of inundation to be maintained within acceptable limits.
- The detailed design of the final uses is anticipated to include underground stormwater network.

In accordance with QUDM 2017, safety criteria requires a VD product $\leq 0.4 \text{ m}^2/\text{s}$ to maintain a low hazard for children and adults. All areas of the carparks remain below this limit.



Figure 2-4 Hazard Assessment – 1% AEP 9 hour VD Product

The attached flood impacted assessment report demonstrates that the proposed development can comply with the Townsville City Council's flood hazard overlay and flood hazard planning scheme policy, which is addressed in the FIA. The development is not expected to increase the risk to life, property, community, economic activity or increase the potential for flood damage on-site or to adjacent and downstream properties.

3.0 STORMWATER DRAINAGE

The existing site is bounded by Racecourse Road (Bruce Highway) to the north, the Stuart Drive (Flinders Highway) to the south-west, Dommett Street to the south-east and the North Coast Line to the east. The existing drainage corridor on-site includes the drainage easement that runs from the south to north along the

west side of the common boundary between Lot 1 on SP101275 and Lot 2 on RP748152. Additionally, drainage associated with the inflows and outflows for the Townsville Turf Club (TTC) Lake generally drains flows from the south of Lot 2 on RP748152 into the TTC Lake which has a high flow outflow that drain to the Racecourse Road drainage corridor to the north. The existing site generally grades from the south to the north / north-east with the current point of discharge being the Racecourse Road table drain.

The proposed water park site aligns with the existing site drainage and mimics existing falls by grading generally to the north / north-east. This general arrangement is proposed to be maintained except with the inclusion of the drainage and flood mitigation measures shown in **Figure 2-3** and outlined in the FIA in **Appendix IV**. It is expected that the proposed development will utilise an underground pit and pipe network to drain runoff into the legal point of discharge or the internal basin and open channel network.

3.1 Quantity

The FIA as discussed above in **Section 2.0** was carried out utilising the proposed land use, roughness and increased imperviousness. Therefore, the storage and mitigation measures identified in the FIA have incorporated the increased runoff from the site. The pre-developed and development scenarios impervious percentages are as defined within the FIA. The existing development area is completely pervious aside from the extension of Lakeside Drive that connects to the TTC grounds. The existing site as per the aerial imagery is shown in **Figure 3-1** below.

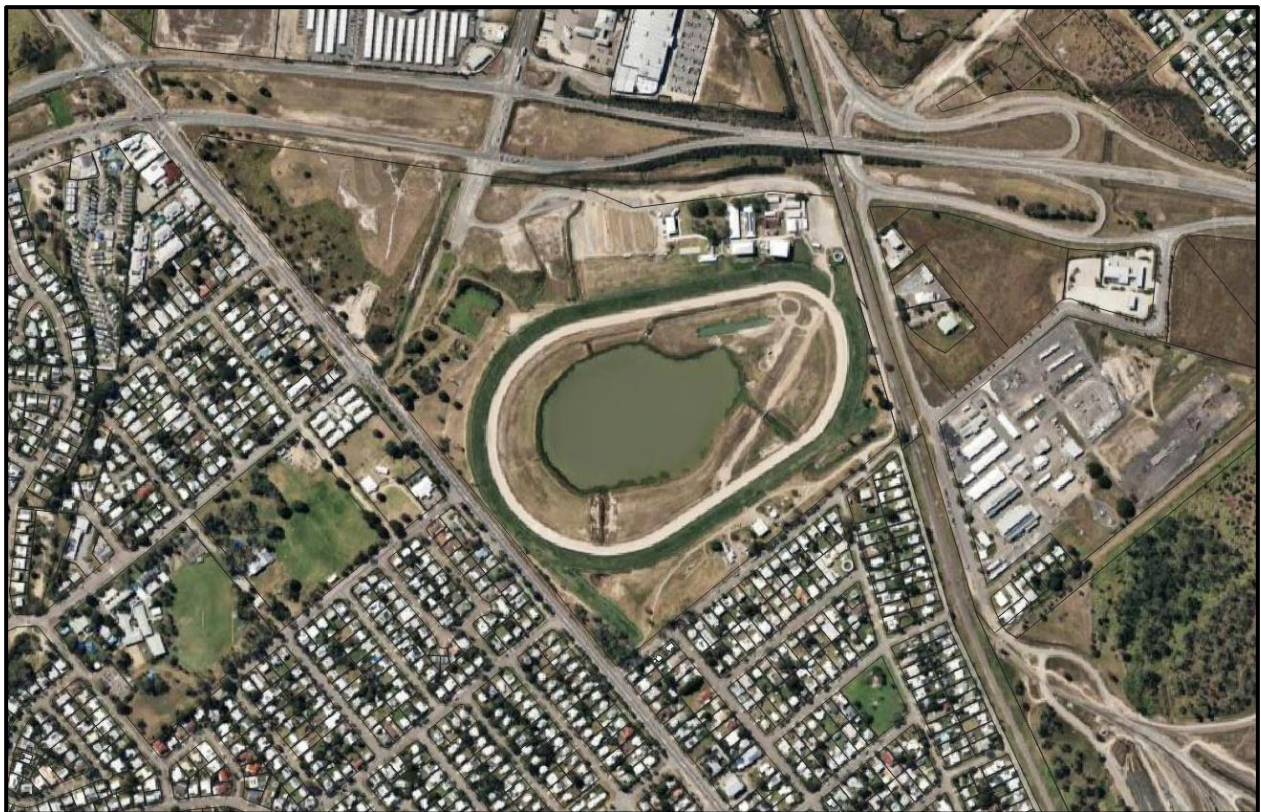


Figure 3-1 Existing development aerial imagery

The post-developed case has been modelled as 90% impervious for a lumped commercial layout which accounts for the new buildings and internal roads. Refer to **Figure 1-1** for the proposed development layout.

3.1.1 Stormwater Modelling

As indicated the increase in stormwater runoff has been assessed by utilising the developed flood model. The model utilises rain-on-grid (ROG) hydrology and 2016 LiDAR to ensure the increase in run-off due to increased impervious area is accurately modelled, inclusive of any upstream contributing catchments. NCE have conducted an assessment of the 1% Annual Exceedance Probability (AEP) and 20% AEP events. The runoff over time has been captured by the TUFLOW modelling in the Racecourse Road (Bruce Highway) table drain downstream of the development outlets for a comparison of pre- vs post-development scenarios. Also considered are the increases in water surface level as outlined in the FIA.

An assessment of the development and baseline flows are outlined in **Table 3-1**.

Table 3-1 Stormwater peak flows

Event	Baseline Flow (m ³ /s)	Developed Flow (m ³ /s)	Difference (m ³ /s)
Racecourse Road Drain			
1% AEP	9.16	5.99	-3.17
20% AEP	8.81	5.33	-3.48
Turf Club Lake Outflow			
1% AEP	7.90	8.17	+0.27
20% AEP	0.89	3.21	+2.32
Total Outflow			
1% AEP	14.23	13.73	-0.50
20% AEP	7.94	7.58	-0.36

The recording location for flows overlain over the baseline depth mapping in the 1% AEP is shown in **Figure 3-2** below.

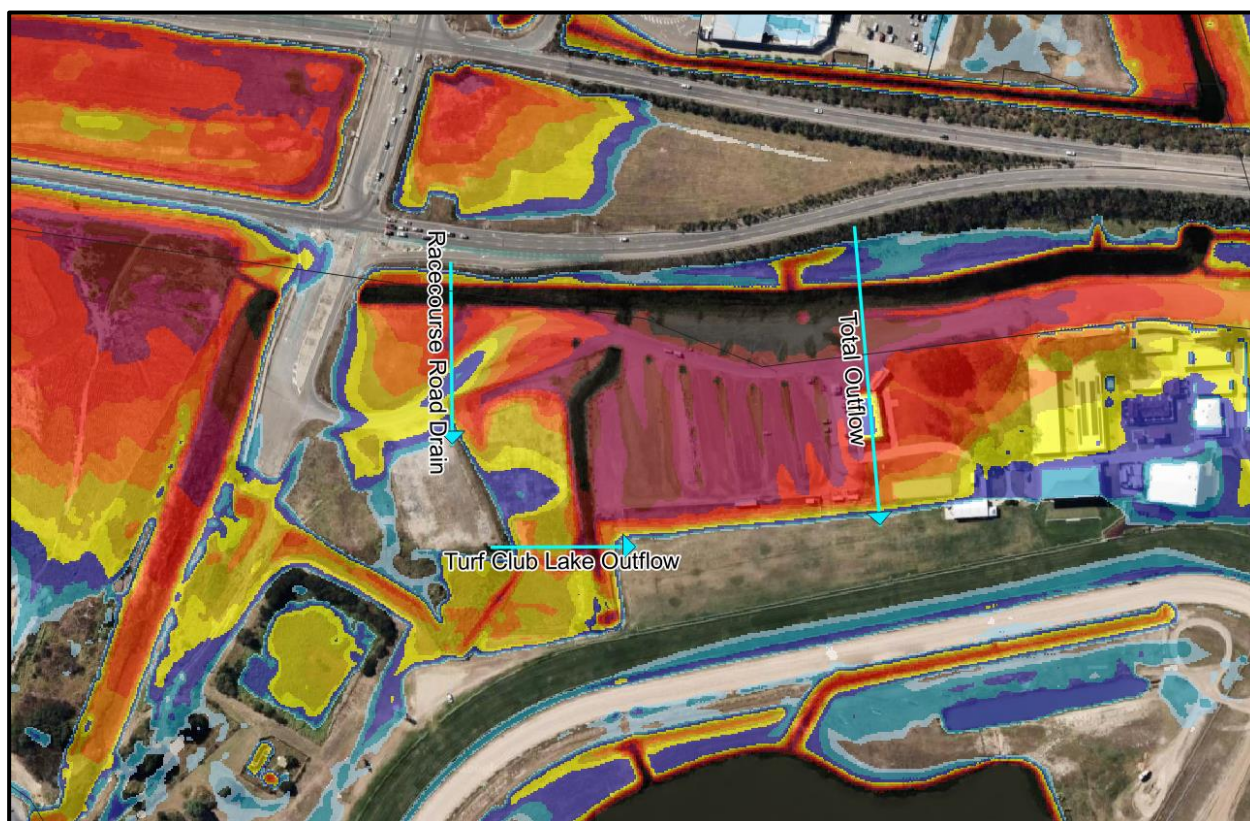


Figure 3-2 TUFLOW time-series reporting location

The flood impacts that occur concurrently with the peak flows are enclosed within the FIA.

Mitigation of stormwater flows has been achieved by utilising the flood mitigation measures as outlined in **Section 2.0** and more in depth in the FIA. The combination of detention basins, culverts, levees, weirs and open drains all attribute to the reduction in peak flows generated downstream of the development. The above results in conjunction with the FIA show that the peak post-development flows can be mitigated to peak pre-development flows, therefore having a non-worsening outcome and demonstrating compliance with the TCC planning scheme. A comparison of the outflow hydrographs for the 1% AEP and 20% AEP events are shown in **Figure 3-3** and **Figure 3-4** respectively.

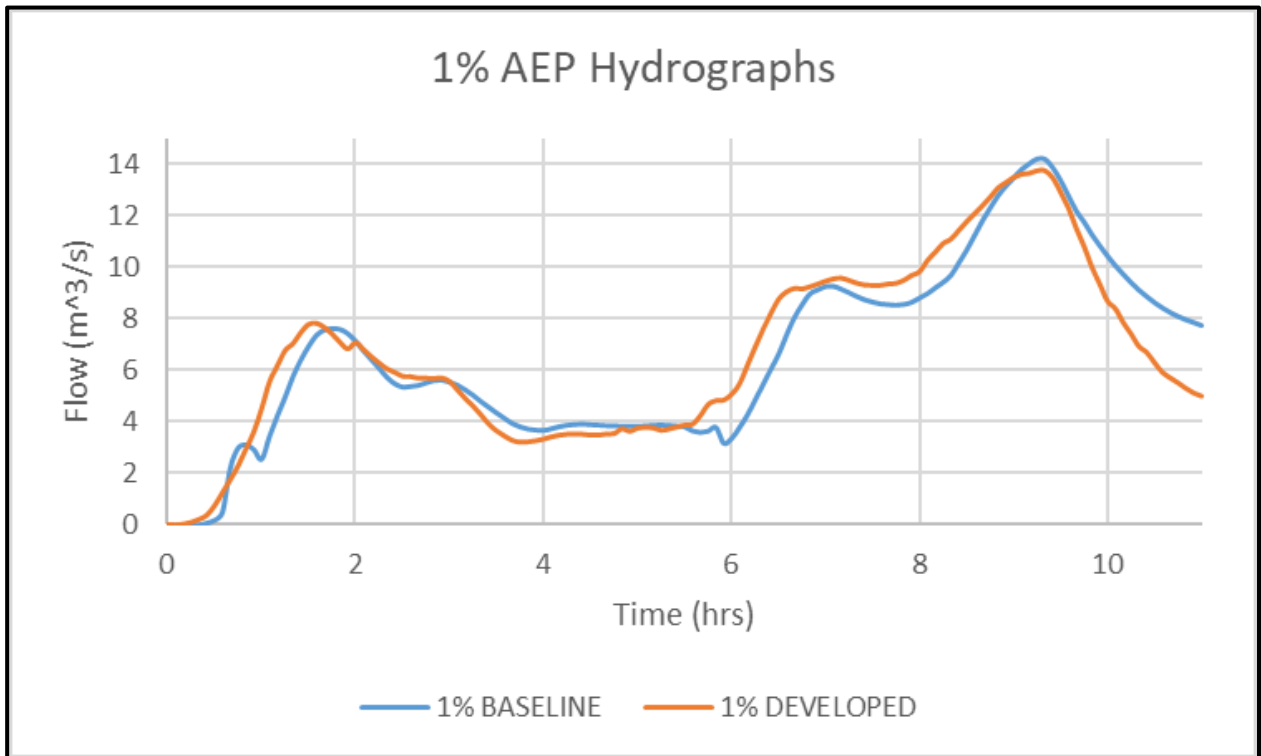


Figure 3-3 1% AEP outflow hydrographs

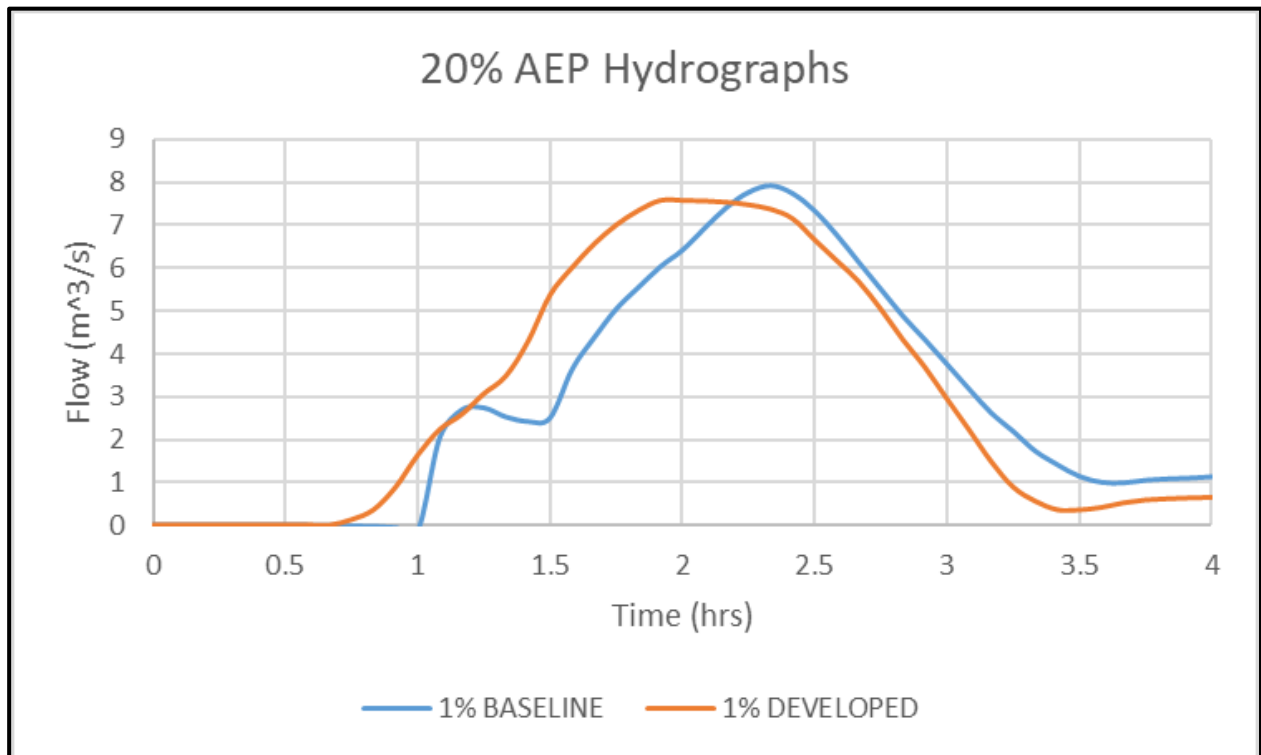


Figure 3-4 20% AEP outflow hydrographs

3.2 Quality

The quality assessment incorporating a stormwater treatment train has been modelled with the aid of MUSIC version 6.3.0 and utilises buffers, swales, detention basins and Stormwater Quality Improvement Devices (SQIDs) to treat runoff. The catchments have been modelled in accordance with the following:

- "MUSIC Modelling Guidelines November 2018 – Consultation Draft", Water by Design (2018);
- Townsville Aero, 6-minute time step from 3/03/1953 to 31/03/2010;
- Water by Design MUSIC Modelling Guidelines Source Nodes (Lumped) utilising modified percent impervious area & pollutant concentration;
- No drainage routing between nodes;
- Water by Design MUSIC Modelling Guidelines recommended MUSIC rainfall-run-off parameters SEQ for commercial land uses.

3.2.1 Stormwater Quality Objectives

The design intent for the system is to meet the current TCC Planning Scheme water quality targets, namely:

- 80% Total Suspended Solids Reduction
- 65% Total Phosphorous Reduction
- 40% Total Nitrogen Reduction
- 90% Gross Pollutants Reduction

In the event that the above targets are not achievable, the design intent is to ensure that the post development water quality discharging the site is equal to or better than the pre-development quality. Treatment targets shall be reached before water discharges from the lot.

Table 3-2 MUSIC source nodes

Node Name	Zoning/Surface Type	Surface Area (ha)	Impervious (%)	Percentage of Upstream Area Treated	Buffer Area (%)
Pre-development					
Pre Dev Catch (11.966ha)	Revegetated Land	10.16	0	-	-
Post-development					
Dev Catch 1 (4.46ha)	Commercial	4.46	90	50	50
Dev Catch 2 (0.7ha)	Commercial	0.7	90	-	-
Dev Catch 3 (0.4ha)	Commercial	0.4	90	-	-
Dev Catch 4 (4.6ha)	Commercial	4.60	90	50	50

Table 3-3 Stormwater quality improvement devices

Stormwater treatment devices				
Node Name	Treatment Train	Cartridge Height (mm)	Number of Cartridges	High Flow By-pass (m ³ /s)
40 x 460 PSORB Stormfilter	1	460	40	0.02300
6 x 460 PSORB Stormfilter	2	460	6	0.00276
6 x 460 PSORB Stormfilter	3	460	6	0.00276
40 x 460 PSORB Stormfilter	4	460	40	0.02300
GPTs				
Node Name	Treatment Train	High Flow By-pass (m ³ /s)		Number of Traps
20 x OceanGuard	1	0.2		20
5 x OceanGuard	2	0.2		5
5 x OceanGuard	3	0.2		5
13 x OceanGuard	4	0.2		13

Table 3-4 Swale parameters

Node Name	Length (m)	Bed Slope (%)	Base Width (m)	Top Width (m)	Depth (m)	Vegetation Height (m)
Swale (80m)	80	0.39	16.4	30	1.70	0.25
Swale (50m)	50	0.39	16.4	30	1.70	0.25

Table 3-5 Detention basin parameters

Node Name	Surface Area (m ²)	Extended Detention Depth (m)	Evaporative Loss as % of PET	Equivalent Pipe Diameter (mm)	Overflow Weir Width (m)
Detention Basin	5000	1.0	100	2200	20

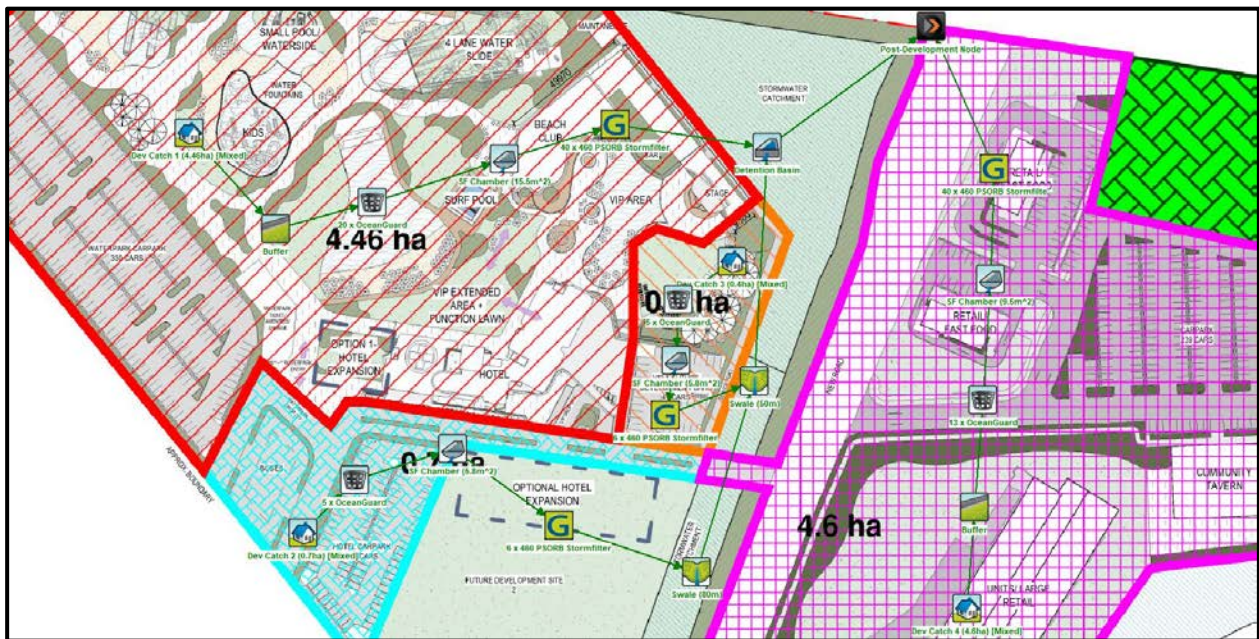


Figure 3-6 MUSIC model set-up

Table 3-6 summarises the results of the assessment. It is evident that the water quality leaving the site post development meets the quality objectives set by TCC.

Table 3-6 MUSIC treatment train effectiveness

Description	Sources	Residual Load	% Reduction	(TCC 15-Aug-2024)
Flow (ML/yr)	93.9	92.9	1.1	
Total Suspended Solids (kg/yr)	19800	2910	85.3	80
Total Phosphorus (kg/yr)	51.7	18.4	64.4*	65
Total Nitrogen (kg/yr)	297	176	40.7	40
Gross Pollutants (kg/yr)	1800	0	100	90

*Whilst the reduction of TP is lower than the required target NCE consider this to be acceptable given how close the value is.

4.0 WATER NETWORK

NCE engaged a specialist water engineer (DPM Water) to provide advice in relation to potable water supply and fire flow for the proposed development. Refer to the Water Supply and Sewerage Planning Report for details of the assessment in **APPENDIX V**.

The summary outcomes of this report is provided below.

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:

Refer to the Water Supply and Sewerage Planning Report in **APPENDIX V** for details of the assessment including the various ultimate development options.

6.0 TRAFFIC ASSESSMENT

NCE engaged a specialist traffic engineer (Geleon) to provide advice in relation to the traffic engineering in order to address the potential impacts due to the development. Refer to the attached Traffic Assessment in **APPENDIX VI**.

The site is proposed to be accessed via a new internal road extension of Lakeside Drive through to Stuart Drive at Edison St. The road category proposed for this new section of road is a TCC major collector (Townsville City Council Drawing SD-002).

The Geleon Traffic Assessment report demonstrates that a new 4-leg, signalised intersection is proposed at the Stuart Drive / Edison St intersection. A new 4-way, single lane roundabout is proposed to access either side of the development site. The roundabout is proposed as the only access to either side of the site with direct property access restricted along the Lakeside Drive extension.

A summary of the outcomes is included below:

Intersection Capacity Assessment

Based on SIDRA modelling and adopting the assumptions listed in Section 2 of this email, to cater for the ultimate development in the 10-year design horizon the following new intersections / existing intersection upgrades are required:

- 1. provide a new road connection between Racecourse Road and Stuart Drive connecting to the Stuart Drive / Edison Street roundabout in the south and Racecourse Road / Lakeside Drive signalised intersection in the north. The road connection will need to be to a two-lane, two-way road configuration.*
- 2. direct property access to the new Lakeside Drive extended road should be prohibited and instead a 4-way intersection be provided at the midpoint between Racecourse Road and Stuart Drive. The 4-way intersection will need to be a single lane roundabout designed in accordance with TMR's Supplement to Austroads Guide to Road Design Part 4B: Roundabouts*
- 3. upgrade the existing Stuart Drive / Edison Street 3-leg roundabout to a 4-leg double lane roundabout in the north-south direction designed in accordance with TMR's Supplement to Austroads Guide to Road Design Part 4B: Roundabouts. A four-lane, two-way carriageway on both Stuart Drive approaches will be required for 130m on the approach and 170m on the exit side of the roundabout*
- 4. apply a common control group (CCG) phasing sequence to the existing Racecourse Road eastbound / Lakeside Drive and Racecourse Road westbound / Lakeside Drive / Townsville Turf Club Access signalised intersections and modify the phase sequence and timing to cater for development generated traffic and a new road connection to Stuart Drive. No physical changes are proposed*

A SIDRA layout of the intersections and a summary of proposed upgrades is attached.

7.0 ELECTRICAL AND COMMUNICATIONS

The client engaged a specialist electrical consultant (Ashburner Francis). Refer to the separate electrical assessment.

8.0 CONCLUSION

NCE have undertaken an engineering investigation associated with the development of the integrated water based outdoor recreation theme park at the existing Townsville and Districts Rugby Union grounds on Hugh St. The findings of this assessment are summarised below:

- An extensive flood impact assessment has been carried out using a fine scale mini TUFLOW model based on inputs and boundary conditions derived from Townsville City Council's new Ross River Flood Study. This extensive assessment which includes a series of low maintenance, free draining flood mitigation measures has demonstrated that the proposed development footprint can comply with the flood hazard overlay code. Refer to the attached NCE flood impact assessment report.
- The initial bulk earthworks to be carried out on the site also does not result in impacts off site. The bulk earthworks proposed align with the proposed development layout.
- Local run-off will be conveyed to legal points of discharge via an underground pit and pipe network. Stormwater quantity and mitigation of post-development flows is addressed utilising the detention storage and flow mitigation measures within the development extents.
- Stormwater quality is demonstrated to be mitigated through a treatment train and utilising best practice stormwater quality improvement devices, including proprietary devices.
- Existing water infrastructure surrounding the site has capacity to service the development for peak demands and fire flows. A DN300 connection is proposed to the DN450 DICL trunk main on Stuart Dr opposite Watt St. The DN300 and reducing to a DN200 water main is proposed through the site is adequately sized to service the development. Refer to the DPM Water report for details of the assessment.
- The sewerage planning assessment has demonstrated that the existing system requires upgrade in order to accommodate the proposed development. A number of options are nominated. Refer to the DPM Water report for details of the assessment and the various options.
- The site is proposed to be accessed via a new internal road extension of Lakeside Drive through to Stuart Drive at Edison St. The road category proposed is a TCC major collector.
- The Geleon Traffic Assessment report demonstrates that a new 4-leg, signalised intersection is proposed at the Stuart Drive / Edison St intersection. A new 4-way, single lane roundabout is proposed to access either side of the development site. The roundabout is proposed as the only access to either side of the site with direct property access restricted along the Lakeside Drive extension. Refer to the Geleon traffic assessment report.

APPENDIX I

CA Architects Concept Plan



2407 TSV Hotel & Water Park

CA Architects

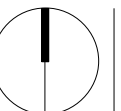
Cairns | Brisbane | Townsville
e: reception@caarchitects.com.au t: +617 4031 6367

Masterplan

2407_PD A-001
Drawn: FT Check: JH

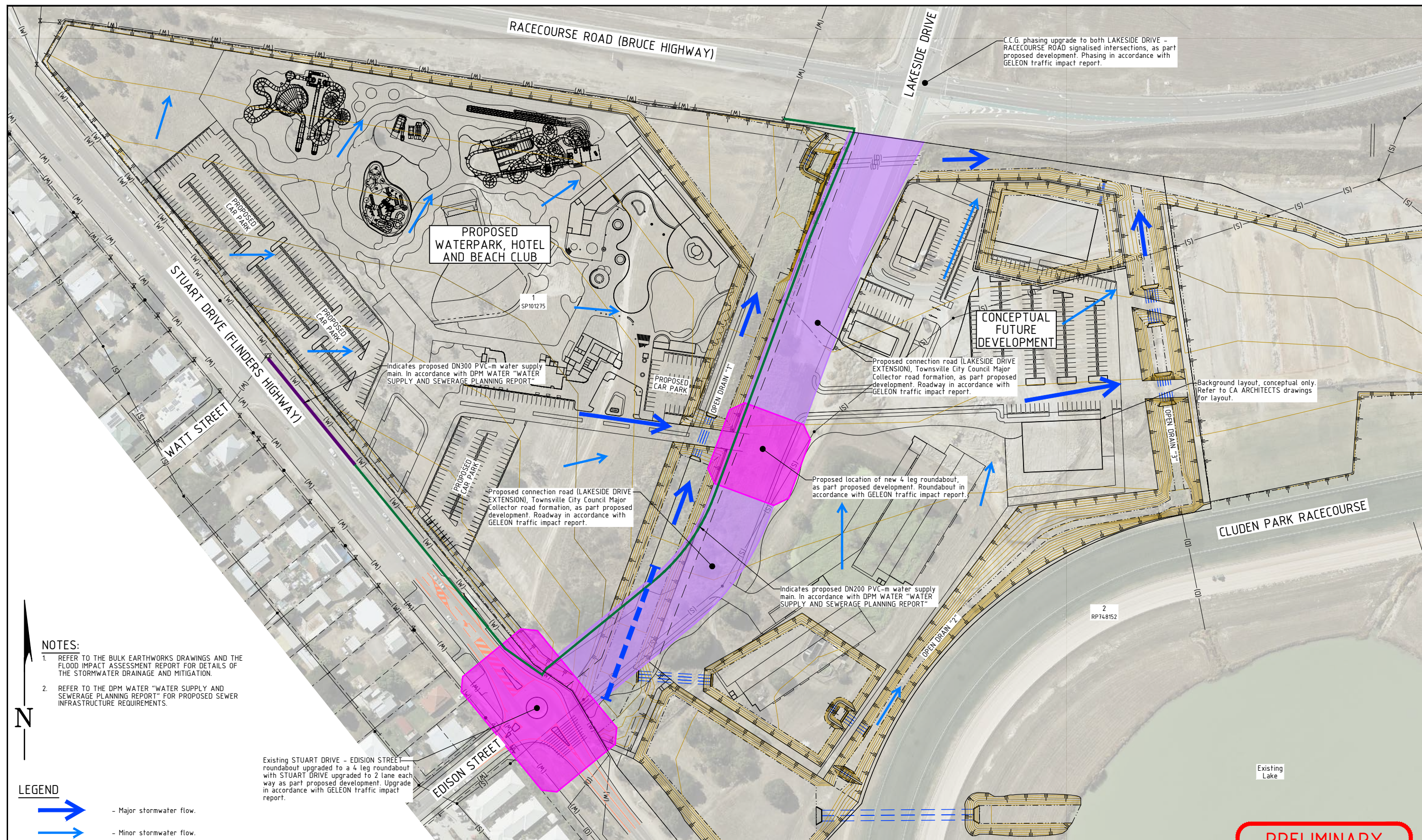
21/06/2024 3:40:49 PM
MASTERPLANNING ■

Shaun McCarthy 1 : 1500 @ A3



APPENDIX II

Northern Consulting Engineers Concept Drawing



NOTES:

1. REFER TO THE BULK EARTHWORKS DRAWINGS AND THE FLOOD IMPACT ASSESSMENT REPORT FOR DETAILS OF THE STORMWATER DRAINAGE AND MITIGATION.
2. REFER TO THE DPM WATER "WATER SUPPLY AND SEWERAGE PLANNING REPORT" FOR PROPOSED SEWER INFRASTRUCTURE REQUIREMENTS.

LEGEND

- Major stormwater flow.
- Minor stormwater flow.
- Existing RP boundary.
- Proposed DN200 water main.
- Proposed DN200 water main.
- Existing sewer main.
- Existing sewer manhole.
- Existing stormwater drain line.
- Existing water main.
- Stormwater drain line.
- Bulk earthworks major contour.
- Bulk earthworks minor contour.
- Top of batter.
- Toe of batter.
- Change of grade.

Existing STUART DRIVE - EDISON STREET roundabout upgraded to a 4 leg roundabout with STUART DRIVE upgraded to 2 lane each way as part proposed development. Upgrade in accordance with GELEON traffic impact report.

LAYOUT PLAN

Scale 1:1000 @ A1

ENGINEERING CERTIFICATION

Signed:

ANDREW IAN WALLACE - RPEQ No. 6743

THE ORIGINAL OF THIS DOCUMENT IS COMPLETED TO THE SCALE NOTED. AS REPRODUCTION CAN DISTORT SIZE & SHAPE USE ONLY THE DIMENSIONS PROVIDED ON ARCHITECTURAL &/OR ENGINEERING DRAWINGS. VERIFY DIMENSIONS ON SITE BEFORE CONSTRUCTION.



All work is to be carried out in accordance with LOCAL AUTHORITY'S standard details.

Civil | Structural | Forensic
Traffic | Flood Modelling

TOWNSVILLE | SUNSHINE COAST
BRISBANE | NEW ZEALAND
T: +617 4725 5550 E: mail@nceng.com.au
W: www.nceng.com.au

P1 PRELIMINARY - NOT FOR CONSTRUCTION - ISSUED FOR APPROVAL.		16/08/2024
Issue	Description	Date
Drawn DC Date 16/08/2024	In Association With MCK TSV Pty Ltd	OVERALL CONCEPT LAYOUT AND SERVICES PLAN
Checked AW Approved AW COPYRIGHT ©	TOWNSVILLE WATERPARK AND HOTEL STUART DRIVE, CLUDEN (1 on SP101275, 2 on RP748152)	
Drawing Number BNC0084/C01		Issue P1

**PRELIMINARY
NOT FOR CONSTRUCTION**

APPENDIX III

Northern Consulting Engineers Bulk Earthworks Drawings

BULK EARTHWORKS

STUART DRIVE, CLUDEN

SCHEDULE OF DRAWINGS

DWG No.	DESCRIPTION
BNC0084/B01	LOCALITY PLAN
BNC0084/B02	OVERALL LAYOUT PLAN
BNC0084/B03	LEVEL LAYOUT PLAN
BNC0084/B04	STORMWATER CULVERT LAYOUT PLAN
BNC0084/B05	CUT-FILL LAYOUT PLAN
BNC0084/B06	SEWER LONGITUDINAL SECTION
BNC0084/B07	LAKE EXPANSION LAYOUT PLAN
BNC0084/Q01	EROSION & SEDIMENT CONTROL MANAGEMENT NOTES
BNC0084/Q02	EROSION & SEDIMENT CONTROL LAYOUT PLAN
BNC0084/Q03	EROSION & SEDIMENT CONTROL CONSTRUCTION DETAILS



LOCALITY PLAN

ASSOCIATED DRAWINGS

QUEENSLAND DEPARTMENT OF MAIN ROADS STANDARD DRAWINGS	
1043	REINFORCING STEEL - STANDARD BAR SHAPES, TYPICAL DETAILS AND NOTES
1044	REINFORCING STEEL - LAP LENGTHS
1250	R C BOX CULVERTS AND SLAB LINK BOX CULVERTS CULVERTS HEIGHT > 600
1260	R C BOX CULVERTS AND SLAB LINK BOX CULVERTS CULVERTS HEIGHT = 375 TO 600
1304	PIPE CULVERT - WINGWALLS, HEADWALL AND APRON FOR PIPE DIAMETER 750 TO 2400
1305	PIPE CULVERT - HEADWALL AND APRON FOR PIPE DIAMETER 375 TO 675
1359	CULVERTS - INSTALLATION, BEDDING AND FILLING/BACKFILLING AGAINST/OVER CULVERTS

TOWNSVILLE CITY COUNCIL STANDARD DRAWINGS SEWER SUPPLY (SEQ-SEW)	
1300-1	MAINTENANCE HOLES < DN300 SEWER TYPES P1, P2 AND P3
1301-1	CAST IN-SITU MAINTENANCE HOLE TYPICAL COPING & ANCHOR BRACKET DETAILS.
1308-8	MAINTENANCE HOLE COVER SEWER-CLASS D-BOLT DOWN TYPICAL FRAME DETAILS.
1308-9	MAINTENANCE HOLE COVER SEWER-CLASS D-BOLT DOWN TYPICAL RISER RING DETAILS.
1308-10	MAINTENANCE HOLE COVER SEWER-CLASS D-BOLT DOWN TYPICAL COVER DETAILS.
1308-11	MAINTENANCE HOLE COVER SEWER-CLASS D-BOLT DOWN TYPICAL COVER DETAILS.
1313-1	MAINTENANCE HOLE SEWER CONNECTION DETAILS ALL PIPE MATERIALS.
1501-1	INSERTIONS AND REPAIR SYSTEMS TYPICAL INSERTION OF JUNCTIONS.
1502-1	INSERTIONS AND REPAIR SYSTEMS TYPICAL MAINTENANCE STRUCTURES.

PRELIMINARY
NOT FOR CONSTRUCTION



Scale 1:3000 @ A1
0 30 60 90 120m

ENGINEERING CERTIFICATION

Signed:

ANDREW IAN WALLACE - RPEQ No. 6743

THE ORIGINAL OF THIS DOCUMENT IS COMPLETED TO THE SCALE NOTED.
AS REPRODUCTION CAN DISTORT SIZE & SHAPE USE ONLY THE DIMENSIONS
PROVIDED ON ARCHITECTURAL &/OR ENGINEERING DRAWINGS. VERIFY
DIMENSIONS ON SITE BEFORE CONSTRUCTION.

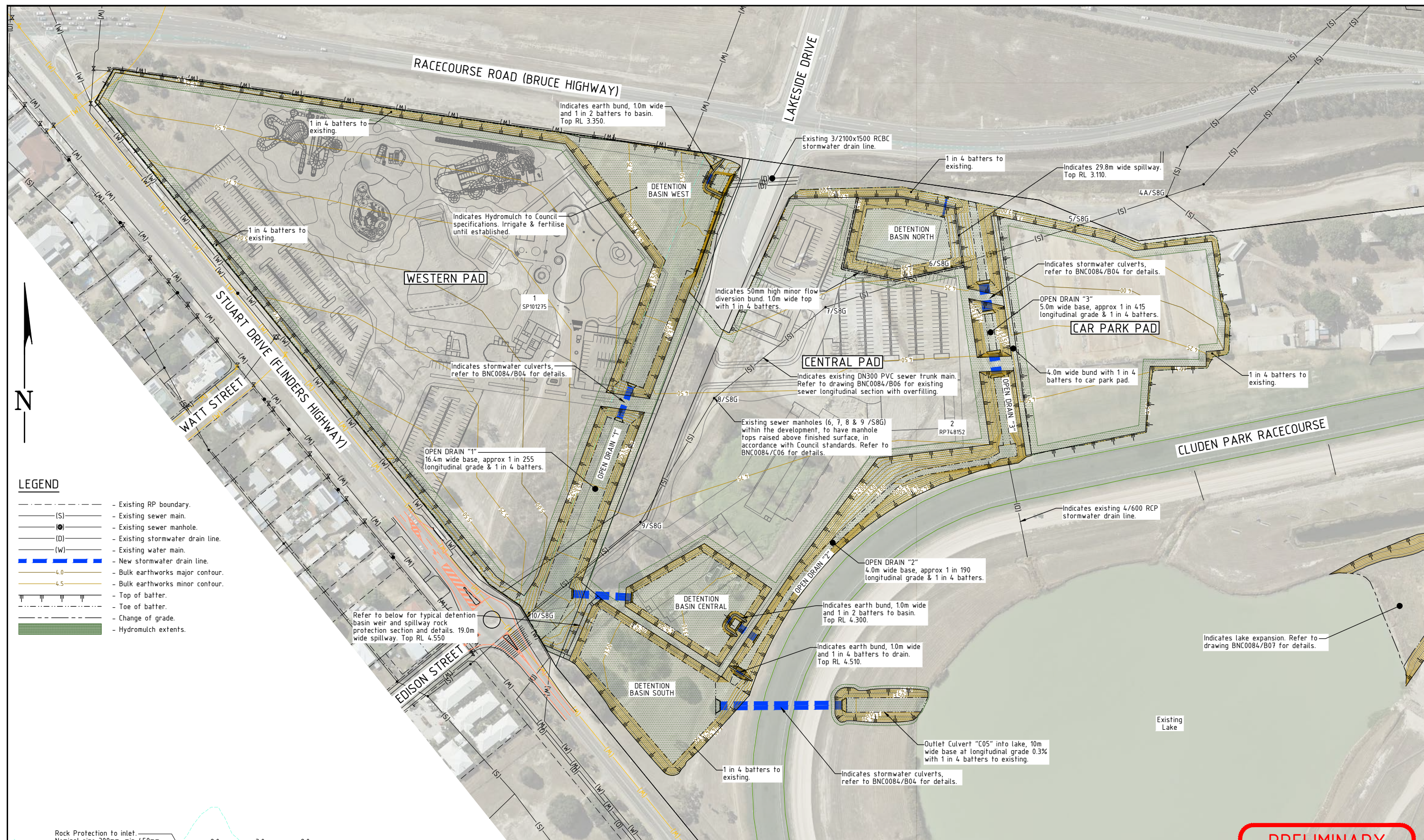


Civil | Structural | Forensic
Traffic | Flood Modelling

TOWNSVILLE | SUNSHINE COAST
BRISBANE | NEW ZEALAND
T: +617 4725 5550 E: mail@nceng.com.au
W: www.nceng.com.au

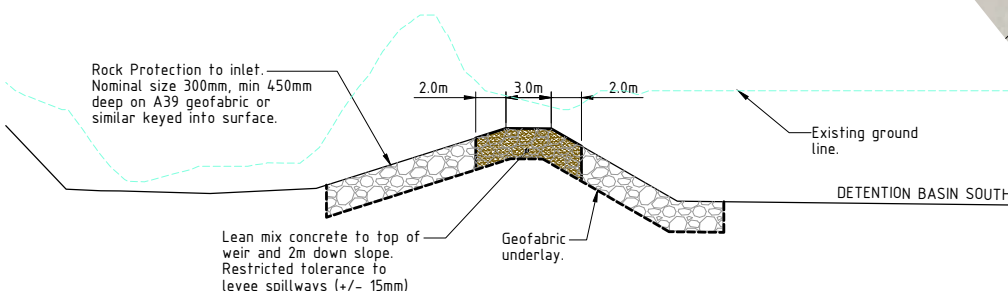
All work is to be carried out in accordance
with LOCAL AUTHORITY'S standard details.

P1	PRELIMINARY - NOT FOR CONSTRUCTION - ISSUED FOR APPROVAL.	16/08/2024
Issue	Description	Date
Drawn DC Date 16/08/2024	In Association With MCK TSV Pty Ltd	LOCALITY PLAN
Checked AW	BULK EARTHWORKS	
Approved AW	STUART DRIVE, CLUDEN	
COPYRIGHT ©	TOWNSVILLE TURF CLUB (1 on SP101275, 2 on RP748152)	
Drawing Number BNC0084/B01		Issue P1



LEGEND

- Existing RP boundary.
- Existing sewer main.
- Existing sewer manhole.
- Existing stormwater drain line.
- Existing water main.
- New stormwater drain line.
- Bulk earthworks major contour.
- Bulk earthworks minor contour.
- Top of batter.
- Toe of batter.
- Change of grade.
- Hydromulch extents.



DETENTION BASIN INLET WEIR AND SPILLWAY

Horz - Scale 'B'
Vert - Scale 'C'

LAYOUT PLAN

Scale 'A'

Scale 'A' 1:1250 @ A1
0 12.5 25 37.5 50m

Scale 'B' 1:250 @ A1
0 2.5 5.0 7.5 10.0m

Scale 'C' 1:50 @ A1
0 0.5 1.0 1.5 2m

ENGINEERING CERTIFICATION

Signed:

ANDREW IAN WALLACE - RPEQ No. 6743

THE ORIGINAL OF THIS DOCUMENT IS COMPLETED TO THE SCALE NOTED.
AS REPRODUCTION CAN DISTORT SIZE & SHAPE USE ONLY THE DIMENSIONS
PROVIDED ON ARCHITECTURAL &/OR ENGINEERING DRAWINGS. VERIFY
DIMENSIONS ON SITE BEFORE CONSTRUCTION.



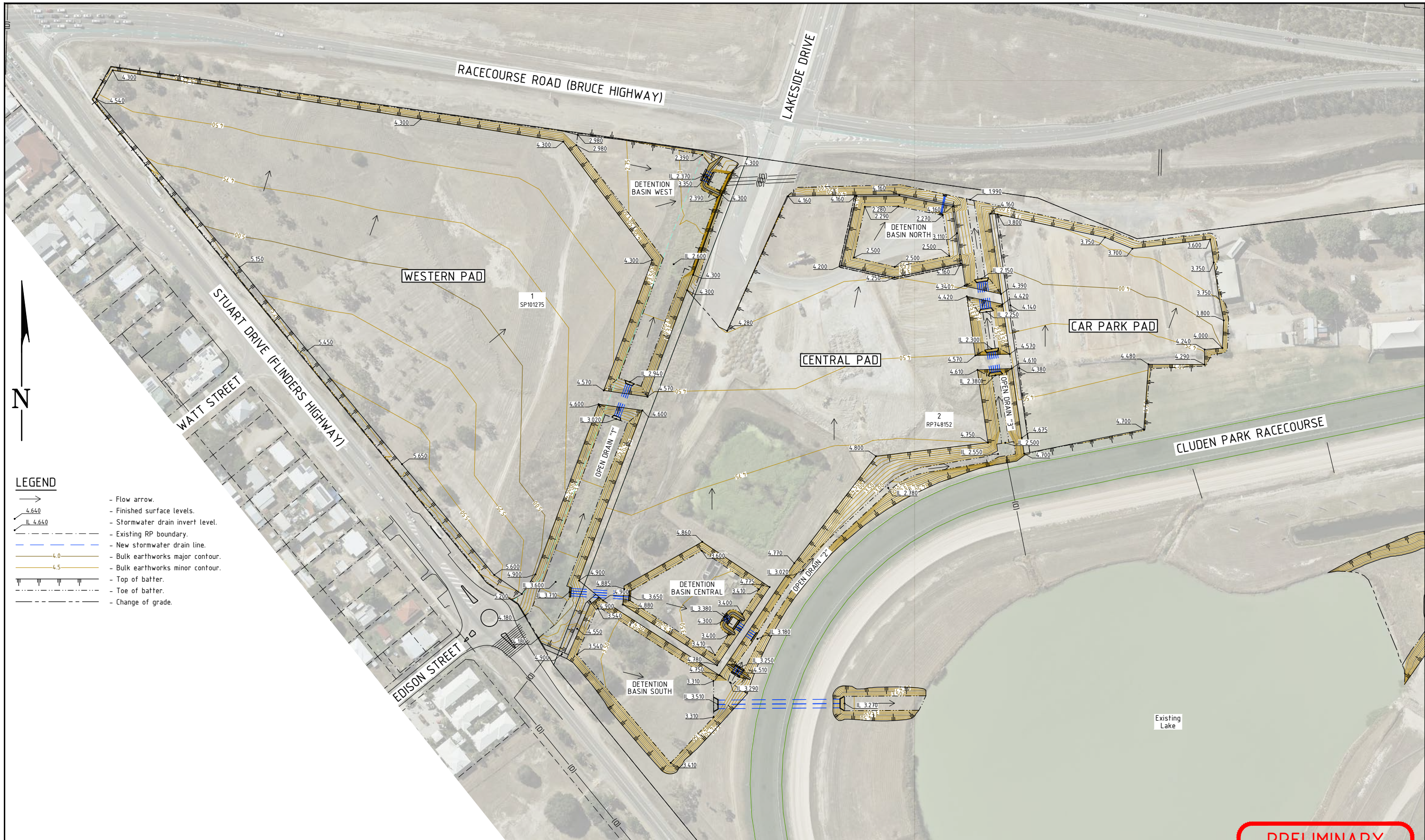
All work is to be carried out in accordance
with LOCAL AUTHORITY'S standard details.

Civil | Structural | Forensic
Traffic | Flood Modelling

TOWNSVILLE | SUNSHINE COAST
BRISBANE | NEW ZEALAND
T: +617 4725 5550 E: mail@nceng.com.au
W: www.nceng.com.au

P1 PRELIMINARY - NOT FOR CONSTRUCTION - ISSUED FOR APPROVAL.		16/08/2024
Issue		Date
Drawn DC Date 16/08/2024	In Association With MCK TSV Pty Ltd	OVERALL LAYOUT PLAN
Checked AW Approved AW	BULK EARTHWORKS STUART DRIVE, CLUDEN TOWNSVILLE TURF CLUB (1 on SP101275, 2 on RP748152)	
COPYRIGHT ©		Drawing Number BNC0084/B02
		Issue P1

PRELIMINARY
NOT FOR CONSTRUCTION



LAYOUT PLAN

PRELIMINARY
NOT FOR CONSTRUCTION

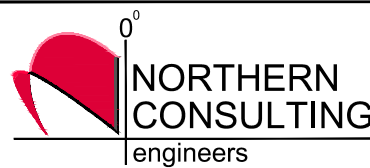
Scale 1:1250 @ A1
0 12.5 25 37.5 50m

ENGINEERING CERTIFICATION

Signed:

ANDREW IAN WALLACE - RPEQ No. 6743

THE ORIGINAL OF THIS DOCUMENT IS COMPLETED TO THE SCALE NOTED.
AS REPRODUCTION CAN DISTORT SIZE & SHAPE USE ONLY THE DIMENSIONS
PROVIDED ON ARCHITECTURAL &/OR ENGINEERING DRAWINGS. VERIFY
DIMENSIONS ON SITE BEFORE CONSTRUCTION.

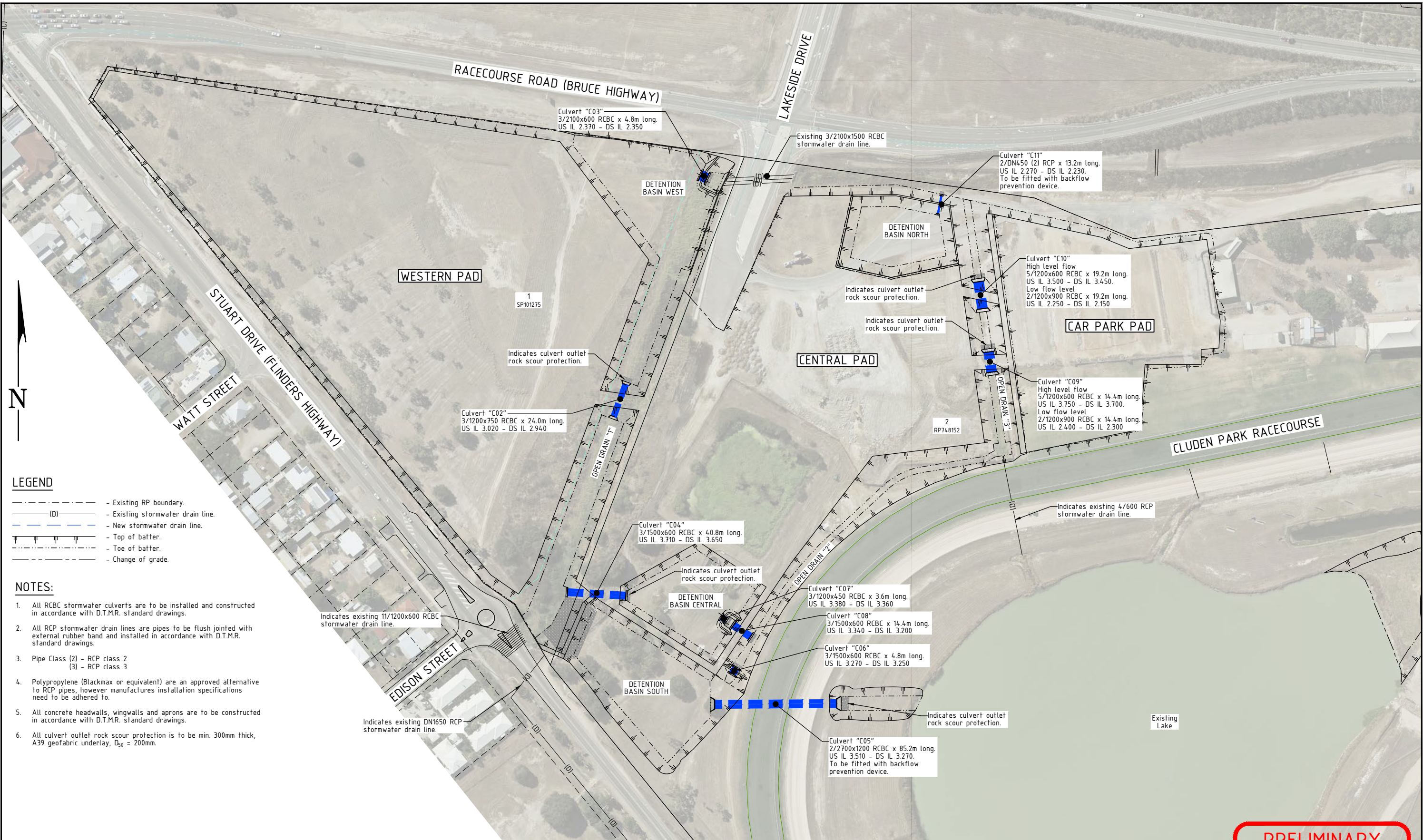


All work is to be carried out in accordance
with LOCAL AUTHORITY'S standard details.

Civil | Structural | Forensic
Traffic | Flood Modelling

TOWNSVILLE | SUNSHINE COAST
BRISBANE | NEW ZEALAND
T: +617 4725 5550 E: mail@nceng.com.au
W: www.nceng.com.au

P1 PRELIMINARY - NOT FOR CONSTRUCTION - ISSUED FOR APPROVAL.		16/08/2024
Issue	Description	Date
Drawn DC Date 16/08/2024	In Association With MCK TSV Pty Ltd	LEVEL LAYOUT PLAN
Checked AW	BULK EARTHWORKS	
Approved AW	STUART DRIVE, CLUDEN	
COPYRIGHT ©	TOWNSVILLE TURF CLUB (1 on SP101275, 2 on RP748152)	
Drawing Number BNC0084/B03		Issue P1



LAYOUT PLAN

LEGEND

- Existing RP boundary.
- Existing stormwater drain line.
- New stormwater drain line.
- Top of batter.
- Toe of batter.
- Change of grade.

NOTES:

- All RCBC stormwater culverts are to be installed and constructed in accordance with D.T.M.R. standard drawings.
- All RCP stormwater drain lines are pipes to be flush jointed with external rubber band and installed in accordance with D.T.M.R. standard drawings.
- Pipe Class (2) - RCP class 2
(3) - RCP class 3
- Polypropylene (Blackmax or equivalent) are an approved alternative to RCP pipes, however manufactures installation specifications need to be adhered to.
- All concrete headwalls, wingwalls and aprons are to be constructed in accordance with D.T.M.R. standard drawings.
- All culvert outlet rock scour protection is to be min. 300mm thick, A39 geofabric underlay, $D_{50} = 200\text{mm}$.

Scale 1:1250 @ A1
0 12.5 25 37.5 50m

ENGINEERING CERTIFICATION

Signed:

ANDREW IAN WALLACE - RPEQ No. 6743

THE ORIGINAL OF THIS DOCUMENT IS COMPLETED TO THE SCALE NOTED.
AS REPRODUCTION CAN DISTORT SIZE & SHAPE USE ONLY THE DIMENSIONS
PROVIDED ON ARCHITECTURAL &/OR ENGINEERING DRAWINGS. VERIFY
DIMENSIONS ON SITE BEFORE CONSTRUCTION.



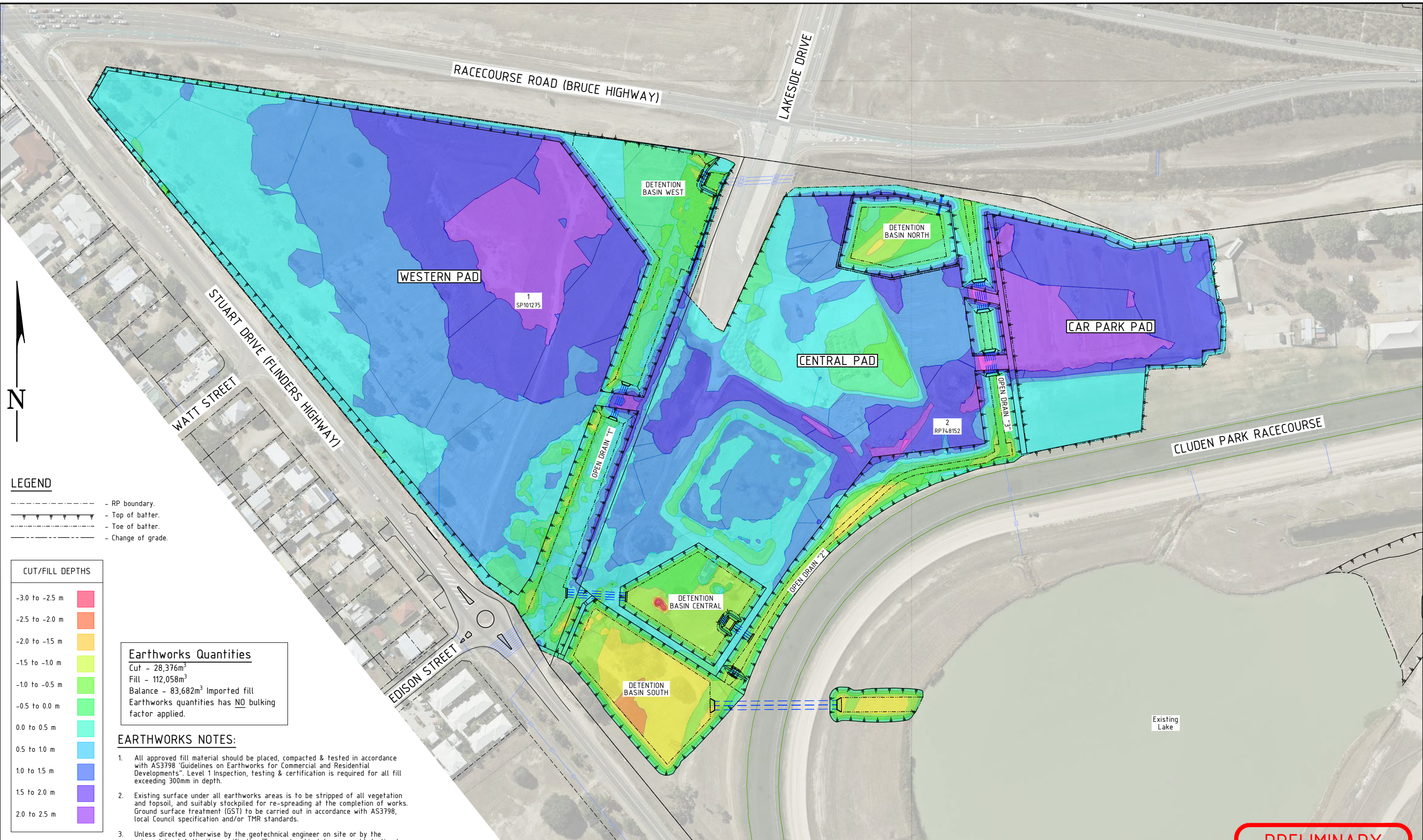
All work is to be carried out in accordance with LOCAL AUTHORITY'S standard details.

Civil | Structural | Forensic
Traffic | Flood Modelling

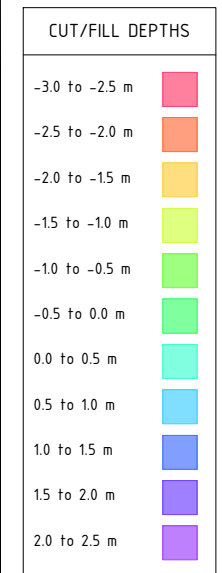
TOWNSVILLE | SUNSHINE COAST
BRISBANE | NEW ZEALAND
T: +617 4725 5550 E: mail@nceng.com.au
W: www.nceng.com.au

P1 PRELIMINARY - NOT FOR CONSTRUCTION - ISSUED FOR APPROVAL.		16/08/2024
Issue	Description	Date
Drawn DC Date 16/08/2024	In Association With MCK TSV Pty Ltd	STORMWATER CULVERT LAYOUT PLAN
Checked AW	BULK EARTHWORKS	
Approved AW	STUART DRIVE, CLUDEN	
COPYRIGHT ©	TOWNSVILLE TURF CLUB (1 on SP101275, 2 on RP748152)	
Drawing Number BNC0084/B04		Issue P1

PRELIMINARY
NOT FOR CONSTRUCTION



- LEGEND**
- RP boundary.
 - Top of batter.
 - Toe of batter.
 - Change of grade.



Earthworks Quantities
Cut - 28,376m³
Fill - 112,058m³
Balance - 83,682m³ Imported fill
Earthworks quantities has **NO** bulking factor applied.

- EARTHWORKS NOTES:**
- All approved fill material should be placed, compacted & tested in accordance with AS3798 'Guidelines on Earthworks for Commercial and Residential Developments'. Level 1 inspection, testing & certification is required for all fill exceeding 300mm in depth.
 - Existing surface under all earthworks areas is to be stripped of all vegetation and topsoil, and suitably stockpiled for re-spreading at the completion of works. Ground surface treatment (GST) to be carried out in accordance with AS3798, local Council specification and/or TMR standards.
 - Unless directed otherwise by the geotechnical engineer on site or by the relevant local Authority specification (For work subject to approval/adoption by the local Authority) filling shall be compacted in accordance with Table 5.1 of AS3798. Absolute minimum density ratios are the following:
 - Residential lot fill - 95% STD;
 - Commercial fill (For minor loads) - 98% STD;
 - Subgrade (Exceeding 300mm below pavement) - 95% STD
 - Subgrade (Within 300mm of pavement) - 98% STD
 - Imported general fill material (If required) should be
 - Cohesive and non-dispersive in nature and be good quality
 - Low Plasticity
 - Liquid limit of less than 45%
 - Plasticity index of less than 15%
 - Shrink/swell index of less than 1.0%
 - Soaked CBR>10%
 - Maximum particle size of 75mm with at least 80% passing the 19mm sieve.
 - Quality testing to confirm imported fill quality should be carried out prior to delivery to site.

OVERALL LAYOUT PLAN

Scale 1:1250 @ A1
0 12.5 25 37.5 50m

ENGINEERING CERTIFICATION

Signed:

ANDREW IAN WALLACE - RPEQ No. 6743

THE ORIGINAL OF THIS DOCUMENT IS COMPLETED TO THE SCALE NOTED. AS REPRODUCTION CAN DISTORT SIZE & SHAPE USE ONLY THE DIMENSIONS PROVIDED ON ARCHITECTURAL &/OR ENGINEERING DRAWINGS. VERIFY DIMENSIONS ON SITE BEFORE CONSTRUCTION.

NORTHERN CONSULTING
engineers

All work is to be carried out in accordance with LOCAL AUTHORITY'S standard details.

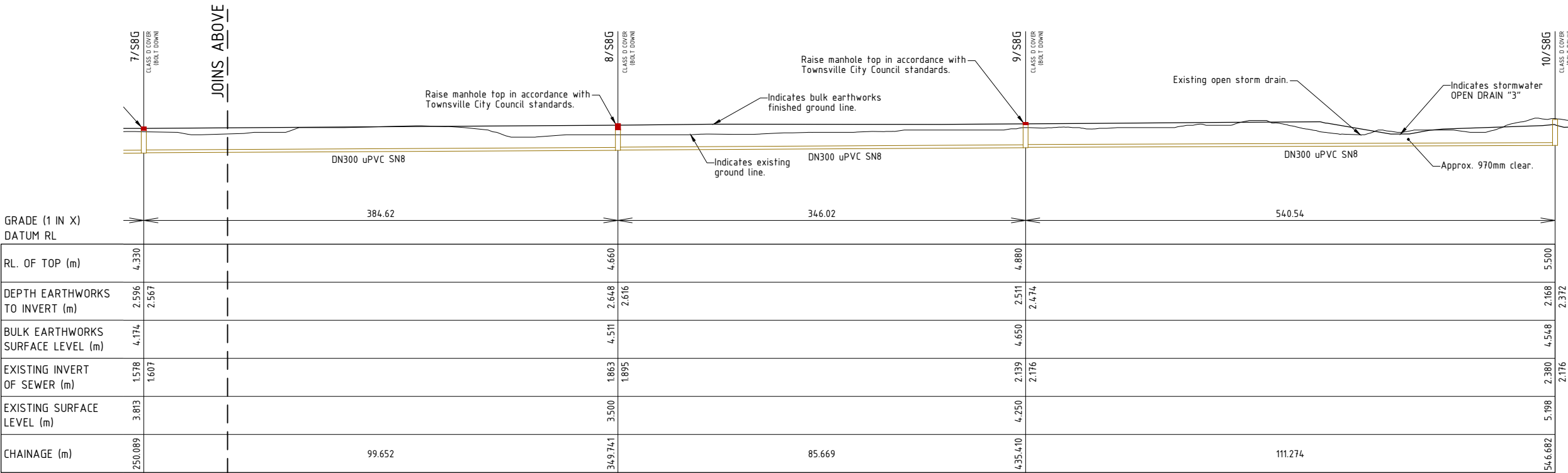
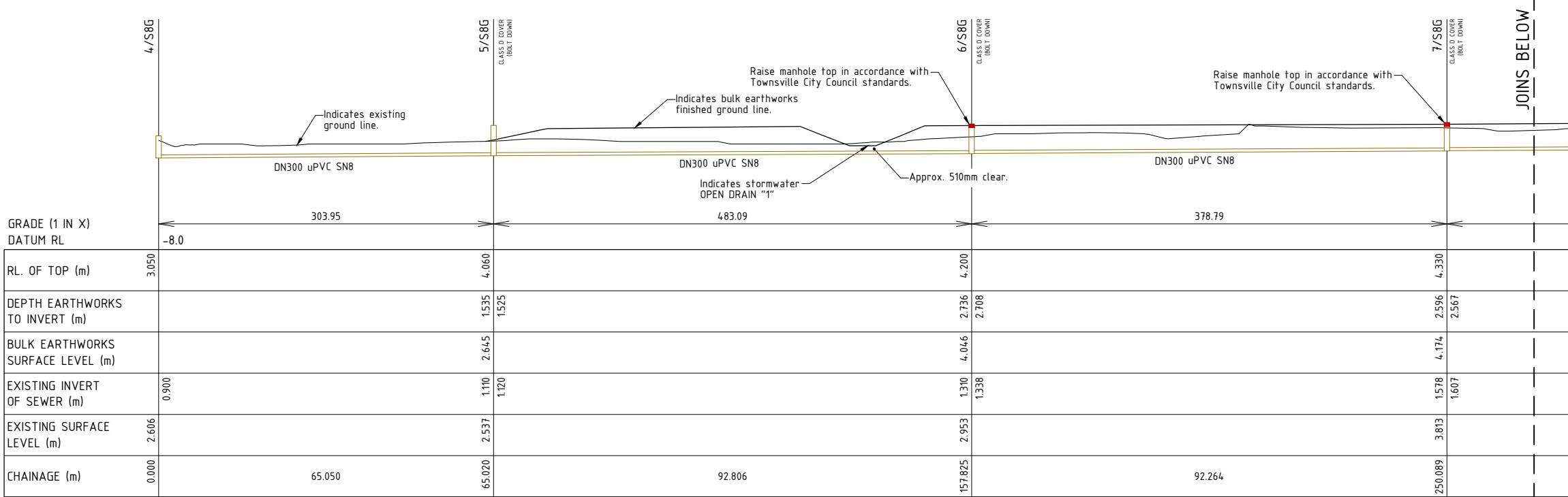
Civil | Structural | Forensic
Traffic | Flood Modelling

TOWNSVILLE | SUNSHINE COAST
BRISBANE | NEW ZEALAND

T: +617 4725 5550 E: mail@nceng.com.au
W: www.nceng.com.au

P1 PRELIMINARY - NOT FOR CONSTRUCTION - ISSUED FOR APPROVAL.		16/08/2024
Issue	Description	Date
Drawn DC Date 16/08/2024	In Association With MCK TSV Pty Ltd	CUT-FILL LAYOUT PLAN
Checked AW	BULK EARTHWORKS	
Approved AW	STUART DRIVE, CLUDEN	
COPYRIGHT ©	TOWNSVILLE TURF CLUB (1 on SP101275, 2 on RP748152)	
Drawing Number BNC0084/B05		Issue P1

PRELIMINARY
NOT FOR CONSTRUCTION



LONGITUDINAL SECTION

Scale 'A' - Horizontal
Scale 'B' - Vertical

PRELIMINARY
NOT FOR CONSTRUCTION



ENGINEERING CERTIFICATION

Signed:

ANDREW IAN WALLACE - RPEQ No. 6743

THE ORIGINAL OF THIS DOCUMENT IS COMPLETED TO THE SCALE NOTED. AS REPRODUCTION CAN DISTORT SIZE & SHAPE USE ONLY THE DIMENSIONS PROVIDED ON ARCHITECTURAL &/OR ENGINEERING DRAWINGS. VERIFY DIMENSIONS ON SITE BEFORE CONSTRUCTION.

NORTHERN CONSULTING engineers

Civil | Structural | Forensic
Traffic | Flood Modelling

TOWNSVILLE | SUNSHINE COAST
BRISBANE | NEW ZEALAND

T: +617 4725 5550 E: mail@nceng.com.au
W: www.nceng.com.au

Drawn DC Date 16/08/2024	In Association With MCK TSV Pty Ltd	SEWER LONGITUDINAL SECTION	
Checked AW Approved AW	BULK EARTHWORKS STUART DRIVE, CLUDEN TOWNSVILLE TURF CLUB (1 on SP101275, 2 on RP748152)	Drawing Number BNC0084/B06	Issue P1
COPYRIGHT ©			

LEGEND

- Existing RP boundary.
- Existing stormwater drain line.
- New stormwater drain line.
- Bulk earthworks major contour.
- Bulk earthworks minor contour.
- Top of batter.
- Toe of batter.
- Change of grade.

CUT/FILL DEPTHS

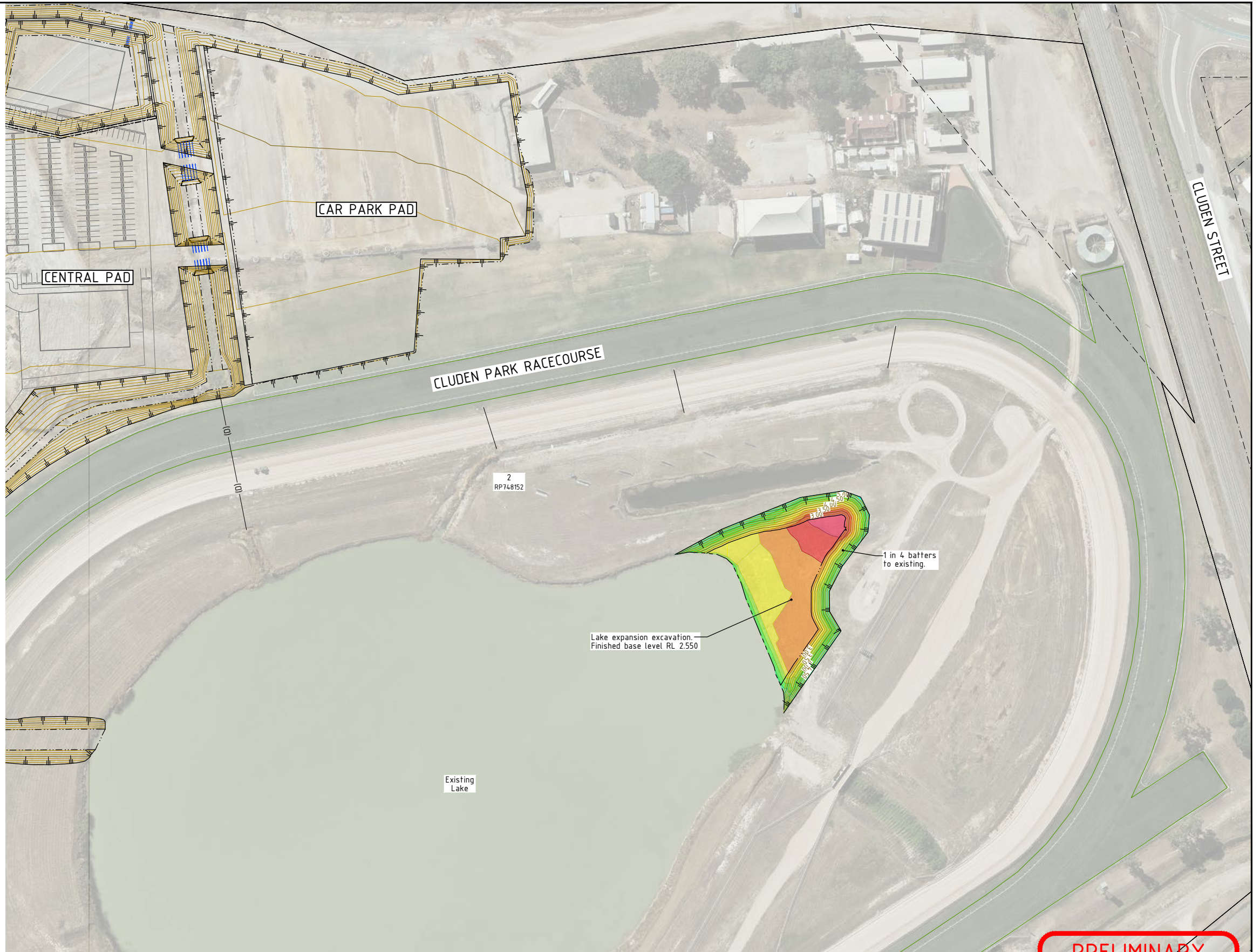
- 3.5 to -3.0 m
- 3.0 to -2.5 m
- 2.5 to -2.0 m
- 2.0 to -1.5 m
- 1.5 to -1.0 m
- 1.0 to -0.5 m
- 0.5 to 0.0 m
- 0.0 to 0.5 m

Earthworks Quantities

Cut - 7242m³
Earthworks quantities has NO bulking factor applied.

EARTHWORKS NOTES:

- All approved fill material should be placed, compacted & tested in accordance with AS3798 "Guidelines on Earthworks for Commercial and Residential Developments". Level 1 Inspection, testing & certification is required for all fill exceeding 300mm in depth.
- Existing surface under all earthworks areas is to be stripped of all vegetation and topsoil, and suitably stockpiled for re-spreading at the completion of works. Ground surface treatment (GST) to be carried out in accordance with AS3798, local Council specification and/or TMR standards.
- Unless directed otherwise by the geotechnical engineer on site or by the relevant local Authority specification (For work subject to approval/adoption by the local Authority) filling shall be compacted in accordance with Table 5.1 of AS3798. Absolute minimum density ratios are the following:
 - Residential lot fill - 95% STD;
 - Commercial fill (For minor loads) - 98% STD;
 - Subgrade (Exceeding 300mm below pavement) - 95% STD
 - Subgrade (Within 300mm of pavement) - 98% STD
- Imported general fill material (If required) should be
 - Cohesive and non-dispersive in nature and be good quality
 - Low Plasticity
 - Liquid limit of less than 45%
 - Plasticity index of less than 15%
 - Shrink/swell index of less than 1.0%
 - Soaked CBR>10%
 - Maximum particle size of 75mm with at least 80% passing the 19mm sieve.
 - Quality testing to confirm imported fill quality should be carried out prior to delivery to site.



LAYOUT PLAN

Scale 1:1250 @ A1

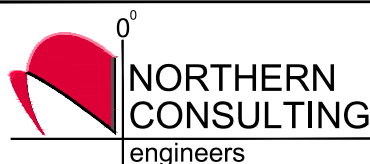
0 12.5 25 37.5 50m

ENGINEERING CERTIFICATION

Signed:

ANDREW IAN WALLACE - RPEQ No. 6743

THE ORIGINAL OF THIS DOCUMENT IS COMPLETED TO THE SCALE NOTED.
AS REPRODUCTION CAN DISTORT SIZE & SHAPE USE ONLY THE DIMENSIONS
PROVIDED ON ARCHITECTURAL &/OR ENGINEERING DRAWINGS. VERIFY
DIMENSIONS ON SITE BEFORE CONSTRUCTION.



All work is to be carried out in accordance with LOCAL AUTHORITY'S standard details.

Civil | Structural | Forensic
Traffic | Flood Modelling

TOWNSVILLE | SUNSHINE COAST
BRISBANE | NEW ZEALAND
T: +617 4725 5550 E: mail@nceng.com.au
W: www.nceng.com.au

P1		PRELIMINARY - NOT FOR CONSTRUCTION - ISSUED FOR APPROVAL.		16/08/2024	
Issue		Description		Date	
Drawn DC Date 16/08/2024		In Association With MCK TSV Pty Ltd		LAKE EXPANSION LAYOUT PLAN	
Checked AW Approved AW		BULK EARTHWORKS STUART DRIVE, CLUDEN TOWNSVILLE TURF CLUB (1 on SP101275, 2 on RP748152)		Drawing Number BNC0084/B07	
COPYRIGHT ©				Issue P1	

Erosion & Sediment Control

EROSION & SEDIMENT CONTROL NOTES:

GENERAL:

1.

The sub-contractors undertaking works following the completion of the civil works will be responsible for maintaining and implementing additional measures as necessary to suit the type of construction occurring and in accordance with IECA best practices guides.
2.

It is assumed that the earthworks will be placed in accordance with the fall direction of the finished earthworks.
3.

The Contractor shall allow for the development of a Erosion and Sediment Control Plan (ESCP) for the "Construction Phase" that is to be submitted to the Superintendent and local Council for approval prior to the commencement of works on-site. The plan must comply with;

-

Environmental Protection Act 1994 (EPA) and all its subordinate legislation; and

-

Local Council standards;

using appropriate principals and techniques detailed in the International Erosion Control Association (IECA) Best Practices

The plan must include (but not be limited to):

(i)

Certified by a "suitably qualified person";

(ii)

Performance standards, hold points and end points;

(iii)

Include maps, calculations, timing/staging and rainfall events/design criteria;

(iv)

Include specifications and construction details;

(v)

Include soil and water management plans;

(vi)

Contain supporting documentation;

(vii)

Include maintenance and monitoring program;

(viii)

Include geotechnical advice relating to the stability of the site during and after works, including details on revegetation and stabilisation of the site.

During the construction phase of the project the Contractor shall assume ALL responsibility for the protection of the site and the compliance to their ESCP.

For the purpose of ESCP, the "Construction Phase" is defined as the period commencing the day of possession of site and ceasing the day of receipt of the Practical Completion Certificate provided by the Superintendent, ensure that the site is stable.

The supplied ESCP provided with the tender documents may be adopted by the Contractor during the construction phase should this align with their construction methodology.

The Principal Contractor is the nominated responsible entity in relation to erosion and sediment control matters during construction.

4.

All drainage, erosion and sediment controls to be installed and be operational before commencing up-slope works.
5.

All control measures to be inspected at least weekly and after significant run-off producing storms.
6.

Control measures may be removed when on-site when 70% permanent soil coverage is obtained over all upstream disturbed land.
7.

All disturbed surface to be re-vegetated and established prior to removal of devices.

RESPONSIBILITY:

8.

This ESCP concept has been prepared by a Suitably Qualified Person - John Single TCC Accreditation No. SQP-073.
9.

The Responsible Person nominated for on-site implementation of this ESCP construction is the Contractor's Construction Manager.
10.

The Site Foreman nominated for overseeing and implementing site works is the Contractor's site foreman.

ESCP OBJECTIVE:

11.

The objective of this ESCP concept is to ensure works are carried out in the following manner:

a.

Minimise exposure of disturbed soils at any time, i.e. land clearing should be staged to minimise the extent and duration of soil exposure.

b.

Diversion of runoff from upstream undisturbed areas around disturbed areas.

c.

Site discharge shall have <50mg/L TSS, turbidity not >10% of the receiving waters turbidity and PH 6.5-8.5, unless defined otherwise.

d.

Oils and grease - no visible films or odour.

e.

Litter - no visible litter washed or blown from the site.

f.

Exposed soil/finished earthworks is to be protected (soil binder, mulch, etc) as soon as practical.
12.

This ESCP concept is a living document that can and should be modified by suitably qualified site personnel (Responsible Person or Site Foreman) if:

a.

Site conditions change;

b.

The adopted measures fails to achieve the required treatment standard and/or overall ESCP objective;

Any changes will need to comply with the intent of the original ESCP.

HYDROMULCH SPECIFICATION:

13.

Hydromulch is to be applied to all disturbed areas (even areas beyond the anticipated extents shown) at the completion of works U.N.O on other drawings. hydromulch on lots will be limited to the extent shown on the drawings. The entire verge is to hydromulched.
14.

Prior to the hydromulch being applied to all exposed areas (topsoil & natural) the Contractor shall undertake a minimum of four (4) soil tests to determine the required treatment of the finished surface. The number of tests shall be confirmed by the Superintendent prior to sampling. In lieu of topsoil testing, all topsoil shall be treated with gypsum at 2.0kg/m2 prior to the placement of hydromulch
15.

Topsoil to be re-spread 50mm to 100mm over lots, batters, table drains, mitigation and areas of disturbance.
16.

The hydromulch mix shall be designed for an application rate of 2.5 t/ha and include mix seed (refer below for minimum seed mix), fertiliser, pulp (paper preferable) and acrylic polymer or other tacktifer (typically 5 to 10% by weight).

-

Minimum seed mix:

-

BOTHRIOCHLOA pertusa 40kg/ha

-

Japanese Millet 10kg/ha

SEDIMENT FENCE:

17.

Not to be located in areas of concentrated flow.
18.

Normally located along the contour with a maximum catchment area of 0.6ha per 100m length of fence.
19.

Woven fabrics are preferred, non-woven fabrics may be used on small work sites, i.e. operational period less than 6 months or on sites where significant sediment runoff is not expected.
20.

Where fence need to be located across the contour the layout shall conform to 'typical layout across grade'.
21.

Fences are required 2.0m min. from toe of cut or fill batters. Where not practical one fence can be at the toe with a second fence 1.0m min. away. Fence should not be located parallel with toe if concentration of flow will occur behind the fence.

TEMP CONSTRUCTION ENTRY/EXIT SEDIMENT TRAP:

22.

Adjacent stormwater runoff to be diverted away from entry/exit.
23.

Wheel - wash or spray unit may be required during wet weather.
24.

Safety issued must be considered at all times, incorporate traffic control devices to the satisfaction of the Superintendent.

DEVICE DESIGN:

25.

The devices (sediment traps, catch drains, diversion channels) are anticipated to be evolving structures such that they will change in level as the earthworks are undertaken. The details shown on the typical sections for the devices are the minimum / critical requirements.
26.

The devices have been designed for the following:

a.

Diversion channel - 1 in 2 year ARI as device is anticipated to be in place for <12 months.

b.

Flow diversion bund - 1 in 5 year ARI as device is anticipated to be in place for 12-24 months.

c.

Catch drain - 1 in 2 year ARI as device is anticipated to be in place for <12 months.

d.

Sediment basin - 3 to 12 months, ½ 1 year ARI flow. (design as Type 2 device)

e.

Sediment trap - 3 to 12 months, ½ 1 year ARI flow. (design as Type 2 device)

f.

Sediment basin spillway - 3 to 12 months, 1 in 20 year ARI.

g.

Sediment trap spillway - 3 to 12 months, 1 in 10 year ARI.

h.

Temporary culvert crossings - 1 in 1 year ARI.
27.

The design storm for sediment basin / trap sizing is the 85th percent five-day event. This is due to water discharging into sensitive waters, i.e. Stuart Creek.

ADDITIONAL & TEMPORARY DEVICES:

28.

Rock and/or geofabric lined chutes will be required in catch drains where there is a longitudinal change in invert level >0.3m, refer to IECA for standard chute details.

DUST MANAGEMENT:

29.

Appropriate control is required during all construction activities. This is initially assumed to occur as water application via a water truck.
30.

In the event that an area will be exposed for more than 5 days without water application, a non-vegetation soil binder will be required. Either a cationic bitumen emulsion or organic based binder will be required. For further details, refer to IECA soil binder specification located at <https://www.austieca.com.au/documents/item/227>

IDENTIFICATION OF INCIDENT OR FAILURE:

31.

Non-compliance with the ESCP Objectives will be identified by the following:

a.

Build-up of sediment off the site, i.e. on roadways, kerb and channel, etc;

b.

Excessive sediment build-up on the site at ESC devices;

c.

Excessive erosion on the site;

d.

Release of construction material from the site;

e.

Poorly maintained, damaged or failed ESC devices;

f.

Deteriorated water quality, as identified by the Environmental Consultant, attributed to construction activities;

g.

Excessive dust.

CORRECTIVE ACTION:

32.

After any identification of incident or failure, the source/cause is to be investigated and corrected immediately. Corrective measures for potential incident or failure include, but are not limited to the following:

a.

Build-up of sediment off the site: - collect and dispose of material in a manner that will not cause ongoing environmental nuisance or harm. Amended/rectified ESC measures where appropriate to reduce the risk of further sediment loss.

b.

Excessive sediment build-up on the site: - collect and dispose of material in a manner that will not cause ongoing environmental nuisance or harm. Amended/rectified ESC upstream measures where appropriate and review/modify maintenance/inspection timing.

c.

Sediment/mud on public roads: - sweep/wash streets. Ensure appropriate kerb inlet/table drain protection is in place if streets are washed. Clean out and rectify exit rumble pad and/or review traffic management for vehicles exiting the site.

d.

Excessive erosion in drainage devices: - investigate cause and identify if additional in channel flow control devices are required. This may include upgraded lining methods, rock check dams or other velocity control devices.

e.

Release of construction material/litter from the site: - collect and dispose of material in a manner that will not cause ongoing environmental nuisance or harm then review existing devices and litter control practices.

f.

Poorly maintained, damaged or failed ESC devices: - review maintenance and inspection records. Confirm that inspection and maintenance procedures have been followed and if necessary increase the frequency of inspections or rectification timeframe's to ensure devices are in good working order at all times.

g.

Deteriorated water quality: - increase runoff capture devices and prevent free discharge from site. Collect and treat runoff on-site, ensuring appropriate water quality targets are achieved, prior to discharging from site.

h.

Excessive dust: - increase dust suppression works, i.e. incorporate additional water cart during periods of high winds. Alternately, apply a dust suppression binder and continue to monitor the binders' performance.
33.

If the release of excessive sediment and/or other materials off-site is identified during two (2) consecutive site inspections, or water quality monitoring indicates levels are not within the water quality targets on two (2) consecutive tests, review and revise the ESCP or reduce the rate, extent and/or duration of soil exposure.
34.

If collection and treatment of run-off is required and the water quality targets are not being achieved prior to release, undertake the following:

a.

To reduce suspended solids - add an appropriate flocculent (e.g. gypsum), then retest.

b.

Modify pH - add acid if pH is too high or hydrated lime if pH is too low, then retest.

MONITORING, RECORDS & MAINTENANCE:

35.

The contractor shall ensure that ESC measures are maintained and in good working order at all times. The contractor shall visually inspect ESC measures in accordance with the associated inspection and record plan and maintain records of these checks.
36.

All measures should be inspected:

a.

Daily when rain is occurring;

b.

Weekly, regardless of weather or works occurring on-site;

c.

Within 24 hours prior to expected rainfall;

d.

Immediately after a rainfall event.
37.

The Responsible Person will be responsible for preparing monthly reports that record the following as a minimum:

a.

Records of any failures in ESC measures, identifying the reason for failure and the corrective actions implemented to prevent or reduce the risk of re-occurrence.

b.

Photographic evidence of ESC measures.

c.

For stormwater releases from the site, record the results of water quality samples. In addition, records shall be kept of the reason for the release, the date of the release, date of sampling and the amount of rainfall during the previous 24 hours.

d.

Records of any complaints received, including date, time, person making complaint and the action taken to resolve the complaint.

PRELIMINARY
NOT FOR CONSTRUCTION

All work is to be carried out in accordance with LOCAL AUTHORITY'S standard details.		P1	PRELIMINARY - NOT FOR CONSTRUCTION - ISSUED FOR APPROVAL.		16/08/2024
		Issue	Date		
ENGINEERING CERTIFICATION		Description		Date	
Signed:		In Association With		EROSION & SEDIMENT CONTROL MANAGEMENT NOTES	
ANDREW IAN WALLACE - RPEQ No. 6743		MCK TSV Pty Ltd			
 NORTHERN CONSULTING engineers		Drawn DC			
		Date 16/08/2024			
		Checked AW			
		Approved AW			
THE ORIGINAL OF THIS DOCUMENT IS COMPLETED TO THE SCALE NOTED. AS REPRODUCTION CAN DISTORT SIZE & SHAPE USE ONLY THE DIMENSIONS PROVIDED ON ARCHITECTURAL &/OR ENGINEERING DRAWINGS. VERIFY DIMENSIONS ON SITE BEFORE CONSTRUCTION.		BULK EARTHWORKS STUART DRIVE, CLUDEN TOWNSVILLE TURF CLUB (1 on SP101275, 2 on RP748152)		Drawing Number BNC0084/Q01	
		TOWNSVILLE SUNSHINE COAST BRISBANE NEW ZEALAND T: +617 4725 5550 E: mail@nceng.com.au W: www.nceng.com.au		Issue P1	



LEGEND

- Existing RP boundary.
- Stormwater drain line.
- Bulk earthworks major contour.
- Bulk earthworks minor contour.
- Top of batter.
- Toe of batter.
- Change of grade.
- Hydromulch extents.
- 500mm high mulch bund.

NOTES:

1. The extent of hydromulch shown is the minimum requirement. Refer to Note 13 on BNC0084/Q01.
2. No works to occur from December to March. All disturbed areas must be revegetated with an approved species with a minimum of 50% coverage and established to all areas (or other equivalent protective permanent coverage) prior to December of any year.

LAYOUT PLAN

PRELIMINARY
NOT FOR CONSTRUCTION

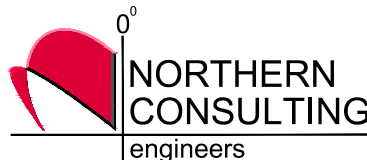
Scale 1:1250 @ A1
0 12.5 25 37.5 50m

ENGINEERING CERTIFICATION

Signed:

ANDREW IAN WALLACE - RPEQ No. 6743

THE ORIGINAL OF THIS DOCUMENT IS COMPLETED TO THE SCALE NOTED.
AS REPRODUCTION CAN DISTORT SIZE & SHAPE USE ONLY THE DIMENSIONS
PROVIDED ON ARCHITECTURAL &/OR ENGINEERING DRAWINGS. VERIFY
DIMENSIONS ON SITE BEFORE CONSTRUCTION.



All work is to be carried out in accordance with LOCAL AUTHORITY'S standard details.

Civil | Structural | Forensic
Traffic | Flood Modelling

TOWNSVILLE | SUNSHINE COAST
BRISBANE | NEW ZEALAND
T: +617 4725 5550 E: mail@nceng.com.au
W: www.nceng.com.au

P1 PRELIMINARY - NOT FOR CONSTRUCTION - ISSUED FOR APPROVAL.		16/08/2024	
Issue	Description		Date
Drawn DC Date 16/08/2024	In Association With MCK TSV Pty Ltd	EROSION & SEDIMENT CONTROL LAYOUT PLAN	
Checked AW	BULK EARTHWORKS STUART DRIVE, CLUDEN TOWNSVILLE TURF CLUB (1 on SP101275, 2 on RP748152)		
Approved AW			
COPYRIGHT ©			
Drawing Number BNC0084/Q02		Issue P1	

