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21 March 2019

Frasers Property Australia
Level 9, 484 St Kilda Road
MELBOURNE, VIC, 3004

Attention: Mr. Mark Cleveland

Dear Mark,

RE: EASTERN CREEK BUSINESS HUB
ROOTY HILL ROAD SOUTH, EASTERN CREEK
STORMWATER AND ROAD DESIGN REPORT FOR RE-SUBMISSION TO DEPARTMENT OF PLANNING AND ENVIRONMENT (DPE) APPLICATION

PROJECT OVERVIEW

To the east of Rooty Hill Road South and to the west of the M7 Motorway is a 35 hectare green field site that is proposed to be developed into an area with mixed uses of commercial, retail and bulky goods. The overall subdivision site is known as the Eastern Creek Quarter (ECQ) Business Hub. The land is currently owned by the Western Sydney Parklands Trust (WSPT), but will be developed by Frasers Property. The development of this area will include a private access road, communal On Site Detention (OSD) and Water Quality (WQ) basins as well as associated stormwater infrastructure. Figure 1 shows the location of the subdivision site. It is the design and documentation of these items that are the focus of this report.

A previous Development Application submission for these works was completed and submitted by Costing Roe (CR) Engineers in 2015, and prior to this, the original submission for the subdivision area was prepared and submitted by J. Wyndham Prince (JWP) Engineers in 2013. These two reports that have been used as a reference and basis for this S96 submission are;

- *Costin Roe – Co12693.00-04b.rpt (August 2015)*
- *J.Wyndhan Prince – 2014-04-23 Appendix 13_Stormwater report 8801Rpt1F (March 2013)*

Key stormwater elements of these previous designs have been reviewed and changed. As a result, a S96 submission has been prepared. The main changes that are occurring as part of this S96 submission are;

- The main overland flow channel has been adjusted to accommodate the proposed widening of Rooty Hill Road South as well as internal lot configurations and constraints.
- The 30 hectare upstream urban catchment will not be routed through the southern OSD/Bio basin and will instead be directed to the existing creek that is located downstream of the proposed main overland flow channel.
- The procedure for calculating the OSD basin size and outlet controls is to be undertaken using Council's latest *deemed to comply calculation spreadsheet.*

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There are proposed to be amplifications of the Rooty Hill Road South and the Great Western Highway as a result of the ECQ subdivision development. The Rooty Hill Road South/Cable Place amplifications are shown as a background to the overall site layout plans. These are currently being documented to a standard to obtain a Works Authorisation Deed (WAD) with RMS. As such, this layout is provided on our drawings for information purposes only. The RMS approved concept plans for these surrounding road works are attached as an appendix to this report.

The above changes were discussed with Council's stormwater Engineer, Tony Merrilees and he agreed to these changes so long as the design calculations and documentation reflects Blacktown Council's latest design policies on Water Sensitive Urban Design (WSUD). The reason for not routing the upstream 30 hectare catchment through the southern detention basin is because it is a separate catchment that is remaining unchanged. The proposed development is not to be responsible for the improvement of water quality of water quantity of this upstream catchment and flows should be able to flow through the development site, unmitigated towards the M7 discharge culverts.

There are two existing culverts that are located at the far eastern boundary of the site. Both culverts pass underneath the M7 motorway and flow eastwards towards Eastern Creek. These culverts are the outlets that define the two catchment areas of the subdivision site. The northern culvert drains the catchments to the north of the proposed subdivision Access Road. The areas to the south of the Access Road will drain towards the southern culvert. The overall catchment areas for the subdivision site are shown on the drawing 17D83_S96_C250. There is approximately 30 hectares of upstream urban catchment that is currently directed to a low point in Rooty Hill Road South. The catchment currently discharges underneath Rooty Hill Road and into an existing creek that traverses the subdivision site in an easterly direction to the southern culvert. The previous stormwater report and study by J. Wyndham Prince (JWP) (2013), calculated the flows off this area to be 12.90m^3/s. According to the report, these flows will enter the subdivision area via the existing twin 750mm pipes as well as via overflows over the low point. In accordance with the original report by JWP, a new proposed channel will need to be created that caters for these flows to be conveyed around the proposed Lot 1 site area. The design and calculation of this channel is described in the following sections of this report.

The existing topography of the site is that the majority falls in an easterly direction at approximately 5%. Runoff from the site currently is directed overland to two sets of culverts located at the far eastern edge of the overall precinct site. These culverts discharge to the east and eventually to Eastern Creek. The proposed stormwater from the developed stage 1 site will ultimately follow this same path to Eastern Creek.

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Figure 1: Location of proposed site

PREVIOUS STORMWATER AND ROAD DESIGN STRATEGY AND SUBMISSIONS

The overall subdivision area is intended to become part of a commercial/retail precinct. This overall precinct area requires the installation of appropriate access roads and downstream stormwater infrastructure for the site to connect in to. In addition to this, there are proposed upgrades and amplifications of the adjoining Rooty Hill Road/Cable Place intersection and Rooty Hill Road South/Great Western Highway intersection.

The original subdivision access road and stormwater infrastructure design for the precinct area was carried out and approved under the following application and development consent.

- Application no. SSD 5175 MOD 1
- Applicant: Western Sydney Parklands Trust
- Consent Authority: Minister for Planning
- Approval date: 28th April 2016

The civil infrastructure design and drawings that formed part of this consent have been used as the basis for this submission. However, some key components of the stormwater design are proposed to be amended and are discussed in detail in the later sections of this report

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STORMWATER STRATEGY

Access Road Drainage design:

The proposed access road drainage has been designed to accommodate up to the 1:20ARI storm event with the piped system. The 1:100ARI storm event has also been checked to ensure that there is not excessive overflow through the access road that causes dangerous velocities or flow depths.

The proposed piped stormwater drainage network for the access road can be seen on the detail plans 17D83_S96_C101-C107. The access road drainage network discharges into a 2.7m x 0.6m RCBC that runs underneath the low point of the Access Road. This culvert then directs all flows (up to and including the 100ARI) to the designated channel towards Basin 2 (Northern Bio/OSD basin). As well as catering for the Access Road piped drainage, this culvert has been sized to accommodate the flows from the 4.187Ha Lot 2 catchment with an assumed impervious percentage of 90%. Lot 2's site drainage connection point has been assumed to be at the upstream end of the culvert at headwall L-4.

In addition to the culvert under the low point of the road, there is a second culvert that is positioned approximately 90m to the north, and this culvert also passes underneath the Access Road. This culvert has been designed to accommodate flows up to the 100ARI from the future Lot 3 site as well as from the "Beggs Road" catchment area. The culvert size required is a 1.5m x 0.45m RCBC.

Refer to drawings 17D83_S96_C255 and C250 for the Access Road drainage and culvert stormwater catchment areas.

The DRAINS modelling software has been used to assess and design the Access Road piped drainage as well the two culverts. As mentioned above, the 20ARI flows have been contained within the piped system and only safe, minor overflows occur in the 100ARI event. The two culverts have been designed to accommodate the 100ARI flows without any overflow or excessively high Hydraulic losses. The DRAINS model prepared and submitted is;

- *17D83 Road rev 3 – option to flatten pipes – with adjusted channel numbers rev1.drn*

The stormwater longsections for the road drainage and culverts have been documented on drawings 17D83_S96_C220-221. Refer to appendix G for the DRAINS model.

Channels to Northern Basin:

As can be seen on drawings 17D83_S96_C105 and C111, there will be two trapezoidal channels to convey the flows from each of the two culverts towards the northern Bio/OSD basin. These two separate channels will converge to one channel approximately 90m to the east of the Access Road. From this point, the single channel will be directed towards the bio retention basin via a diversion weir with flows over and above the treatable flow rates diverted to the main OSD.

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Both the two separate channels and the combined channel have an 8.1m wide base with 1:4 side batters/slopes and a longitudinal grade of approximately 0.3%. To model this channel area, a conservative estimate has been input to the following DRAINS model.

- *17D83 Diversion Drainage System – north basin – with bio modelled rev2.drn*

The model has conservatively represented these channels as one overall channel with a 7m base and 1:4 side slopes. The entire catchment area from both the channels has been modelled to flow through this one channel in the DRAINS model. This is conservative because the flows would actually be split between each of the channels from the upstream culverts. By modelling these channels conservatively as one, a conservative estimate of the flow depths within each channel can be calculated. It should be noted that the invert levels and length of the channel modelled in DRAINS closely represents the inverts of the actual channels as they both will have very similar upstream and downstream inverts as each other. This makes the DRAINS model a conservative representation of the channels. The channel as modelled is named as *Channel with 100ari flow* in the above mentioned DRAINS model.

As a hydraulic check to the DRAINS modelling, we have calculated using the manning's equation what the minimum channel base width would need to be in order to control the flow depths to 0.85m in the channel behind the weir and 0.93m in the main channel(s) leading to the bio basin, respectively. These flow depths were what were originally calculated and designed in the hydraulic modelling and previously submitted, so we have endeavored to maintain these levels. Using the same slopes and a roughness co-efficient of 0.07, the required calculated base widths are 7m for the channel behind the weir and 8.1m for the main channel(s) to the bio basin. As this calculation generates a larger channel width, we have adopted this for nominated dimensions on the design drawings. Refer to the following calculation spreadsheets for the manning's channel design;

- *HYD-COMPUT-LARS-17D83-CHANNEL BEHIND WEIR.xls*
- *HYD-COMPUT-LARS-17D83-MAIN CHANNEL COMPARE.xls*

The top water level in the channels has been calculated to be RL40.14 (100ARI) and RL40.06 (20ARI), with a downstream/tail water level of 39.78. The tail water level of 39.78 has been conservatively assumed to be at 540mm above the top of the diversion weir (RL39.25) at its upstream end. This is the depth of flow that will occur over the 14.5m long diversion weir once the treatable flows rates are exceeded. It has been assumed that this overflow will act as submerged weir flow and the depth of flow has been calculated accordingly in the calculation spreadsheet;

- *HYD-COMPUT-LARS-17D83-SUBMERGED WEIR EQN.xls*

<u>Drains Modelling Data</u>

For the above mentioned model, the IFD data used for the rainfall generation is;

Table 1

	2ARI	50ARI		
1hr	30.7(mm/hr)	59.6(mm/hr)	**G**	0.01
12hr	6.63(mm/hr)	13.1(mm/hr)	**F2**	4.30
72hr	1.99(mm/hr)	4.37(mm/hr)	**F50**	15.81

The standard parameters used in the DRAINS model are as follows;

Table 2

Description	Value
Model for Design and Analysis Run	Rational Method
Rational Method Procedure	ARR87
Soil Type - Normal	3.0
Paved (Impervious) Are Depression Storage	1mm
Supplementary Area Depression Storage	1mm
Grassed (Pervious) Area Depression Storage	5mm
Antecedent Moisture Condition (ARI = 1-5 years)	2.5
Antecedent Moisture Condition (ARI = 10-20 years)	3.0
Antecedent Moisture Condition (ARI = 50-100 years)	3.5
Sag Pit Blocking Factor	0.5
On Grade Pit Blocking Factor	0.2

Main overflow channel from Rooty Hill Road South to M7 Culvert:

In accordance with the original development proposal by JWP and subsequent proposal by CR, a channel capable of accommodating the flows from approximately 30 hectares of urban upstream catchment needs to be conveyed through the subdivision site and to the existing culvert(s) that run underneath the M7 motorway at the far eastern boundary of the site. As discussed above, this catchment will not be routed through the southern detention/water quality basin. This is a significant change from the previously submitted subdivision stormwater strategy presented by Costin Roe.

Based on discussions with Council's stormwater Engineer, Tony Merriless, the following was agreed upon;

- The downstream water levels for the 100ARI event at the M7 Culvert entrance to be adopted is RL39.20
- The upstream urban catchment of approximately 30 hectares is not to be routed through the proposed southern Bio/Detention Basin.
- The new overland flow channel next to Rooty Hill Road is to be designed to accommodate the full 100ARI flows from the upstream urban catchment as previously calculated by JWP. This flow is 12.90m³/s.

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- HEC-RAS modelling is required to assess the depth of flow from the existing creek all the way through and into the proposed new channel that is adjacent to Rooty Hill Road South and the new Access Road.

In response to the above requirements, we have designed the channel, using the HEC-RAS software, to accommodate the 12.90m³/s flow as well as a conservative allowance of 350L/s. This 352L/s the maximum runoff generated from the Rooty Hill Road widening. This increased area equates to 6070m². Therefore, the overall flow to be modelled and designed for this channel is 13.25m³/s.

The HEC-RAS model prepared and submitted is;

- *HEC RAS 10_04_2018.prj*

Refer to Appendix G for the HEC-RAS model.

The HEC-RAS modelling shows that the proposed channel adjacent to the new Access Road and Rooty Hill Road South will have be able to convey the flows and provide a minimum of 300mm to any surrounding pedestrian accessible areas. The top water level in the channel at the upstream end is approximately RL41.50 which is over 1m below the Rooty Hill Road top of the proposed top of kerb levels and over 300mm below the lowest point along the retaining wall adjacent to the channel along the new estate Access Road.

In terms of the Lot 1 side of the channel, there will be a future vertical wall at the top of the bank. This will be part of the future Lot 1 design. For this reason, we have assumed a vertical wall in the cross sections of the HEC RAS model along the Lot 1 side of the channel to obtain the most conservative and ultimate water levels within the channel. What we have shown on these S96 earthworks stage drawings is a 1:3 batter that extends into Lot 1 to ensure no water from the channel spills into the Lot 1 sediment and erosion works. It would be unnecessary to build a wall along the top of the batter in this temporary stage as there is negligible risk of any public pedestrian activity on this side of the channel until Lot 1 is fully developed.

As discussed with Council's Engineer, Tony Merrilees, appropriate scour protection will be required at the major bend in the channel and at the connection to the existing creek. Based on the flows and channel size, a D_{50} stone of 400mm will be required at these locations. This stone sizing is in accordance with the requirements of the *Landcom – Managing Urban Stormwater (Blue Book)* standard scour protection tables.

The drawings 17D83_S96_C102, C103 and C105 show the layout of the proposed channel and its connection into the existing creek downstream through the subdivision site. Drawings 17D83_S96_C110 and C302 show sections through critical locations for this channel.

ON-SITE DETENTION DESIGN

As discussed in the Pre-DA meeting with council's drainage engineer, Tony Merrilees, the development should comply with the BCC's on-site detention (OSD) policy. In this case, it was deemed that OSD shall be provided to control the peak flow of stormwater generated from the

development in accordance with the BCC Development Control Plan (DCP) Part J 2015, and with BCCs Deemed to Comply OSD spreadsheet tool.

In order to mitigate the increased stormwater runoff and pollutants generated by the development, a water management basin for each of the two existing catchments, north and south, is proposed to be constructed to satisfy the water quality and quantity requirements of the development. Each of the water management basins will store the required detention volume for its given catchment as calculated by the BBC Deemed to Comply OSD spreadsheet tool. The required detention volume for each catchment is listed below, and is based on the developable catchment area draining to each basin (refer to Water Quantity Catchment Plan 17D83_96_C250 in Appendix E for details):

- North basin detention volume = 7,173m^3 (15.1300ha in area)
- South basin detention volume = 3,067m^3 (4.1680ha in area)

OSD spreadsheet calculations are available in Appendix E.

Several assumptions were made when using the spreadsheet tool to calculate the detention volumes for each basin. These include:

- Point 4 “RL of invert of Discharge to Council Drainage Pit”, being taken as the invert of the pipe which discharges into the open channel leading to the M7 culverts.
- Inundation of the headwalls of the downstream M7 culverts will affect the discharge rate through the culverts, increasing the head required to drive the flow through the system. This increase in head has the potential to affect the operation of the developments stormwater management system, particularly the on-site detention systems. For this reason, a downstream water level was included in the design of the downstream of the OSD. This water level is represented by Point 5 “RL of obvert of pit outlet pipe” in BCC’s deemed to comply spreadsheet. Following discussion with Council’s stormwater Engineer, Tony Merrilees, the downstream water level for the onsite detention basin, point 5, has been taken as 150mm below the flood level.

Where possible and within site constrains, the design of the on-site detention storage area in water management basins was designed in accordance with, and to fulfill the intent of BCCs Water Sensitive Urban Design (WSUD) Standard Drawings, with particular reference to:

- Surface of bioretention filter system elevated above estimated 2-year water level.
- 1.5-year ARI detention volumes retarded with orifice and weir arrangement which later drains through the 100-year ARI sized orifice (sized with deemed to comply spreadsheet).
- Appropriate access for maintenance purposes.
- Appropriate sized emergency overflow weir with rip rap scour protection designed in accordance with *Landcom – Managing Urban Stormwater - Soils and Construction, Volume 1, 4th Edition March 2004*.

The design of the composite water management basins is detailed on engineering drawings 17D83_96_C230-C231 (north basin) and 17D83_96_C240-C241 (south basin).

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WATER QUALITY STRATEGY

In accordance with the original stormwater management strategy outlined by JWP consulting engineers, water treatment is to be managed by a water quality treatment train consisting of tertiary treatment within dual communal composite water management basins and individual on-lot primary treatment.

Tertiary treatment is proposed to be managed by a bioretention filter system which will reduce total suspended solids and nutrient loads, which in-turn is protected from the influx of sediments and gross pollutants by the individual on-lot primary treatment and communal swales. Primary on-lot treatment is proposed to be managed by a combination of Enviropod pit baskets and gross pollutant traps (GPT's). In addition to the individual lots, the access road will be primarily treated in a similar manner. As such, all surface inlet pits within the access road (24 in total) have been nominated to be fitted with Enviropod pit baskets. In areas of vehicular traffic, suitable practices to manage the run-off of hydrocarbons will be implemented, taking the form of oilsorbs within pit baskets and oil baffles in GPTs. To ensure the treatment train remains functional and operational, the treatment measures must be regularly maintained. A maintenance schedule that outlines the specific maintenance requirement of each of treatment devices is provided in appendix x.

In order to meet WSUD goals outlined by BCC, all developments are required to achieve a minimum percentage reduction of the post development average annual load of pollutants in accordance with of BCC's DCP Part J 2017, shown in Table 3 below. The water quality pollutants modelled in MUSIC and specific to water quality outcomes for the development as a whole are Gross pollutants (GPs), Total Suspended Solids (TSS), Total Phosphorous (TP), Total Nitrogen (TN) and Total Hydrocarbons.

Table 3: Post development average annual pollutant load reduction target. Source: BCCs DCP Part J 2017

Pollutant	% post development reduction target
Gross Pollutants	90
Total Suspended Solids	85
Total Phosphorous	65
Total Nitrogen	45
Total Hydrocarbons	90

In order to better determine the conceptual design of the water quality treatment trains and to ensure the treatment trains satisfy the reduction parameters outlined in table 3, a preliminary Model for Urban Stormwater Improvement Conceptualisation (MUSIC) was developed. The MUSIC model prepared and presented is;

- *BCC STD Music Model_17D83 – Sub 2 nw 21.03.2019.SQZ*

The MUSIC model was set up with the in-built rainfall station, time period data, evapotranspiration data, source node data and run-off parameters of BCC's MUSIC Link model. A schematic of the MUSIC model can be viewed below in figure 2, in conjunction with the resultant post developed pollutants calculated by the simulation. The resultant post developed pollutant loads have been reduced below the reduction target for all pollutants. The schematic illustrates the interrelationship

between source nodes (catchments) and treatment nodes (water quality treatment measures) for each catchment (north and south). An in-depth analysis of the specific catchments and their spatial distribution is also detailed on engineering drawing 17D83_S96_C251 and a short summary is provided in the following subsection of this report. Additionally, the design of key individual treatment systems is further elaborated on.

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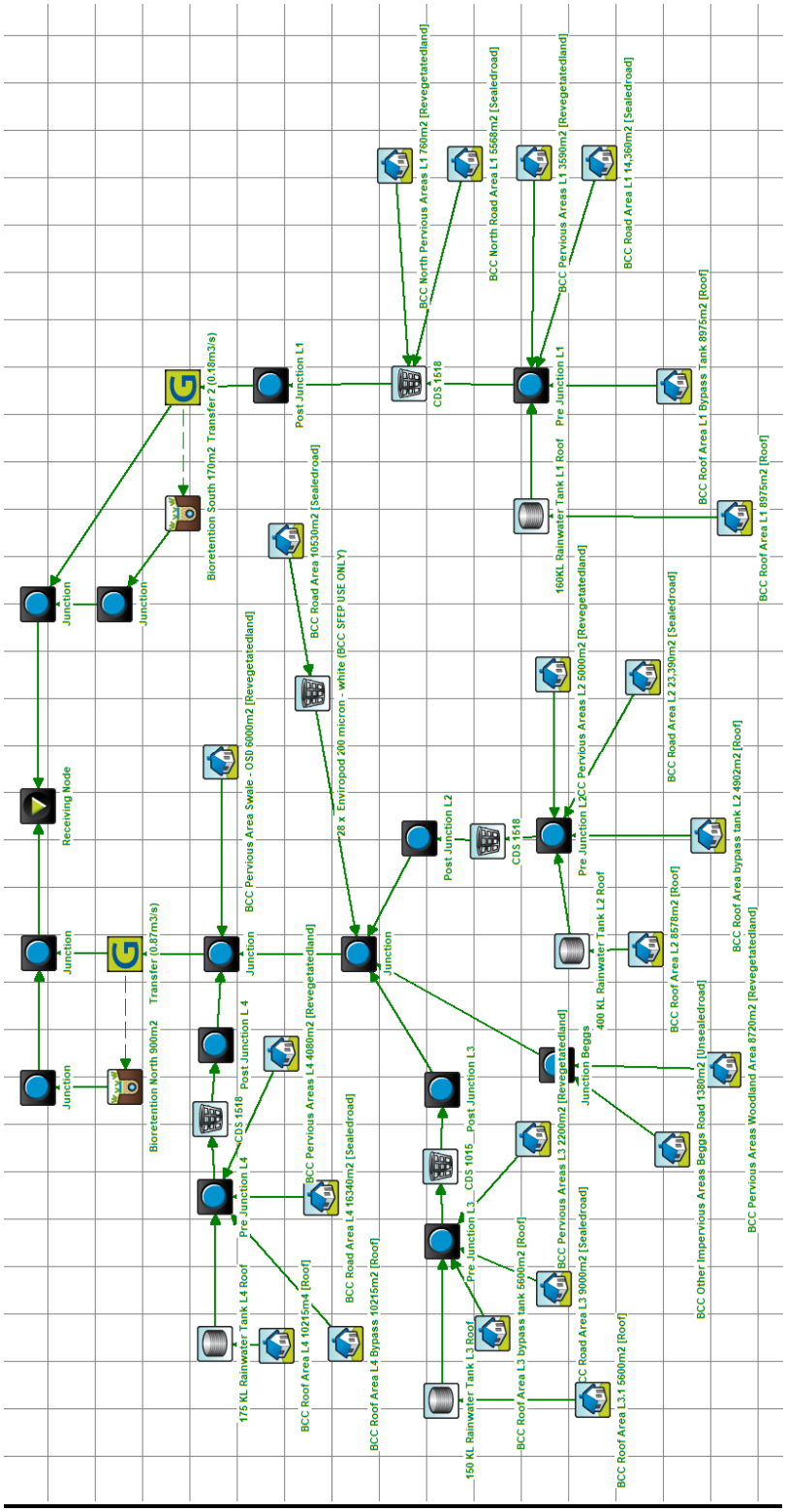

	Sources	Residual Load	% Reduction
Flow (ML/yr)	111	101	9.3
Total Suspended Solids (kg/yr)	22300	2430	89.1
Total Phosphorus (kg/yr)	42.9	13.1	69.4
Total Nitrogen (kg/yr)	253	137	45.8
Gross Pollutants (kg/yr)	2740	8.04	99.7

Figure 2: Schematic of Music model and resultant pollutant load reductions.

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Catchments – Water Quality

In terms of water quality, the proposed development is divided into two catchments, North and South, each of which drain to a separate water management basin. Each catchment's surface area break down is listed below as well as key assumptions incorporated into the modelling methodology.

South Catchment

The south catchment is comprised of the following areas:

Lot 1			**Source of Information / assumption**
Hardstand Area	1.436	ha	Same Distribution as Costin Roe
Roof Area	1.795	ha	S96 submission
Landscape Area	0.359	ha	10% LS Roof 50% HS 40%
Total Area	3.590	ha	

North Catchment

The north catchment is comprised of the following areas:

Lot 2			**Source of Information / assumption**
Hardstand Area	2.215	ha	Engineering Drawings DA_17570
Roof Area	1.348	ha	Engineering Drawings DA_17570
Landscape Area	0.5	ha	Engineering Drawings DA_17570
Total Area	4.063	ha	
Lot 3			
Hardstand Area	0.9	ha	Same Distribution as Costin Roe
Roof Area	1.12	ha	S96 submission
Landscape Area	0.22	ha	10% LS Roof 50% HS 40%
Total Area	2.24	ha	
Lot 4			
Hardstand Area	1.634	ha	Same Distribution as Costin Roe
Roof Area	2.043	ha	S96 submission
Landscape Area	0.408	ha	10% LS Roof 50% HS 40%
Total Area	4.085	ha	
New Estate Road			
Hardstand Area	1.229	ha	

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Swale area draining to North Bio-retention			
Landscape Area	0.523	ha	Conservatively modelled as 0.6ha
Beggs Road Catchment & Woodland Reserve			
Landscape	0.872	ha	
Unsealed Road	0.138	ha	
Total Area	1.01	ha	1.307ha for OSD calculations

BIORETENTION SYSTEMS

Modelling of Bioretention in MUSIC

The bioretention filter system was modelled in MUSIC, adopting the principles outlined in BCC's Handbook Part 4: Modelling Guide Draft June 2013. A screenshot of the modelling and design parameters of the north bioretention system is provided in figure 3 below.

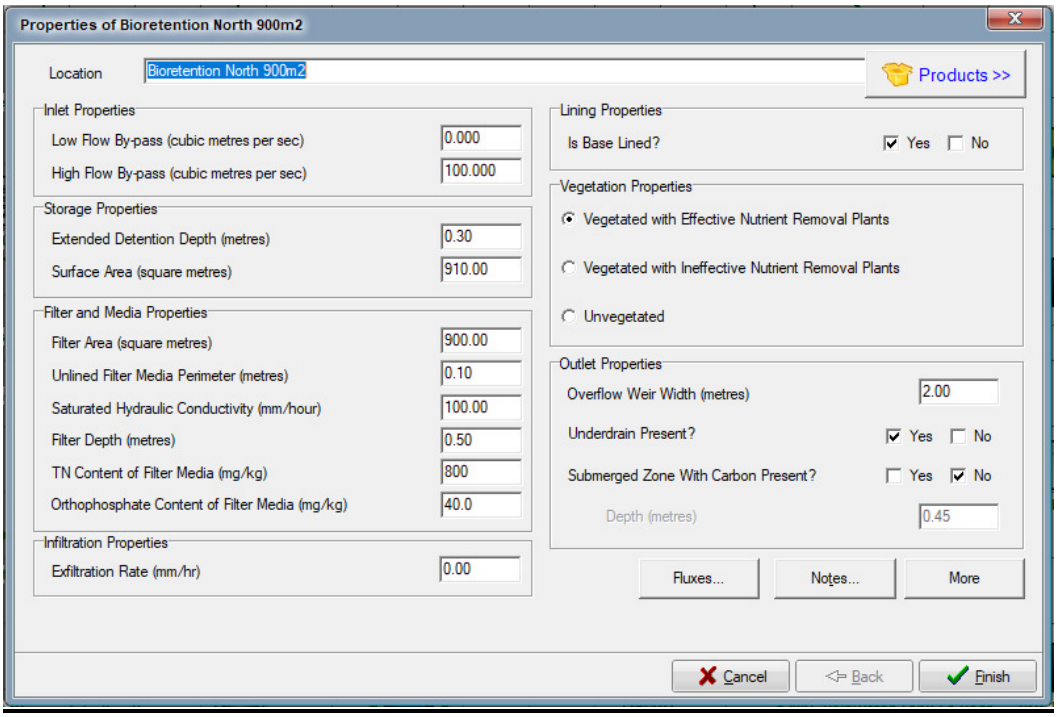

Figure 3: Screenshot of Bioretention properties of north basin

Low flow diversion systems

To ensure the bioretention filter systems are protected from the scour of extreme storm events, the filter systems are designed with a low flow diversion system. The diversion system splits the flows from upstream catchment, only allowing flows at or below the treatable flow rate to enter the treatment device. The treatable flow rate of the bioretention system was determined by configuring a transfer function in MUSIC, as shown in figure 4 below.

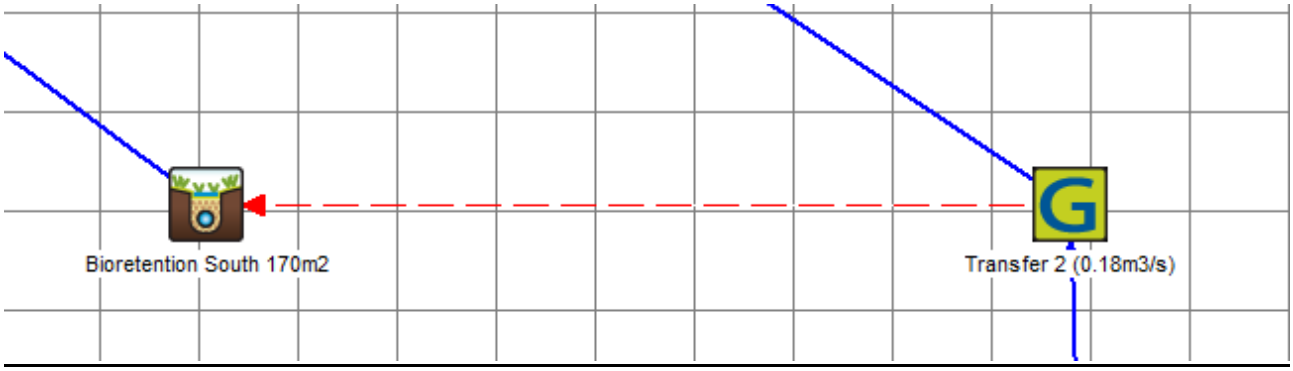

Figure 4: Sample of transfer function in MUSIC, South Basin

The transfer function is configured with a low-flow bypass, which routes all flows below a certain flow rate to the bioretention system. Under an iterative process, the low-flow bypass is reduced and the treatment performance is reviewed. The process is repeated, and the low-flow bypass is continually lowered until the treatment performance of the bioretention is noticeably impacted. In this manner, MUSIC is effectively removing more extreme storm events (high flows above the low-flow bypass) until the performance of the bioretention system is impacted, thus determining the flow rate at which a bio-retention system remains functional, or in other terms, the treatable flow rate of a given system under specific climatic conditions. For each bioretention system (north and south) this iterative process was applied and a transfer function employed to determine and divert low-flows. The resultant low-flow bypass for each basin is listed below:

- Treatable flow rate of north basin = 0.87m^3/s
- Treatable flow rate of south basin = 0.18m^3/s

With a treatable flow rate for each system having been determined, a low-flow diversion system could be designed. As stormwater run-off enters these systems under different flow conditions, different types of diversion systems are required.

For the south basin, flows contained within the pipe network originating from lot 1 are proposed to be diverted by the use of an offtake pit. This pit contains a small weir that is appropriately sized to divert flows under a certain magnitude by controlling the head which drives the diversion pipe. The calculations for the south offtake pit are available in appendix F.

A more complex design is required to divert low flows for the north basin, as the flow is much larger and the potential for a possible detrimental backwater effect is much greater. Stormwater draining down open channels 1 & 2 flow into a channel formed by a small bund that runs longitudinally with the channel. This bund directs the water over a series of on-grade pits culminating in a low point located adjacent to the entrance of the bioretention area. The height of the bund is specifically designed to control ponding over the pit network, with the head produced by the ponding driving all stormwater flows up to the treatable flow rate into the bioretention distribution system. The bund in the channel is graded in such a way as to mimic the hydraulic grade line from the ponding over the pit. At the point where the treatable flow rate is exceeded, the total bund length acts as an overflow weir, distributing the backwater effect of the weir flow over a greater distance. Hydraulic calculations for bund and pit arrangement are submitted in the form of drains model *Diversion Drainage System.drn*. Refer to appendix H for modelling of this low flow channel.

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Bioretention design

Where possible and within site constrains, the design of the bioretention filter system within the water management basins was designed in accordance with, and to fulfill the intent of BCC's Water Sensitive Urban Design Standard Drawings, with particular reference to:

- Surface of bioretention filter system elevated above estimated 2-year water level.
- Flows directed to the bioretention limited to the treatable flow rate of the treatment system (aforementioned)
- Partially permanently saturated transition zone to increased the longevity and establishment of biofilm, in addition to ensuring adequate water sources for planted macrophilic plant species
- Appropriate depth of filter media, transition and drainage layers as outlined in typical bioretention filter detail in BCC's Water Sensitive Urban Design Standard Drawings (refer to figure 5). Filter media is to be tested as Measurement of Hydraulic Conductivity manual in appendix C.
- Appropriate access and maintenance paths (min 4m), refer to standard drawings and maintenance schedule.
- Adequate dispersal and retarding distribution systems in the form of a system of up-flow pits, as well as, hydrocon permeable concrete pipes, where required.

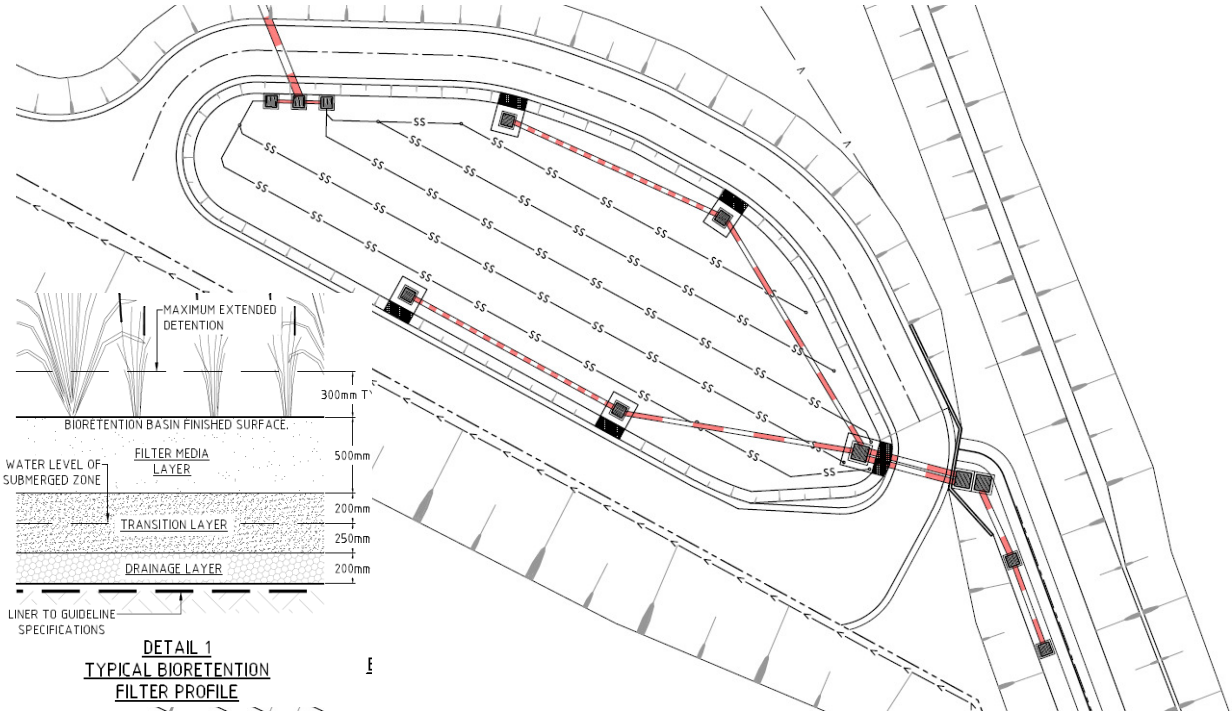

Figure 5: Design of north bio-retention filter system

Additional information and details regarding the bioretention systems is detailed on engineering drawings 17D83_96_C230-C231 (north basin) and 17D83_96_C240-C241 (south basin).

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WATER CONSERVATION

To assist with water conservation, and assuming each individual lot is developed in accordance with BCC's DCP Part J 2017, each lot is nominated and modelled with a rainwater tank which meets a significant portion of the non-potable demands. Using MUSIC water quality modelling software, preliminary rainwater tank sizing that satisfies 80% of the non-potable water demand of each of the developments was estimated.

Several assumptions were made when sizing the rainwater tanks. These assumptions are fundamental for determining the water demand of each building layout concept, and thus the tank volume. These assumptions, as well as the corresponding tank volume for each individual lot are presented in tabular form below;

Lot 1				**Source of Information**
Roof area draining to tank		0.8975	ha	50% - Same Dist. as Costin Roe S96
Internal daily demand	28 Toilets X (0.1kl/toilet/day)	2.8	kL	BCA Report 074716-04BCA Report-Stage 2
External annual demand (0.3kL/m2/year)	Landscape Area x	1079	kL	Same Dist. as Costin Roe S96
Tank size volume	Including 20% loss in	**160**	kL	

Lot 2				**Source of Information**
Roof area draining to tank		0.8578	ha	Engineering Drawings DA_17570
Internal daily demand	56 Toilets X (0.1kl/toilet/day)	5.6	kL	Engineering Drawings DA_17570
External annual demand (0.3kL/m2/year)	Landscape Area x	1500	kL	Engineering Drawings DA_17570
Tank size volume	Including 20% loss in	**400**	kL	

Lot 3				**Source of Information**
Roof area draining to tank		0.56	ha	50% - Same Dist. as Costin Roe S96
Internal daily demand	28 Toilets X (0.1kl/toilet/day)	2.8	kL	'Like' development to lot 1
External annual demand (0.3kL/m2/year)	Landscape Area x	660	kL	Same Dist. as Costin Roe S96
Tank size volume	Including 20% loss in	**150**	kL	

Lot 4				**Source of Information**
Roof area draining to tank		1.021	ha	50% - Dist. as Costin Roe S96
Internal daily demand	28 Toilets X (0.1kl/toilet/day)	2.8	kL	'Like' development to lot 1

henry&hymas

External annual demand (0.3kL/m2/year)	Landscape Area x	1230	kL	Same Dist. as Costin Roe S96
Tank size volume	Including 20% loss in	**175**	kL	

henry&hymas

FLOODING

An investigation of Blacktown Council's online flooding maps system showed that the subdivision site is not within a high, medium or low risk flood area. The proposed lot pad levels higher than the lowest potential access points to the proposed access road. Figure 3 shows the flooding zone extents in relation to the site. The maximum level that the furthest flood zone extends to is below RL39.25. Therefore all Pad levels have been set higher than RL40.00 which achieves in excess of 500mm freeboard.

In accordance with the NSW Floodplain Development Manual (2005), the pad levels of the development have been set so that it is not impacted by surrounding flood levels. In future DA designs for each individual Lot, safe evacuation paths of egress to Rooty Hill Road South will need to be designed. Based on the proposed pad levels and levels of the proposed Access Road, there will be sufficient freeboard to allow this to occur.

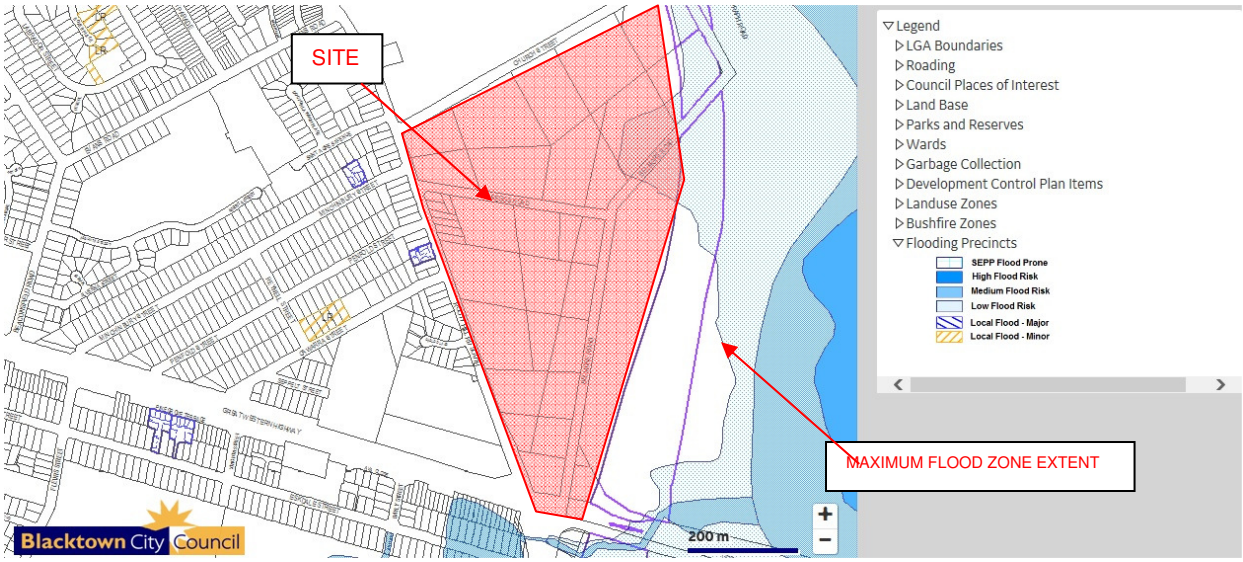


Figure 5: Flooding extents as shown by BCC.

EROSION AND SEDIMENT CONTROL

During construction, appropriate sediment and erosion control measures need to be implemented to ensure that downstream receiving waters are not adversely impacted. Our drawings 17D83_S96_SE01 – SE02 have detailed the required measures. These have been designed in accordance with the requirements of the *Landcom – Managing Urban Stormwater - Soils and Construction, Volume 1, 4th Edition March 2004*.

EARLY STAGE ACCESS ROAD OPTION – STAGE 1

As part of this submission, we have prepared a series of drawings that show an early works staging for the internal access road, referred to as *STAGE 1.* This option would only construct the access road up until the northern driveway of the Lot 2 development site. As part of this staging

option, there would need to be alterations and allowances made to the stormwater channels and drainage strategy. This option assumes that Lot 3 and 4 would not be benched and as such stormwater measures have been shown to allow existing runoff to pass around the permanent channels and northern BIO/OSD basin.

DRAWING LIST

The Civil DA drawings provided for submission and to be read in conjunction with this report are;

Drawing No.	Drawing Name
17D83_S96_BE01	CUT AND FILL PLAN
17D83_S96_C000	COVER SHEET, DRAWING SCHEDULE, NOTES AND LOCALITY SKETCH
17D83_S96_C100	GENERAL ARRANGEMENT PLAN
17D83_S96_C101	DETAIL CIVIL PLAN, SHEET 1 OF 7
17D83_S96_C102	DETAIL CIVIL PLAN, SHEET 2 OF 7
17D83_S96_C103	DETAIL CIVIL PLAN, SHEET 3 OF 7
17D83_S96_C104	DETAIL CIVIL PLAN, SHEET 4 OF 7
17D83_S96_C105	DETAIL CIVIL PLAN, SHEET 5 OF 7
17D83_S96_C106	DETAIL CIVIL PLAN, SHEET 6 OF 7
17D83_S96_C107	DETAIL CIVIL PLAN, SHEET 7 OF 7
17D83_S96_C110	TYPICAL SITE SECTIONS, SHEET 1 OF 2
17D83_S96_C111	TYPICAL SITE SECTIONS, SHEET 2 OF 2
17D83_S96_C115	STORMWATER CHANNELS TYPICAL SECTIONS
17D83_S96_C130	ACCESS ROAD CL 1 LONG SECTION AND CHAINAGES PLAN
17D83_S96_C131	ACCESS ROAD CL 2 LONGSECTION AND CHAINAGES PLAN
17D83_S96_C200	STORMWATER MISCELLANEOUS DETAILS AND PIT LID SCHEDULE
17D83_S96_C220	STORMWATER LONGITUDINAL SECTIONS SHEET 1 OF 2
17D83_S96_C221	STORMWATER LONGITUDINAL SECTIONS SHEET 2 OF 2
17D83_S96_C230	NORTH BASIN PLAN AND SECTIONS
17D83_S96_C231	NORTH BASIN DETAILS
17D83_S96_C240	SOUTH BASIN PLAN AND SECTIONS
17D83_S96_C241	SOUTH BASIN DETAILS
17D83_S96_C250	CATCHMENT PLAN - WATER QUANTITY
17D83_S96_C251	CATCHMENT PLAN - WATER QUALITY
17D83_S96_C255	ACCESS ROAD CATCHMENT PLAN
17D83_S96_C300	RETAINING WALL OVERALL PLAN
17D83_S96_C301	RETAINING WALL LONG SECTIONS
17D83_S96_C302	RETAINING WALL SECTIONS
17D83_S96_SE01	SEDIMENT AND EROSION CONTROL PLAN
17D83_S96_SE02	SEDIMENT AND EROSION CONTROL DETAILS

We trust this serves as an adequate summary and explanation for the complex nature of the storm water and grading issues related to this site.

Yours faithfully,

TOM DEMPSEY (Senior Civil Engineer)
For, and on behalf of,
H & H Consulting Engineers Pty Ltd

henry&hymas

APPENDIX A:
CIVIL DEVELOPMENT APPLICATION PLANS

EARTHWORKS QUANTITIES

(APPROXIMATE ONLY)
NOT TO BE USED FOR CONTRACTUAL PURPOSES. TENDERERS TO DETERMINE VOLUMES USING THEIR OWN METHOD OF CALCULATION.

- EARTHWORKS QUANTITIES -	
TOTAL AREA (19.00 ha)	
CUT	38340 m³
FILL	166735 m³
SHORT FALL	128395 m³
TOPSOIL STRIPPING "100mm" OF 19000m² NOT INCLUDED IN CALCULATION	
EXCAVATION FOR SERVICE TRENCHES NOT INCLUDED IN CALCULATION	

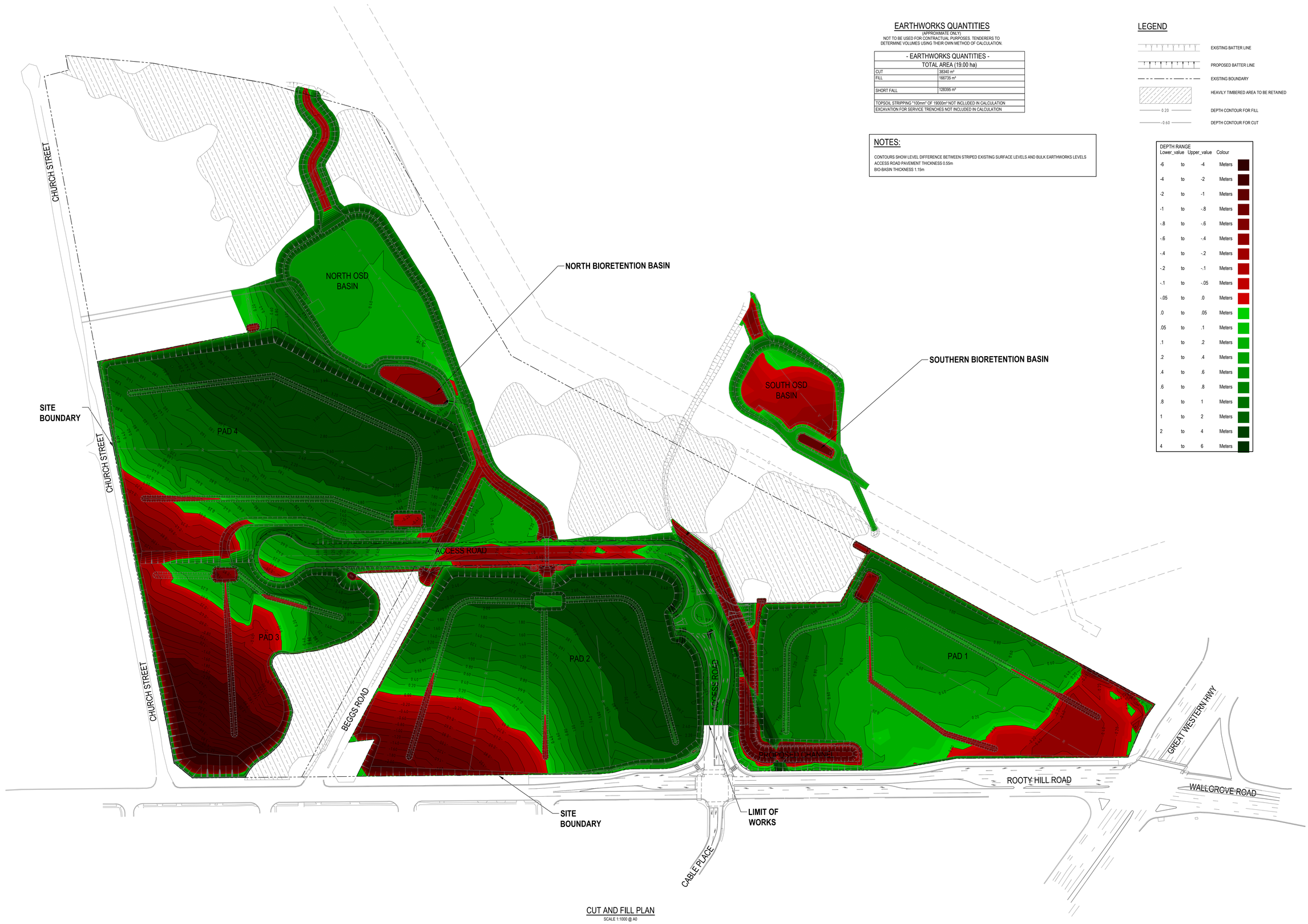
NOTES:

CONTOURS SHOW LEVEL DIFFERENCE BETWEEN STRIPED EXISTING SURFACE LEVELS AND BULK EARTHWORKS LEVELS
ACCESS ROAD PAVEMENT THICKNESS 0.55m
BIO-BASIN THICKNESS 1.15m

LEGEND

EXISTING BATTER LINE
PROPOSED BATTER LINE
EXISTING BOUNDARY
HEAVILY TIMBERED AREA TO BE RETAINED
0.20 DEPTH CONTOUR FOR FILL
-0.60 DEPTH CONTOUR FOR CUT

DEPTH RANGE Lower_value		Upper_value	Colour
-6	to	-4	Meters
-4	to	-2	Meters
-2	to	-1	Meters
-1	to	-.8	Meters
-.8	to	-.6	Meters
-.6	to	-.4	Meters
-.4	to	-.2	Meters
-.2	to	-.1	Meters
-.1	to	-.05	Meters
-.05	to	.0	Meters
.0	to	.05	Meters
.05	to	.1	Meters
.1	to	.2	Meters
.2	to	.4	Meters
.4	to	.6	Meters
.6	to	.8	Meters
.8	to	1	Meters
1	to	2	Meters
2	to	4	Meters
4	to	6	Meters



CUT AND FILL PLAN
SCALE 1:1000 @ A0

0 20 40 60 80 100m
20 15 10 5
SCALE 1:1000

ISSUED FOR S96

SURVEY INFORMATION
SURVEYED BY: LAND PARTNERS
DATUM: AHD
ORIGIN OF LEVELS: PM 30122 RL 43.58

REVISION	AMENDMENT	DRAWN	DESIGNED	DATE
02	ISSUED FOR S96	LC	LC	13.04.2018
01	ISSUED FOR S96	MC	LC	09.02.2018

Client: FRASER PROPERTY AUSTRALIA
Surveyor: LANDPARTNERS

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Project: EASTERN CREEK BUSINESS HUB
WESTERN SYDNEY PARKLANDS
Title: CUT AND FILL PLAN

Drawn	Designed	Date
L.Caha	L.Caha	FEB 18
Checked	Approved	Scale
T.Dempsey	A.Francis	1:1000 @A0

Drawing number: 17D83_S96_BE01
Revision: 02

PROPOSED BUSINESS HUB
ROOTY HILL ROAD SOUTH, EASTERN CREEK, NSW
CIVIL ENGINEERING WORKS FOR S96

GENERAL NOTES:

1. ALL WORK TO BE CARRIED OUT IN ACCORDANCE WITH BLACKTOWN CITY COUNCIL'S SPECIFICATION. CONTRACTOR TO OBTAIN AND RETAIN A COPY ON SITE DURING THE COURSE OF THE WORKS.
2. ALL NEW WORKS ARE TO MAKE A SMOOTH JUNCTION WITH EXISTING CONDITIONS AND MARRY IN A 'WORKMANLIKE' MANNER.
3. THE CONTRACTOR IS TO VERIFY THE LOCATION OF ALL SERVICES WITH EACH RELEVANT AUTHORITY. ANY DAMAGE TO SERVICES SHALL BE RECTIFIED BY THE CONTRACTOR OR THE RELEVANT AUTHORITY AT THE CONTRACTOR'S EXPENSE. SERVICES SHOWN ON THESE CIVIL PLAN ARE ONLY THOSE EVIDENT AT THE TIME OF SURVEY OR AS DETERMINED FROM SERVICE DIAGRAMS. HENRY AND HYMAS CONSULTING P/TY. LTD. CANNOT GUARANTEE THE INFORMATION SHOWN NOR ACCEPT ANY RESPONSIBILITY FOR INACCURACIES OR INCOMPLETE DATA.
4. SERVICES & ACCESSES TO THE EXISTING PROPERTIES ARE TO BE MAINTAINED IN WORKING ORDER AT ALL TIMES DURING CONSTRUCTION.
5. ADJUST EXISTING SERVICE COVERS TO SUIT NEW FINISHED LEVELS TO RELEVANT AUTHORITY REQUIREMENTS WHERE NECESSARY.
6. REINSTATE AND STABILISE ALL DISTURBED LANDSCAPED AREAS.
7. MINIMUM GRADE OF SUBSOIL SHALL BE 0.5% (1:200) FALL TO OUTLETS.
8. ALL TEMPORARY SEDIMENT AND EROSION CONTROL DEVICES ARE TO BE CONSTRUCTED, PLACED AND MAINTAINED IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS, EROSION AND SEDIMENTATION CONTROL PLAN AND BLACKTOWN CITY COUNCIL'S REQUIREMENTS WHERE APPLICABLE.
9. CONTRACTOR TO CHECK AND CONFIRM SITE DRAINAGE CONNECTIONS ACROSS THE VERGE PRIOR TO COMMENCEMENT OF SITE DRAINAGE WORKS.
10. PROPERTIES AFFECTED BY THE WORKS ARE TO BE NOTIFIED IN ADVANCE WHERE DISRUPTION TO EXISTING ACCESS IS LIKELY.

EXISTING SERVICES & FEATURES

- THE CONTRACTOR SHALL ALLOW FOR THE CAPPING OFF, EXCAVATION AND REMOVAL (IF REQUIRED) OF ALL EXISTING SERVICES IN AREAS AFFECTED BY WORKS WITHIN THE CONTRACT AREA OR AS SHOWN ON THE DRAWINGS UNLESS DIRECTED OTHERWISE BY THE SUPERINTENDENT.
- THE CONTRACTOR SHALL ENSURE THAT AT ALL TIMES SERVICES TO ALL BUILDINGS NOT AFFECTED BY THE WORKS ARE NOT DISRUPTED.
- PRIOR TO COMMENCEMENT OF ANY WORKS THE CONTRACTOR SHALL GAIN APPROVAL OF HIS PROGRAM FOR THE RELOCATION/ CONSTRUCTION OF TEMPORARY SERVICES.
- CONTRACTOR SHALL CONSTRUCT TEMPORARY SERVICES TO MAINTAIN SUPPLY TO EXISTING BUILDING REMAINING IN OPERATION DURING WORKS TO THE SATISFACTION AND APPROVAL OF THE SUPERINTENDENT. ONCE DIVERSION IS COMPLETE AND COMMISSIONED, THE CONTRACTOR SHALL REMOVE ALL SUCH TEMPORARY SERVICES AND MAKE GOOD TO THE SATISFACTION OF THE SUPERINTENDENT.
- INTERRUPTION TO SUPPLY OF EXISTING SERVICES SHALL BE DONE SO AS NOT TO CAUSE ANY INCONVENIENCE TO THE PRINCIPAL. CONTRACTOR TO GAIN APPROVAL FROM THE SUPERINTENDENT FOR TIME OF INTERRUPTION.
- EXISTING SERVICES, BUILDINGS, EXTERNAL STRUCTURES AND TREES SHOWN ON THESE DRAWINGS ARE EXISTING FEATURES PRIOR TO ANY DEMOLITION WORKS.
- EXISTING SERVICES UNLESS SHOWN ON SURVEY PLAN HAVE BEEN PLOTTED FROM SERVICES SEARCH CIVIL PLAN AND AS SUCH THEIR ACCURACY CANNOT BE GUARANTEED. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO COMPLETE A 'DIAL BEFORE YOU DIG' SEARCH AND TO ESTABLISH THE LOCATION AND LEVEL OF ALL EXISTING SERVICES PRIOR TO THE COMMENCEMENT OF ANY WORK. ANY DISCREPANCIES SHALL BE REPORTED TO THE SUPERINTENDENT. CLEARANCES SHALL BE OBTAINED FROM THE RELEVANT SERVICE AUTHORITY.
- ALL BRANCH GAS AND WATER SERVICES UNDER DRIVEWAYS AND BRICK PAVING SHALL BE LOCATED IN Ø80 uPVC SEWER GRADE CONDUITS EXTENDING A MINIMUM OF 500mm BEYOND EDGE OF PAVING.

LOCALITY PLAN
SCALE: NTS

DRAWING SCHEDULE

17D83_S96_BE01	CUT AND FILL PLAN
17D83_S96_C000	COVER SHEET, DRAWING SCHEDULE, NOTES AND LOCALITY SKETCH
17D83_S96_C100	GENERAL ARRANGEMENT PLAN
17D83_S96_C101	DETAIL CIVIL PLAN, SHEET 1 OF 7
17D83_S96_C102	DETAIL CIVIL PLAN, SHEET 2 OF 7
17D83_S96_C103	DETAIL CIVIL PLAN, SHEET 3 OF 7
17D83_S96_C104	DETAIL CIVIL PLAN, SHEET 4 OF 7
17D83_S96_C105	DETAIL CIVIL PLAN, SHEET 5 OF 7
17D83_S96_C106	DETAIL CIVIL PLAN, SHEET 6 OF 7
17D83_S96_C107	DETAIL CIVIL PLAN, SHEET 7 OF 7
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17D83_S96_C111	TYPICAL SITE SECTIONS, SHEET 2 OF 2
17D83_S96_C115	STORMWATER CHANNELS TYPICAL SECTIONS
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17D83_S96_C131	ACCESS ROAD CL 2 LONG SECTION AND CHAINAGES PLAN
17D83_S96_C200	STORMWATER MISCELLANEOUS DETAILS AND PIT LID SCHEDULE
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17D83_S96_C221	STORMWATER LONGITUDINAL SECTIONS SHEET 2 OF 2
17D83_S96_C230	NORTH BASIN PLAN AND SECTIONS
17D83_S96_C231	NORTH BASIN DETAILS
17D83_S96_C240	SOUTH BASIN PLAN AND SECTIONS
17D83_S96_C241	SOUTH BASIN DETAILS
17D83_S96_C250	CATCHMENT PLAN - WATER QUANTITY
17D83_S96_C251	CATCHMENT PLAN - WATER QUALITY
17D83_S96_C255	ACCESS ROAD CATCHMENT PLAN
17D83_S96_C300	RETAINING WALL OVERALL PLAN
17D83_S96_C301	RETAINING WALL LONG SECTIONS
17D83_S96_C302	RETAINING WALL SECTIONS
17D83_S96_SE01	SEDIMENT AND EROSION CONTROL PLAN
17D83_S96_SE02	SEDIMENT AND EROSION CONTROL DETAILS

SITEWORKS NOTES

- DATUM : A.H.D.
- ORIGIN OF LEVELS : REFER TO BENCH OR STATE SURVEY MARKS WHERE SHOWN ON PLAN.
- CONTRACTOR MUST VERIFY ALL DIMENSIONS AND EXISTING LEVELS ON SITE PRIOR TO THE COMMENCEMENT OF WORK.
- ALL WORKS TO BE UNDERTAKEN IN ACCORDANCE WITH THE DETAILS SHOWN ON THE DRAWINGS & THE DIRECTIONS OF THE SUPERINTENDENT.
- EXISTING SERVICES UNLESS SHOWN ON THE SURVEY PLAN HAVE BEEN PLOTTED FROM SERVICES SEARCH PLANS AND AS SUCH THEIR ACCURACY CANNOT BE GUARANTEED. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ESTABLISH THE LOCATION AND LEVEL OF ALL EXISTING SERVICES PRIOR TO THE COMMENCEMENT OF ANY WORK. ANY DISCREPANCIES SHALL BE REPORTED TO THE SUPERINTENDENT. CLEARANCES SHALL BE OBTAINED FROM THE RELEVANT SERVICE AUTHORITY.
- WHERE NEW WORKS ABUT EXISTING THE CONTRACTOR SHALL ENSURE THAT A SMOOTH EVEN PROFILE, FREE FROM ABRUPT CHANGES IS ACHIEVED.
- THE CONTRACTOR SHALL ARRANGE ALL SURVEY SETOUT TO BE CARRIED OUT BY A REGISTERED SURVEYOR.
- CARE IS TO BE TAKEN WHEN EXCAVATING NEAR EXISTING SERVICES. NO MECHANICAL EXCAVATION IS TO BE UNDERTAKEN OVER TELSTRA OR ELECTRICAL SERVICES. HAND EXCAVATE IN THESE AREAS.
- CONTRACTOR TO OBTAIN AUTHORITY APPROVALS WHERE APPLICABLE.
- MAKE SMOOTH TRANSITION TO EXISTING SURFACES AND MAKE GOOD.
- THESE PLANS SHALL BE READ IN CONJUNCTION WITH APPROVED LANDSCAPE, ARCHITECTURAL, STRUCTURAL, HYDRAULIC AND MECHANICAL DRAWINGS AND SPECIFICATIONS
  OR WRITTEN INSTRUCTIONS THAT MAY BE ISSUED RELATING TO DEVELOPMENT AT THE SITE.
- TRENCHES THROUGH EXISTING ROAD AND CONCRETE PAVEMENTS SHALL BE SAWCUT TO FULL DEPTH OF CONCRETE AND A MINIMUM OF 50mm IN BITUMINOUS PAVING.
- ALL BRANCH GAS AND WATER SERVICES UNDER DRIVEWAYS AND BRICK PAVING SHALL BE LOCATED IN Ø80 uPVC SEWER GRADE CONDUITS EXTENDING A MINIMUM OF 500mm BEYOND EDGE OF PAVING.
- GRADES TO PAVEMENTS TO BE AS IMPLIED BY RL'S ON PLAN . GRADE EVENLY BETWEEN NOMINATED RL'S. AREAS EXHIBITING PONDING GREATER THAN 5mm DEPTH WILL NOT BE ACCEPTED UNLESS IN A DESIGNATED SAG POINT.
- ALL COVERS AND GRATES ETC TO EXISTING SERVICE UTILITIES ARE TO BE ADJUSTED TO SUIT NEW FINISHED SURFACE LEVELS WHERE APPLICABLE.

SURVEY NOTES

THE EXISTING SITE CONDITIONS SHOWN ON THE FOLLOWING DRAWINGS HAVE BEEN INVESTIGATED BY THE SURVEYOR SPECIFIED IN THE TITLE BLOCK.
THE INFORMATION IS SHOWN TO PROVIDE A BASIS FOR DESIGN. HENRY AND HYMAS PTY. LTD. DOES NOT GUARANTEE THE ACCURACY OR COMPLETENESS OF THE SURVEY BASE OR ITS SUITABILITY AS A BASIS FOR CONSTRUCTION DRAWINGS.
SHOULD DISCREPANCIES BE ENCOUNTERED DURING CONSTRUCTION BETWEEN THE SURVEY DATA AND ACTUAL FIELD DATA, CONTACT HENRY AND HYMAS PTY. LTD. THE FOLLOWING NOTES HAVE BEEN TAKEN DIRECTLY FROM ORIGINAL SURVEY DOCUMENTS.

ORIGIN OF LEVELS	PM 30122 - RL 43.58
DATUM	A.H.D

ISSUED FOR S96

SURVEY INFORMATION
SURVEYED BY: LAND PARTNERS
DATUM: AHD
ORIGIN OF LEVELS: PM 30122 RL 43.58

REVISION	AMENDMENT	DRAWN	DESIGNED	DATE
04	ISSUED FOR S96	IK	NW	20.03.2019
03	ISSUED FOR S96	MS	LC	30.05.2018
02	ISSUED FOR S96	MC	LC	13.04.2018
01	ISSUED FOR S96	MC	LC	09.02.2018

Client: HB+B PROPERTY
Surveyor: LANDPARTNERS

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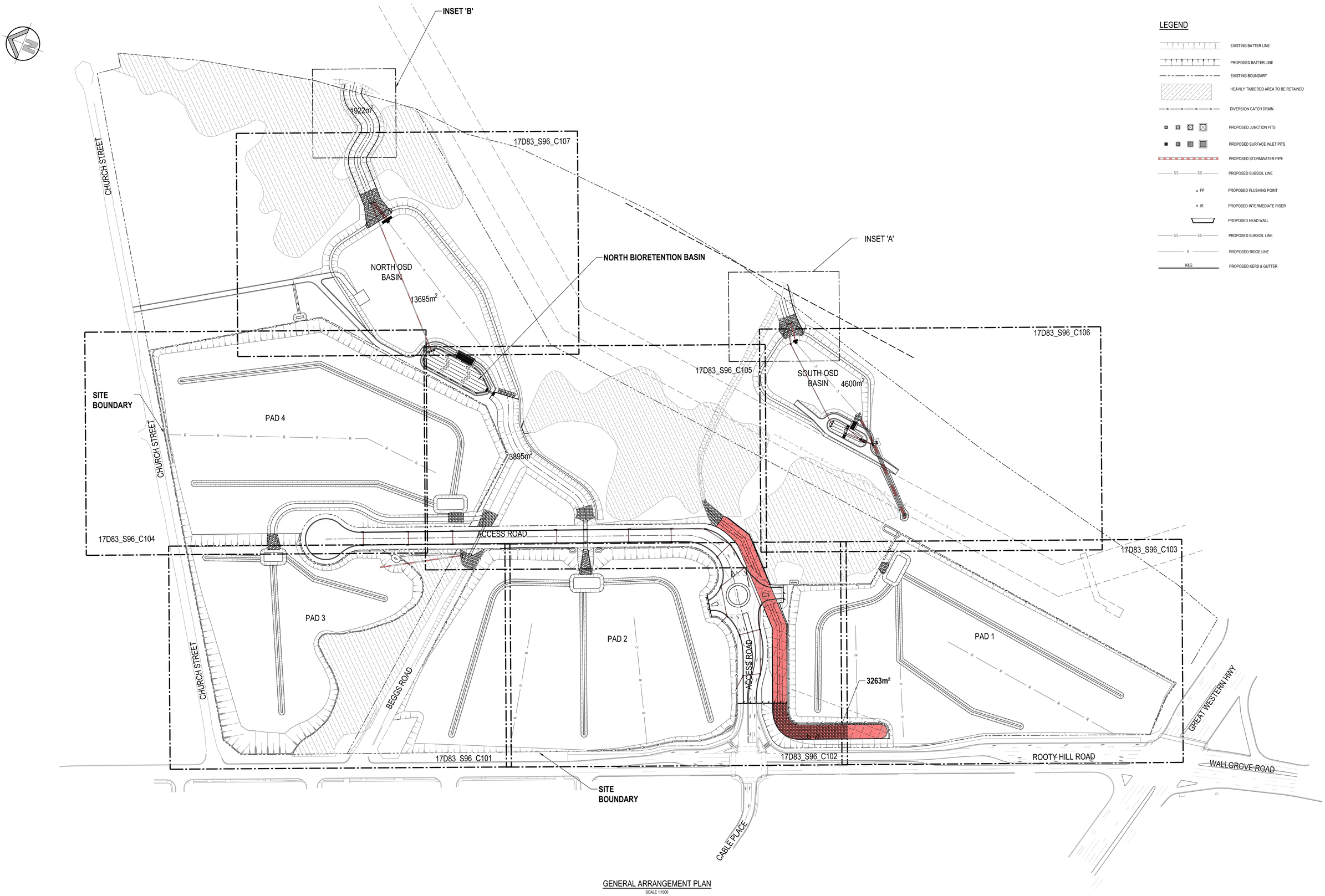
Project: EASTERN CREEK BUSINESS HUB
WESTERN SYDNEY PARKLANDS

Drawn: M.Cerna	Designed: L.Caha	Date: FEB 18	
Checked: T.Dempsey	Approved: A.Francis	Scale: NTS @A0	

Title: COVER SHEET, DRAWING SCHEDULE, AND LOCALITY SKETCH

Drawing number: 17D83_S96_C000
Revision: 04



LEGEND

- EXISTING BATTER LINE
- PROPOSED BATTER LINE
- EXISTING BOUNDARY
- HEAVILY TIMBERED AREA TO BE RETAINED
- DIVERSION CATCH DRAIN
- PROPOSED JUNCTION PITS
- PROPOSED SURFACE INLET PITS
- PROPOSED STORMWATER PIPE
- PROPOSED SUBSOIL LINE
- FP PROPOSED FLUSHING POINT
- IR PROPOSED INTERMEDIATE RISER
- PROPOSED HEAD WALL
- SS PROPOSED SUBSOIL LINE
- R PROPOSED RIDGE LINE
- K&G PROPOSED KERB & GUTTER

GENERAL ARRANGEMENT PLAN
SCALE 1:1000

0 20 40 60 80 100m
20 15 10 5
SCALE 1:1000

ISSUED FOR S96

SURVEY INFORMATION
SURVEYED BY: LAND PARTNERS
DATUM: AHD
ORIGIN OF LEVELS: PM 30122 RL 43.58

REVISION	AMENDMENT	DRAWN	DESIGNED	DATE
03	ISSUED FOR S96	IK	NW	20.03.2019
02	ISSUED FOR S96	MC	LC	13.04.2018
01	ISSUED FOR S96	MC	LC	09.02.2018

Client: FRASER PROPERTY AUSTRALIA
Surveyor: LANDPARTNERS

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henry&hymas

Project: EASTERN CREEK BUSINESS HUB
WESTERN SYDNEY PARKLANDS

Title: GENERAL ARRANGEMENT PLAN

Drawn	Designed	Date
L.Caha	L.Caha	FEB 18
Checked	Approved	Scale
T.Dempsey	A.Francis	1:1000 @A0

Drawing number: 17D83_S96_C100
Revision: 03

FOR CONTINUATION REFER TO DWG.17D83_S96_C104

BASIN "PAD 3"
V = 217m³

PROPOSED 1.2m WIDE TEMPORARY SWALE
REFER DRAWING C115 FOR DETAILS

PROPOSED SEDIMENTATION BASIN
REFER DRAWING SE01 FOR DETAILS

PROPOSED 0.2m DEEP TEMPORARY
GRASSED SWALE

PROPOSED SEDIMENTATION BASIN
REFER DRAWING SE02 FOR DETAILS

PROPOSED 0.2m DEEP
TEMPORARY GRASSED
SWALE

SCOUR PROTECTION
STONE SIZE D_{50}=200mm, 400mm
TRICK OVER GEOFABRIC (BIDIM A34
OR APPROVED EQUIVALENT)
LENGTH 5m MIN.

PROPOSED 1500x450
RCBC

PROPOSED
HEADWALL

SITE BOUNDARY

Ø750 RCP C2 FUTURE
CONNECTION LINE FOR
PAD 3 STORMWATER

PROPOSED 0.3m DEEP 1.2m WIDE
TEMPORARY GRASSED
SWALE

PAD 3

PAD 2

PROPOSED 1.2m WIDE TEMPORARY SWALE
REFER DRAWING C115 FOR DETAILS

PROPOSED 0.2m DEEP TEMPORARY
GRASSED SWALE

PAD BOUNDARY

0.5m MIN. HIGH EARTH MOUND
REFER DRAWING C115 FOR DETAILS

BEGGS ROAD

CHURCH STREET

SITE BOUNDARY

EDGE OF BITUMEN

PROPOSED SITE BOUNDARY

FUTURE ROAD WIDENING
EXISTING BOUNDARY

EXISTING KERB AND GUTTER

PROPOSED BOUNDARY

ROOTY HILL ROAD SOUTH

FOR CONTINUATION REFER TO DWG.17D83_S96_C102

0 5 10 15 20 25m
5 4 3 2 1
SCALE 1:250

DETAIL CIVIL PLAN
SCALE 1:250

ISSUED FOR S96

SURVEY INFORMATION
SURVEYED BY: LAND PARTNERS
DATUM: AHD
ORIGIN OF LEVELS: PM 30122 RL 43.58

REVISION	AMENDMENT	DRAWN	DESIGNED	DATE
03	ISSUED FOR S96	IK	NW	20.03.2019
02	ISSUED FOR S96	MC	LC	13.04.2018
01	ISSUED FOR S96	LC	LC	09.02.2018

Client: FRASER PROPERTY AUSTRALIA
Surveyor: LANDPARTNERS

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henry&hymas

Project: EASTERN CREEK BUSINESS HUB
WESTERN SYDNEY PARKLANDS

Title: DETAIL CIVIL PLAN
SHEET 1 OF 7

Drawn	Designed	Date
L.Caha	L.Caha	FEB 18
Checked	Approved	Scale
T.Dempsey	A.Francis	1:250 @A0

Drawing number: 17D83_S96_C101
Revision: 03

FOR CONTINUATION REFER TO DWG.17D83_S96_C105

PROPOSED 0.2m DEEP TEMPORARY GRASSED SWALE

PROPOSED SEDIMENTATION BASIN REFER DRAWING SE02 FOR DETAILS

PROPOSED HEADWALL

SCOUR PROTECTION STONE SIZE D_{50}=300mm. 400mm THICK OVER GEOFABRIC (BIDIM A34 OR APPROVED EQUIVALENT) LENGTH 10m MIN

BASIN "PAD 4" V = 340m³

PAD 2

PROPOSED 1.2m WIDE TEMPORARY SWALE REFER DRAWING C115 FOR DETAILS

PROPOSED 0.2m DEEP TEMPORARY GRASSED SWALE

ACCESS ROAD

0.1m HIGH MOUNT WITH 1 IN 3 BATTERS

PROPOSED 0.2m DEEP GRASSED SWALE

SITE BOUNDARY

PROPOSED 5.2m WIDE SWALE REFER DRAWING C115 FOR DETAILS

0.25m HIGH MOUNT WITH 1 IN 3 BATTERS

PROPOSED 4.0m WIDE PERMANENT CHANNEL "4" REFER DRAWING C115 FOR DETAILS

PAD 1

SCOUR PROTECTION STONE SIZE D_{50}=400mm. 400mm THICK OVER GEOFABRIC (BIDIM A34 O APPROVED EQUIVALENT) LENGTH 60m MIN

LIMIT OF WORKS FOR ACCESS ROAD

PROPOSED SITE BOUNDARY

EXISTING KERB AND GUTTER

ROOTY HILL ROAD SOUTH

FOR CONTINUATION REFER TO DWG.17D83_S96_C101

FOR CONTINUATION REFER TO DWG.17D83_S96_C103

0 5 10 15 20 25m

SCALE 1:250

DETAIL CIVIL PLAN

SCALE 1:250

ISSUED FOR S96

SURVEY INFORMATION
SURVEYED BY: LAND PARTNERS
DATUM: AHD
ORIGIN OF LEVELS: PM 30122 RL 43.58

REVISION	AMENDMENT	DRAWN	DESIGNED	DATE
03	ISSUED FOR S96	K	NW	20.03.2019
02	ISSUED FOR S96	LC	LC	13.04.2018
01	ISSUED FOR S96	MC	LC	09.02.2018

Client: FRASER PROPERTY AUSTRALIA

Surveyor: LANDPARTNERS

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henry&hymas

Project: EASTERN CREEK BUSINESS HUB
WESTERN SYDNEY PARKLANDS

Title: DETAIL CIVIL PLAN
SHEET 2 OF 7

Drawn	Designed	Date
L.Caha	L.Caha	FEB 18
Checked	Approved	Scale
T.Dempsey	A.Francis	1:250 @A0

Drawing number: 17D83_S96_C102

Revision: 03

SCOUR PROTECTION
STONE SIZE D_{50}=200mm,
400mm THICK OVER
GEOFABRIC (BIDIM A34 OR
APPROVED EQUIVALENT)

BASIN "PAD 1"
V = 333m³

PROPOSED SEDIMENTATION
BASIN
REFER DRAWING SE02 FOR DETAILS

HEAVILY TIMBERED AREA

PAD BOUNDARY

PROPOSED 1.2m WIDE TEMPORARY SWALE
REFER DRAWING C115 FOR DETAILS

GAS EASEMENT

SITE BOUNDARY

PROPOSED 0.2m DEEP TEMPORARY
GRASSED SWALE

EXISTING MOUND TO BE REMOVED

PAD 1

0.25m HIGH MOUNT
WITH 1 IN 3 BATTERS

PROPOSED 0.2m DEEP GRASSED
SWALE

PROPOSED 4.0m WIDE PERMANENT CHANNEL 'A'
REFER DRAWING C115 FOR DETAILS

PROPOSED SITE BOUNDARY

BATTER 1 IN 3 MAX

EXISTING MOUND TO BE
REMOVED

SITE BOUNDARY

GREAT WESTERN HWY

ROOTY HILL ROAD SOUTH

FOR CONTINUATION REFER TO DWG 17D83_S96_C101

DETAIL CIVIL PLAN
SCALE 1:250

0 5 10 15 20 25m
5 4 3 2 1
SCALE 1:250

ISSUED FOR S96

SURVEY INFORMATION

SURVEYED BY: LAND PARTNERS
DATUM: AHD
ORIGIN OF LEVELS: PM 30122 RL 43.58

REVISION	AMENDMENT	DRAWN	DESIGNED	DATE
03	ISSUED FOR S96	IK	NW	20.03.2019
02	ISSUED FOR S96	MC	LC	13.04.2018
01	ISSUED FOR S96	MC	LC	09.02.2018

Client: FRASER PROPERTY AUSTRALIA
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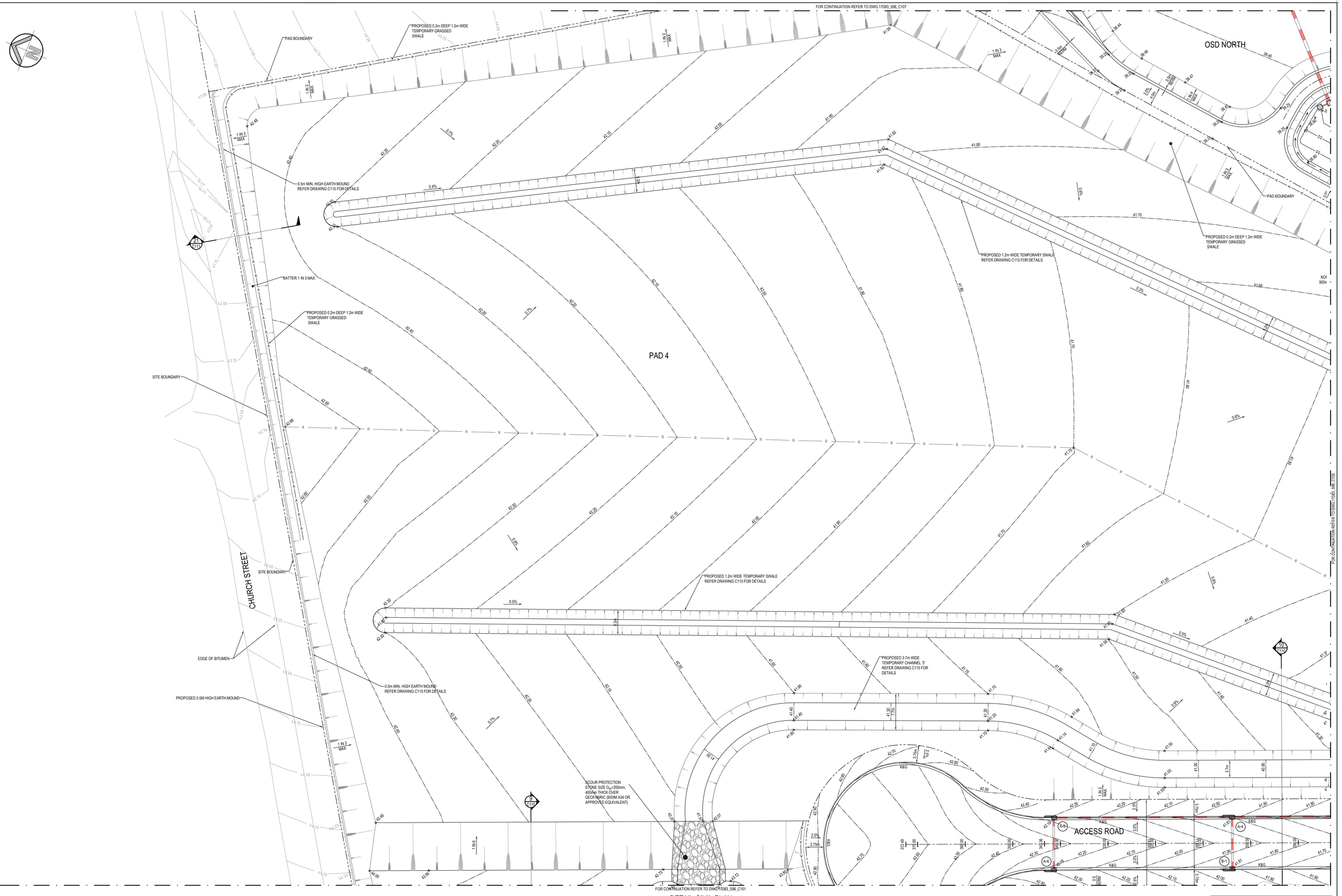
Project: EASTERN CREEK BUSINESS HUB
WESTERN SYDNEY PARKLANDS

Title: DETAIL CIVIL PLAN
SHEET 3 OF 7

Drawn	Designed	Date
L.Caha	L.Caha	FEB 18
Checked	Approved	Scale
T.Dempsey	A.Francis	1:250 @A0

Drawing number: 17D83_S96_C103
Revision: 03



DETAIL CIVIL PLAN

SCALE 1:250

0 5 10 15 20 25m

5 4 3 2 1

SCALE 1:250

ISSUED FOR S96

SURVEY INFORMATION

SURVEYED BY: LAND PARTNERS

DATUM: AHD

ORIGIN OF LEVELS: PM 30122 RL 43.58

REVISION	AMENDMENT	DRAWN	DESIGNED	DATE
03	ISSUED FOR S96	IK	NW	20.03.2019
02	ISSUED FOR S96	LC	LC	13.04.2018
01	ISSUED FOR S96	MC	LC	09.02.2018

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henry&hymas

Project: EASTERN CREEK BUSINESS HUB
WESTERN SYDNEY PARKLANDS

Title: DETAIL CIVIL PLAN
SHEET 4 OF 7

Drawn	Designed	Date
L.Caha	L.Caha	FEB 18
Checked	Approved	Scale
T.Dempsey	A.Francis	1:250 @A0

Drawing Number: 17D83_S96_C104

Revision: 03

FOR CONTINUATION REFER TO DWG.17D83_S96_C107

15m WIDE CONCRETE WEIR AT RL39.10

2 x (3m x 1.5m x 0.6m DEEP) SILT TRAPS

SCOUR PROTECTION STONE SIZE D_{50}=300mm, 400mm THICK OVER GEOFABRIC (BIDIM A34 OR APPROVED EQUIVALENT)

14.5m LONG WEIR IN CONCRETE WALL AT RL39.25

GAS EASEMENT

EXISTING CHANNEL

NORTH BASIN. FILTER AREA 900m². REFER TO DETAILS ON DWGS SERIES_C230

900mm WIDE DISH SURROUND DRAIN

PROPOSED 0.2m DEEP 1.2m WIDE TEMPORARY GRASSED SWALE

1.2x0.6 RCBC WITH CUSTOM TRASH RACK FITTED TO ENTRANCE

GRADE CHANNEL BED AND PRE-WEIR AREA TO FALL TO SILT TRAP

PROVIDE RETAINING WALL AROUND TREE ZONE. MATCH EXISTING LEVELS AT RETAINING WALL BASE

PROPOSED 8.1m WIDE PERMANENT CHANNEL "1" REFER DRAWING C115 FOR DETAILS

PROPOSED 1.2m WIDE TEMPORARY SWALE REFER DRAWING C115 FOR DETAILS

PAD 4

PROPOSED 0.2m DEEP 1.2m WIDE TEMPORARY GRASSED SWALE

PROPOSED 8.1m WIDE PERMANENT CHANNEL "2" REFER DRAWING C115 FOR DETAILS

SCOUR PROTECTION STONE SIZE D_{50}=200mm, 400mm THICK OVER GEOFABRIC (BIDIM A34 OR APPROVED EQUIVALENT) LENGTH 5m MIN

BASIN "PAD 4" V = 343m³

SCOUR PROTECTION STONE SIZE D_{50}=200mm, 250mm THICK OVER GEOFABRIC (BIDIM A34 OR APPROVED EQUIVALENT) LENGTH 5m MIN

SCOUR PROTECTION STONE SIZE D_{50}=300mm, 400mm THICK OVER GEOFABRIC (BIDIM A34 OR APPROVED EQUIVALENT) LENGTH 10m MIN

PROPOSED HEADWALL

PROPOSED 2700 x 600 RCBC

SCOUR PROTECTION STONE SIZE D_{50}=400mm, 600mm THICK OVER GEOFABRIC (BIDIM A34 OR APPROVED EQUIVALENT) LENGTH 10m MIN

PROVIDE RETAINING WALL AROUND TREE ZONE. MATCH EXISTING LEVELS AT RETAINING WALL BASE

ACCESS ROAD

ACCESS ROAD

PROPOSED 0.2m DEEP TEMPORARY GRASSED SWALE

PROPOSED SEDIMENTATION BASIN REFER DRAWING SE02 FOR DETAILS

PROPOSED SEDIMENTATION BASIN REFER DRAWING SE02 FOR DETAILS

PROPOSED 0.2m DEEP TEMPORARY GRASSED SWALE

PROPOSED 1500x450 RCBC

PROPOSED HEADWALL

SCOUR PROTECTION STONE SIZE D_{50}=200mm, 400mm THICK OVER GEOFABRIC (BIDIM A34 OR APPROVED EQUIVALENT) LENGTH 5m MIN

SCOUR PROTECTION STONE SIZE D_{50}=300mm, 400mm THICK OVER GEOFABRIC (BIDIM A34 OR APPROVED EQUIVALENT) LENGTH 10m MIN

SITE BOUNDARY

FOR CONTINUATION REFER TO DWG.17D83_S96_C102

FOR CONTINUATION REFER TO DWG.17D83_S96_C104

FOR CONTINUATION REFER TO DWG.17D83_S96_C106

DETAIL CIVIL PLAN

SCALE 1:250

0 5 10 15 20 25m

SCALE 1:250

ISSUED FOR S96

SURVEY INFORMATION
SURVEYED BY: LAND PARTNERS
DATUM: AHD
ORIGIN OF LEVELS: PM 30122 RL 43.58

REVISION	AMENDMENT	DRAWN	DESIGNED	DATE
03	ISSUED FOR S96	IK	NW	20.03.2019
02	ISSUED FOR S96	LC	LC	13.04.2018
01	ISSUED FOR S96	MC	LC	09.02.2018

Client: FRASER PROPERTY AUSTRALIA

Surveyor: LANDPARTNERS

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Project: EASTERN CREEK BUSINESS HUB
WESTERN SYDNEY PARKLANDS

Title: DETAIL CIVIL PLAN
SHEET 5 OF 7

Drawn	Designed	Date
L.Caha	L.Caha	FEB 18
Checked	Approved	Scale
T.Dempsey	A.Francis	1:250 @A0
Drawing number		Revision
17D83_S96_C105		03

FOR CONTINUATION REFER TO INSET 'A'

OSD SOUTH

SCOUR PROTECTION
STONE SIZE D_{50}=300mm,
400mm THICK OVER
GEOFABRIC (BIDIM A34 OR
APPROVED EQUIVALENT)
LENGTH 5m MIN

ACCESS TRACK

3.4m WIDE CONCRETE
WEIR AT RL40.15

SOUTH BASIN. FILTER AREA
170m². REFER TO DETAILS ON
DWG. C240 SERIES

BATTER 1 IN 4 MAX.

EDGE OF EXISTING EASEMENT

BATTER 1 IN 4 MAX.

BATTER 1 IN 4 MAX.

GAS EASEMENT

HEAVILY TIMBERED AREA

Ø900 STUB FOR FUTURE PAD 1 DRAINAGE.
LOCATION OF STUB HAS BEEN BASED ON FUTURE PAD 1 LAYOUT.
THIS Ø900mm PIPE TO BE CONSTRUCTED AND EXTENDED AT THE
TIME OF PAD DEVELOPMENT

PROPOSED SEDIMENTATION BASIN
REFER DRAWING SE02 FOR DETAILS

FOR CONTINUATION REFER TO DWG.17D83_S96_C103

FOR CONTINUATION REFER TO DWG.17D83_S96_C105

DETAIL CIVIL PLAN
SCALE 1:250

0 5 10 15 20 25m
5 4 3 2 1
SCALE 1:250

EXISTING 2 x 1.8m x 1.2m RCBC TO BE RETAINED

EXISTING HEADWALL TO BE RETAINED

PROPOSED 5.0m WIDE PERMANENT CHANNEL 'S'
REFER DRAWING C115 FOR DETAILS

SCOUR PROTECTION
STONE SIZE D_{50}=200mm,
400mm THICK OVER
GEOFABRIC (BIDIM A34 OR
APPROVED EQUIVALENT)

EXISTING CHANNEL

DISCHARGE CONTROL PIT
1 x (3.6x1.2) SURCHARGE STYLE GRATE
1 x (1.8x1.2) SURCHARGE STYLE GRATE
REFER TO C231 FOR DETAILS

JUNCTION PIT. PROVIDE 900x900 MEDIUM
DUTY CLASS "C" SEALED CONCRETE LID

INSET 'A'
SCALE: 1:250 @A0

ISSUED FOR S96

SURVEY INFORMATION
SURVEYED BY: LAND PARTNERS
DATUM: AHD
ORIGIN OF LEVELS: PM 30122 RL 43.58

REVISION	AMENDMENT	DRAWN	DESIGNED	DATE
03	ISSUED FOR S96	IK	NW	20.03.2019
02	ISSUED FOR S96	LC	LC	13.04.2018
01	ISSUED FOR S96	MC	LC	09.02.2018

Client: FRASER PROPERTY AUSTRALIA
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Project: EASTERN CREEK BUSINESS HUB
WESTERN SYDNEY PARKLANDS

Title: DETAIL CIVIL PLAN
SHEET 6 OF 7

Drawn	Designed	Date
L.Caha	L.Caha	FEB 18
Checked	Approved	Scale
T.Dempsey	A.Francis	1:250 @A0

Drawing number: 17D83_S96_C106
Revision: 03

FOR CONTINUATION REFER TO INSET 'A'

FOR CONTINUATION REFER TO DWG 17D83_S96_C105

PROPOSED 5.0m WIDE PERMANENT CHANNEL 'B'
REFER DRAWING C115 FOR DETAILS

SCOUR PROTECTION
STONE SIZE D_{50}=300mm,
400mm THICK OVER
GEOFABRIC (BIDIM A34 OR
APPROVED EQUIVALENT)

DISCHARGE CONTROL PIT
1 x (9x1.8m) SURCHARGE STYLE GRATE
1 x (2.4x1.2m) SURCHARGE STYLE GRATE
REFER TO C231 FOR DETAILS

OSD NORTH

PROPOSED
SERVICES TRACK

PROPOSED SEDIMENTATION BASIN
REFER DRAWING SE02 FOR DETAILS

4.0m WIDE ACCESS PATH
REFER TO DETAIL C231

FOR CONTINUATION REFER TO DWG 17D83_S96_C103

SITE BOUNDARY

EXISTING BOX CULVERTS

EXISTING HEADWALL

PROPOSED 5.0m WIDE PERMANENT CHANNEL 'B'
REFER DRAWING C115 FOR DETAILS

SITE BOUNDARY

INSET 'B'
SCALE: 1:250 @A0

DETAIL CIVIL PLAN
SCALE 1:250

0 5 10 15 20 25m
5 4 3 2 1
SCALE 1:250

ISSUED FOR S96

SURVEY INFORMATION
SURVEYED BY: LAND PARTNERS
DATUM: AHD
ORIGIN OF LEVELS: PM 30122 RL 43.58

REVISION	AMENDMENT	DRAWN	DESIGNED	DATE
03	ISSUED FOR S96	IK	NW	20.03.2019
02	ISSUED FOR S96	MC	LC	13.04.2018
01	ISSUED FOR S96	MC	LC	09.02.2018

Client: FRASER PROPERTY AUSTRALIA
Surveyor: LANDPARTNERS

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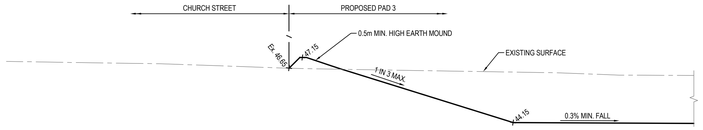
Project: EASTERN CREEK BUSINESS HUB
WESTERN SYDNEY PARKLANDS

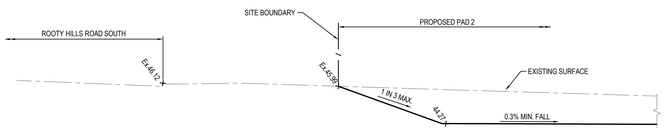
Title: DETAIL CIVIL PLAN
SHEET 7 OF 7

Drawn	Designed	Date
L.Caha	L.Caha	FEB 18
Checked	Approved	Scale
T.Dempsey	A.Francis	1:250 @A0

Drawing number: 17D83_S96_C107
Revision: 03



SECTION 1 C101
SCALE: 1:100 @ A0



SECTION 2 C101
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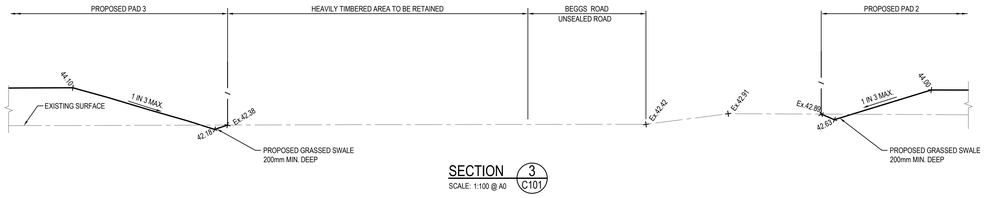
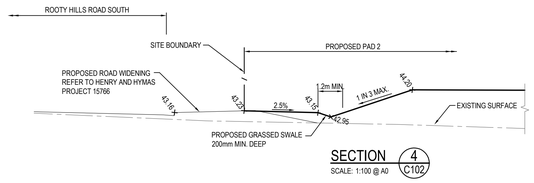
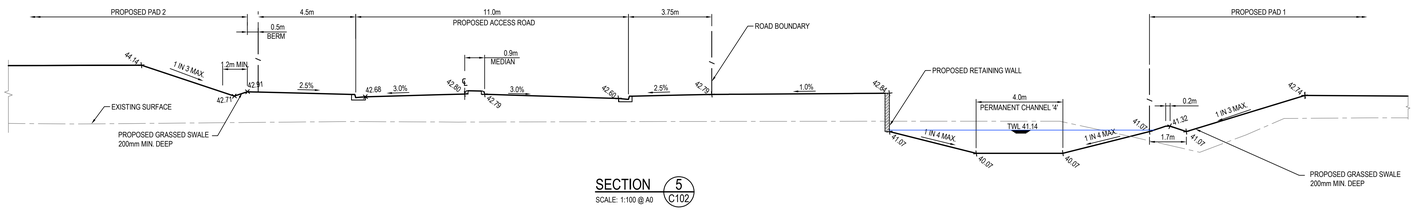


SECTION 3 C101
SCALE: 1:100 @ A0



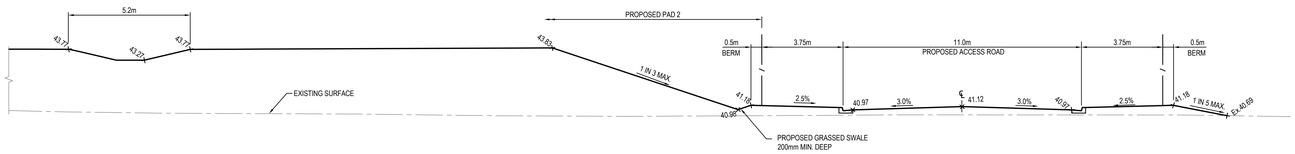
SECTION 4 C102
SCALE: 1:100 @ A0



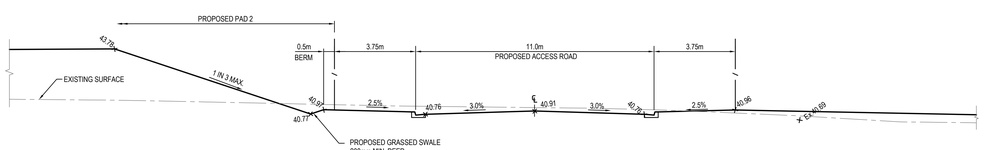
SECTION 5 C102
SCALE: 1:100 @ A0

SECTION 6 C102
SCALE: 1:100 @ A0

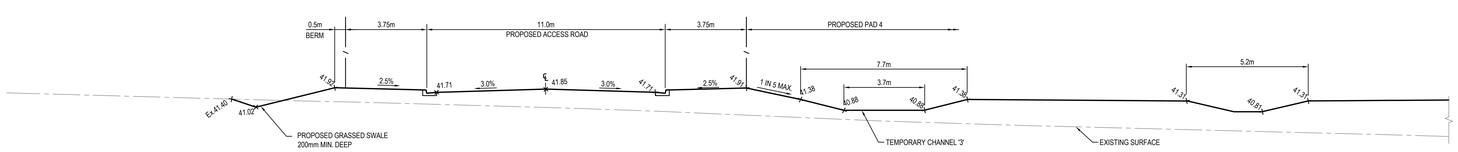
SECTION 7 C102
SCALE: 1:100 @ A0



SECTION 8 C102
SCALE: 1:100 @ A0



SECTION 9 C102
SCALE: 1:100 @ A0



SECTION 10 C104
SCALE: 1:100 @ A0

0 2 4 6 8 10m
2 1
SCALE 1:100

ISSUED FOR S96

SURVEY INFORMATION

SURVEYED BY: LAND PARTNERS
DATUM: AHD
ORIGIN OF LEVELS: PM 30122 RL 43.58

REVISION	AMENDMENT	DRAWN	DESIGNED	DATE
03	ISSUED FOR S96	LC	LC	20.03.2019
02	ISSUED FOR S96	LC	LC	13.04.2018
01	ISSUED FOR S96	LC	LC	09.02.2018

Client: FRASER PROPERTY AUSTRALIA
Surveyor: LANDPARTNERS

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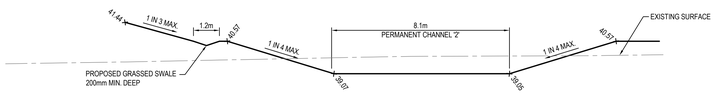
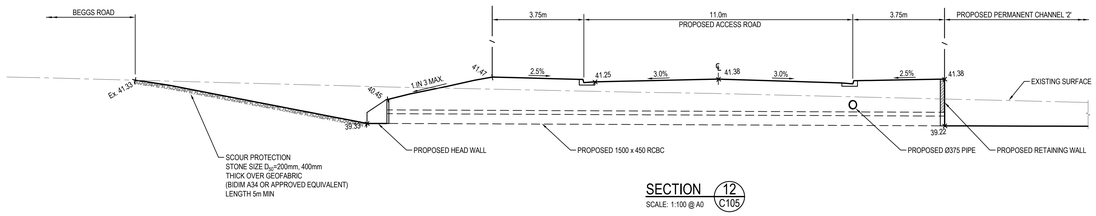
Project: EASTERN CREEK BUSINESS HUB
WESTERN SYDNEY PARKLANDS
Title: TYPICAL SITE SECTIONS
SHEET 1 OF 2

Drawn	Designed	Date
L.Caha	L.Caha	FEB 18
Checked	Approved	Scale
T.Dempsey	A.Francis	1:100 @ A0

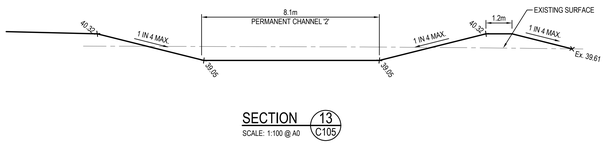
Drawing number: 17D83_S96_C110
Revision: 03



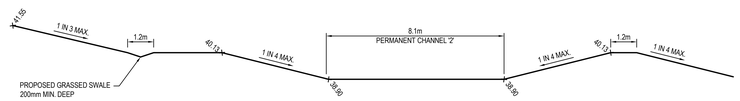
SECTION 11 (C105)
SCALE: 1:100 @ A0



SECTION 12 (C105)
SCALE: 1:100 @ A0

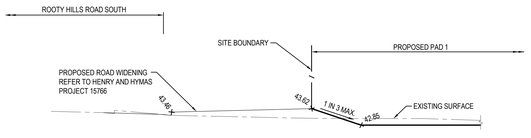


SECTION 13 (C105)
SCALE: 1:100 @ A0

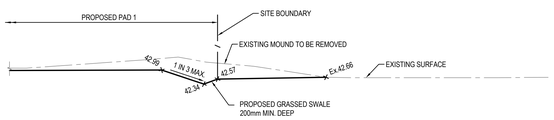


SECTION 14 (C105)
SCALE: 1:100 @ A0

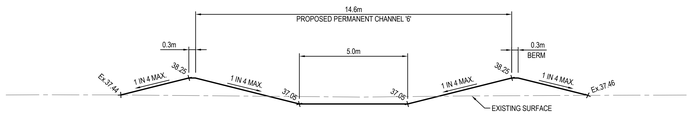
SECTION 15 (C102)
SCALE: 1:100 @ A0



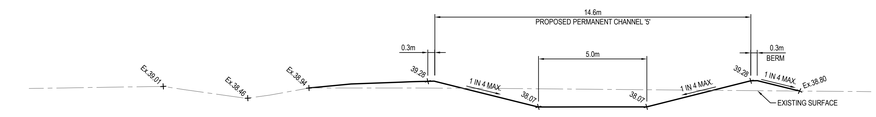
SECTION 16 (C103)
SCALE: 1:100 @ A0



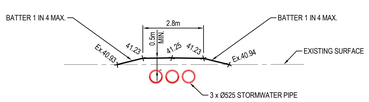
SECTION 17 (C103)
SCALE: 1:100 @ A0



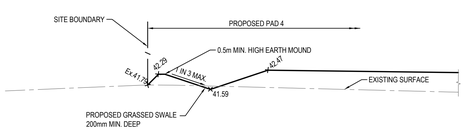
SECTION 18 (C107)
SCALE: 1:100 @ A0



SECTION 19 (C106)
SCALE: 1:100 @ A0



SECTION 20 (C106)
SCALE: 1:100 @ A0



SECTION 21 (C104)
SCALE: 1:100 @ A0

0 2 4 6 8 10m
2 1
SCALE 1:100

SURVEY INFORMATION

SURVEYED BY: LAND PARTNERS
DATUM: AHD
ORIGIN OF LEVELS: PM 30122 RL 43.58

REVISION	AMENDMENT	DRAWN	DESIGNED	DATE
03	ISSUED FOR S96	LC	LC	20.03.2019
02	ISSUED FOR S96	LC	LC	13.04.2018
01	ISSUED FOR S96	LC	LC	09.02.2018

Client: FRASER PROPERTY AUSTRALIA
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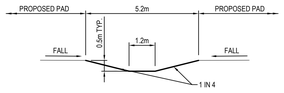
ISSUED FOR S96

Project: EASTERN CREEK BUSINESS HUB
WESTERN SYDNEY PARKLANDS

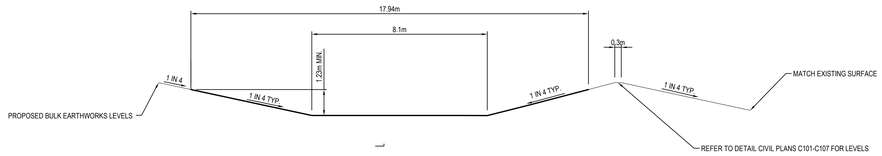
Title: TYPICAL SITE SECTIONS
SHEET 1 OF 2

Drawn	Designed	Date
L.Caha	L.Caha	FEB 18
Checked	Approved	Scale
T.Dempsey	A.Francis	1:100 @ A0

Drawing number: 17D83_S96_C111
Revision: 03



1.2m WIDE TEMPORARY SWALE
SCALE 1:100



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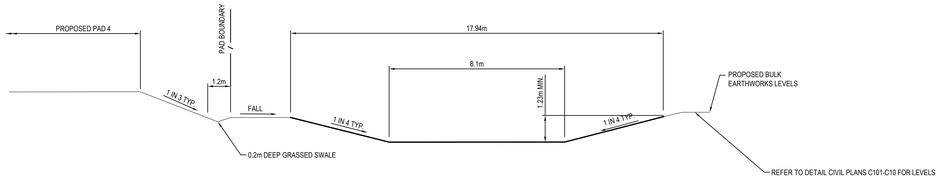
SCALE 1:100



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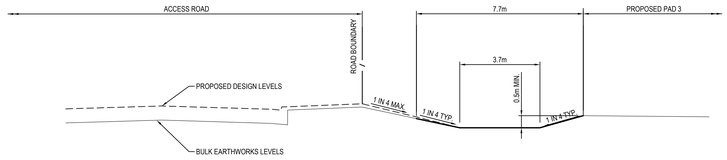

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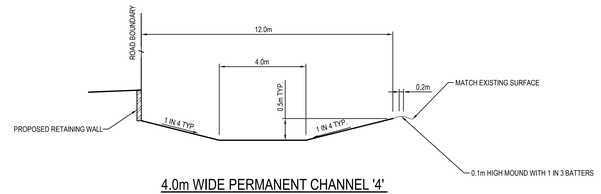
SCALE 1:100



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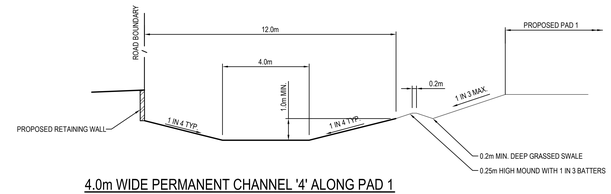

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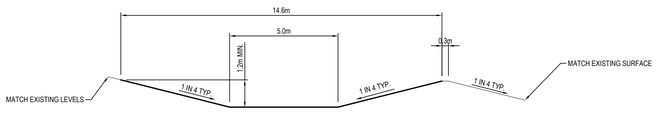
SCALE 1:100



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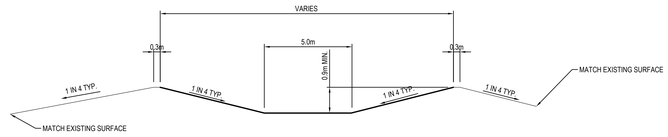

5.0m WIDE PERMANENT CHANNEL '6'
SCALE 1:100

0 2 4 6 8 10m
SCALE 1:100

SURVEY INFORMATION
SURVEYED BY: LAND PARTNERS
DATUM: AHD
ORIGIN OF LEVELS: PM 30122 RL 43.58

REVISION	AMENDMENT	DRAWN	DESIGNED	DATE
03	ISSUED FOR S96	IK	NW	20.03.2019
02	ISSUED FOR S96	LC	LC	13.04.2018
01	ISSUED FOR S96	LC	LC	09.02.2018

Client
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ISSUED FOR S96

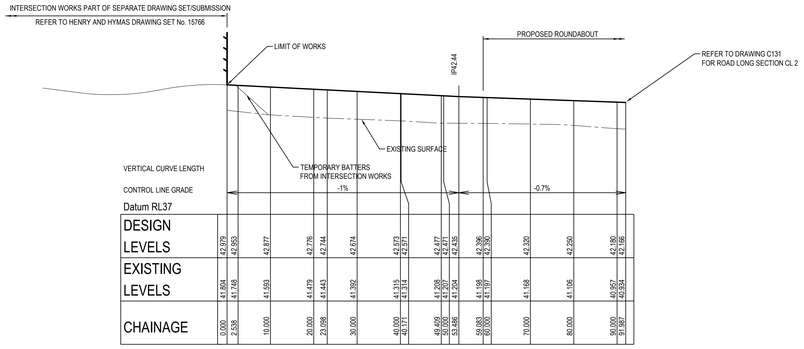
Project
EASTERN CREEK BUSINESS HUB
WESTERN SYDNEY PARKLANDS

Title
STORMWATER CHANNELS
TYPICAL SECTIONS

Drawn	Designed	Date
L.Caha	L.Caha	FEB 18
Checked	Approved	Scale
T.Dempsey	A.Francis	1:100 @A0

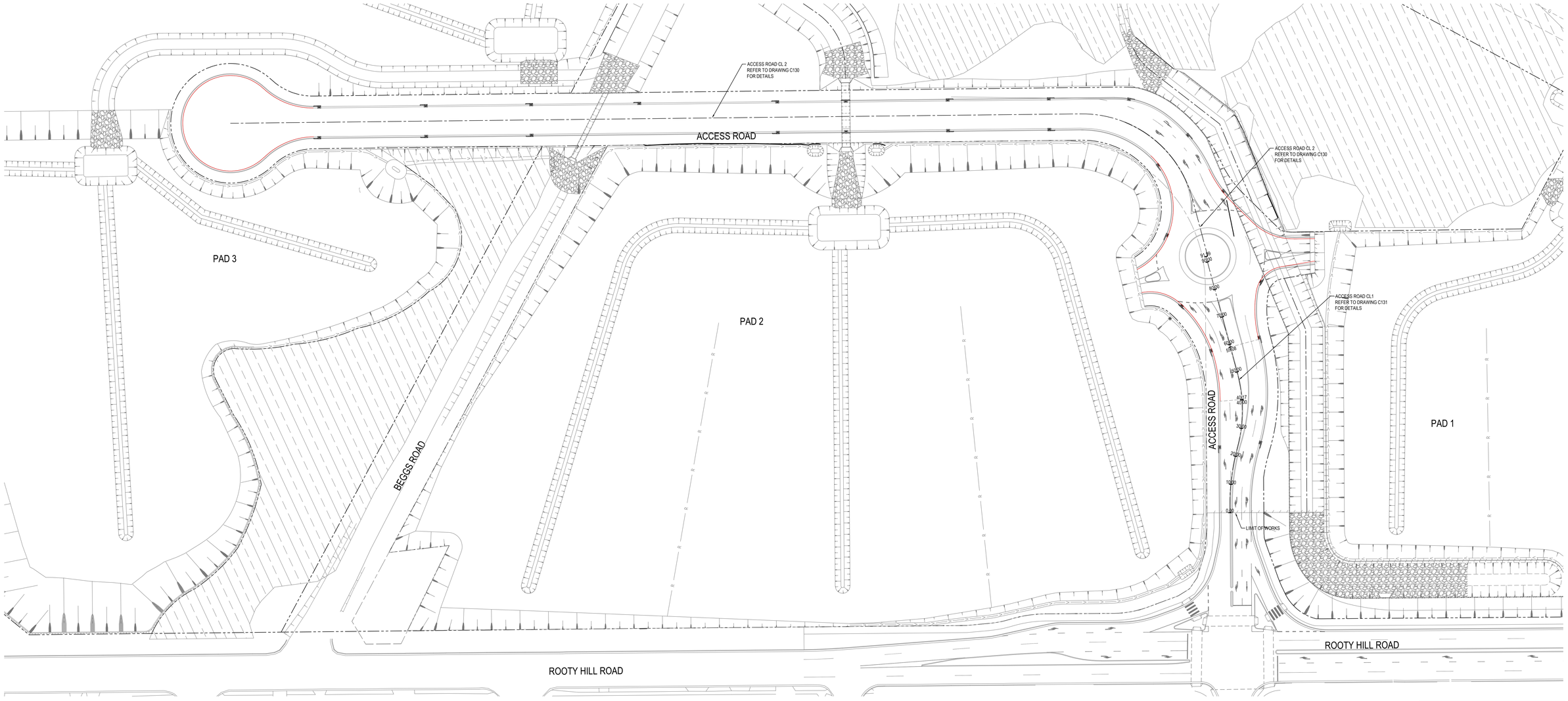
Drawing number
17D83_S96_C115

Revision
03



ACCESS ROAD CL 1 LONGITUDINAL SECTION

HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100



ACCESS ROAD CHAINAGES PLAN

SCALE: 1:500

SCALE 1:100

SCALE 1:500

ISSUED FOR S96

SURVEY INFORMATION

SURVEYED BY: LAND PARTNERS
DATUM: AHD
ORIGIN OF LEVELS: PM 30122 RL 43.58

REVISION	AMENDMENT	DRAWN	DESIGNED	DATE
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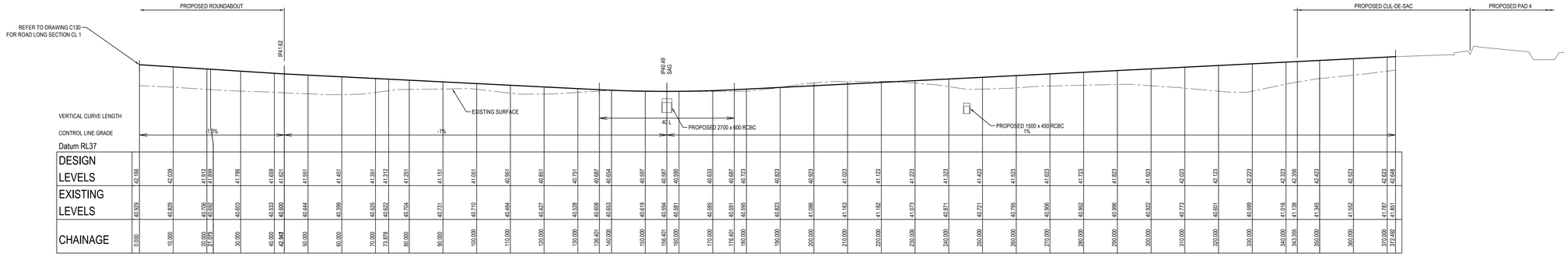
Project: EASTERN CREEK BUSINESS HUB
WESTERN SYDNEY PARKLANDS

Title: ACCESS ROAD CL 1 LONG SECTION AND CHAINAGES PLAN

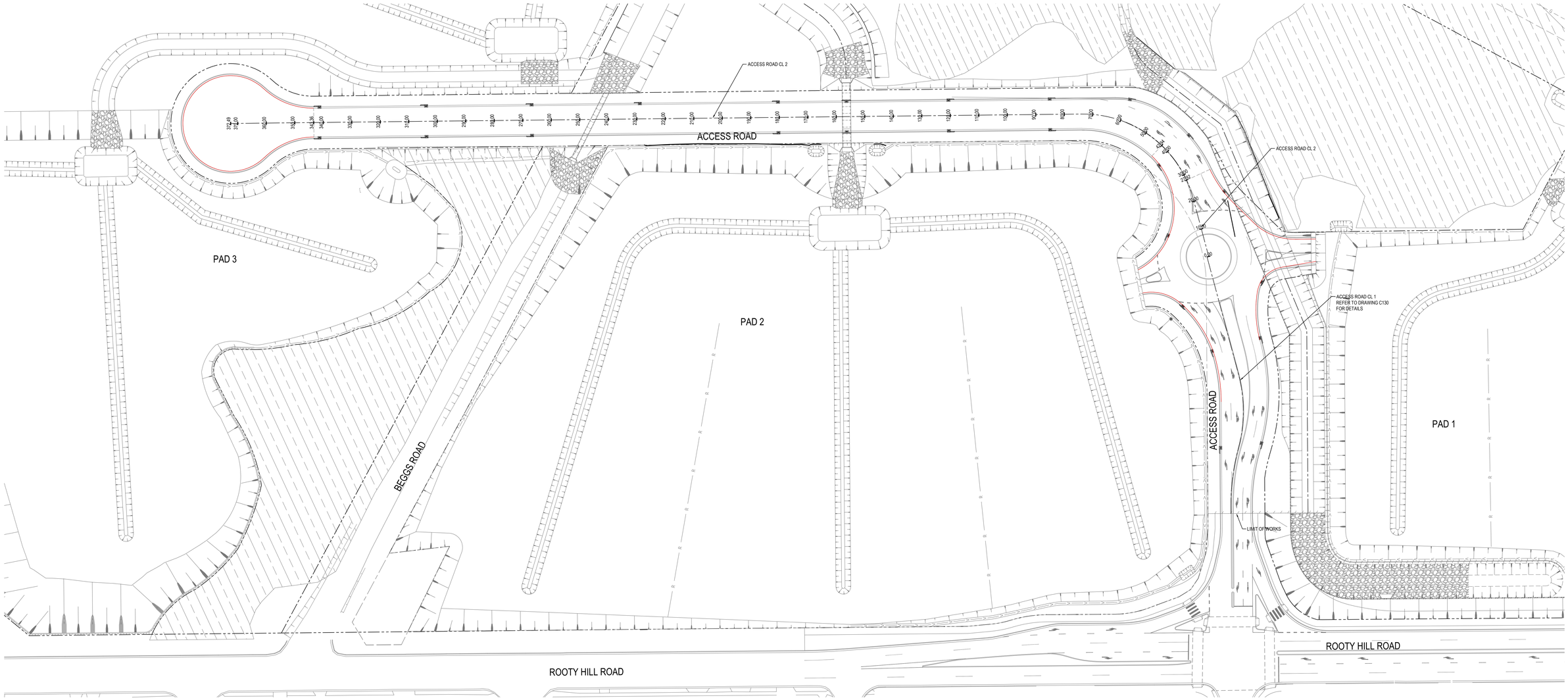
Drawn	Designed	Date
L.Caha	L.Caha	FEB 18
Checked	Approved	Scale
T.Dempsey	A.Francis	AS NOTED @A0

Drawing number: 17D83_S96_C130
Revision: 03



ACCESS ROAD CL 2 LONGITUDINAL SECTION

HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100



ACCESS ROAD CHAINAGES PLAN

SCALE: 1:500

SCALE 1:100

SCALE 1:500

ISSUED FOR S96

SURVEY INFORMATION
SURVEYED BY: LAND PARTNERS
DATUM: AHD
ORIGIN OF LEVELS: PM 30122 RL 43.58

REVISION	AMENDMENT	DRAWN	DESIGNED	DATE
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01	ISSUED FOR S96	LC	LC	13.04.2018

Client: FRASER PROPERTY AUSTRALIA
Surveyor: LANDPARTNERS

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Project: EASTERN CREEK BUSINESS HUB
WESTERN SYDNEY PARKLANDS

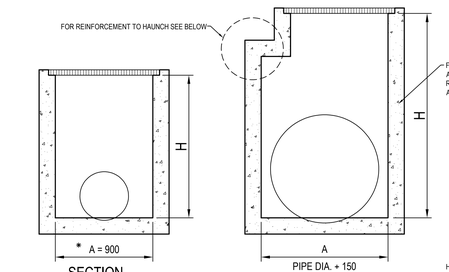
Title: ACCESS ROAD CL 2 LONG SECTION AND CHAINAGES PLAN

Drawn	Designed	Date
L.Caha	L.Caha	FEB 18
Checked	Approved	Scale
T.Dempsey	A.Francis	AS NOTED @A0

Drawing number: 17D83_S96_C131
Revision: 02

TYPICAL PIT CHAMBER SIZES
IT IS THE CONTRACTORS RESPONSIBILITY TO SELECT PIT CHAMBER SIZE WITH REGARDS TO PIPE SIZE, DEPTH TO INVERT AND SKEW ANGLE. REFER SKETCHES BELOW.

1. SELECT PIT CHAMBER USING THE STEPS BELOW:
2. SELECT PIT CHAMBER SIZE DEPENDING ON THE PIPE DIAMETERS.
3. CHECK PIT CHAMBER SIZE TO SATISFY DEPTH TO INVERT REQUIREMENTS.
   CHECK PIT CHAMBER DIMENSIONS TO SATISFY THE SKEW ANGLE IN THE TABLE.



SECTION
NTS

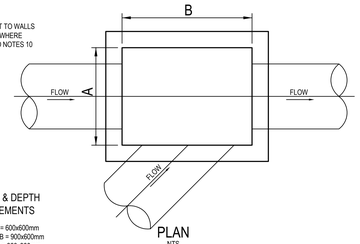
*A = 600 FOR PIPES UP TO 375 DIA.

(1) PIT CHAMBER DIMENSIONS FOR PIPES UP TO 600 DIA.

SECTION
NTS

(1) PIT CHAMBER FOR PIPES GREATER THAN 600 DIA.

FOR B = 600mm - MAX. SIDE ENTRY PIPE AT 45° SKEW = 225mm
FOR B = 900mm - MAX. SIDE ENTRY PIPE AT 45° SKEW = 375mm
FOR B = 1200mm - MAX. SIDE ENTRY PIPE AT 45° SKEW = 600mm
FOR B = 1500mm - MAX. SIDE ENTRY PIPE AT 45° SKEW = 825mm
FOR B = 1900mm - MAX. SIDE ENTRY PIPE AT 45° SKEW = 1050mm

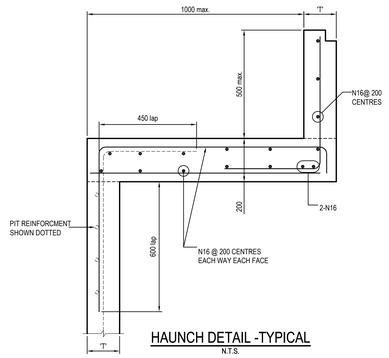


PLAN
NTS

(3) PIT CHAMBER FOR SIDE ENTRY ON SKEW

(2) PIT SIZE & DEPTH REQUIREMENTS

H = 0-900mm - AxB = 600x600mm
H = 900-1200mm - AxB = 900x600mm
H = >1200mm - AxB = 900x900mm



HAUNCH DETAIL -TYPICAL
N.T.S.

PIT LID SCHEDULE

PIT/STRUCTURE NUMBER	DESCRIPTION
A-5 A-6 B-1 C-1 D-1 E-1 E-2 E-3 K-1 E-4 E-5 E-6 E-7 E-8 F-1 G-1 H-1 J-1 E-9	ON GRADE KERB INLET PIT WITH 1.8m LINTEL AND HEAVY DUTY GRATED LID CLASS "D" IN ACCORDANCE WITH BLACKTOWN CITY COUNCIL REQUIREMENT. PITS TO BE FITTED WITH "ENVIROPOD" 200 MICRON PIT BASKET WITH OILSORBS OR EQUAL APPROVED EQUIVALENT.
L-2 L-3 G-2 E-6	SAG KERB INLET PIT WITH 2.4m LINTEL AND HEAVY DUTY GRATED LID CLASS "D" IN ACCORDANCE WITH BLACKTOWN CITY COUNCIL REQUIREMENT. PITS TO BE FITTED WITH "ENVIROPOD" 200 MICRON PIT BASKET WITH OILSORBS OR EQUAL APPROVED EQUIVALENT.
M-1 M-2 L-1 L-4	CONCRETE HEADWALL TO SUIT BOX CULVERTS AS SPECIFIED ON DETAIL PLANS
N-1	CONCRETE HEADWALL TO SUIT 3x525mm CONCRETE PIPES AS SPECIFIED ON DETAIL PLANS
N-2 N-3	JUNCTION PIT WITH 900x900 HINGED HEAVY DUTY CONCRETE LID CLASS "D" IN ACCORDANCE WITH BLACKTOWN CITY COUNCIL REQUIREMENT.
G-3	GRATED INLET PIT WITH 900x900 HINGED MEDIUM DUTY GRATED LID CLASS "C" IN ACCORDANCE WITH BLACKTOWN CITY COUNCIL REQUIREMENT.

TABLE 1

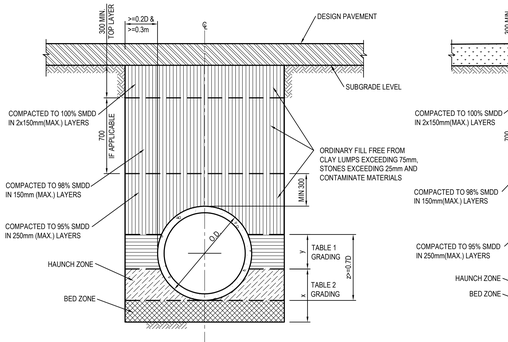
SIEVE SIZE (MM)	WEIGHT PASISNG (%)
75.0	100
9.5	100 TO 50
2.36	100 TO 30
0.60	50 TO 15
0.075	25 TO 0

TABLE 2

SIEVE SIZE (MM)	WEIGHT PASISNG (%)
19.0	100
2.36	100 TO 50
0.60	90 TO 20
0.30	60 TO 10
0.15	25 TO 0
0.075	10 TO 0

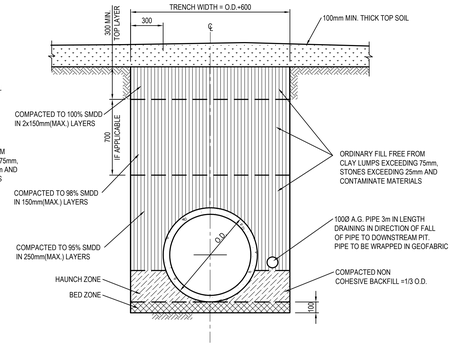
TABLE 3

SUPPORT TYPE	BED ZONE X	HAUNCH ZONE Y	BED AND HAUNCH ZONES COMPACTION	MAX BEDDING FACTOR
HS1	100 IF D<=1500, OR 150 IF D>=1500	0.1D	50	2.0
HS2		0.3D	60	2.5
HS3		0.3D	70	4.0

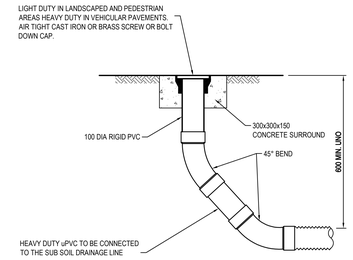


PIPE TRENCH INSTALLATION BENEATH PAVEMENT
(HS SUPPORT TO BE USED UNDER ROADWAY)
SCALE 1:20

NOTE:
TYPE HS2 TO BE USED AS A TYPICAL SUPPORT FOR TRENCHES UNDER ROADWAY UNLESS SPECIFIED SEPERATELY



PIPE TRENCH INSTALLATION IN LANDSCAPE AREAS
(H1 & H2 SUPPORT)
SCALE 1:20



FLUSHING POINT (FP)
SCALE 1:10

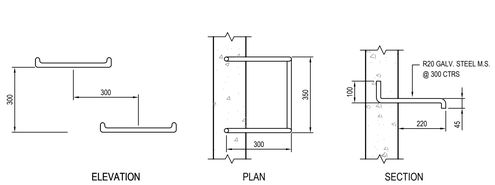
NOTE: SLOTTED RIGID PVC PIPE AND FITTINGS MAY BE USED

SUBSOIL DRAINAGE NOTES

1. GENERALY PROVIDE SUBSOIL DRAINS TO INTERCEPT GROUNDWATER SEEPAGE AND PREVENT WATER BUILD-UP BEHIND WALLS AND UNDER FLOORS AND PAVEMENTS. CONNECT SUBSOIL TO SURFACE DRAINS OR TO THE STORMWATER DRAINAGE SYSTEM AS APPLICABLE.
2. PIPE DEPTH:
   PROVIDE THE FOLLOWING MINIMUM CLEAR DEPTH, MEASURED TO THE CROWN OF THE PIPE, WHERE THE PIPE PASSES BELOW THE FOLLOWING ELEMENTS:
   - 100mm BELOW FORMATION LEVEL OF THE PAVEMENT, KERB OR CHANNEL.
   - 100mm BELOW THE AVERAGE GRADIENT OF THE BOTTOM OF FOOTINGS.
3. JOINTING:
   AT JUNCTIONS OF SUBSOIL PIPES PROVIDE TEES, COUPLINGS OR ADAPTORS TO AS2439.1.
4. TRENCH WIDTH MINIMUM 300mm.
5. PIPE UNDERLAY
   GENERAL: GRADE THE TRENCH FLOOR EVENLY TO THE GRADIENT OF THE PIPELINE. IF THE TRENCH FLOOR IS ROCK, CORRECT ANY IRREGULARITIES WITH COMPACTED BEDDING MATERIAL. BED PIPING ON A CONTINUOUS UNDERLAY OF BEDDING MATERIAL, AT LEAST 75mm THICK AFTER COMPACTION. LAY THE PIPE WITH ONE LINE OF PERFORATIONS AT THE BOTTOM.

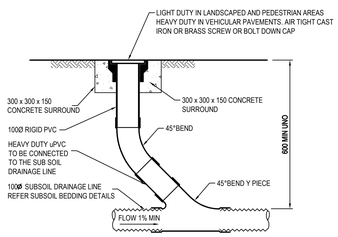
   CHASES: IF NECESSARY TO PREVENT PROJECTIONS SUCH AS SOCKETS AND FLANGES FROM BEARING ON THE TRENCH BOTTOM OR UNDERLAY.
6. PIPE SURROUNDS:
   GENERAL: PLACE THE MATERIAL IN THE PIPE SURROUND IN LAYERS SMALLER THAN OR EQUAL TO 200mm LOOSE THICKNESS, AND COMPACT WITHOUT DAMAGING OR DISPLACING PIPING.
   DEPTH OF OVERLAY: TO THE UNDERSIDE OF THE BASE OF OVERLYING STRUCTURES SUCH AS PAVEMENTS, SLABS AND CHANNELS TO WITHIN 150mm OF THE FINISHED SURFACE OF UNPAVED OR LANDSCAPED AREAS.
7. FILTER SOCKS:
   PROVIDE POLYESTER PERMEABLE SOCKS CAPABLE OF RETAINING PARTICLES OF 0.25mm SIZES. SECURELY FIT OR JOIN THE SOCK AT EACH JOINT.

DRAINAGE NOTES:
1. ALL STORMWATER WORK TO COMPLY WITH AS 3500 PART 3.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING THE MINIMUM COVER OF 600mm ON ALL PIPES.
3. PROTECTION OF PIPES DUE TO LOADS EXCEEDING W7 WHEEL LOAD SHALL BE THE CONTRACTOR'S RESPONSIBILITY.
4. BEDDING TYPE SHALL BE TYPE H2 FOR RCP. WHERE NECESSARY THE OVERLAY ZONE SHALL BE REDUCED TO ACCOMMODATE PAVEMENT REQUIREMENTS. REFER TO THIS DRAWING FOR DETAILS.
5. MINIMUM COVER OVER EXISTING PIPES FOR PROTECTION DURING CONSTRUCTION SHALL BE 800mm.
6. NO CONSTRUCTION LOADS SHALL BE APPLIED TO PLASTIC PIPES.
7. FINISHED SURFACE LEVELS SHOWN ON LAYOUT PLAN DRGS TAKE PRECEDENCE OVER DESIGN DRAINAGE SURFACE LEVELS.
8. ALL PIPES UP TO AND INCLUDING 300 DIA. SHALL BE SOLVENT OR RUBBER RING JOINTED PVC CLASS SH PIPE TO AS1260. ALL OTHER PIPES TO BE RCP USING CLASS 2 RUBBER RING JOINTED PIPE. HARDIES FRC PIPE MAY BE USED IN LIEU OF RCP IF DESIRED IN GROUND. ALL AERIAL PIPES TO BE PVC CLASS SH.
9. ALL PITS IN NON TRAFFICABLE AREAS TO BE PREFABRICATED POLYESTER CONCRETE "POLYCRETE" WITH "LIGHT DUTY" CLASS B GALV. MILD STEEL GRATING AND FRAME.
   ALL PITS IN TRAFFICABLE AREAS (CLASS "D" LOADING MAX) TO HAVE 150mm THICK CONCRETE WALLS AND BASE CAST IN-SITU f'c=32 MPa, REINFORCED WITH N12-200 BOTH LOADING WAYS CENTRALLY PLACE. U.N.O. ON SEPARATE DESIGN DRAWINGS IN THIS SET. GALV MILD STEEL GRATING AND FRAME TO SUIT DESIGN LOADING. PRECAST PITS, RECTANGULAR OR CIRCULAR IN SHAPE, MAY BE USED IN LIEU AND SHALL COMPLY WITH RELEVANT AUSTRALIAN STANDARDS.
10. ALL PITS, GRATINGS AND FRAMES SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURERS SPECIFICATION AND TO BE IN ACCORDANCE WITH AS3500.3 AND AS3996.
11. PIT CHAMBER DIMENSIONS ARE TO BE SELECTED TO SATISFY THE FOLLOWING:
    - PIPE SIZE
    - DEPTH TO INVERT
    - SKEW ANGLE
    REFER TYPICAL PIT CHAMBER DETAILS BELOW
    IF PIT LID SIZE IS SMALLER THAN THE PIT CHAMBER SIZE THEN THE PIT LID IS TO BE CONSTRUCTED ON THE CORNER OF THE PIT CHAMBER WITH THE STEP IRONS DIRECTLY BELOW. ALTERNATIVELY THE PIT LID TO BE USED, IS TO BE THE SAME SIZE AS THE PIT CHAMBER.
12. FOR PIPE SIZES GREATER THAN Ø300mm, PIT FLOOR IS TO BE BENCHED TO FACILITATE FLOW.
13. GALVANISED STEP IRONS SHALL BE PROVIDED AT 300 CTS FOR PITS HAVING A DEPTH EXCEEDING 1200mm. SUBSOIL DRAINAGE PIPE SHALL BE PROVIDED IN PIPE TRENCHES ADJACENT TO INLET PIPES. (MINIMUM LENGTH 3m).
14. ALL SUBSOIL PIPES SHALL BE 100mm SLOTTED PVC IN A FILTER SOCK, UNO, WITH 3m INSTALLED UPSTREAM OF ALL PITS.
15. ALL PIPEWORK SHALL HAVE MINIMUM DIAMETER 100.
16. MINIMUM GRADE FOR ROOFWATER DRAINAGE LINES SHALL BE 1%.
17. ALL PIPE JUNCTIONS AND TAPER UP TO AND INCLUDING 300 DIA. SHALL BE VIA PURPOSE MADE FITTINGS.
18. ALL ROOF DRAINAGE TO BE INSTALLED IN ACCORDANCE WITH AS3500, PART 3. TESTING TO BE UNDERTAKEN AND REPORTS PROVIDED TO THE SUPERINTENDENT.
19. LOCATION OF THE DIRECT DOWN PIPE CONNECTIONS MAY VARY ON SITE TO SUIT SITE CONDITIONS, WHERE CONNECTION SHOWN ON LONG SECTIONS CHAINAGES ARE INDICATIVE ONLY.
20. PITS IN EXCESS OF 1.5 m DEEP TO HAVE WALL AND FLOOR THICKNESS INCREASED TO 200mm. REINFORCED WITH N12@200 CTS CENTRALLY PLACED BOTH WAYS THROUGHOUT U.N.O.ON SEPARATE DESIGN DRAWINGS IN THIS SET. IF DEPTH EXCEEDS 5m CONTACT ENGINEER.
21. SUBSOIL DRAINAGE LINES FOR LANDSCAPE AREA NOT SHOWN ON THESE DRAWINGS. REFER TO LANDSCAPING PLANS FOR DETAILS.
22. ALL STORMWATER PITS TO HAVE Ø100 uPVC SLOTTED SUBSOIL PIPES CONNECTED TO THEM. THESE SUBSOILS TO EXTEND 3m UPSTREAM OF THE PIT AT A MINIMUM GRADE.



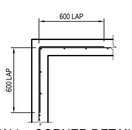
ELEVATION PLAN SECTION

TYPICAL STEP IRON DETAIL
SCALE 1:10

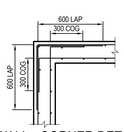


INTERMEDIATE RISER (IR)
SCALE 1:10

NOTE: SLOTTED RIGID PVC PIPE AND FITTINGS MAY BE USED



150 WALL - CORNER DETAIL
SCALE 1:20



200 WALL - CORNER DETAIL
SCALE 1:20

0 400 800 1200 1600 2000mm
400 200
SCALE 1:20

0 200 400 600 800 1000mm
200 100
SCALE 1:10

ISSUED FOR S96

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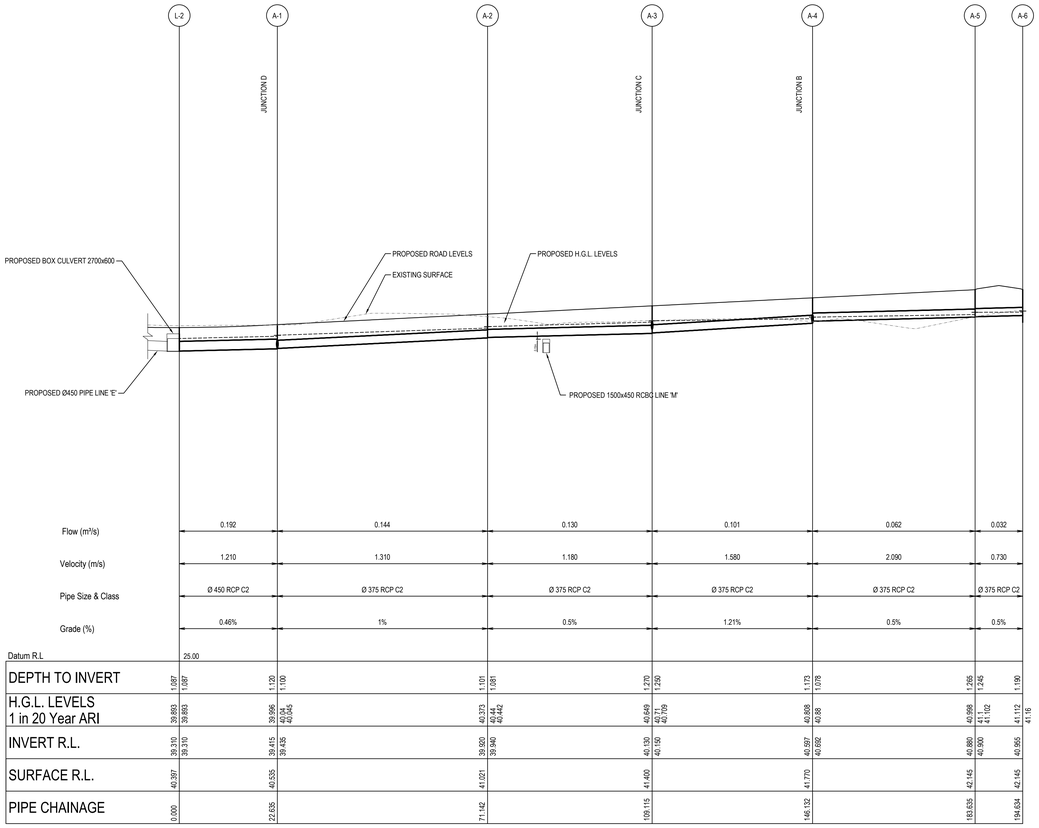
Project: EASTERN CREEK BUSINESS HUB
WESTERN SYDNEY PARKLANDS

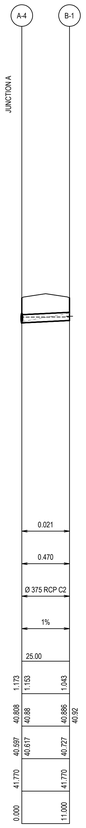
Title: STORMWATER MISCELLANEOUS DETAILS & PIT LID SCHEDULE

Drawn	Designed	Date
M.Cerna	L.Caha	FEB 18
Checked	Approved	Scale
T.Dempsey	A.Francis	AS NOTED @A0

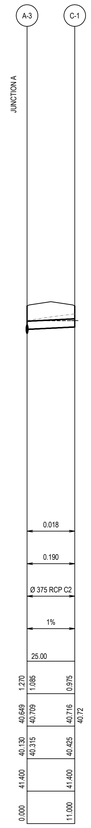
Drawing number: 17D83_S96_C200
Revision: 03



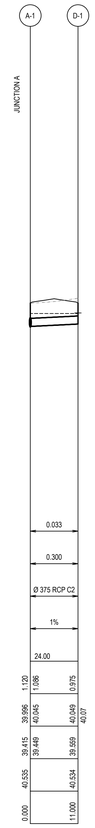
LINE A
SCALE: H 1:500
V 1:100



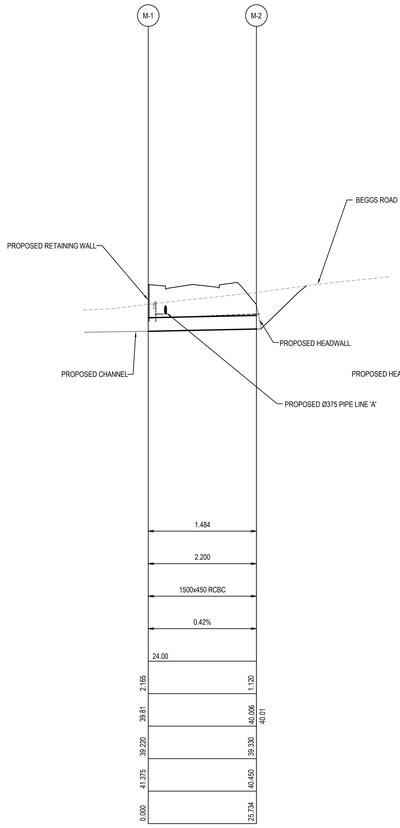
LINE B
SCALE: H 1:500
V 1:100



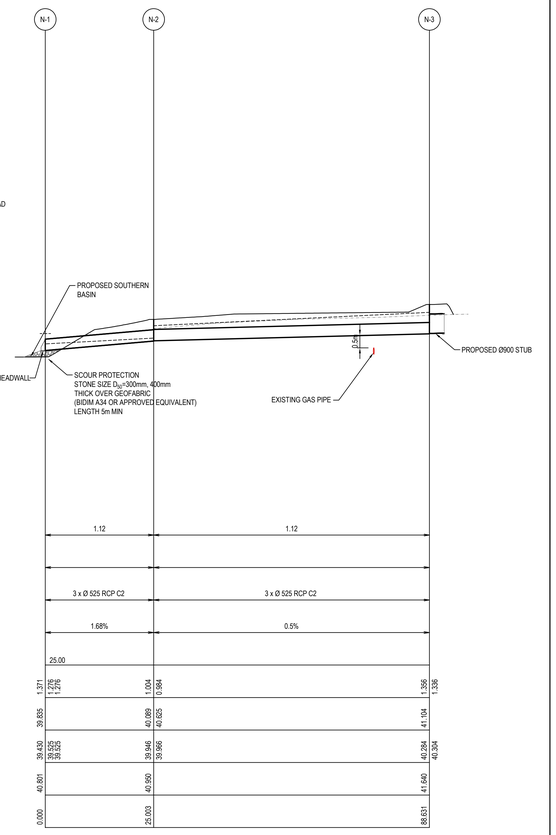
LINE C
SCALE: H 1:500
V 1:100



LINE D
SCALE: H 1:500
V 1:100



LINE M
SCALE: H 1:500
V 1:100



LINE N
SCALE: H 1:500
V 1:100

0 2 4 6 8 10m
2 1
SCALE 1:100

0 10 20 30 40 50m
10 8 6 4 2
SCALE 1:500

ISSUED FOR S96

SURVEY INFORMATION
SURVEYED BY: LAND PARTNERS
DATUM: AHD
ORIGIN OF LEVELS: PM 30122 RL 43.58

REVISION	AMENDMENT	DRAWN	DESIGNED	DATE
03	ISSUED FOR S96	IK	NW	20.03.2019
02	ISSUED FOR S96	LC	LC	13.04.2018
01	ISSUED FOR S96	MC	LC	09.02.2018

Client: FRASER PROPERTY AUSTRALIA
Surveyor: LANDPARTNERS

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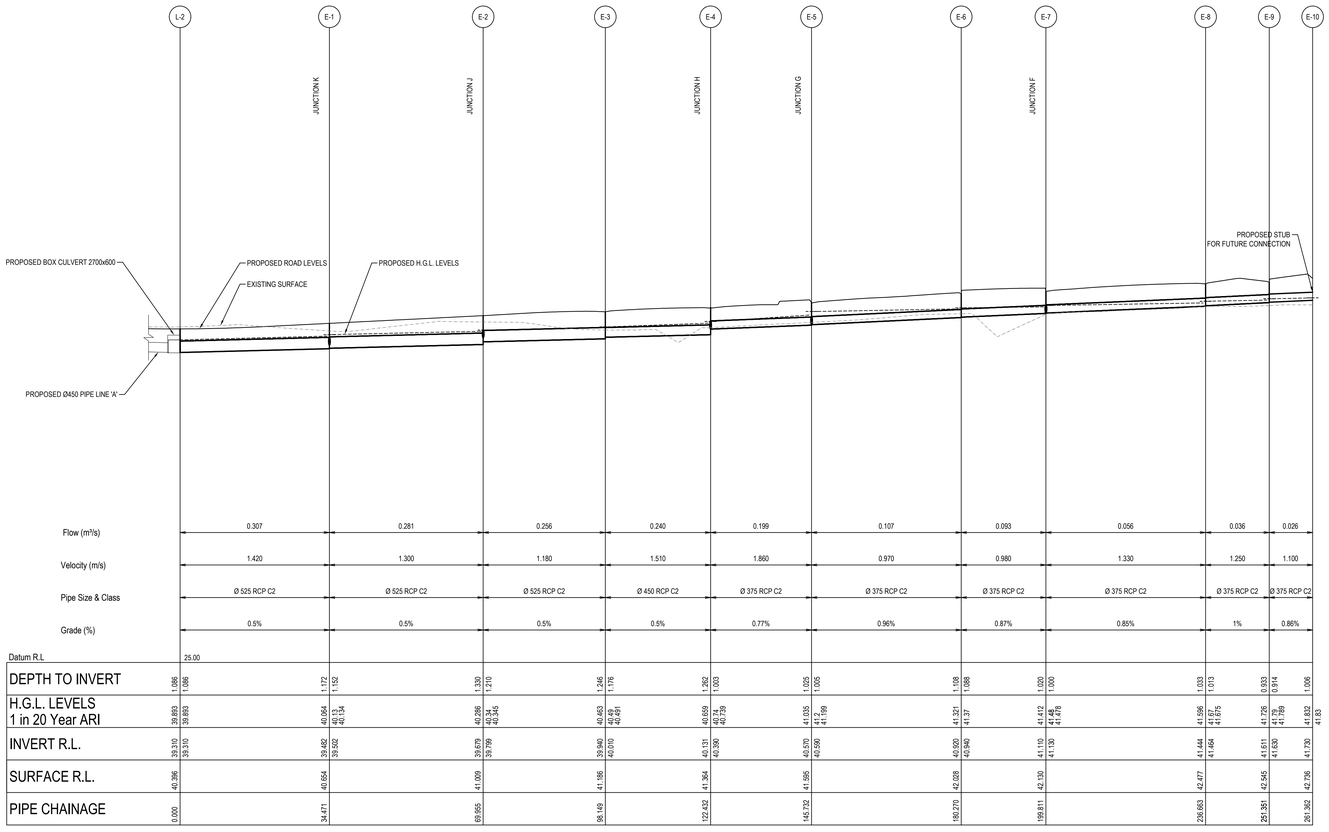
Project: EASTERN CREEK BUSINESS HUB
WESTERN SYDNEY PARKLANDS

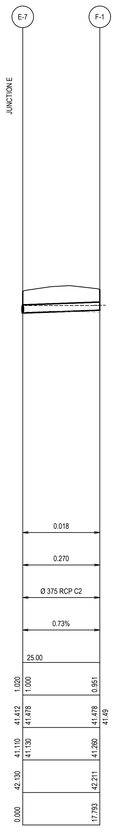
Title: STORMWATER LONGITUDINAL SECTIONS
SHEET 1 OF 2

Drawn	Designed	Date
L.Caha	L.Caha	FEB 18
Checked	Approved	Scale
T.Dempsey	A.Francis	AS NOTED @A0
Drawing number		Revision
17D83_S96_C220		03



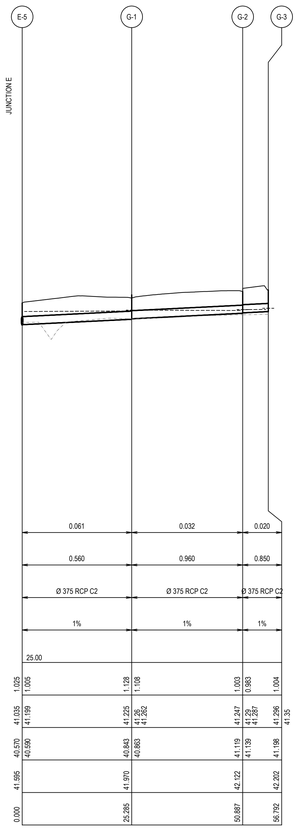
Flow (m³/s)	0.307	0.281	0.256	0.240	0.199	0.107	0.093	0.056	0.036	0.026	
Velocity (m/s)	1.420	1.300	1.180	1.510	1.860	0.970	0.980	1.330	1.250	1.100	
Pipe Size & Class	Ø 525 RCP C2	Ø 525 RCP C2	Ø 525 RCP C2	Ø 450 RCP C2	Ø 375 RCP C2	Ø 375 RCP C2	Ø 375 RCP C2	Ø 375 RCP C2	Ø 375 RCP C2	Ø 375 RCP C2	
Grade (%)	0.5%	0.5%	0.5%	0.5%	0.77%	0.96%	0.87%	0.85%	1%	0.86%	
Datum R.L	25.00										
DEPTH TO INVERT	1.086	1.172	1.152	1.330	1.210	1.246	1.176	1.262	1.033	1.025	1.088	1.108	1.088	1.020	1.033	1.013	0.933	0.914	1.006
H.G.L. LEVELS 1 in 20 Year ARI	39.893 39.893	40.064 40.134		40.286 40.346		40.463 40.491		40.659 40.739		41.035 41.199		41.321 41.37		41.412 41.48 41.478		41.696 41.675		41.726 41.789		41.832 41.93
INVERT R.L.	39.310 39.310	39.492 39.562		39.679 39.799		39.940 40.010		40.131 40.390		40.570 40.590		40.920 40.940		41.110 41.130		41.444 41.464		41.611 41.630		41.730 41.730
SURFACE R.L.	40.396	40.664		41.009		41.186		41.364		41.895		42.028		42.130		42.477		42.545		42.736
PIPE CHAINAGE	0.000	34.471		69.955		98.149		122.432		145.732		180.270		199.811		228.683		251.381	256.382	261.382

LINE E
SCALE: H 1:500
V 1:100



Flow (m³/s)	0.018		
Velocity (m/s)	0.270		
Pipe Size & Class	Ø 375 RCP C2		
Grade (%)	0.73%		
Datum R.L	25.00		
DEPTH TO INVERT	1.020	1.000	0.951
H.G.L. LEVELS 1 in 20 Year ARI	41.412	41.478	41.49
INVERT R.L.	41.110	41.130	41.290
SURFACE R.L.	42.130		42.211
PIPE CHAINAGE	0.000		17.793

LINE F
SCALE: H 1:500
V 1:100

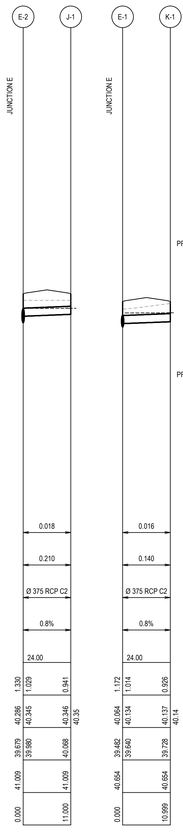


Flow (m³/s)	0.061	0.032	0.020	
Velocity (m/s)	0.560	0.960	0.850	
Pipe Size & Class	Ø 375 RCP C2	Ø 375 RCP C2	Ø 375 RCP C2	
Grade (%)	1%	1%	1%	
Datum R.L	25.00			
DEPTH TO INVERT	1.035	1.128	1.003	0.983	1.004
H.G.L. LEVELS 1 in 20 Year ARI	41.035 41.199	41.225 41.26 41.262	41.247 41.29 41.297	41.296 41.35
INVERT R.L.	40.570 40.590	40.843 40.863	41.119 41.139	41.198
SURFACE R.L.	41.986	41.970	42.122	42.202
PIPE CHAINAGE	0.000	25.285	50.887	56.792

LINE G
SCALE: H 1:500
V 1:100

Flow (m³/s)	0.019		
Velocity (m/s)	0.280		
Pipe Size & Class	Ø 375 RCP C2		
Grade (%)	0.86%		
Datum R.L	24.00		
DEPTH TO INVERT	1.233	1.074	0.864
H.G.L. LEVELS 1 in 20 Year ARI	40.659 40.739	40.739 40.75
INVERT R.L.	40.131 40.390	40.020
SURFACE R.L.	41.364	41.484
PIPE CHAINAGE	0.000	15.122

LINE H
SCALE: H 1:500
V 1:100

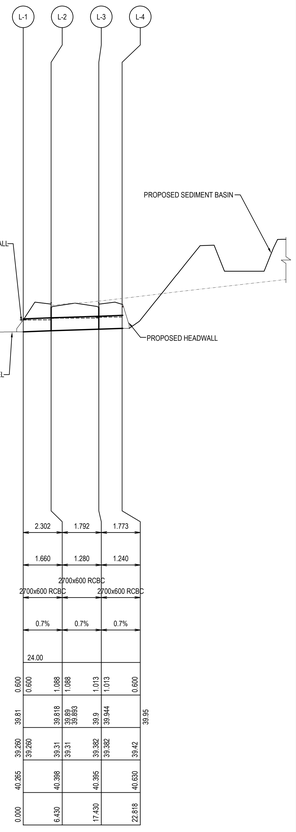


Flow (m³/s)	0.018		
Velocity (m/s)	0.210		
Pipe Size & Class	Ø 375 RCP C2		
Grade (%)	0.8%		
Datum R.L	24.00		
DEPTH TO INVERT	1.130	1.029	0.941
H.G.L. LEVELS 1 in 20 Year ARI	40.286 40.346	40.346 40.35
INVERT R.L.	39.679 39.990	40.068
SURFACE R.L.	41.009	41.009
PIPE CHAINAGE	0.000	11.000

LINE J
SCALE: H 1:500
V 1:100

Flow (m³/s)	0.016	
Velocity (m/s)	0.140	
Pipe Size & Class	Ø 375 RCP C2	
Grade (%)	0.8%	
Datum R.L	24.00	
DEPTH TO INVERT	1.172	1.014	0.926
H.G.L. LEVELS 1 in 20 Year ARI	40.064 40.134	40.137 40.14
INVERT R.L.	39.482 39.990	39.728
SURFACE R.L.	40.664	40.664
PIPE CHAINAGE	0.000	10.999

LINE K
SCALE: H 1:500
V 1:100



Flow (m³/s)	2.302	1.792	1.773	
Velocity (m/s)	1.660	1.280	1.240	
Pipe Size & Class	2700x600 RCBC	2700x600 RCBC	2700x600 RCBC	
Grade (%)	0.7%	0.7%	0.7%	
Datum R.L	24.00			
DEPTH TO INVERT	0.600	0.600	1.088	1.088	1.013	1.013	0.600
H.G.L. LEVELS 1 in 20 Year ARI	39.91 39.91	39.918 39.893	39.9 39.944	39.95
INVERT R.L.	39.290 39.290	39.31 39.31	39.392 39.392	39.42
SURFACE R.L.	40.285	40.396	40.395	40.630
PIPE CHAINAGE	0.000	6.430	17.430	22.818

LINE L
SCALE: H 1:500
V 1:100

SCALE 1:100

SCALE 1:500

SURVEY INFORMATION
SURVEYED BY: LAND PARTNERS
DATUM: AHD
ORIGIN OF LEVELS: PM 30122 RL 43.58

REVISION	AMENDMENT	DRAWN	DESIGNED	DATE
03	ISSUED FOR S96	IK	NW	20.03.2019
02	ISSUED FOR S96	LC	LC	13.04.2018
01	ISSUED FOR S96	MC	LC	09.02.2018

Client: FRASER PROPERTY AUSTRALIA
Surveyor: LANDPARTNERS

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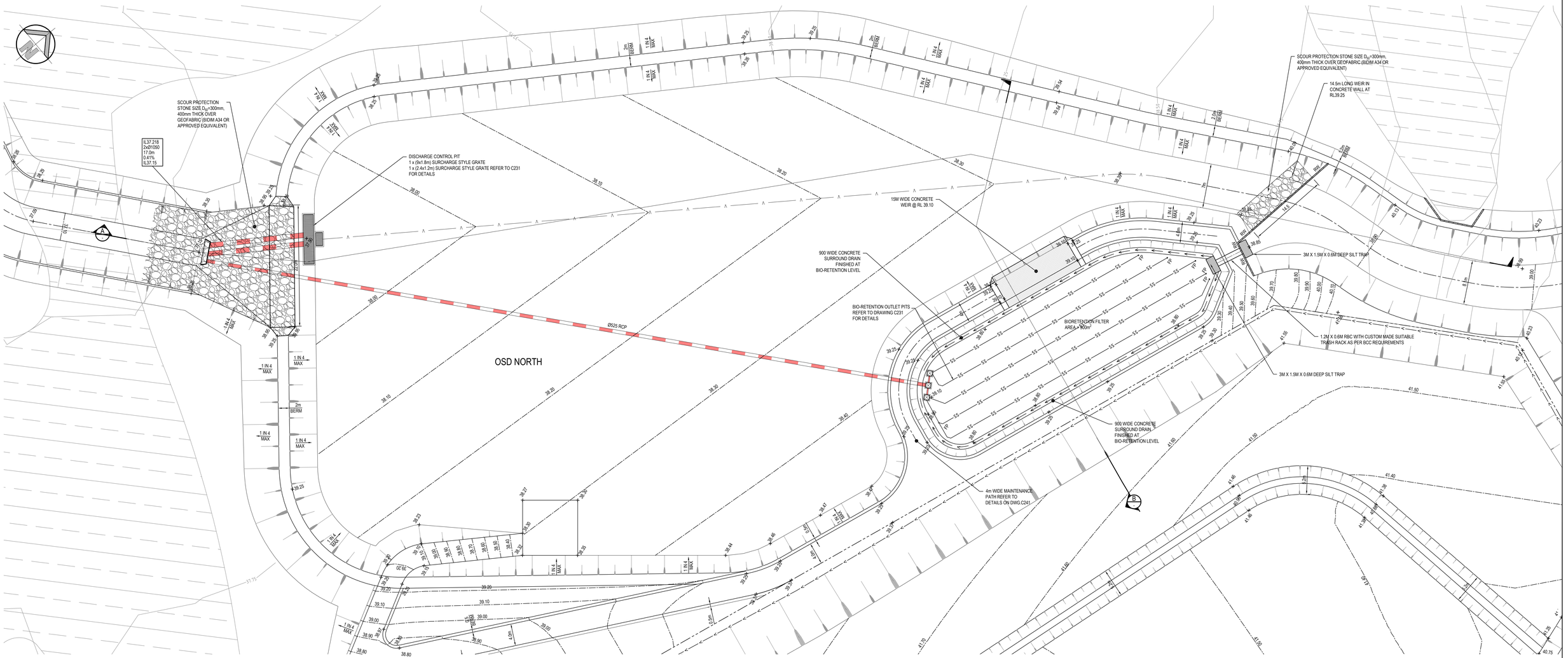
ISSUED FOR S96

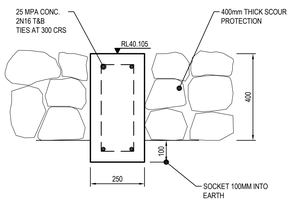
Project: EASTERN CREEK BUSINESS HUB
WESTERN SYDNEY PARKLANDS

Title: STORMWATER LONGITUDINAL SECTIONS
SHEET 2 OF 2

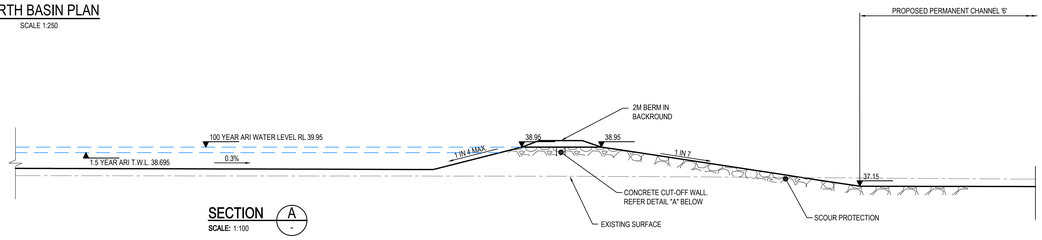
Drawn	Designed	Date
L.Caha	L.Caha	FEB 18
Checked	Approved	Scale
T.Dempsey	A.Francis	AS NOTED @A0
Drawing number		Revision
17D83_S96_C221		03



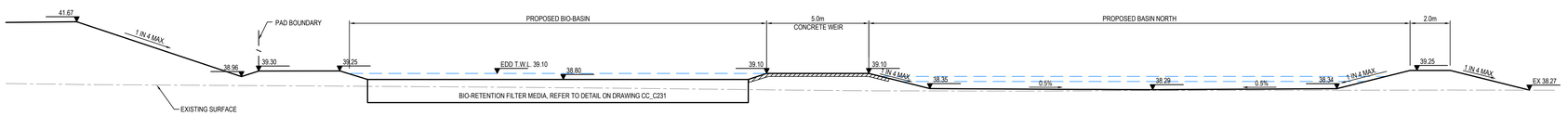
NORTH BASIN PLAN
SCALE 1:250



DETAIL A
SCALE: 1:10



SECTION A
SCALE: 1:100



SECTION B
SCALE: 1:100

SCALE 1:100

SCALE 1:250

ISSUED FOR S96

SURVEY INFORMATION
SURVEYED BY: LAND PARTNERS
DATUM: AHD
ORIGIN OF LEVELS: PM 30122 RL 43.58

REVISION	AMENDMENT	DRAWN	DESIGNED	DATE
03	ISSUED FOR S96	K	NW	20.03.2019
02	ISSUED FOR S96	MC	LC	13.04.2018
01	ISSUED FOR S96	MC	LC	09.02.2018

Client: FRASER PROPERTY AUSTRALIA
Surveyor: LANDPARTNERS

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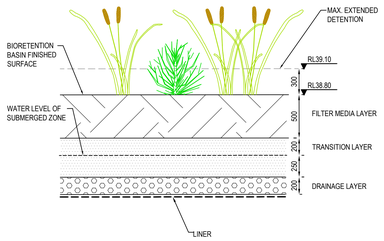
Project: EASTERN CREEK BUSINESS HUB
WESTERN SYDNEY PARKLANDS

Title: NORTH BASIN
PLAN AND SECTIONS

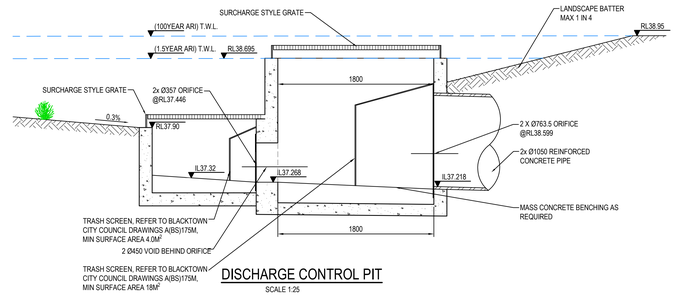
Drawn	Designed	Date
L.Caha	L.Caha	FEB 18
Checked	Approved	Scale
T.Dempsey	A.Francis	AS SHOWN @A0

Drawing number: 17D83_S96_C230
Revision: 03



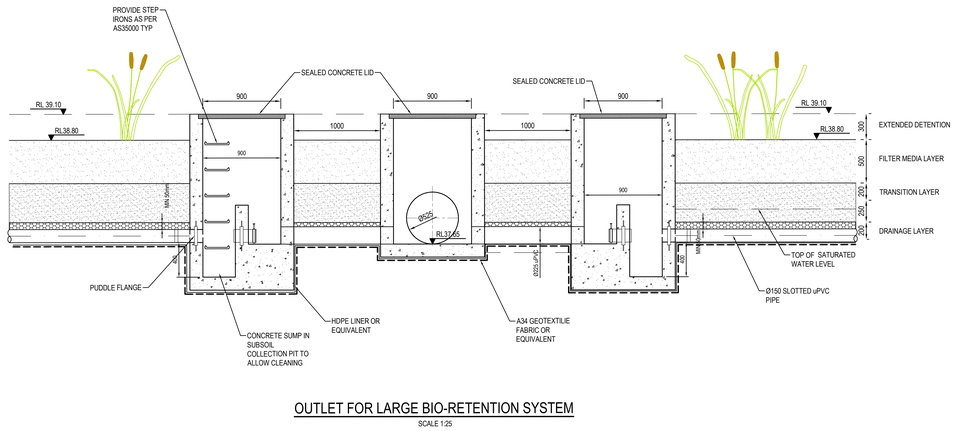
BIO-RETENTION FILTER PROFILE

SCALE 1:25



DISCHARGE CONTROL PIT

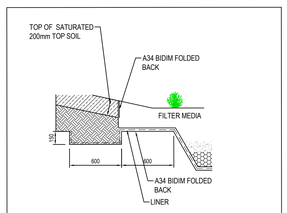
SCALE 1:25



OUTLET FOR LARGE BIO-RETENTION SYSTEM

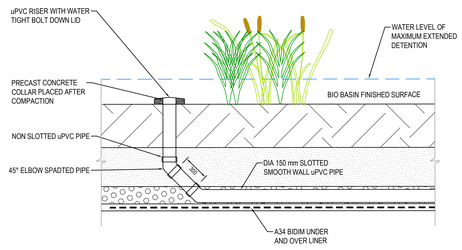
SCALE 1:25

Above Ground OSD Summary with calculated values	
Site:	
Site Area	151300 m²
Site Area NOT Draining to OSD	0 m²
Reduced Levels (AHD):	
RL of Top of Tank	39.25
RL of Bottom of OSD Tank	38.2
RL of 1.5 Year ARI Overflow Weir	38.695
RL of Emergency Overflow Weir	38.95
RL of 1.5 Year ARI Orifice Centerline	37.446
RL of 100 Year ARI Orifice Centreline	37.599
RL of Invert of Discharge to Council Drainage Pit	37.15
RL of obvert of Pit outlet pipe	37.68
Minium RL of Garage Floor	39.34
Minium RL of House Floor	39.44
OSD Volume:	
Required Storage BELOW 1.5 Year ARI Overflow Weir	4729.6 m³
Required Storage BELOW Emergency Overflow Weir	7173.3 m³
Discharge Details:	
Using Filter Cartridges to Manage Water Quality	No
Discharge Location	Council Drainage Pit
Length of Emergency Overflow Weir	22.00 m
Maximum 1.5 Year ARI Site Discharge	605.20 L/s
1.5 Year ARI Orifice Discharge	605.20 L/s
Maximum 100 Year ARI Site Discharge	2874.7
100 Year ARI Orifice Discharge	2874.70 L/s
Orifice Details:	
Number of 1.5 Year ARI Orifices	2
Number of 100 Year ARI Orifices	2
1.5 Year ARI Orifice Size (mm)	357.0 mm
100 Year ARI Orifice Size (mm)	763.5 mm
Notifications:	
Due to the Outlet Orifice being drowned by 14% during 100 ARI event an extra 4.2% of Storage volume has been added.	



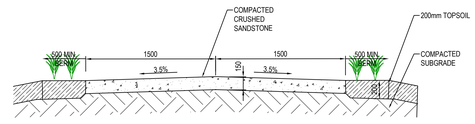
BIO-RETENTION LINER DETAIL

NTS



FLUSHING POINT

NTS



MAINTENANCE ACCESS TRACK

SCALE 1:25

NOTE:
ACCESS PATH TO HAVE MAXIMUM 10% LONGITUDINAL GRADE

0 500 1000 1500 2000 2500mm
500 300 100
SCALE 1:25

0 400 800 1200 1600 2000mm
400 200
SCALE 1:20

SURVEY INFORMATION
SURVEYED BY: LAND PARTNERS
DATUM: AHD
ORIGIN OF LEVELS: PM 30122 RL 43.58

REVISION	AMENDMENT	DRAWN	DESIGNED	DATE
03	ISSUED FOR S96	IK	NW	20.03.2018
02	ISSUED FOR S96	MC	LC	13.04.2018
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Client: FRASER PROPERTY AUSTRALIA
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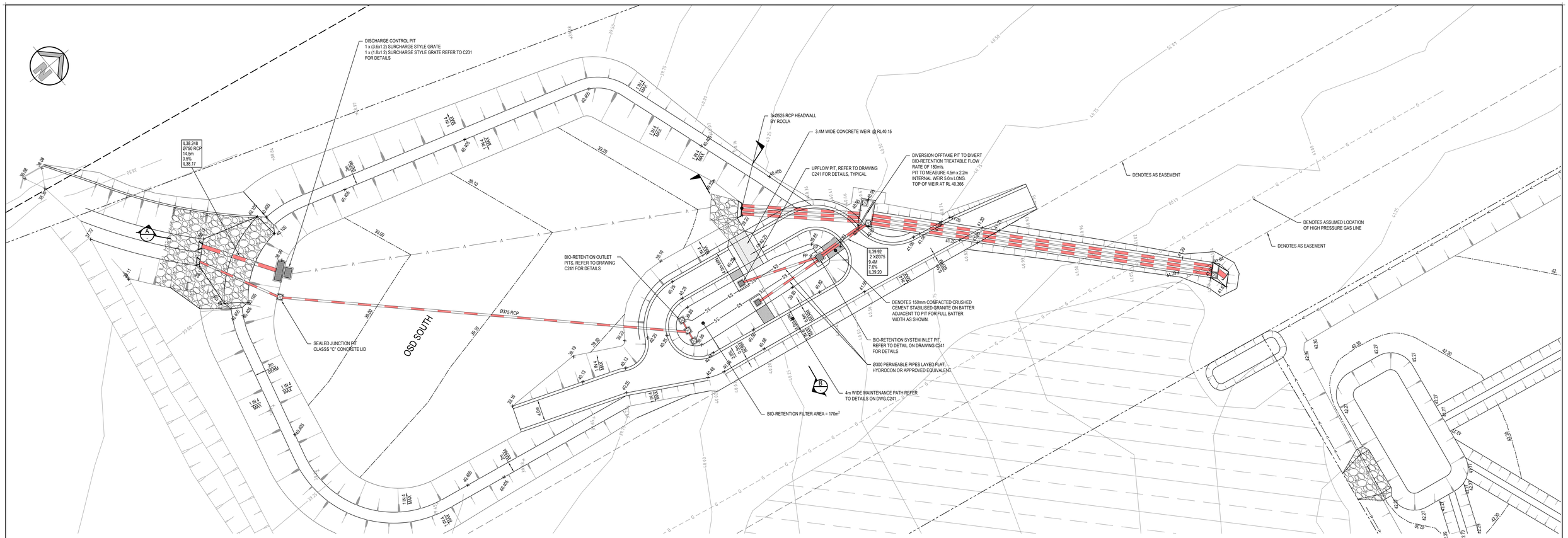
ISSUED FOR S96

Project: EASTERN CREEK BUSINESS HUB
WESTERN SYDNEY PARKLANDS

Title: NORTH BASIN DETAILS

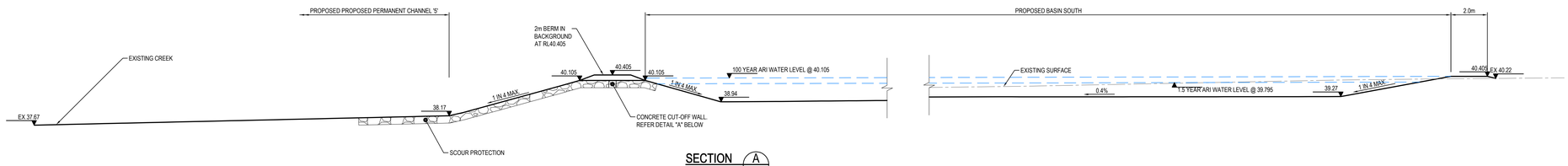
Drawn	Designed	Date
L.Caha	L.Caha	FEB 18
Checked	Approved	Scale
T.Dempsey	A.Francis	AS SHOWN @A0

Drawing number: 17D83_S96_C231
Revision: 03



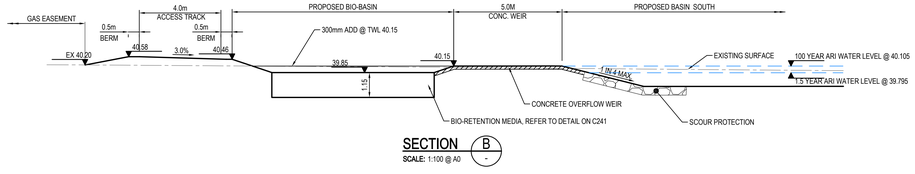
SOUTH BASIN PLAN

SCALE 1:250 @ A0



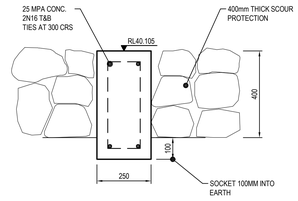
SECTION A

SCALE: 1:100 @ A0



SECTION B

SCALE: 1:100 @ A0



DETAIL A

SCALE: 1:100

SCALE 1:100

SCALE 1:250

ISSUED FOR S96

SURVEY INFORMATION

SURVEYED BY: LAND PARTNERS

DATUM: AHD

ORIGIN OF LEVELS: PM 30122 RL 43.58

REVISION	AMENDMENT	DRAWN	DESIGNED	DATE
03	ISSUED FOR S96	IK	NW	20.03.2019
02	ISSUED FOR S96	MC	LC	13.04.2018
01	ISSUED FOR S96	MC	LC	09.02.2018

Client: FRASER PROPERTY AUSTRALIA

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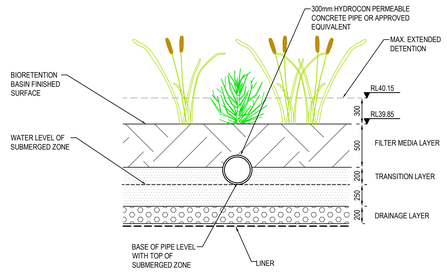
Project: EASTERN CREEK BUSINESS HUB
WESTERN SYDNEY PARKLANDS

Title: SOUTH BASIN
PLAN AND SECTIONS

Drawn	Designed	Date
L.Caha	L.Caha	FEB 18
Checked	Approved	Scale
T.Dempsey	A.Francis	AS SHOWN @A0

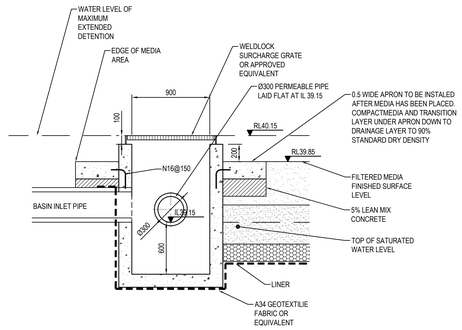
Drawing number: 17D83_S96_C240

Revision: 03



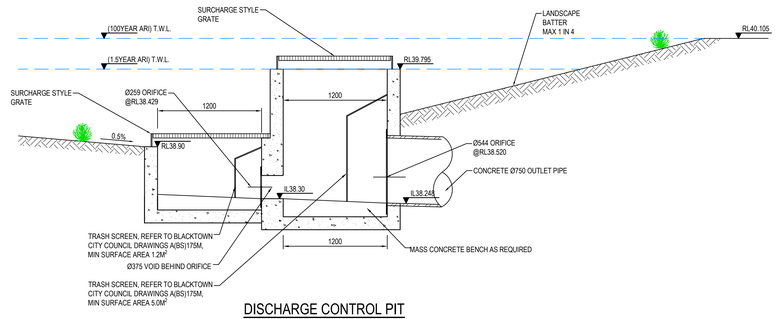
BIO-RETENTION FILTER PROFILE INCUDING PERMEABLE CONCRETE PIPE

SCALE 1:25



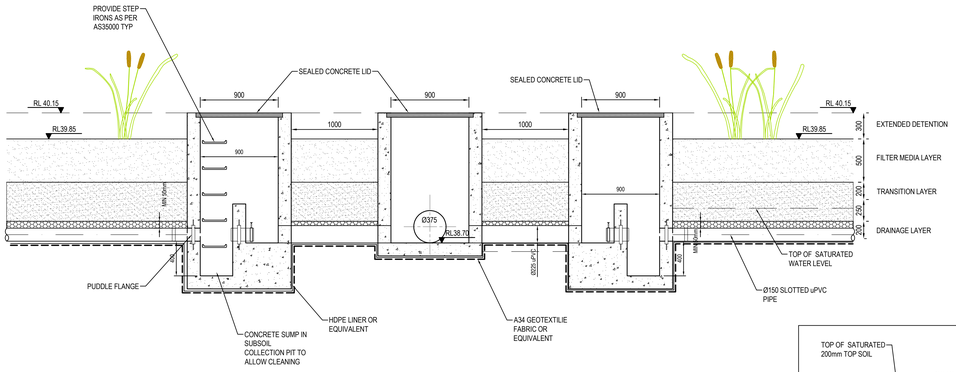
BIO-RETENTION SYSTEM INLET PIT

SCALE 1:25



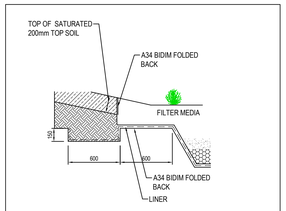
DISCHARGE CONTROL PIT

SCALE 1:25



OUTLET FOR LARGE BIO-RETENTION SYSTEM

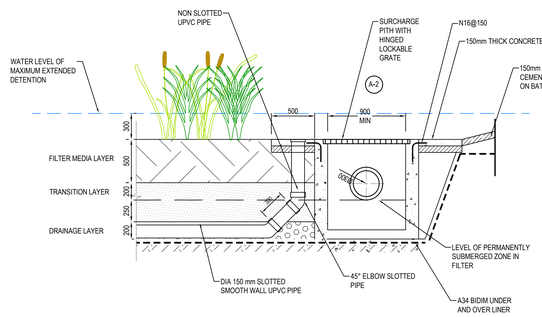
SCALE 1:25



BIO-RETENTION LINER DETAIL

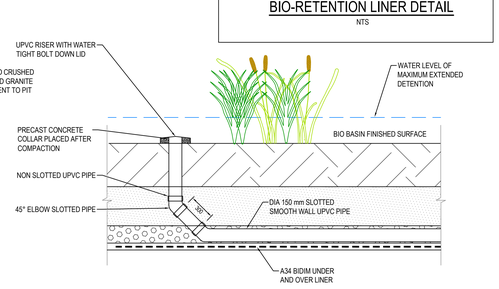
NTS

Above Ground OSD Summary with calculated values	
Site:	
Site Area	41680 m²
Site Area NOT Draining to OSD	0 m²
Reduced Levels (AHD):	
RL of Top of Tank	40.245
RL of Bottom of OSD Tank	39.2
RL of 1.5 Year ARI Overflow Weir	39.795
RL of Emergency Overflow Weir	40.105
RL of 1.5 Year ARI Orifice Centerline	38.429
RL of 100 Year ARI Orifice Centreline	38.52
RL of Invert of Discharge to Council Drainage Pit	38.17
RL of obvert of Pit outlet pipe	39.05
Minium RL of Garage Floor	40.335
Minium RL of House Floor	40.435
OSD Volume:	
Required Storage BELOW 1.5 Year ARI Overflow Weir	2021.9 m³
Required Storage BELOW Emergency Overflow Weir	3066.5 m³
Discharge Details:	
Using Filter Cartridges to Manage Water Quality	No
Discharge Location	Council Drainage Pit
Length of Emergency Overflow Weir	20.00 m
Maximum 1.5 Year ARI Site Discharge	166.72 L/s
1.5 Year ARI Orifice Discharge	166.72 L/s
Maximum 100 Year ARI Site Discharge	791.92
100 Year ARI Orifice Discharge	791.92 L/s
Orifice Details:	
Number of 1.5 Year ARI Orifices	1
Number of 100 Year ARI Orifices	1
1.5 Year ARI Orifice Size (mm)	259.5 mm
100 Year ARI Orifice Size (mm)	544.5 mm
Notifications:	
Due to the Outlet Orifice being drowned by 39.4% during 100 ARI event an extra 61.7% of Storage volume has been added.	



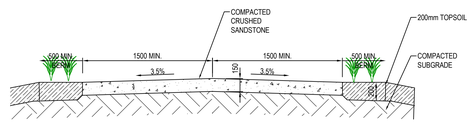
TYPICAL UPFLOW OUTLET PIT LOCATED IN BIORETENTION BASIN

NTS



FLUSHING POINT

NTS



MAINTENANCE ACCESS TRACK

SCALE 1:25

NOTE:
ACCESS PATH TO HAVE MAXIMUM 10% LONGITUDINAL GRADE

SCALE 1:100

SCALE 1:250

SURVEY INFORMATION

SURVEYED BY: LAND PARTNERS
DATUM: AHD
ORIGIN OF LEVELS: PM 30122 RL 43.58

REVISION	AMENDMENT	DRAWN	DESIGNED	DATE
03	ISSUED FOR S96	K	NW	20.03.2019
02	ISSUED FOR S96	MC	LC	13.04.2018
01	ISSUED FOR S96	MC	LC	09.02.2018

Client: FRASER PROPERTY AUSTRALIA
Surveyor: LANDPARTNERS

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henry&hymas

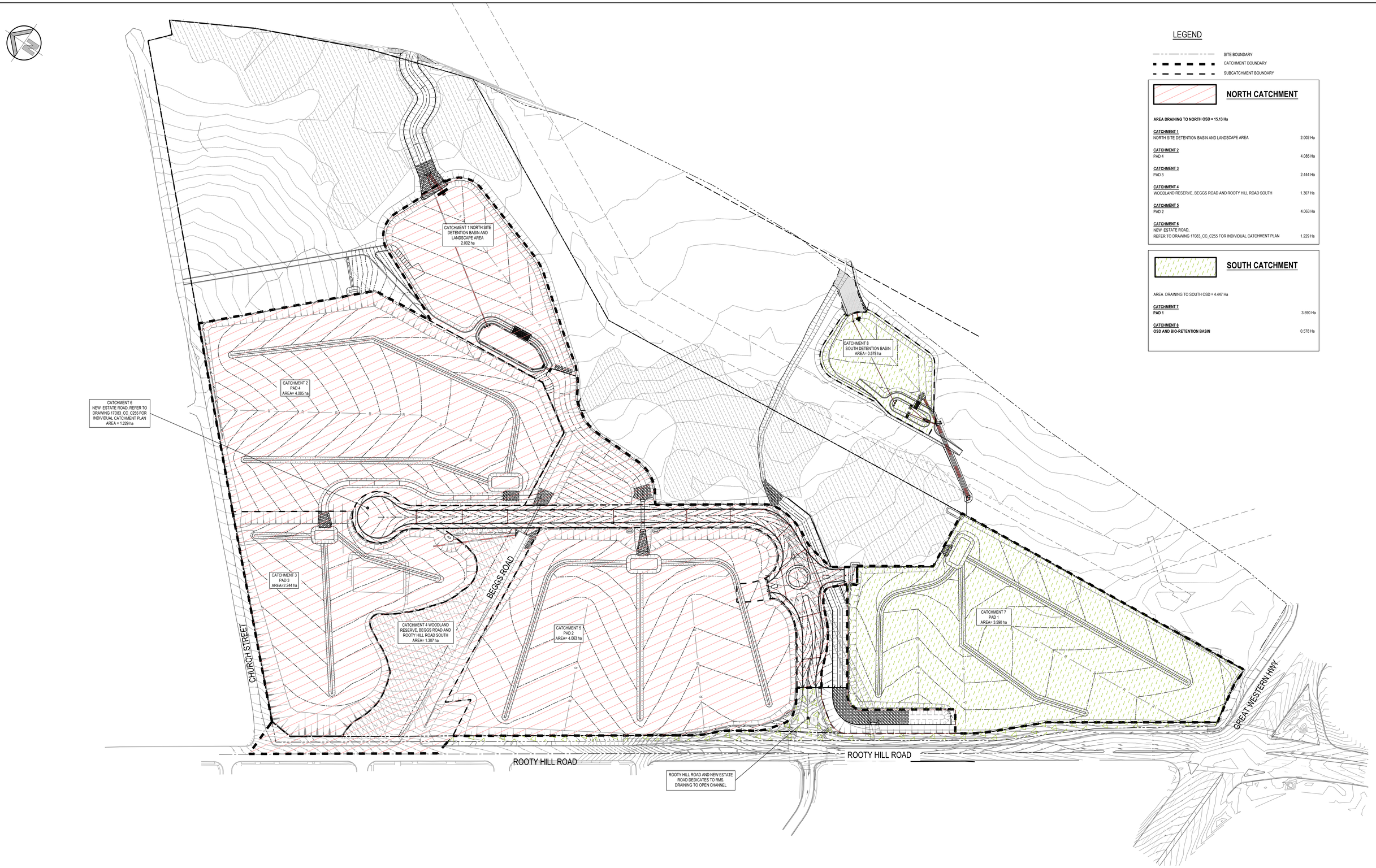
ISSUED FOR S96

Project: EASTERN CREEK BUSINESS HUB
WESTERN SYDNEY PARKLANDS

Title: SOUTH BASIN
DETAILS

Drawn	Designed	Date
L.Caha	L.Caha	FEB 18
Checked	Approved	Scale
T.Dempsey	A.Francis	AS SHOWN @A0

Drawing number: 17D83_S96_C241
Revision: 03



LEGEND

SITE BOUNDARY

CATCHMENT BOUNDARY

SUBCATCHMENT BOUNDARY

NORTH CATCHMENT

AREA DRAINING TO NORTH OSD = 15.13 Ha

CATCHMENT 1 NORTH SITE DETENTION BASIN AND LANDSCAPE AREA	2.002 Ha
CATCHMENT 2 PAD 4	4.085 Ha
CATCHMENT 3 PAD 3	2.444 Ha
CATCHMENT 4 WOODLAND RESERVE, BEGGS ROAD AND ROOTY HILL ROAD SOUTH	1.307 Ha
CATCHMENT 5 PAD 2	4.063 Ha
CATCHMENT 6 NEW ESTATE ROAD, REFER TO DRAWING 17083_CC_C255 FOR INDIVIDUAL CATCHMENT PLAN	1.229 Ha

SOUTH CATCHMENT

AREA DRAINING TO SOUTH OSD = 4.447 Ha

CATCHMENT 7 PAD 1	3.590 Ha
CATCHMENT 8 OSD AND BIO-RETENTION BASIN	0.578 Ha

CATCHMENT PLAN - WATER QUANTITY

SCALE: 1:1000

0 20 40 60 80 100m

20 15 10 5

SCALE 1:1000

ISSUED FOR S96

SURVEY INFORMATION

SURVEYED BY: LAND PARTNERS

DATUM: AHD

ORIGIN OF LEVELS: PM 30122 RL 43.58

REVISION	AMENDMENT	DRAWN	DESIGNED	DATE
03	ISSUED FOR S96	K	NW	20.03.2019
02	ISSUED FOR S96	MC	LC	13.04.2018
01	ISSUED FOR S96	MC	LC	09.02.2018

Client: FRASER PROPERTY AUSTRALIA

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henry&hymas

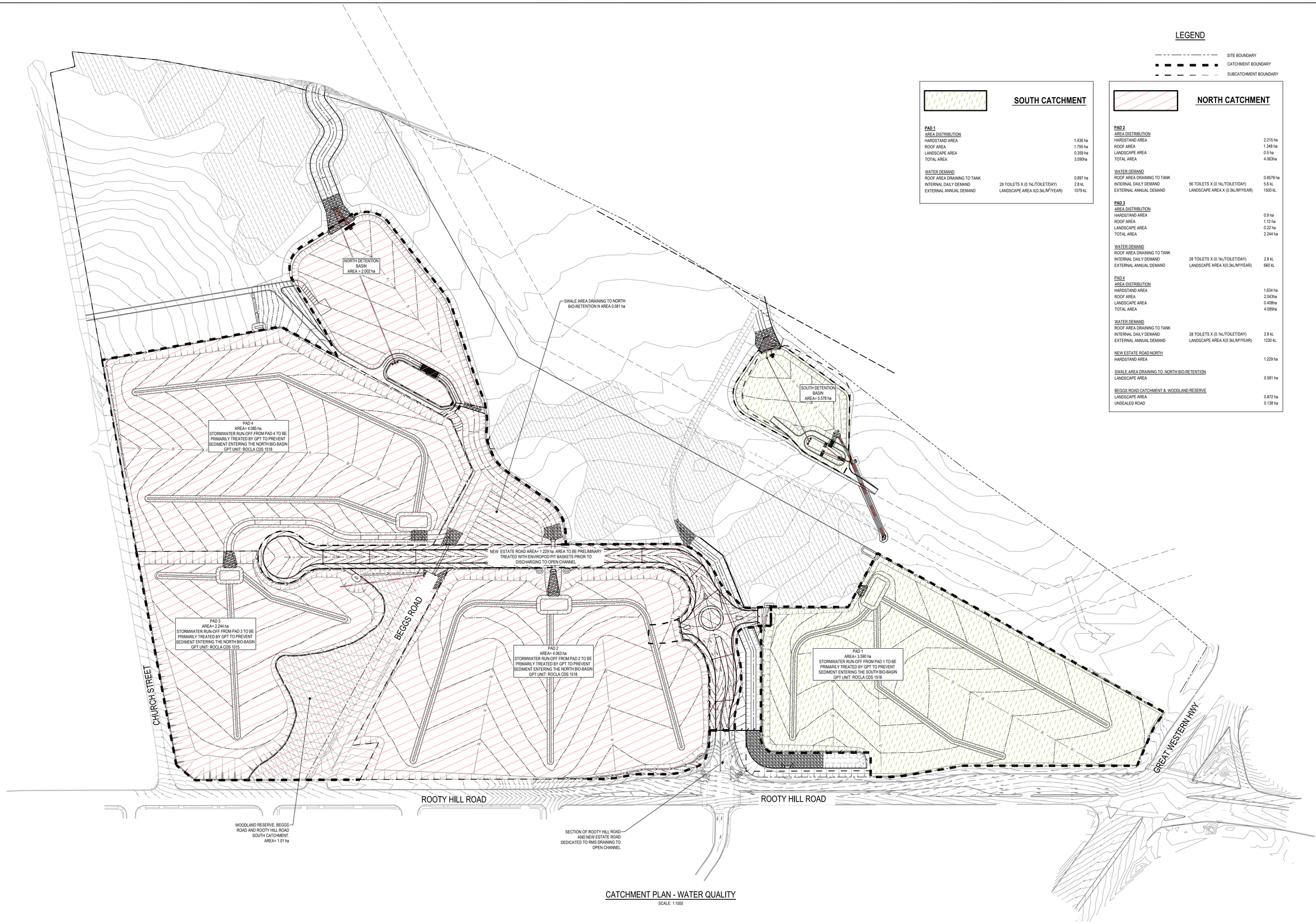
Project: EASTERN CREEK BUSINESS HUB
WESTERN SYDNEY PARKLANDS

Title: CATCHMENT PLAN - WATER QUANTITY

Drawn	Designed	Date
M.Cerna	L.Caha	FEB 18
Checked	Approved	Scale
T.Dempsey	A.Francis	1:1000 @A0

Drawing number: 17D83_S96_C250

Revision: 03



LEGEND

- SITE BOUNDARY
- CATCHMENT BOUNDARY
- SUBCATCHMENT BOUNDARY

SOUTH CATCHMENT

PAD 1

AREA DISTRIBUTION		
HARDSTAND AREA		1.436 ha
ROOF AREA		1.795 ha
LANDSCAPE AREA		0.359 ha
TOTAL AREA		3.590ha
WATER DEMAND		
ROOF AREA DRAINING TO TANK		0.897 ha
INTERNAL DAILY DEMAND	28 TOILETS X (0.1kL/TOILET/DAY)	2.8 kL
EXTERNAL ANNUAL DEMAND	LANDSCAPE AREA X(0.3kL/M²/YEAR)	1079 kL

NORTH CATCHMENT

PAD 2

AREA DISTRIBUTION		
HARDSTAND AREA		2.215 ha
ROOF AREA		1.348 ha
LANDSCAPE AREA		0.5 ha
TOTAL AREA		4.063ha
WATER DEMAND		
ROOF AREA DRAINING TO TANK		0.8578 ha
INTERNAL DAILY DEMAND	56 TOILETS X (0.1kL/TOILET/DAY)	5.6 kL
EXTERNAL ANNUAL DEMAND	LANDSCAPE AREA X (0.3kL/M²/YEAR)	1500 kL

PAD 3

AREA DISTRIBUTION		
HARDSTAND AREA		0.9 ha
ROOF AREA		1.12 ha
LANDSCAPE AREA		0.22 ha
TOTAL AREA		2.244 ha
WATER DEMAND		
ROOF AREA DRAINING TO TANK		
INTERNAL DAILY DEMAND	28 TOILETS X (0.1kL/TOILET/DAY)	2.8 kL
EXTERNAL ANNUAL DEMAND	LANDSCAPE AREA X(0.3kL/M²/YEAR)	660 kL

PAD 4

AREA DISTRIBUTION		
HARDSTAND AREA		1.634 ha
ROOF AREA		2.043ha
LANDSCAPE AREA		0.408ha
TOTAL AREA		4.085ha
WATER DEMAND		
ROOF AREA DRAINING TO TANK		
INTERNAL DAILY DEMAND	28 TOILETS X (0.1kL/TOILET/DAY)	2.8 kL
EXTERNAL ANNUAL DEMAND	LANDSCAPE AREA X(0.3kL/M²/YEAR)	1230 kL
NEW ESTATE ROAD NORTH		
HARDSTAND AREA		1.229 ha
SWALE AREA DRAINING TO NORTH BIO-RETENTION		
LANDSCAPE AREA		0.581 ha
BEGGS ROAD CATCHMENT & WOODLAND RESERVE		
LANDSCAPE AREA		0.872 ha
UNSEALED ROAD		0.138 ha

CATCHMENT PLAN - WATER QUALITY

SCALE: 1:1000

0 20 40 60 80 100m
20 15 10 5
SCALE 1:1000

ISSUED FOR S96

SURVEY INFORMATION
SURVEYED BY: LAND PARTNERS
DATUM: AHD
ORIGIN OF LEVELS: PM 30122 RL 43.58

REVISION	AMENDMENT	DRAWN	DESIGNED	DATE
03	ISSUED FOR S96	IK	NW	20.03.2019
02	ISSUED FOR S96	MC	LC	13.04.2018
01	ISSUED FOR S96	MC	LC	09.02.2018

Client: FRASER PROPERTY AUSTRALIA
Surveyor: LANDPARTNERS

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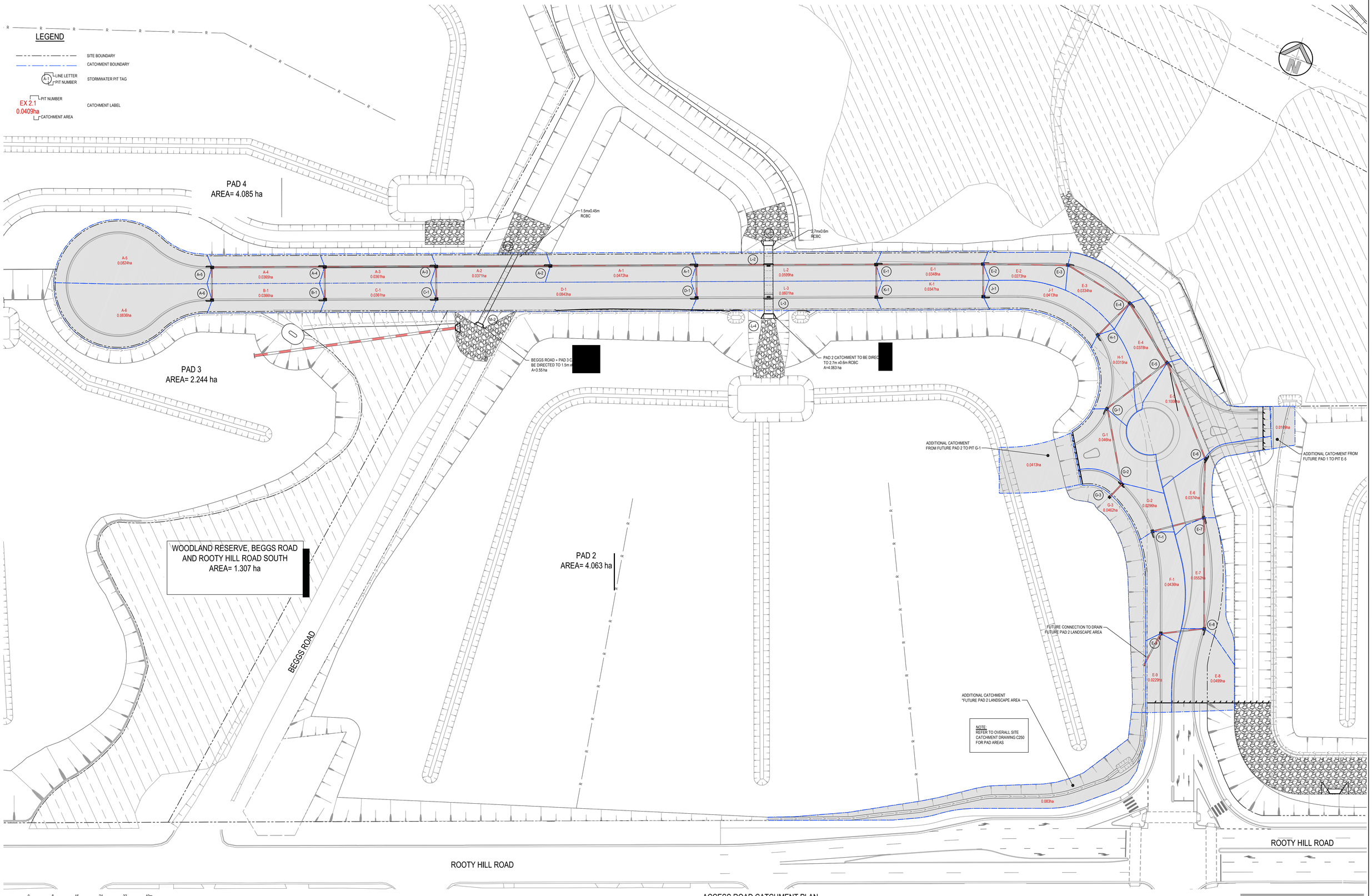
Project: EASTERN CREEK BUSINESS HUB
WESTERN SYDNEY PARKLANDS

Title: CATCHMENT PLAN - WATER QUALITY

Drawn	Designed	Date
M.Cerna	L.Caha	FEB 18
Checked	Approved	Scale
T.Dempsey	A.Francis	1:1000 @A0

Drawing number: 17D83_S96_C251
Revision: 03



ACCESS ROAD CATCHMENT PLAN

SCALE: 1:400

ISSUED FOR S96

SURVEY INFORMATION
SURVEYED BY: LAND PARTNERS
DATUM: AHD
ORIGIN OF LEVELS: PM 30122 RL 43.58

REVISION	AMENDMENT	DRAWN	DESIGNED	DATE
03	ISSUED FOR S96	IK	NW	20.03.2019
02	ISSUED FOR S96	LC	LC	13.04.2018
01	ISSUED FOR S96	LC	LC	09.02.2018

Client: FRASER PROPERTY AUSTRALIA
Surveyor: LANDPARTNERS

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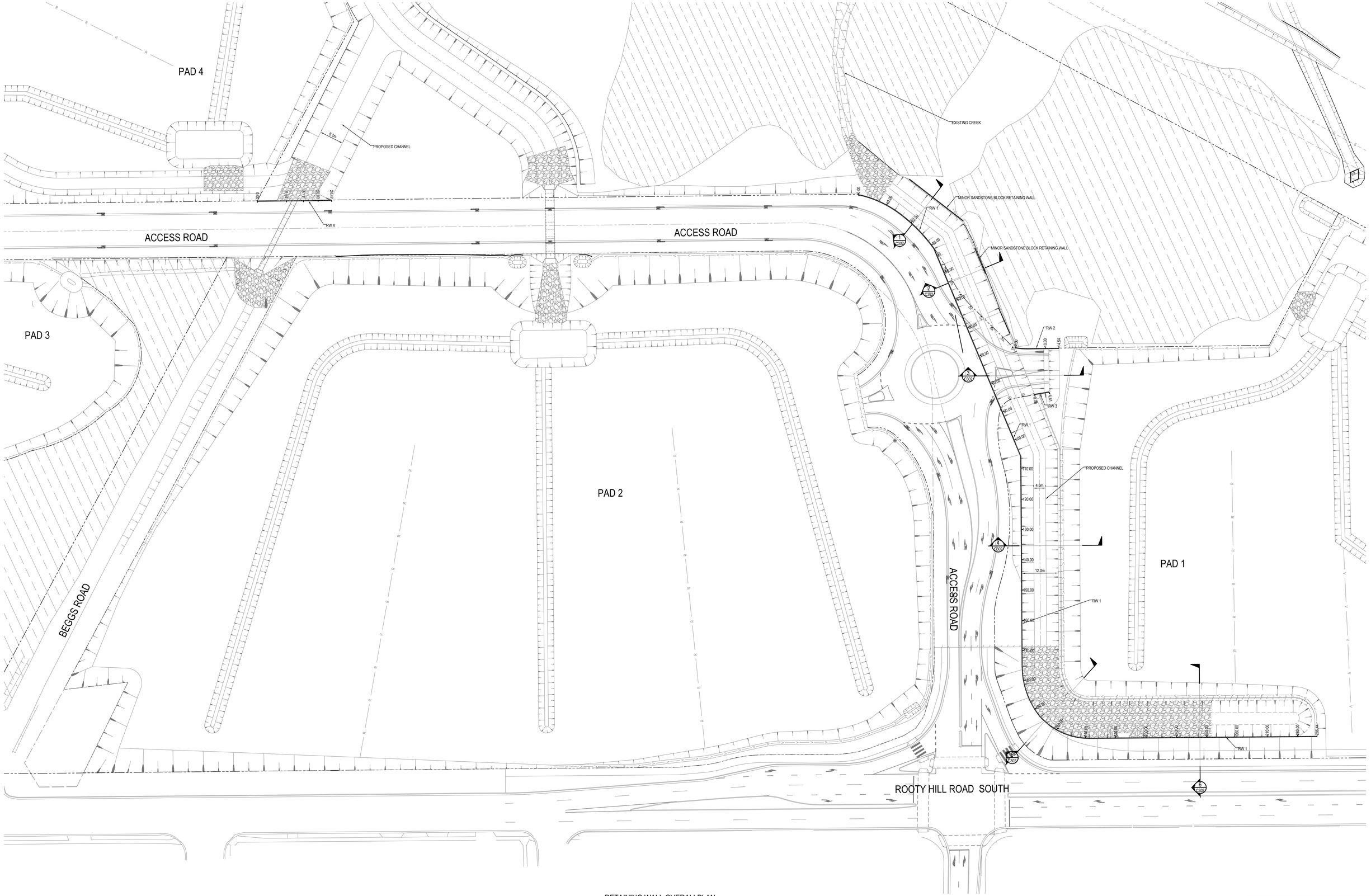
henry&hymas

Project: EASTERN CREEK BUSINESS HUB
WESTERN SYDNEY PARKLANDS

Title: ACCESS ROAD CATCHMENT PLAN

Drawn	Designed	Date
M.Cerna	L.Caha	FEB 18
Checked	Approved	Scale
T.Dempsey	A.Francis	1:400 @A0

Drawing number: 17D83_S96_C255
Revision: 03



0 8 16 24 32 40m
8 6 4 2
SCALE 1:400

RETAINING WALL OVERALLPLAN

SCALE: 1:400

ISSUED FOR S96

SURVEY INFORMATION

SURVEYED BY: LAND PARTNERS
DATUM: AHD
ORIGIN OF LEVELS: PM 30122 RL 43.58

REVISION	AMENDMENT	DRAWN	DESIGNED	DATE
03	ISSUED FOR S96	IK	NW	20.03.2019
02	ISSUED FOR S96	LC	LC	13.04.2018
01	ISSUED FOR S96	MC	LC	09.02.2018

Client: FRASER PROPERTY AUSTRALIA
Surveyor: LANDPARTNERS

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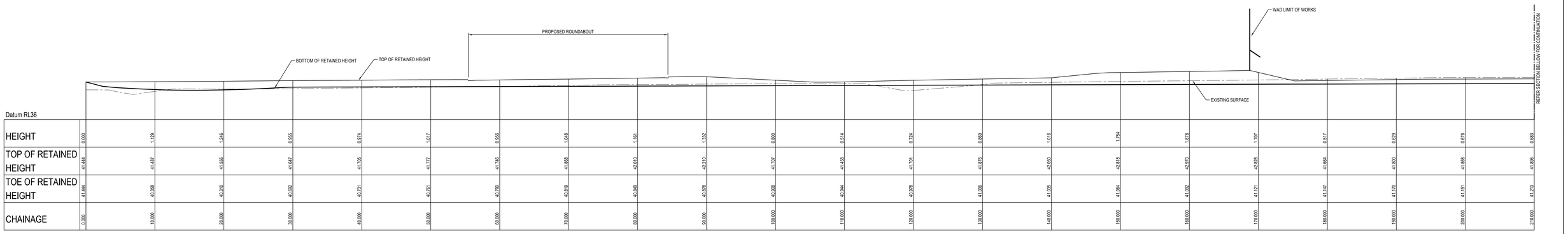
Project: EASTERN CREEK BUSINESS HUB
WESTERN SYDNEY PARKLANDS

Title: RETAINING WALL OVERALL PLAN

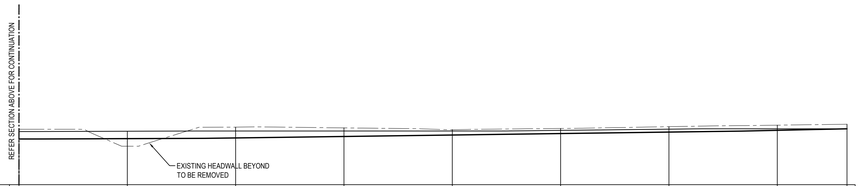
Drawn	Designed	Date
L.Caha	L.Caha	FEB 18
Checked	Approved	Scale
T.Dempsey	A.Francis	1:400 @A0
Drawing number		Revision
17D83_S96_C300		03



Datum RL36

HEIGHT	0.000	1.129	1.246	0.955	0.974	1.017	0.956	1.048	1.161	1.392	0.800	0.514	0.724	0.869	1.016	1.754	1.878	1.707	0.517	0.629	0.676	0.883
TOP OF RETAINED HEIGHT	41.444	41.487	41.566	41.647	41.705	41.777	41.746	41.868	42.010	42.210	41.707	41.458	41.701	41.876	42.050	42.818	42.870	42.838	41.664	41.800	41.868	41.866
TOE OF RETAINED HEIGHT	41.444	40.358	40.319	40.682	40.731	40.761	40.790	40.819	40.849	40.878	40.908	40.944	40.978	41.006	41.035	41.064	41.092	41.121	41.147	41.170	41.191	41.213
CHAINAGE	0.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000	100.000	110.000	120.000	130.000	140.000	150.000	160.000	170.000	180.000	190.000	200.000	210.000

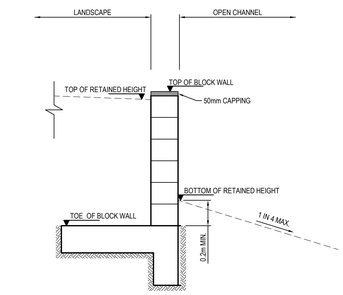
RETAINING WALL - RW 1
HORIZONATL SCALE 1:200 @ A0
VERTICAL SCALE 1:200 @ A0



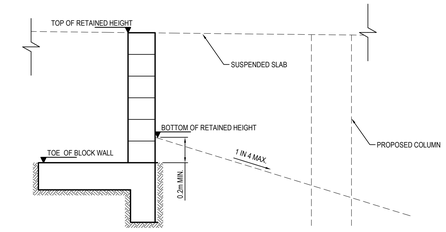
Datum RL37

HEIGHT	0.883	0.884	0.638	0.501	0.360	0.287	0.261	0.135	0.000
TOP OF RETAINED HEIGHT	41.896	41.929	41.950	41.950	41.950	42.007	42.117	42.150	42.150
TOE OF RETAINED HEIGHT	41.213	41.244	41.314	41.449	41.585	41.720	41.856	42.015	42.150
CHAINAGE	210.000	220.000	230.000	240.000	250.000	260.000	270.000	280.000	286.436

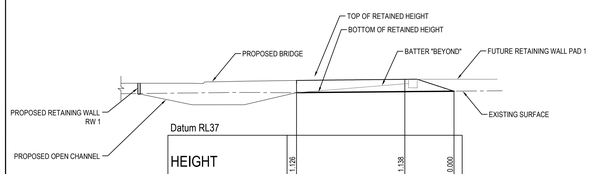
RETAINING WALL - RW 1 - CONTINUATION
HORIZONATL SCALE 1:200 @ A0
VERTICAL SCALE 1:200 @ A0



TYPICAL BLOCK RETAINING WALL RW 1
SCALE: NTS



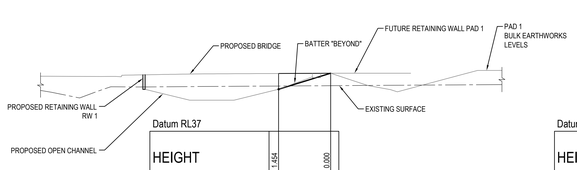
TYPICAL BLOCK RETAINING WALL RW 1 UNDER ROAD
SCALE: NTS



Datum RL37

HEIGHT	1.126	1.138	0.000
TOP OF RETAINED HEIGHT	42.061	42.167	41.999
TOE OF RETAINED HEIGHT	40.935	41.029	41.999
CHAINAGE	0.000	10.000	14.539

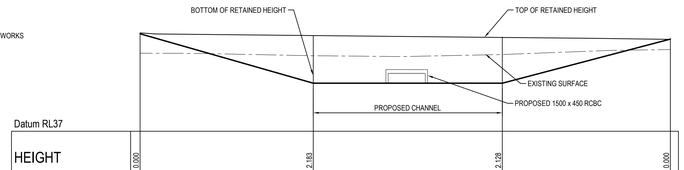
RETAINING WALL - RW 2
HORIZONATL SCALE 1:200 @ A0
VERTICAL SCALE 1:200 @ A0



Datum RL37

HEIGHT	1.454	0.000
TOP OF RETAINED HEIGHT	42.334	42.357
TOE OF RETAINED HEIGHT	40.881	42.357
CHAINAGE	0.000	4.611

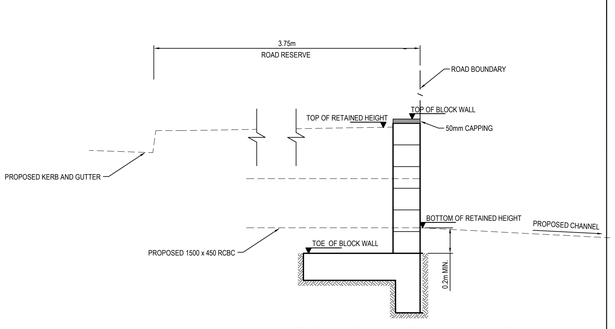
RETAINING WALL - RW 3
HORIZONATL SCALE 1:200 @ A0
VERTICAL SCALE 1:200 @ A0



Datum RL37

HEIGHT	0.000	2.183	2.128	0.000
TOP OF RETAINED HEIGHT	41.499	41.483	41.348	41.254
TOE OF RETAINED HEIGHT	41.499	39.300	39.220	41.254
CHAINAGE	0.000	7.991	16.719	24.473

RETAINING WALL - RW 4
HORIZONATL SCALE 1:100 @ A0
VERTICAL SCALE 1:100 @ A0



TYPICAL BLOCK RETAINING WALL RW 4
SCALE: NTS

NOTE:
RETAINING WALL SECTIONS SHOWN ON THIS PLAN ARE TYPICAL ONLY. FULL STRUCTURAL DETAILS TO BE PROVIDED AT CC STAGE.

0 2 4 6 8 10m
2 1
SCALE 1:100

0 4 8 12 16 20m
4 3 2 1
SCALE 1:200

SURVEY INFORMATION
SURVEYED BY: LAND PARTNERS
DATUM: AHD
ORIGIN OF LEVELS: PM 30122 RL 43.58

REVISION	AMENDMENT	DRAWN	DESIGNED	DATE
03	ISSUED FOR S96	IK	NW	20.03.2019
02	ISSUED FOR S96	LC	LC	13.04.2018
01	ISSUED FOR S96	MC	LC	09.02.2018

Client: FRASER PROPERTY AUSTRALIA
Surveyor: LANDPARTNERS

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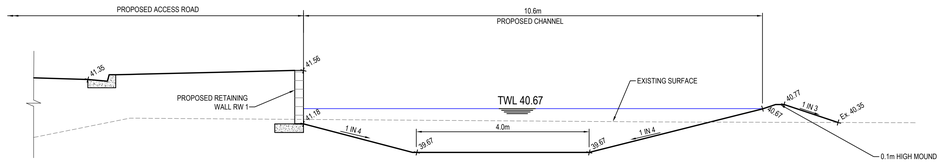
ISSUED FOR S96

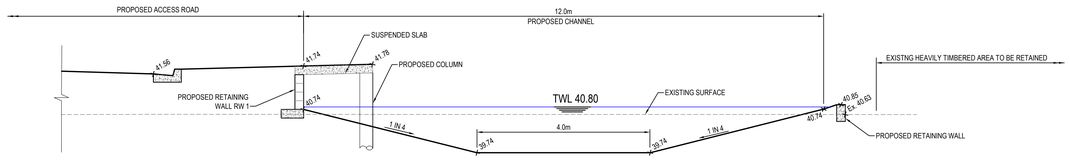
Project: EASTERN CREEK BUSINESS HUB
WESTERN SYDNEY PARKLANDS

Drawn	Designed	Date
L.Caha	L.Caha	FEB 18
Checked	Approved	Scale
T.Dempsey	A.Francis	AS NOTED @A0

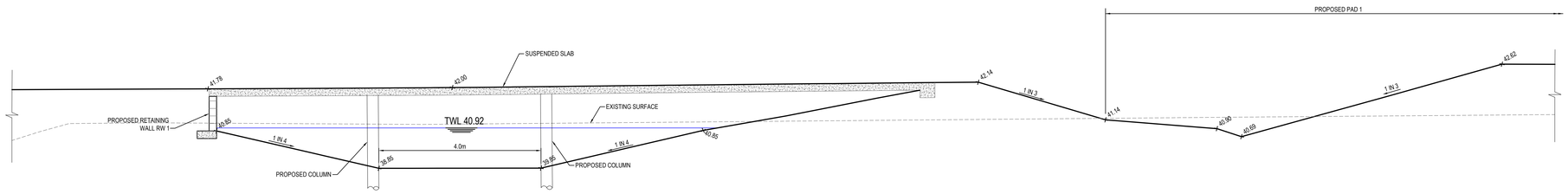
Title: RETAINING WALL LONG SECTIONS
Drawing number: 17D83_S96_C301
Revision: 03



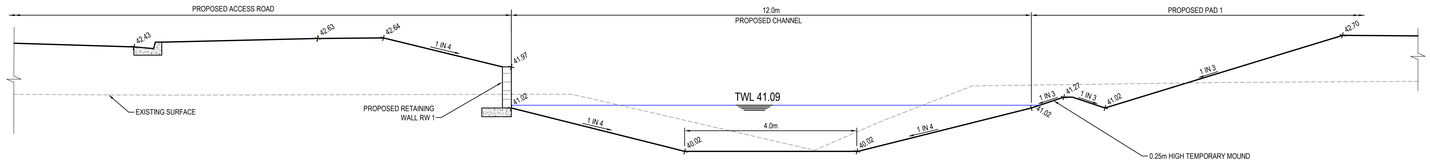
SECTION 1 C300
SCALE: 1:50 @ A1



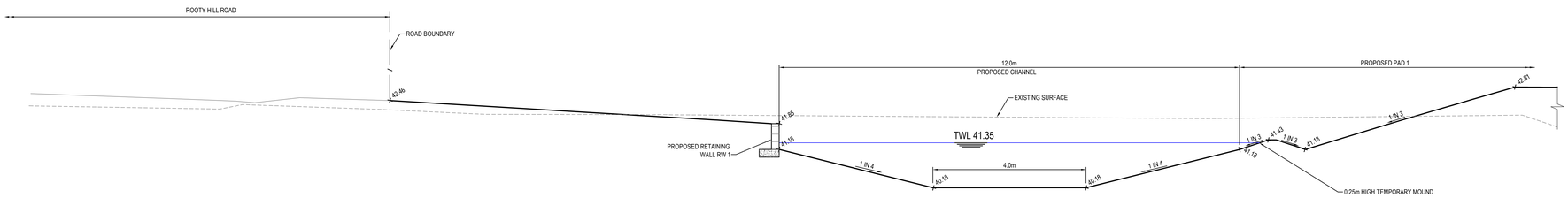
SECTION 2 C300
SCALE: 1:50 @ A1



SECTION 3 C300
SCALE: 1:50 @ A1



SECTION 4 C300
SCALE: 1:50 @ A1



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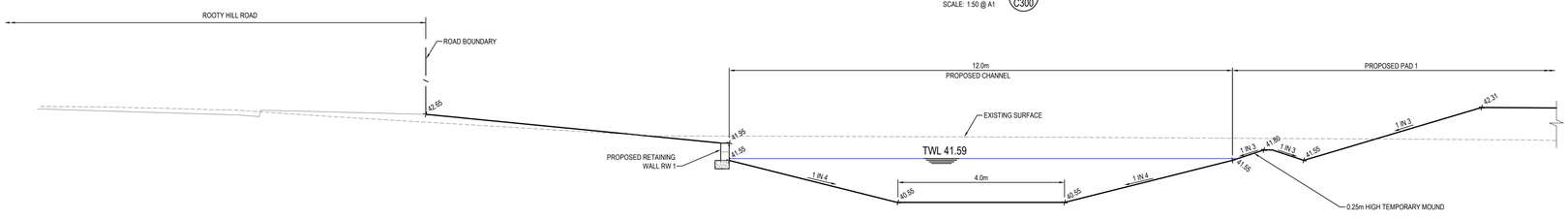

SECTION 6 C300
SCALE: 1:50 @ A1

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SCALE 1:50

SURVEY INFORMATION

SURVEYED BY: LAND PARTNERS
DATUM: AHD
ORIGIN OF LEVELS: PM 30122 RL 43.58

REVISION	AMENDMENT	DRAWN	DESIGNED	DATE
02	ISSUED FOR S96	K	NW	20.03.2019
01	ISSUED FOR S96	LC	LC	13.04.2018

Client: FRASER PROPERTY AUSTRALIA
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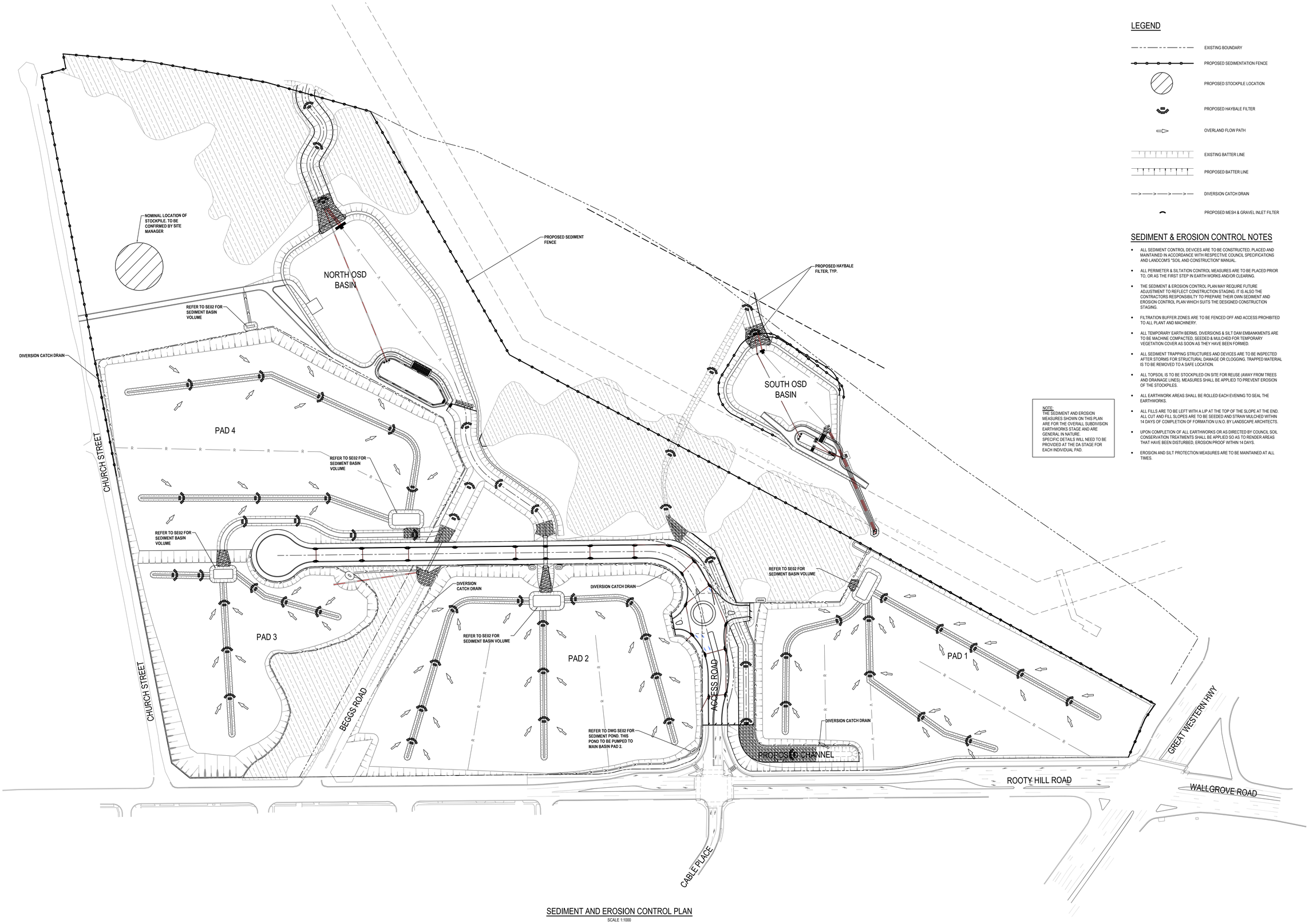
ISSUED FOR S96

Project: EASTERN CREEK BUSINESS HUB
WESTERN SYDNEY PARKLANDS

Title: RETAINING WALL SECTIONS

Drawn	Designed	Date
L.Caha	L.Caha	FEB 18
Checked	Approved	Scale
T.Dempsey	A.Francis	1:50 @ A0
Drawing number		Revision
17D83_S96_C302		02



LEGEND

- EXISTING BOUNDARY
- PROPOSED SEDIMENTATION FENCE
- PROPOSED STOCKPILE LOCATION
- PROPOSED HAYBALE FILTER
- OVERLAND FLOW PATH
- EXISTING BATTER LINE
- PROPOSED BATTER LINE
- DIVERSION CATCH DRAIN
- PROPOSED MESH & GRAVEL INLET FILTER

SEDIMENT & EROSION CONTROL NOTES

- ALL SEDIMENT CONTROL DEVICES ARE TO BE CONSTRUCTED, PLACED AND MAINTAINED IN ACCORDANCE WITH RESPECTIVE COUNCIL SPECIFICATIONS AND LANDCOM'S "SOIL AND CONSTRUCTION" MANUAL.
- ALL PERIMETER & SILTATION CONTROL MEASURES ARE TO BE PLACED PRIOR TO, OR AS THE FIRST STEP IN EARTH WORKS AND/OR CLEARING.
- THE SEDIMENT & EROSION CONTROL PLAN MAY REQUIRE FUTURE ADJUSTMENT TO REFLECT CONSTRUCTION STAGING. IT IS ALSO THE CONTRACTORS RESPONSIBILITY TO PREPARE THEIR OWN SEDIMENT AND EROSION CONTROL PLAN WHICH SUITS THE DESIGNED CONSTRUCTION STAGING.
- FILTRATION BUFFER ZONES ARE TO BE FENCED OFF AND ACCESS PROHIBITED TO ALL PLANT AND MACHINERY.
- ALL TEMPORARY EARTH BERMS, DIVERSIONS & SILT DAM EMBANKMENTS ARE TO BE MACHINE COMPACTED, SEEDED & MULCHED FOR TEMPORARY VEGETATION COVER AS SOON AS THEY HAVE BEEN FORMED.
- ALL SEDIMENT TRAPPING STRUCTURES AND DEVICES ARE TO BE INSPECTED AFTER STORMS FOR STRUCTURAL DAMAGE OR CLOGGING. TRAPPED MATERIAL IS TO BE REMOVED TO A SAFE LOCATION.
- ALL TOPSOIL IS TO BE STOCKPILED ON SITE FOR REUSE (AWAY FROM TREES AND DRAINAGE LINES). MEASURES SHALL BE APPLIED TO PREVENT EROSION OF THE STOCKPILES.
- ALL EARTHWORK AREAS SHALL BE ROLLED EACH EVENING TO SEAL THE EARTHWORKS.
- ALL FILLS ARE TO BE LEFT WITH A LIP AT THE TOP OF THE SLOPE AT THE END. ALL CUT AND FILL SLOPES ARE TO BE SEEDED AND STRAW MULCHED WITHIN 14 DAYS OF COMPLETION OF FORMATION U.N.O. BY LANDSCAPE ARCHITECTS.
- UPON COMPLETION OF ALL EARTHWORKS OR AS DIRECTED BY COUNCIL SOIL CONSERVATION TREATMENTS SHALL BE APPLIED SO AS TO RENDER AREAS THAT HAVE BEEN DISTURBED, EROSION PROOF WITHIN 14 DAYS.
- EROSION AND SILT PROTECTION MEASURES ARE TO BE MAINTAINED AT ALL TIMES.

NOTE:
THE SEDIMENT AND EROSION MEASURES SHOWN ON THIS PLAN ARE FOR THE OVERALL SUBDIVISION EARTHWORKS STAGE AND ARE GENERAL IN NATURE.
SPECIFIC DETAILS WILL NEED TO BE PROVIDED AT THE DA STAGE FOR EACH INDIVIDUAL PAD.

SEDIMENT AND EROSION CONTROL PLAN

SCALE 1:1000

0 20 40 60 80 100m
20 15 10 5
SCALE 1:1000

ISSUED FOR S96

SURVEY INFORMATION
SURVEYED BY: LAND PARTNERS
DATUM: AHD
ORIGIN OF LEVELS: PM 30122 RL 43.58

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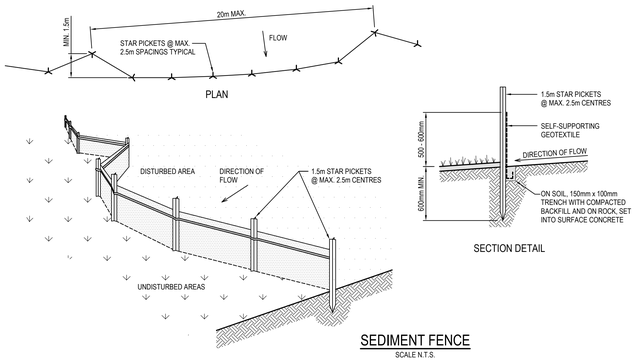
Project: EASTERN CREEK BUSINESS HUB
WESTERN SYDNEY PARKLANDS
Title: SEDIMENT AND EROSION CONTROL PLAN

Drawn	Designed	Date
L.Caha	L.Caha	FEB 18
Checked	Approved	Scale
T.Dempsey	A.Francis	1:1000 @A0

Drawing number: 17D83_S96_SE01
Revision: 03

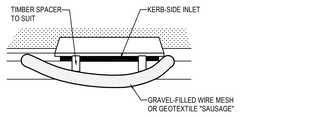


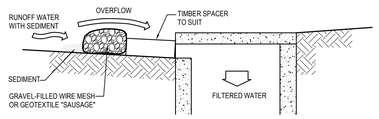
SEDIMENT FENCE

SCALE N.T.S.

SEDIMENT FENCE CONSTRUCTION NOTES:

1. CONSTRUCT SEDIMENT FENCES AS CLOSE AS POSSIBLE TO BEING PARALLEL TO THE CONTOURS OF THE SITE, BUT WITH SMALL RETURNS AS SHOWN IN THE DRAWING TO LIMIT THE CATCHMENT AREA OF ANY ONE SECTION. THE CATCHMENT AREA SHOULD BE SMALL ENOUGH TO LIMIT WATER FLOW IF CONCENTRATED AT ONE POINT TO 50 LITRES PER SECOND IN THE DESIGN STORM EVENT, USUALLY THE 10-YEAR EVENT.
2. CUT A 150mm DEEP TRENCH ALONG THE UPSLOPE LINE OF THE FENCE FOR THE BOTTOM OF THE FABRIC TO BE ENTRENCHED.
3. 3. DRIVE 1.5m LONG STAR PICKETS INTO GROUND @ 2.5m INTERVALS (MAX.) AT THE DOWNSLOPE EDGE OF THE TRENCH. ENSURE ANY STAR PICKETS ARE FITTED WITH SAFETY CAPS.
4. 4. FIX SELF-SUPPORTING GEOTEXTILE TO THE UPSLOPE SIDE OF THE POSTS ENSURING IT GOES TO THE BASE OF THE TRENCH. FIX THE GEOTEXTILE WITH WIRE TIES OR AS RECOMMENDED BY THE MANUFACTURER. ONLY USE GEOTEXTILE SPECIFICALLY PRODUCED FOR SEDIMENT FENCING. THE USE OF SHADE CLOTH FOR THIS PURPOSE IS NOT SATISFACTORY.
5. 5. JOIN SECTIONS OF FABRIC AT A SUPPORT POST WITH A 150mm OVERLAP. 6. BACKFILL THE TRENCH OVER THE BASE OF THE FABRIC AND COMPACT IT THOROUGHLY OVER THE GEOTEXTILE.



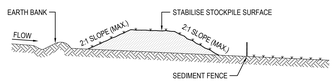


MESH & GRAVEL INLET FILTER CONSTRUCTION NOTES:

1. FABRICATE A SLEEVE MADE FROM GEOTEXTILE OR WIRE MESH LONGER THAN THE LENGTH OF THE INLET PIT AND FILL IT WITH 25mm TO 50mm GRAVEL.
2. FORM AN ELLIPTICAL CROSS-SECTION ABOUT 150mm HIGH x 400mm WIDE.
3. PLACE THE FILTER AT THE OPENING LEAVING AT LEAST A 100mm SPACE BETWEEN IT AND THE KERB INLET. MAINTAIN THE OPENING WITH SPACER BLOCKS.
4. FORM A SEAL WITH THE KERB TO PREVENT SEDIMENT BYPASSING THE FILTER.
5. SANDBAGS FILLED WITH GRAVEL CAN SUBSTITUTE FOR THE MESH OR GEOTEXTILE PROVIDING THEY ARE PLACED SO THAT THEY CAN FIRMLY ABUT EACH OTHER AND SEDIMENT / LADEN WATERS CANNOT PASS BETWEEN.

MESH & GRAVEL INLET FILTER

SCALE N.T.S.

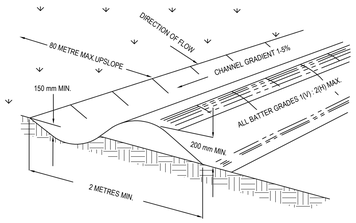


STOCKPILE CONSTRUCTION NOTES:

1. PLACE STOCKPILES MORE THAN 2 (PREFERABLY 5) METRES FROM EXISTING VEGETATION, CONCENTRATED WATER FLOW, ROADS AND HAZARD AREAS.
2. CONSTRUCT ON THE CONTOUR AS LOW, FLAT, ELONGATED MOUNDS.
3. WHERE THERE IS SUFFICIENT AREA, TOPSOIL STOCKPILES SHALL BE LESS THAN 2 METRES IN HEIGHT.
4. WHERE THEY ARE TO BE PLACED FOR MORE THAN 10 DAYS, STABILISE FOLLOWING THE APPROVED E.S.C.P. OR S.W.M.P. TO REDUCE THE C-FACTOR TO LESS THAN 0.10.
5. CONSTRUCT EARTH BANKS ON THE UPSLOPE SIDE TO DIVERT WATER AROUND STOCKPILES AND SEDIMENT FENCES 1 TO 2 METRES DOWNSLOPE.

STOCKPILES

SCALE N.T.S.



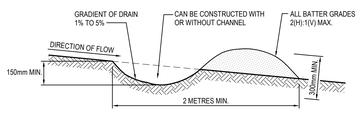
NOTE: ONLY TO BE USED AS TEMPORARY BANK WHERE MAC.UPSLOPE LENGTH IS 80 METERS.

CATCH DRAIN CONSTRUCTION NOTES:

1. CONSTRUCT ALONG GRADIENT AS SPECIFIED.
2. MAXIMUM SPACING BETWEEN BANKS SHALL BE 80 METRES.
3. DRAINS TO BE OF PARABOLIC OR TRAPEZOIDAL CROSS SECTION NOT V-SHAPED.
4. EARTH BANKS TO BE ADEQUATELY COMPACTED IN ORDER TO PREVENT FAILURE.
5. CONSTRUCTION IS OF A TEMPRORARY NATURE AND SHALL BE COMPACTED AT THE END A DAYS WORK OR IMMEDIATELY PRIOR RAIN.
6. ALL OUTLETS FROM DISTURBED LANDS ARE TO FEED INTO SEDIMENT BASIN OR SIMILAR.
7. DISCHARGE RUNOFF COLLECTED FROM UNDISTURBED LANDS ONTO EITHER A STABILISED OR AN UNDISTURBED DISPOSAL AISTE WITHIN THE SAME SUBCATCHMENT AREA FROM WHICH THE WATER ORIGINATED.
8. COMPACT WITH A SUITABLE IMPLEMENT IN SITUATIONS WHERE THEY ARE REQUIRED TO FUNCTION FOR MORE THAN FIVE DAYS.
9. EARTH BANKS TO BE FREE OF PROJECTIONS OR OTHER IRREGULARITIES THAT WILL IMPEDE NORMAL FLOW.

CATCH DRAINS SD 5-8

SCALE N.T.S.



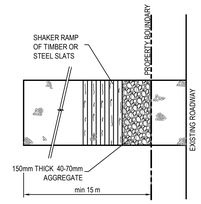
NOTE: ONLY TO BE USED AS TEMPORARY BANK WHERE MAXIMUM UPSLOPE LENGTH IS 80 METRES.

EARTH BANK CONSTRUCTION NOTES:

1. BUILD WITH GRADIENTS BETWEEN 1% AND 5%.
2. AVOID REMOVING TREES AND SHRUBS IF POSSIBLE - WORK AROUND THEM.
3. ENSURE THE STRUCTURES ARE FREE OF PROJECTIONS OR OTHER IRREGULARITIES THAT COULD IMPEDE WATER FLOW.
4. BUILD THE DRAINS WITH CIRCULAR, PARABOLIC OR TRAPEZOIDAL CROSS-SECTIONS, NOT "V" SHAPED.
5. ENSURE BANKS ARE PROPERLY COMPACTED TO PREVENT FAILURE.
6. COMPLETE PERMANENT OR TEMPORARY STABILISATION WITHIN 10 DAYS OF CONSTRUCTION.

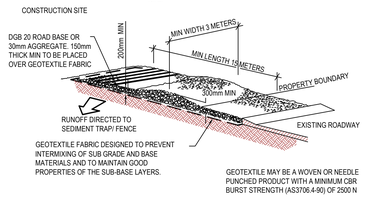
EARTH BANK (LOW FLOW)

SCALE N.T.S.



PLAN
STABILISED SITE ACCESS WITH SHAKER RAMP

N.T.S.



STABILISED SITE ACCESS WITH SHAKER RAMP

N.T.S.

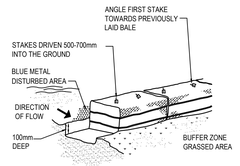
NOTES:

1. THIS DEVICE IS TO BE LOCATED AT ALL EXITS FROM CONSTRUCTION SITE.
2. THIS DEVICE IS TO BE REGULARLY CLEANED OF DEPOSITED MATERIAL SO AS TO MAINTAIN A 50mm DEEP SPACE BETWEEN PLANKS.
3. ANY UNSEALED ROAD BETWEEN THIS DEVICE AND NEAREST ROADWAY IS TO BE TOPPED WITH 100mm THICK 40-70mm SIZE AGGREGATE.
4. ALTERNATIVELY, THREE(3) PRECAST CONCRETE CATTLE GRIDS (AS MANUFACTURED BY "HUMES CONCRETE MAY BE USED. 1, 2 & 3 ABOVE ALSO APPLY.

CONSTRUCTION SEQUENCE

WORKS SHALL BE UNDERTAKEN IN THE FOLLOWING SEQUENCE:

1. INSTALL SEDIMENT FENCING AND CUT DRAINS TO MEET THE REQUIREMENTS OF THE SEDIMENT AND EROSION CONTROL PLAN. WASTE COLLECTION BINS SHALL BE INSTALLED ADJACENT TO SITE OFFICE.
2. CONSTRUCT STABILISED SITE ACCESS IN ACCORDANCE WITH BLACKTOWN CITY COUNCIL'S REQUIREMENTS.
3. REDIRECT CLEAN WATER AROUND THE CONSTRUCTION SITE.
4. INSTALL SEDIMENT CONTROL PROTECTION MEASURES AT ALL NATURAL AND MAN-MADE DRAINAGE STRUCTURES. MAINTAIN UNTIL ALL THE DISTURBED AREAS ARE STABILISED.
5. CLEAR AND STRIP THE WORK AREAS. MINIMISE THE DAMAGE TO THE GRASS AND LOW GROUND COVER OF NON-DISTURBED AREAS.
6. ANY DISTURBED AREAS, OTHER THAN BUILDING PAD AREAS, SHALL IMMEDIATELY BE COVERED WITH SITE TOPSOIL WITHIN 7 DAYS OF CLEARING. BUILDING PAD AREAS SHALL BE COVERED WITH BITUMEN EMULSION AS SPECIFIED.
7. APPLY PERMANENT STABILISATION TO SITE (LANDSCAPING).



HAYBALE BARRIERS

N.T.S.

SEDIMENT BASIN SIZING

1. THE SEDIMENT BASIN SHALL BE CONSTRUCTED ON A RATE PER HECTARE BASIS AND HAS BEEN IN ACCORDANCE WITH THE REQUIREMENTS OF THE LANDCOM MANUAL "MANAGING URBAN STORMWATER - SOILS AND CONSTRUCTION", FOR SEDIMENTATION **TYPE D** SOILS. THE DISTURBED AREA WITHIN THIS CATCHMENT AT ANY ONE TIME SHOULD BE LIMITED TO AN AREA FOR WHICH EACH SEDIMENT BASIN CAN HANDLE. EACH BASIN SHALL BE SIZED IN ACCORDANCE WITH THE TABLE BELOW.

SEDIMENT BASIN SIZING TYPE D SOILS	
VOLUMETRIC RUNOFF COEFFICIENT, CV	0.25 (APPENDIX F - TABLE F2)
75TH PERCENTILE 5 DAY TOTAL RAINFALL DEPTH, R	19.0 mm
CATCHMENT AREA, A	1 Ha (UNIT AREA)
SETTLING ZONE VOLUME (PER HECTARE) 10 CV A R	47.5 m³
DISTURBED CATCHMENT AREA	1 Ha (UNIT AREA)
R K LS P C	110.87m³
SEDIMENT ZONE VOLUME (0.17 A (R K LS P C)/1.3	14.5m³ < 50% SETTLING VOL
TOTAL SEDIMENT BASIN VOLUME REQUIRED :	71.25 m³/Ha

* (LANDCOM MANAGING URBAN STORMWATER MANUAL REFERENCE)

2. THE FOLLOWING DESIGN PARAMETERS HAVE BEEN ASSESSED FOR THE SITE:

CONSTRAINT	VALUE	(SOURCE)*
RAINFALL EROSIVITY (R-FACTOR)	2350	APPENDIX B
LENGTH/SLOPE GRADIENT FACTOR, LS	0.955	APPENDIX A - TABLE A1
SOIL ERODIBILITY (K-FACTOR)	0.038	(TABLE C20 - BLACKTOWN)
EROSION CONTROL PRACTICE FACTOR (P-FACTOR)	1.3 (COMPACTED)	APPENDIX A - TABLE A2
COVER FACTOR (C-FACTOR)	1.0 (DURING EARTHWORKS)	APPENDIX A - FIGURE A5
CALCULATED SOIL LOSS, A (RUSLE EQUATION)	110.87t/Ha/YR	A = R K LS P C
SOIL HYDROLOGIC GROUP	GROUP C	APPENDIX C TABLE 20
SEDIMENT TYPE	TYPE D	APPENDIX C TABLE 4
75TH PERCENTILE 5-DAY RAINFALL EVENT	19.0mm (BLACKTOWN)	TABLE 6.3A

* (LANDCOM MANAGING URBAN STORMWATER MANUAL REFERENCE)

BASIN MANAGEMENT

1. THE CAPTURED STORMWATER IN THE SETTLING ZONE SHOULD BE DRAINED TO MEET THE MINIMUM STORAGE CAPACITY REQUIRED WITHIN A FIVE (5) DAY PERIOD FOLLOWING RAINFALL, PROVIDED THE ACCEPTABLE WATER QUALITY (NFR) AND TURBIDITY HAVE BEEN ACHIEVED.
2. CHEMICAL FLOCCULENT SUCH AS GYPSUM MAY BE DOSED TO AID SETTLING WITHIN 24 HOURS OF CONCLUSION OF EACH STORM. THE APPLIED DOSING RATES SHOULD ACHIEVE THE TARGET QUALITY WITHIN 36 TO 72 HOURS OF THE STORM EVENT.
3. INSPECT THE SEDIMENT BASINS AFTER EACH RAINFALL EVENT AND/OR WEEKLY. ENSURE THAT ALL SEDIMENT IS REMOVED ONCE THE SEDIMENT STORAGE ZONE IS FULL (REFER TO PEGS INSTALLED IN BASINS IN ACCORDANCE WITH THE SWMP). ENSURE THAT OUTLET AND EMERGENCY SPILLWAY WORKS ARE MAINTAINED IN A FULLY OPERATIONAL CONDITION AT ALL TIMES.

SOWING SEASON	SEED MIX
AUTUMN/WINTER	OATS@40KG/Ha + JAPANESE MILLET@10kg/Ha
SPRING/SUMMER	OATS@20kg/Ha + JAPANESE MILLET@20kg/Ha

NOTE : THESE PLANT SPECIES ARE FOR TEMPORARY REVEGETATION ONLY. THEY WILL ONLY PROVIDE PROTECTION FROM EROSION FOR SIX MONTHS. WHERE THE PADS ARE TO BE LEFT UNDEVELOPED FOR A LONGER PERIOD, THE CONTRACTOR SHALL SEEK ADVICE FROM THE SITE SUPERINTENDENT AS TO MORE APPROPRIATE REVEGETATION METHODS.

REVEGETATION IN ACCORDANCE WITH THE ABOVE TABLE WILL BE ENHANCED BY ADDING LIME AT A RATE OF 4kg/TONNE OF TOPSOIL AND 7.5kg/TONNE OF SUBSOIL.

4. THE LONG TERM GROUND COVER FACTORS FOR THE CONSTRUCTION WORKS IS NOT TO EXCEED THE FOLLOWING LIMITS:

LAND	MAXIMUM C-FACTOR	REMARKS
WATERWAYS AND OTHER AREAS OF CONCENTRATED FLOWS. POST CONSTRUCTION	0.05	APPLIES AFTER TEN WORKING DAYS OF COMPLETION OF FORMATION AND BEFORE CONCENTRATED FLOWS ARE APPLIED. FOOT AND VEHICULAR TRAFFIC IS PROHIBITED IN THIS AREA AND 70% GROUND COVER IS REQUIRED.
STOCKPILES. POST CONSTRUCTION	0.10	APPLIES AFTER TEN WORKING DAYS FROM COMPLETION OF FORMATION. 60% GROUND COVER IS REQUIRED.
ALL LANDS, INCLUDING WATERWAYS AND STOCKPILES, DURING CONSTRUCTION.	0.15	APPLIES AFTER 20 DAYS OF INACTIVITY, EVEN THOUGH WORKS MAY BE INCOMPLETE. 50% GROUND COVER IS REQUIRED.

ISSUED FOR S96

SURVEY INFORMATION
SURVEYED BY: LAND PARTNERS
DATUM: AHD
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REVISION	AMENDMENT	DRAWN	DESIGNED	DATE
03	ISSUED FOR S96	IK	NW	20.03.2019
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Project: EASTERN CREEK BUSINESS HUB
WESTERN SYDNEY PARKLANDS

Title: SEDIMENT AND EROSION CONTROL
TYPICAL SECTIONS AND DETAILS

Drawn	Designed	Date
L.Caha	L.Caha	FEB 18
Checked	Approved	Scale
T.Dempsey	A.Francis	NTS @A0

Drawing number: 17D83_S96_SE02
Revision: 03

henry&hymas

APPENDIX B:
STORMWATER MAINTENANCE MANUALS

1 LONG TERM MAINTENANCE TASKS

1.1 Schedule of visits

1.1.1 Schedule of Site Visits (Regular Inspec & Maint)	
Purpose of visit	Frequency
Inspection	Regular inspection and maintenance should be carried out to ensure the system functions as designed. It is recommended that these checks be undertaken on a three monthly basis during the initial period of operating the system. A less frequent schedule might be determined after the system has established.
Maintenance	

1.2 Tasks

The scope of maintenance tasks should include verifying the function and condition of the following elements:

- Filter media
- Horticultural
- Drainage infrastructure
- Other routine tasks

1.2.1 FILTER MEDIA TASKS	
Sediment deposition	Remove sediment build up from forebays in raingardens and from the surface of bioretention street trees. Frequency – 3 MONTHLY AFTER RAIN
Holes or scour	Infill any holes in the filter media. Check for erosion or scour and repair, provide energy dissipation (e.g. rocks and pebbles at inlet) if necessary. Frequency – 3 MONTHLY AFTER RAIN
Filter media surface porosity	Inspect for the accumulation of an impermeable layer (such as oily or clayey sediment) that may have formed on the surface of the filter media. A symptom may be that water remains ponded in the raingarden or tree pit for more than a few hours after a rain event. Repair minor accumulations by raking away any mulch on the surface and scarifying the surface of the filter media between plants. For bioretention tree pits without understorey vegetation, any accumulation of leaf litter should be removed to help maintain the surface porosity of the filter media. Frequency – 3 MONTHLY AFTER RAIN
Litter Control	Check for litter (including organic litter) in and around treatment areas. Remove both organic and anthropogenic litter to ensure flow paths and infiltration through the filter media are not hindered. Frequency – 3 MONTHLY OR AS DESIRED FOR AESTHETICS

1.2.2 HORTICULTURAL TASKS	
Pests and Diseases	Assess plants for disease, pest infection, stunted growth or senescent plants. Treat or replace as necessary. Reduced plant density reduces pollutant removal and infiltration performance. Frequency – 3 MONTHLY OR AS DESIRED FOR AESTHETICS
Maintain original plant densities	Infill planting: Between 6 and 10 plants per square metre should (depending on species) be adequate to maintain a density where the plant's roots touch each other. Planting should be evenly spaced to help prevent scouring due to a concentration of flow. Frequency – 3 MONTHLY OR AS DESIRED FOR AESTHETICS
Weeds	It is important to identify the presence of any rapidly spreading weeds as they occur. The presence of such weeds can reduce dominant species distributions and diminish aesthetics. Weed species can also compromise the systems long term performance. Inspect for and manually remove weed species. Application of herbicide should be limited to a wand or restrictive spot spraying due to the fact that raingardens and bioretention tree pits are directly connected to the stormwater system. Frequency – 3 MONTHLY OR AS DESIRED FOR AESTHETICS
1.2.3 DRAINAGE TASKS	
Perforated pipe	Ensure that perforated pipes are not blocked to prevent filter media and plants from becoming waterlogged. A small steady clear flow of water may be observed discharging from the perforated pipe at its connection into the downstream pit some hours after rainfall. Note that smaller rainfall events after dry weather may be completely absorbed by the filter media and not result in flow. Remote camera (e.g. CCTV) inspection of pipelines for blockage and structural integrity could be useful. Frequency – 6 MONTHLY AFTER RAIN
High flow inlet pits, overflow pits and other stormwater junction pits	Ensure inflow areas and grates over pits are clear of litter and debris and in good and safe condition. A blocked grate would cause nuisance flooding of streets. Inspect for dislodged or damaged pit covers and ensure general structural integrity. Remove sediment from pits and entry sites etc. (likely to be an irregular occurrence in mature catchment). Frequency – MONTHLY AND OCCASIONALLY AFTER RAIN
1.2.4 OTHER ROUTINE TASKS	
Inspection after rainfall	Occasionally observe raingarden or bioretention tree pit after a rainfall event to check infiltration. Identify signs of poor drainage (extended ponding on the filter media surface). If poor drainage is identified, check landuse and assess whether is has altered from design capacity (e.g. unusually high sediment loads may require installation of a sediment forebay). Frequency – TWICE A YEAR AFTER RAIN

1.2.5 FORM (REGULAR INSPECTION & MAINTENANCE)			
Location	**Raingarden/Tree Pit**		
Site Visit Date:		Site Visit By:	
Weather:			
Purpose of the Site Visit	Routine Inspection	☐	Complete section 1 (below)
	Routine Maintenance	☐	Complete sections 1 and 2 (below)

NOTE: Where maintenance is required ('yes' in Section 2), details should be recorded in the 'Additional Comments' section at the end of this document.

1. Filter media				
*In addition to regular inspections, it is recommended that inspection for damage and blockage is made after significant rainfall events that might occur once or twice a year.	Section 1		Section 2	
	Maintenance Required?		Maintenance Performed	
	Yes	No	Yes	No
Filter media (CIRCLE – pooling water/accumulation of silt & clay layer/scour/holes/sediment build up)	☐	☐	☐	☐
Litter (CIRCLE – large debris/accumulated vegetation/anthropogenic)	☐	☐	☐	☐
2. Vegetation				
Vegetation health (CIRCLE – signs of disease/pests/poor growth)	☐	☐	☐	☐
Vegetation densities (CIRCLE – low densities– infill planting required)	☐	☐	☐	☐
Build up of organic matter, leaf litter (CIRCLE – requires removal) BIORETENTION TREE PITS ONLY	☐	☐	☐	☐
Weeds (CIRCLE – isolated plants/infestation) (SPECIES – ……..)	☐	☐	☐	☐

3. Pits, pipes and inflow areas				
	Section 2		Section 3	
	Maintenance Required?		Maintenance Performed	
	Yes	No	Yes	No
Perforated pipes (CIRCLE – full blockage/partial blockade/damage)	☐	☐	☐	☐
Inflow areas (CIRCLE – scour/excessive sediment deposition/litter blockage)	☐	☐	☐	☐
Over flow grates (CIRCLE – damage/scour/blockage)	☐	☐	☐	☐
Pits (CIRCLE – poor general integrity/sediment build up/litter/blockage)	☐	☐	☐	☐
Other stormwater pipes and junction pits (CIRCLE – poor general integrity/sediment build up/litter/blockage)	☐	☐	☐	☐

4. Additional Comments

Note: Each year on the 1st September the occupier or body corporate is to provide to Council's Assets Design Services Section an annual collation of all maintenance carried out from the previous year. This includes the bio retention maintenance as well as the Enviropod Pit basket maintenance.

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MAINTENANCE SCHEDULE

MAINTENANCE ACTION	FREQUENCY	RESPONSIBILITY	PROCEDURE
Enviropod Pit Baskets			
	(Refer to SW360 maintenance schedule/handbook)	Owner/Maintenance Contractor	(Refer to SW360 maintenance schedule/handbook)
Grass Lined Swale(s)			
Sediment deposition	Three monthly or after heavy rain	Maintenance Contractor	Remove sediment build up from swale and in and around trees
Holes or Scour	Three monthly or after heavy rain	Maintenance Contractor	Infill any holes in the turf/grass area. Check for erosion or scour repair. Provide energy dissipation (eg. Rocks and pebbles at inlet) if necessary.
Litter Control	Three monthly or as desired for aesthetics	Maintenance Contractor	Check for litter (including organic litter) in and around the swale area. Remove both organic and anthropogenic litter to ensure flow paths is maintained.
Pests and diseases	Three monthly or as desired for aesthetics	Maintenance Contractor	Assess plants for disease, pest infection, stunted growth or senescent plants. Treat or replace as necessary. Reduced plant density reduces pollutant removal and performance
Maintain original plant densities	Three monthly or as desired for aesthetics	Maintenance Contractor	Infill planting – between 6 and 10 plants per square metre should be adequate (depending on species) to maintain a density where the plants' roots touch each other. Planting should be evenly spaced to help prevent scouring due to a concentration of flow.
Weeds	Three monthly or as desired for aesthetics	Maintenance Contractor	Inspect for and manually remove weed species. Application of herbicide should be limited to a wand or restrictive spot spraying due to the fact that the swale is directly connected to the waterways.
Inspection after rainfall	Twice a year after rain	Maintenance Contractor	Occasionally observe the swale system after a rainfall event to check infiltration. Identify signs of poor drainage (extended ponding). If poor drainage is identified, check land use and assess whether it has altered from design capacity (eg. Unusually high sediment loads may require installation of a sediment forebay).

MAINTENANCE ACTION	FREQUENCY	RESPONSIBILITY	PROCEDURE
Stormwater Pits, Grated Drains and Pipes			
Pits, grated drains and pipes around the site	Annually	Maintenance Contractor	Check pits, grated drains and pipes for blockages. Remove debris and flush pipes if required.
Check step irons for corrosion	Annually	Maintenance Contractor	Remove grate. Examine step irons and repair any corrosion or damage.
Check fixing of step irons is secure	Six monthly	Maintenance Contractor	Remove grate and ensure fixings secure prior to placing weight on step iron.
Rainwater Sprinkler Tank			
Refer to manufacturer or tank suppliers recommendations	As per suppliers recommendations	Maintenance Contractor	As per suppliers recommendations

Yours sincerely,

Tom Dempsey
For, and on behalf of,
H & H Consulting Engineers Pty Ltd

Our Ref: 17D83/td
Date: 07/02/18

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APPENDIX C:
HYDRAULIC TESTING OF BIO-RETENTION FILTER MEDIA

CONDITION ASSESSMENT AND PERFORMANCE EVALUATION OF BIORETENTION SYSTEMS

PRACTICE NOTE 1: *In Situ* Measurement of Hydraulic Conductivity

Belinda Hatt, Sebastien Le Coustumer

April 2008

The Facility for Advancing Water Biofiltration (FAWB) aims to deliver its research findings in a variety of forms in order to facilitate widespread and successful implementation of biofiltration technologies. This Practice Note for *In Situ* Measurement of Hydraulic Conductivity is the first in a series of Practice Notes being developed to assist practitioners with the assessment of construction and operation of biofiltration systems.

1. SCOPE OF THE DOCUMENT

This Practice Note for *In Situ* Measurement of Hydraulic Conductivity is designed to complement FAWB's Guidelines for Soil Filter Media in Bioretention Systems, Version 2.01 (visit http://www.monash.edu.au/fawb/publications/index.html for a copy of these guidelines). However, the recommendations contained within this document are more widely applicable to assessing the hydraulic conductivity of filter media in existing biofiltration systems.

For new systems, this Practice Note ***does not*** remove the need to conduct laboratory testing of filter media prior to installation.

2. DETERMINATION OF HYDRAULIC CONDUCTIVITY

The recommended method for determining *in situ* hydraulic conductivity uses a single ring infiltrometer under constant head. The single ring infiltrometer consists of a small plastic or metal ring that is driven 50 mm into the soil filter media. It is a constant head test that is conducted for two different pressure heads (50 mm and 150 mm). The head is kept constant during all the experiments by pouring water into the ring. The frequency of readings of the volume poured depends on the filter media, but typically varies from 30 seconds to 5 minutes. The experiment is stopped when the infiltration rate is considered steady (i.e., when the volume poured per time interval remains constant for at least 30 minutes). This method has been used extensively (e.g. Reynolds and Elrick, 1990; Youngs *et al.*, 1993).

Note: This method measures the hydraulic conductivity at the surface of the soil filter media. In most cases, it is this top layer which controls the hydraulic conductivity of the system as a whole (i.e., the underlying drainage layer has a flow capacity several orders of magnitude higher than the filter media), as it is this layer where fine sediment will generally be deposited to form a "clogging layer". However this shallow test would not be appropriate for systems where the controlling layer

is not the surface layer (e.g. where migration of fine material down through the filter media has caused clogging within the media). In this case, a 'deep ring' method is required; for further information on this method, please consult FAWB's report "Hydraulic performance of biofilter systems for stormwater management: lessons from a field study", available at www.monash.edu.au/fawb/publications/index.html.

2.1 Selection of monitoring points

For bioretention systems with a surface area less than 50 m^2, *in situ* hydraulic conductivity testing should be conducted at three points that are spatially distributed (Figure 1). For systems with a surface area greater than 50 m^2,an extra monitoring point should be added for every additional 100 m^2. It is ***essential*** that the monitoring point is flat and level. Vegetation should not be included in monitoring points.

Figure 1. Spatially distributed monitoring points

2.2 Apparatus

The following is required:

- 100 mm diameter PVC rings with a height of at least 220 mm. The bottom edge of the ring should be bevelled and the inside of the ring should be marked to indicate 50 mm and 150 mm above the filter media surface (Figure 2).
- 40 L water
- 100 mL, 250 mL and 1000 mL measuring cylinders
- Stopwatch
- Thermometer

- Measuring tape
- Spirit level
- Hammer
- Block of wood, approximately 200 x 200 mm

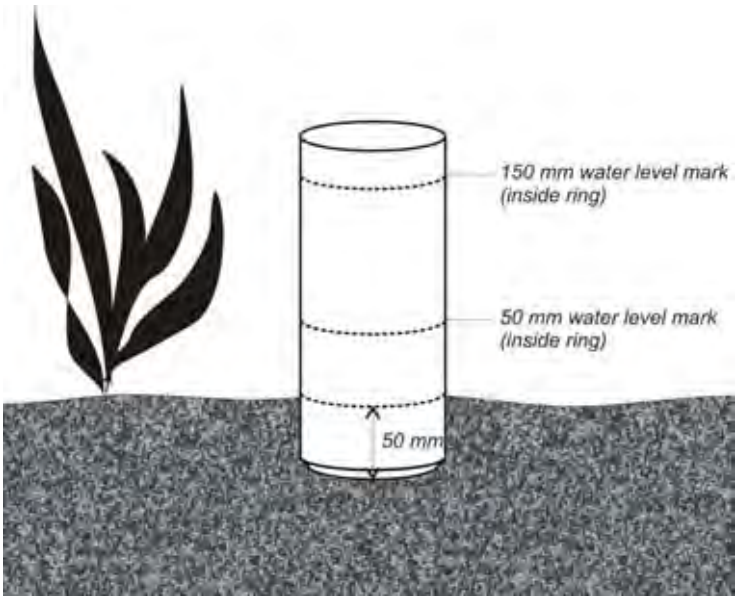

Figure 2. Diagram of single ring infiltrometer

2.3 Procedure

a. Carefully scrape away any surface covering (e.g. mulch, gravel, leaves) ***without disturbing*** the soil filter media surface (Figure 3b).

b. Locate the ring on the surface of the soil (Figure 3c), and then place the block of wood on top of the ring. Gently tap with the hammer to drive the ring 50 mm into the filter media (Figure 3d). Use the spirit level to check that the ring is level.

   Note: It is ***essential*** that this the ring is driven in slowly and carefully to minimise disturbance of the filter media profile.

c. Record the initial water temperature.

d. Fill the 1000 mL measuring cylinder.

e. Using a different pouring apparatus, slowly fill the ring to a ponding depth of 50 mm, taking care to minimise disturbance of the soil surface (Figure 3f). Start the stopwatch when the water level reaches 50 mm.

f. Using the 1000 mL measuring cylinder, maintain the water level at 50 mm (Figure 3g). After 30 seconds, record the volume poured.

g. Maintain the water level at 50 mm, recording the time interval and volume required to do so.

Note: The time interval between recordings will be determined by the infiltration capacity of the filter media. For fast draining media, the time interval should not be greater than one minute however, for slow draining media, the time between recordings may be up to five minutes.

Note: The smallest measuring cylinder that can pour the volume required to maintain a constant water level for the measured time interval should be used for greater accuracy. For example, if the volume poured over one minute is 750 mL, then the 1000 mL measuring cylinder should be used. Similarly, if the volume poured is 50 mL, then the 100 mL measuring cylinder should be used.

h. Continue to repeat Step f until the infiltration rate is steady i.e., the volume poured per time interval remains constant for at least 30 minutes.

i. Fill the ring to a ponding depth of 150 mm (Figure 3h). Restart the stopwatch. Repeat steps e – g for this ponding depth.

Note: Since the filter media is already saturated, the time required to reach steady infiltration should be less than for the first ponding depth.

j. Record the final water temperature.

k. Enter the temperature, time, and volume data into a calculation spreadsheet (see "Practice Note 1_Single Ring Infiltration Test_Example Calculations.xls", available at www.monash.edu.au/fawb/publications/index.html, as an example).

2.4 Calculations

In order to calculate K_{fs} a 'Gardner's' behaviour for the soil should be assumed (Gardner, 1958 in Youngs *et al.*, 1993):

$$K(h) = K_{fs} e^{\alpha h} \qquad \text{Eqn. 1}$$

where K is the hydraulic conductivity, α is a soil pore structure parameter (large for sands and small for clay), and h is the negative pressure head. K_{fs} is then found using the following analytical expression (for a steady flow) (Reynolds and Elrick, 1990):

$$K_{fs} = \frac{G}{a}\left(\frac{Q_2 - Q_1}{H_2 - H_1}\right) \qquad \text{Eqn. 2}$$

where a is the ring radius, H_1 and H_2 are the first (50 mm) and second (150 mm) pressure heads, respectively, Q_1 and Q_2 are the steady flows for the first and second pressure heads, respectively, and G is a shape factor estimated as:

$$G = 0.316\frac{d}{a} + 0.184 \qquad \text{Eqn. 3}$$

where d is the depth of insertion of the ring and a is the ring radius.

G is nearly independent of soil hydraulic conductivity (i.e. K_{fs} and α) and ponding, if the ponding is greater than 50 mm.

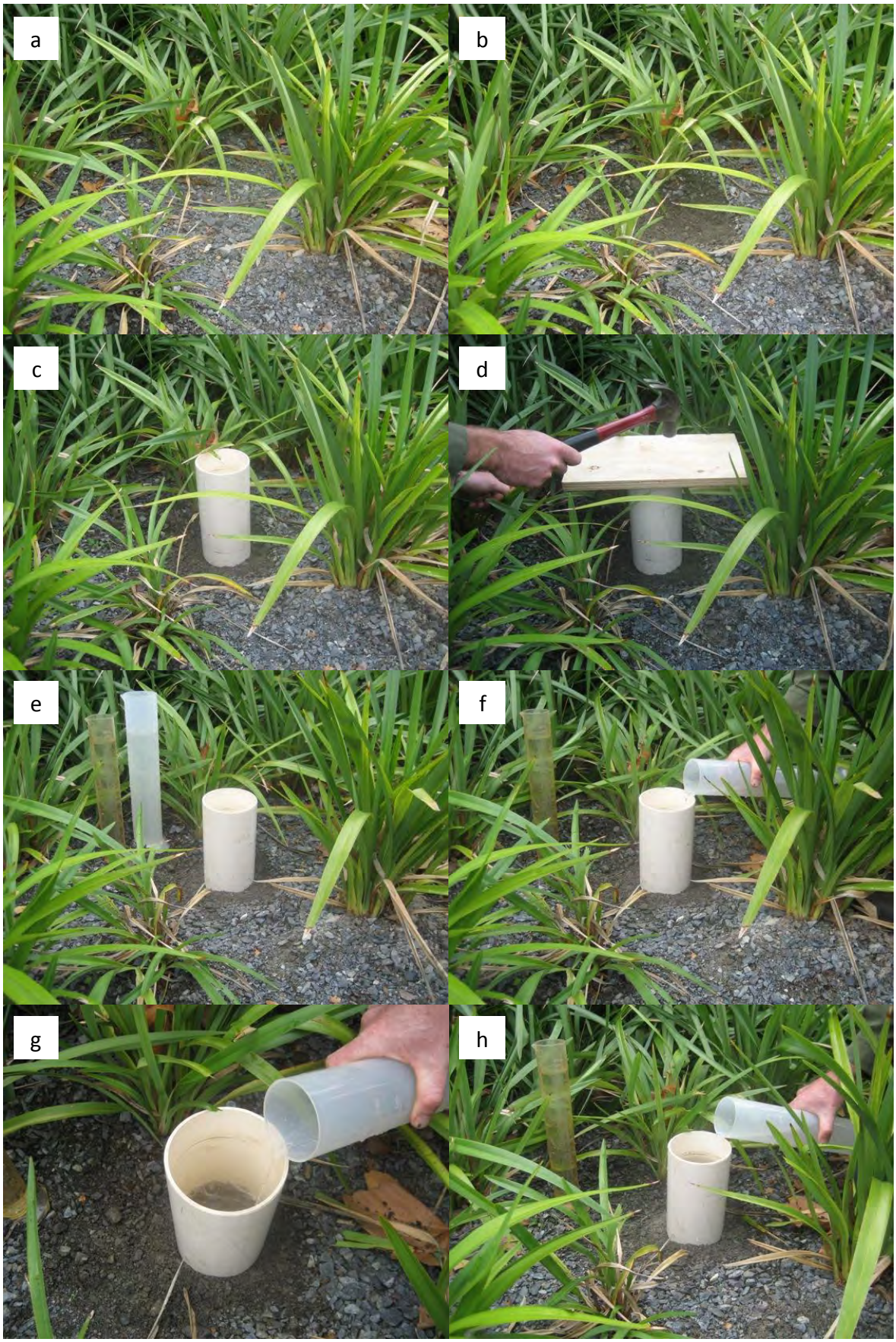

Figure 3. Measuring hydraulic conductivity

The possible limitations of the test are (Reynolds *et al.*, 2000): (1) the relatively small sample size due to the size of the ring, (2) soil disturbance during installation of the ring (compaction of the soil), and (3) possible edge flow during the experiments.

3 INTERPRETATION OF RESULTS

This test method has been shown to be relatively comparable to laboratory test methods (Le Coustumer *et al.*, 2008), taking into account the inherent variability in hydraulic conductivity testing and the heterogeneity of natural soil-based filter media. While correlation between the two test methods is low, results are not statistically different. In light of this, laboratory and field results are deemed comparable if they are within 50% of each other. In the same way, replicate field results are considered comparable if they differ by less than 50%. Where this is not the case, this is likely to be due to a localised inconsistency in the filter media, therefore additional measurement should be conducted at different monitoring points until comparable results are achieved. If this is not achieved, then an area-weighted average value may need to be calculated.

4 MONITORING FREQUENCY

Field testing of hydraulic conductivity should be carried out at least twice: (1) One month following commencement of operation, and (2) In the second year of operation to assess the impact of vegetation on hydraulic conductivity. Following this, hydraulic conductivity testing should be conducted every two years or when there has been a significant change in catchment characteristics (e.g., construction without appropriate sediment control).

REFERENCES

Gardner, W. R. (1958). Some steady-state solutions of the unsaturated moisture flow equation with application to evaporation from a water table. *Soil Science* **85**: 228-232.

Le Coustumer, S., T. D. Fletcher, A. Deletic and M. Potter (2008). Hydraulic performance of biofilter systems for stormwater management: lessons from a field study, Melbourne Water Corporation.

Reynolds, W. D., B. T. Bowman, R. R. Brunke, C. F. Drury and C. S. Tan (2000). Comparison of tension infiltrometer, pressure infiltrometer, and soil core estimates of saturated hydraulic conductivity. *Soil Science Society of America journal* **64**(2): 478-484.

Reynolds, W. D. and D. E. Elrick (1990). Ponded infiltration from a single ring: Analysis of steady flow. *Soil Science Society of America journal* **54**: 1233-1241.

Youngs, E. G., D. E. Elrick and W. D. Reynolds (1993). Comparison of steady flows from infiltration rings in "Green and Ampt" and "Gardner" soils. *Water Resources Research* **29**(6): 1647-1650.

Single Ring Infiltration Test

Site: ____

Date: ____

Constant water level = 50 mm		
Time (min)	Volume (mL)	Q (mL/s)

Constant water level = 150 mm		
Time (min)	Volume (mL)	Q (mL/s)

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APPENDIX D:
FLOOD LEVELS DISCUSSIONS

Nick Wetzlar

From: Tony Merrilees <Tony.Merrilees@blacktown.nsw.gov.au>
Sent: Wednesday, 10 January 2018 3:01 PM
To: Nick Wetzlar
Subject: Eastern Creek Business Hub

Nick

We have reviewed he latest models that Council has for this area and note the following.

1. 100 year ARI 2 hr storm at peak (approx. 40 min) water surface levels.

Upstream of Southern Culvert = RL 39.2 m AHD
Upstream of Northern Culvert = RL 37.81 m AHD

2. 100 year ARI 6 hr storm at peak (approx. 40 min) water surface levels.

Upstream of Southern Culvert = RL 39.15 m AHD
Upstream of Northern Culvert = RL 37.83 m AHD

I am not sure how this compares to the Wyndam Prince study.

Regards

Tony Merrilees
Senior Engineer (Drainage) Developments
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APPENDIX E:
BCCs DEEMED TO COMPLY SPREADSHEET PRINTOUTS

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APPENDIX F:
OFFTAKE WEIR CALCULATION (SOUTH)

Circular culvert / Throttling pipe flow estimator

Based on chapters 9.1 - 9.33 , Willi H Hager "Wastewater Hydraulics" Springer 1999

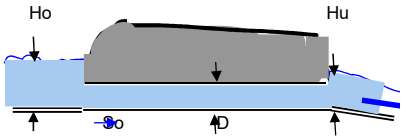
D	Ho	Hu	So	n	L	χ	Yo	Flow type
m	m	m	m/m		m	full pipe		
0.375	0.366	1.05	0.079	0.013	9.4	5.862	0.976	**pressurised**
Offtake	**Rl 40.316**	**Rl40.25**						N/A
R*d	**Rd**	**jd**	**Hd**	**h/l culvert**	**qd**	**Q**	χ	
			m	m		cub.m/sec	free	**transitional flow type**
-0.0671	0.0576	1.9803	0.0586	0.7313	N/A	**0.090**	5.812	**N/A**

Project No	17D83
Date	12-Feb-19

Draft 3

Qc max	Qcr	Q uni	Qgate tr	Qpress tr	Qpress	Qgate	Quni
							free
0.155	0.110	0.027	0.111	0.288	0.090	0.111	0.507
f	Yt	Cd	Q simple culvert	Qor	Sf	Fd	Qunifull
0.154	2.41	0.64	N/A	N/A	0.0778	N/A	0.507

Operational Diagram



Logic:

Ho and **Hu** are Energy Heads u/s and d/s of culvert respectively. **So** and **Sf** are Energy and pipe's gradients respectively. D is a pipe diameter.
χ is pipe roughness characteristic (5.31). **L** is culvert's length. **Yo** =Ho/D and **Fd** is pipe Froude number
Free Flow in the culvert can be either critical, uniform or gated. Flow is critical whenever χ >2. Maximum filling ratio should be 95%. Yo is generally lower than 1.20.
If **Sf** exceeds **So** hydraulic jump may develop in the pipe leading to the formation of standing waves and if filling ratio is larger than 90% to choking of the pipe (usually near the outlet).
For larger approach level 1.2<Yo<1.5 and free culvert flow, gated flow appears when the u/s section is submerged sealing the culvert's inlet against airflow.
Pressurised flow develops when outlet of the culvert is submerged (choked) and Yo is equal or larger than 1.0.
Transition between gated and pressurised flow is analysed using roughness characteristics **Rd** and **Rd*** as per chapter 9.33 as well as possibilities of outlet choking due to hydraulic jump formation and/or high filling ratio. Then the choice is made between gated and pressurised flow for a transitional flow type (this selection is automatic).
It is a well known fact that for the culvert flow situation a free surface flow often needs more head than pressurised flow. Also supercritical flow in the pipe is unstable leading to formation of waves,h/jumps etc thus discharge under these conditions (described as "critical" in the program) may be lower than that under the "uniform" flow conditions.
Please note that the sharp-crested inlet configuration (Cd=0.64) is considered for transitional gated flow. For **Qgate** coefficient **Cd** can be changed in cell C15.
The approach taken in this spreadsheet is based on formulas valid for a long culvert (L/D>=10).
This spreadsheet is set up to automatically compute the discharge through the pipe/culvert for the flow situation described by the input parameters(Ho;Hu;n;So;D;L;Cd).
The final flow rate appears in cell G9 (brown font).
Flowrates for each flow situation are displayed in cells A13-H13 and D15,E15 and H15. It allows the user to compare the floweret selected by the program to other relevant Flowrates and make his/her own judgements. The Flowrates calculated by this spreadsheet are on the conservative side.

To use this program please follow these easy steps:

1 Type input data in yellow cells
2 Read flow type in cells I5 and I9
3 Read culvert discharge in cell G9

Good luck

Abbreviations and formulas used in the spreadsheet

Qcmax Maximum free flow discharge for this situation (9.6)
Qcr Discharge for "critical" flow situation
Quni Discharge for "uniform" flow situation
Qgate tr. Discharge for transitional-gated flow situation
Q press. tr Discharge for transitional-pressurised flow situation
Q press. tr Discharge for "pressurised" flow situation
Qgate Discharge for "gated" flow situation
Q uni free Free uniform discharge
Q uni full Uniform discharge for the 95% full pipe
Q simple culvert Discharge calculated using formulas for a "simple culvert" (9.9 - 9.13)
Qor Discharge calculated using small orifice formulae with Cor = 0.64

χ > 2

1. Free flow

Uniform flow

$$\frac{Hon}{D}=\frac{2}{\sqrt{3}}\left(\frac{nQ}{So^{\frac{1}{2}}D^{\frac{8}{3}}}\right)^{\frac{1}{2}}\frac{1}{2}\left[1+\left(\frac{9}{16}\chi^2\right)\right] \quad (5.31)$$

Critical flow

$$\frac{Hoc}{D}=\frac{5}{3}\left[\frac{Q}{\left(gD^5\right)^{\frac{1}{2}}}\right]^{\frac{3}{5}};\ Qc\max=0.61\left(gD^5\right)^{\frac{1}{2}}$$

2. Gate flow

$$Q=Cd\left(\frac{\pi}{4}\right)D^2\left[2g(Ho-CdD)\right]^{\frac{1}{2}}$$

3. Pressurised flow

$$Qp=\left(\frac{\pi}{4}\right)D^2\left[\frac{2gHd}{1+\sum\xi}\right]^{\frac{1}{2}}$$

5. Other formulas used

$$q_n=\frac{nQ}{So^{\frac{1}{2}}D^{\frac{8}{3}}}=\frac{3}{4}y_n^2\left(1-\frac{7}{12}y_n^2\right) \quad (5.14)$$

$$\chi(roughness)=\frac{So^{\frac{1}{2}}D^{\frac{1}{6}}}{ng^{\frac{1}{2}}}$$

$$Fd=\frac{Q}{(gDh^4)^{\frac{1}{2}}} \quad (6.35;9.9-9.13)$$

$$h/lculvert=\sum\xi=12.64\left(\frac{gLn^2}{D^{\frac{4}{3}}}\right)$$

$$Hd=Ho+SoLd-Hu$$

$$flow\ is\ critical\ if\ \chi\geq 2$$

$$for\ trans.\ flow\ regime$$

$$Rd<R*d-gated\ flow$$

$$Rd>R*d-pressur.\ flow$$

4. Transitional flow

$$R*d=\frac{1}{9}\left[1.75\frac{Yo-0.90}{Yo-0.64}-1\right]$$

$$Rd=\frac{gL_dn^2}{D^{\frac{4}{3}}}$$

$$Q=q_d(gD^5)^{\frac{1}{2}};$$

$$gated\ flow\ q_d=0.71(Yo-0.64)^{\frac{1}{2}}$$

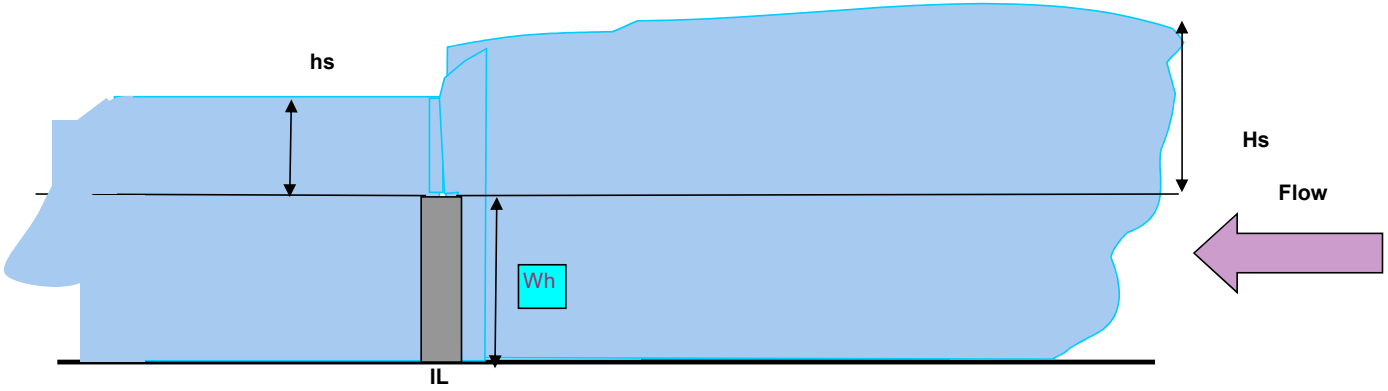
$$\Pr essurised\ flow\ q_d=0.94\left[\frac{Yo+j_d-1}{1+9j_d\chi_d^{-2}}\right]^{\frac{1}{2}}$$

$$Yo=\frac{Ho}{D},\ j_d=So\frac{L_d}{D}$$

Submerged weir Flow

					Project:	Airport 1	P1512	CDS	
	x				System flow	1360	l/sec		
Qsys (cumecs)	**IL (m)**	**Wh (m)**	**hs**	**d/s WL**	**Q(if not subm.- the same H)**	**L**	**Qsubm.**	**Hs**	**Culvert dimensions (WxH)**
1.36	0	40.366	0.161	40.53	1.59	5	1.354	0.327	
					V weir	**V culv**	**hw**	**SL**	
Qsubm-Qsys	**Cw**				0.83	0.007	40.69	2.9	
-0.0059	**1.71**	**(Hs-hs)/hs%**	**Hs-hs(m)**				**u/s**	40.66	
		103.1055901	0.166		Formulaes:	Qs=Q(1-(hs/H)^1.5)^0.385			
						Q=Cw LH^1.5			
						Hs = D + V^2/2g			

1 **Type system flow in cumecs in cell A5**
2 **Type Wh in metres (cellC5) and invert level (cellB5)**
3 **Type length of weir (m) in cell G5**
4 **Use Goal Seek or manual iteration in cell I5 so that contents of cell A8 equal zero.**



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APPENDIX G:
HYDRAULIC AND WATER QUALITY MODELS

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APPENDIX H:
NORTH BASIN LOW FLOW CHANNEL CALCUALTION MODELS

NORTH BASIN - CALCULATION SHEET

(2) TOP WATER LEVEL @ BJD OVERFLOW WEIR

INV. = 39.20

Based on a treatable flow of 870L/s

∴ Top berm/weir level = 39.10 : 100mm depth

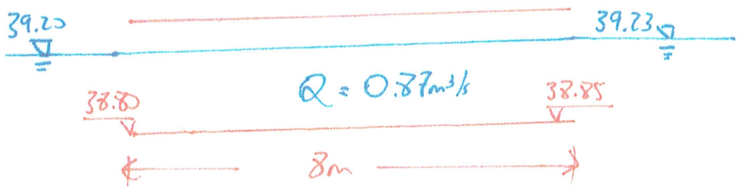
∴ L = 15m (min)

$H = \left(\frac{0.87}{1.7 \times 15}\right)^{\frac{2}{3}} = 0.10m$

(1) BOX CULVERT INLET TO BJD AREA

- Q_T = 870 L/s
- MODELLED BOX CULVERT = 1.2 x 0.6 RCBC

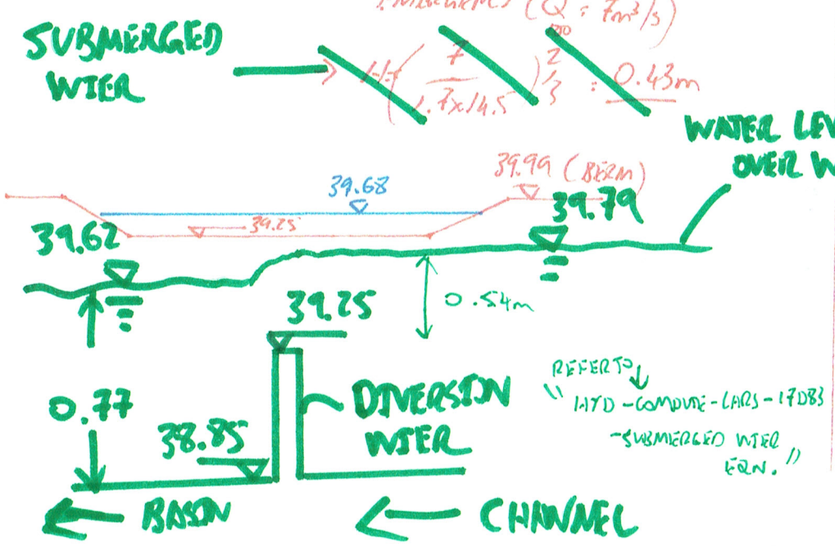
"Diversion Drainage System - north basin - with bjs modelled.rev1.drn" (Box Culvert to BJD)



(3) OVERFLOW WIER HEIGHT @ OFFTAKE CHANNEL

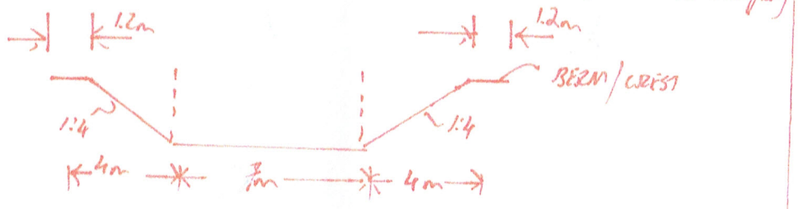
- SET @ RL 39.25 - LEVEL OF WATER @ U.S. END OF OFFTAKE CULVERT.
- 14.5m CONC. WIER → FLOW HEIGHT IN EMERGENCY (Q = 7m³/s)

$H = \left(\frac{7}{1.7 \times 14.5}\right)^{\frac{2}{3}} = 0.43m$

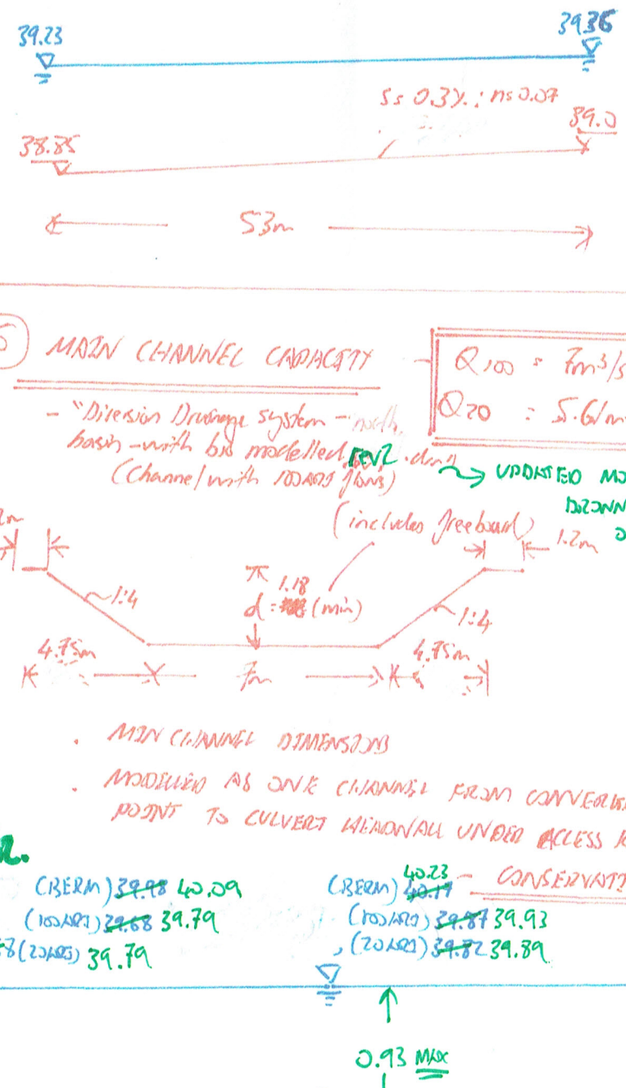


(4) CHANNEL TO BJD CULVERTS - LOW FLOW - 870L/s

"Diversion Drainage System - north basin - with bjs modelled.rev1.drn" (Channel with low flow)



MAIN CHANNEL DIMENSIONS - MODELLED WITH VERTICAL WALLS.



(5) MAIN CHANNEL CAPACITY

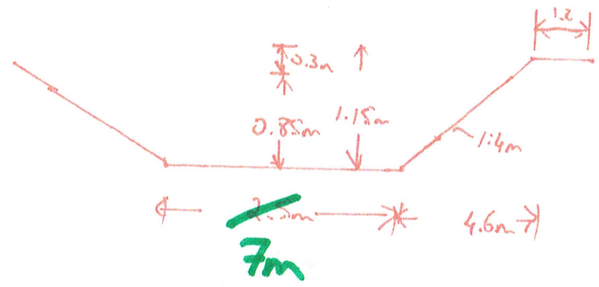
$Q_{100} = 7m^3/s$

$Q_{20} = 5.6m^3/s$

- "Diversion Drainage system - north basin - with bjs modelled.rev1.drn" (Channel with 100ARI flows) → UPDATED MODEL USING DOWNSTREAM D.S. WL OF 39.79

- MAIN CHANNEL DIMENSIONS
- MODELLED AS ONE CHANNEL FROM CONVERGENCE POINT TO CULVERT HEADWALL UNDER ACCESS ROAD.

(6) CHANNEL TO MAIN O.S. BASIN BEHIND OVERFLOW WIER



S = 0.01; n = 0.07

- FLOW DEPTH - 7m³/s - 0.85m - REFER TO SOBEK SHEET "17SD - CHANNEL BEHIND WIER". xs/x."

AT 7m WIDE CHANNEL, FLOW DEPTH = 0.77m USING MANNING'S EQN.

REFER TO "HYD - COMPUT - LARS - 17DB3 - CHANNEL BEHIND WIER"

(7) U.S. FLOWS TO USE IN ACCESS ROAD DRAINS MODEL

100ARI 40.14
20ARI 40.06

→ "17DB3 Road Rev 3 - option to flatten pipes - with adjusted channel numbers.. rev1.drn"

(8) U.S. FLOWS TO USE IN LOT 2 DRAINS MODEL

→ OBTAINED FROM ROAD DRAINS MODEL

100ARI - 40.36
20ARI - 40.20

→ "17SD rev 15 DP walkdown lines.. rev1.drn"

100ARI 40.46
20ARI 40.16
40.08

UPDATES 27/2/19

* USING DRAINS - WATER LEVELS ONLY CHANGE BY APPROXIMATELY 20mm AT UPSTREAM END.
* USING MANNING'S EQN, TO KEEP CHANNEL FLOW DEPTH ≤ 0.93m WIDTH TO BE INCREASED TO 8.10m → HYD - COMPUT - 17DB3 - MAIN CHANNEL - MODIFIED"

- 17DB3
- 4/2/19
- TP

7m
4.6m
4.6m
0.85 + 0.3 = 1.15m
D.S. OF WIER
S = 1%. n = 0.07
6
39.54
14.5m
4.6m
7m
3
14.5m LONG WEIR
RL 39.25
1:4
1:4
8.10m
4.92m
0.93 + 0.3 = 1.23m
WEIR - CONCRETE WALL
MAIN CHANNEL
S = 0.3%. n = 0.07
4, 5
40.09
40.23
APPROX 300mm LOW FLOW DIVERSION BUND
1.2m CREST
4.7
4.92m
8.1m
4.92m
53m
1.2 x 0.6
RCBC WITH TRASH RACK / WELDTONE GRATE OVER ENTRANCE
1.5m LONG CONCRETE SILT TRAP - 600mm DEEP.
CONCRETE SILT TRAP, 600mm DEEP AND 3m WIDE.
CHANNEL TO EXTEND INTO FUTURE LOT WITH RDT'S TO BE MODIFIED
1
15m
15m LONG WEIR BUILT OUT OF CONCRETE TO RL 39.10
MAINTENANCE PATH BUILT TO RL 39.35 (MIN)
39.35
39.10
UPFLOW PIT, REFER TO DRAWING C231 FOR DETAILS
1%
BIO-RETENTION OUTLET PITS REFER TO DRAWING C231 FOR DETAILS
PITS TO HAVE SEALED LIDS.
BIORETENTION FILTER AREA = 900m². OVERALL RD AREA TO BE ADJUSTED TO MAINTAIN 900m²
BIO-RETENTION SYSTEM INLET PIT, REFER TO DRAWING C231 FOR DETAILS.
BIORETENTION FILTER PROFILE INCLUDING PERMEABLE PIPE. REFER TO DETAIL ON DWG.C231
DENOTES 150mm COMPACTED CRUSHED CEMENT STABILISED GRANITE ON BATTER ADJACENT TO PIT FOR FULL BATTER WIDTH AS SHOWN.
4m WIDE MAINTENANCE PATH REFER TO DETAILS ON DWG.C241
B
900mm WIDE CONCRETE FLOW SPREADERS
SS
38.20
38.30
38.35
38.40
38.44
38.46
38.47
39.16
39.20
39.22
39.25
39.30
39.40
39.50
39.60
39.66
39.70
39.80
39.90
40.03
41.38
41.40
41.46
41.50
41.60
UPDATES | 27/2/19
• NORTH BASIN OFFTAKE SKETCH SHEET 1 OF 2
• ISSUED - 6/11/19

PAD 4

PROPOSED 1.2m WIDE TEMPORARY SWALE
REFER DRAWING C115 FOR DETAILS

CHANNEL TO EXTEND INTO LOT - 809; TO BE MODIFIED.

PROPOSED 0.2m DEEP 1.2m WIDE TEMPORARY GRASSED SWALE

SCOUR PROTECTION
STONE SIZE D_{50}=200mm,
400mm THICK OVER
GEOFABRIC (BIDIM A34 OR
APPROVED EQUIVALENT)

BASIN "PAD 4"
V = 343m³

PROPOSED 5.0m WIDE PERMANENT CHANNEL '1'
REFER DRAWING C115 FOR DETAILS

PROPOSED 5.0m WIDE PERMANENT CHANNEL '2'
REFER DRAWING C115 FOR DETAILS

SCOUR PROTECTION
STONE SIZE D_{50}=200mm,
400mm THICK OVER
GEOFABRIC (BIDIM A34 OR
APPROVED EQUIVALENT)
LENGTH 5m MIN

1.2m WIDE CREST

80m

1.2m WIDE CREST

EXISTING CHANNEL

PROPOSED HEADWALL

PROPOSED 27 RCBC

NORTH BASIN OFFTAKE SEARCH SHEET TOPO 1:250 . 4/11/19

UPDATES 27/2/19