WATER CYCLE MANAGEMENT STUDY

GOULBURN AQUATIC CENTRE REDEVELOPMENT

PREPARED FOR:
DWP
LEVEL 7, 232 VICTORIA PARADE,
EAST MELBOURNE
VIC 3002

PREPARED BY
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REVISION TABLE

Revision	Date	Issue	Author	Approved
/	13.04.2018	Preliminary for comments	SH	SH
A	26.06.2018	DA Submission	ND	SH
B	27.06.2018	Coordinated to incorporate design team comments and issued for DA	SH	SH
C	31.10.2018	Updated for Revised Staging & Incorporating irrigation requirements from council	SH	ND
D	19.12.2018	Updated for Revised Staging for stages 1 and 2 and Incorporating VM exercise	SH	ND

E	05.03.2019	Updated to Incorporate Council comments	SH	ND
F	17.04.2019	Updated to Incorporate Council comments	ND	SH
G	17.05.2019	Updated to Incorporate Council comments	SH	ND

1.0 INTRODUCTION

1.1 BACKGROUND

1.1.1 Crackerjack Consulting Engineers (CJCE) has been engaged by dwp (design world partnership) to prepare a Water Cycle Management Study for a proposed aquatic centre development at Goulburn Aquatic and Leisure Centre, 85 Deccan Street, Goulburn, NSW, 2580.

1.1.2 This report is intended to conceptually outline stormwater management design for the proposed development, conceptual erosion and sediment control measures and detail stormwater management methodology. A "detailed" design should be carried out to provide construction documentation and incorporate stormwater design principles outlined in this report. The final documentation is considered to be beyond the scope of this report.

1.1.3 dwp have provided a schematic site design, which is included in Appendix A and shows the split in staging between stages 1 and 2 as per drawing 0400. Stage 1 works relate to the new indoor aquatic facility with associated changing rooms, office, admin, creche, café and sub-basement plant room, incorporating swim club rooms, stores, gymnasium and 1 No. outdoor water play area. The external works for stage 1 will include the east and west carparks, entry plaza, access road and the external temporary seating. Stage 2 works include a new outdoor 50 m pool and associated separate plant room/ changing facilities/Storage and 1 No. external water play areas, as well as extensions to both east and west carparks as shown on Architects proposed site plan drawing 0400.

1.2 ASSUMPTIONS

1.2.1 At the time of writing this report, the layout of the complex and the various elements to be included are still under design development. As such, the water cycle management plan and stormwater concept design presented in this report is based on the layout presented in Illustration in Appendix A.

1.3 SCOPE OF PROJECT

1.3.1 The preparation of the plan comprises the scope of services listed below:

- Undertake a site visit to confirm layout and existing infrastructure.
- Liaise with the Goulburn Mulwaree Council to determine appropriate stormwater requirements for the site and irrigation re-use requirements.
- Prepare a water cycle management plan and Stormwater conceptual design with a proposed method of collection and disposal of site generated stormwater runoff.
- Prepare a preliminary plan showing possible site drainage infrastructure.
- Prepare a preliminary erosion and sediment control plan.
- Based on the MUSIC Climate Zone Maps, Goulburn falls within Zone 1.
- Pollutant concentration parameters coordinated with Tables 4.6 and 4.7 and clause 4.1.4 in Water NSW Current Recommended Practice "Using MUSIC in Sydney's Drinking Water Catchment".
- GTP removal rates based on calibration inputs provided in Table 5,4 in Water NSW Current Recommended Practice "Using MUSIC in Sydney's Drinking Water Catchment".
- Taking into consideration the parklands across the site to equate the total treatment areas for pre-development, stage 1 and existing, and post development (stage 1 and 2) conditions, the overall site treatment area considered in MUSIC is 16,012 m2.
- To model the treatment node provided by the 600 wide trench adjacent to proposed carpark for stages 1 and 2, CJCE based on liaison with Catchment Assessments Officer for Goulburn Council have modelled this treatment node as a bioretention system as agreed with 400 mm of sandy loam overlying 100mm of coarse sand over 40% voided 400mm of ballast/gravel. The extended detention depth is modelled as 200 mm and detailed as 200mm on proposed civils drawings.

2.0 DETAILED REPORT

2.1 DEVELOPMENT DESCRIPTION

2.1.1 The site of the proposed works is located at 85 Deccan Street, Goulburn NSW 2580. The development involves stage 1 demolition of the existing brick built changing rooms, canteen/Gym and club house, covered play areas, basketball court, playground, covered kids pool and Glulam structure and substructure to existing 25m heated indoor pool. The existing 50m outdoor pool will remain operational during construction of stage 1 works, as well as retaining the associated changing rooms, covered areas and 50m pool plant room.

2.1.2 Stage 2 works will involve replacement of the existing 50m outdoor pool and surrounding concourse, a new fully compliant plantroom, and 1 No. new outdoor waterplay area adjacent to Victoria park.

2.1.3 The existing site currently has 3 No. above ground rainwater water tanks, 2 No. are located along the southern boundary to the east of existing 25m heated indoor pool which will be demolished as part of stage 1 works. 1 No. larger RWT is located to east of existing male change rooms (denoted as area E on existing site catchment plan). We understand the current water re-usage for the site involved collecting rainwater from the roof of existing 25m heated indoor pool for irrigation re-use. We understand the larger tank located to east of male change was initially used for toilet flushing, however, the size of tank installed was too great for re-use for toilet flushing and was constantly getting topped up by mains water, hence, the facility has bypassed this tank which is no longer used for toilet flushing. CJCE have excluded this water re-use from the predevelopment MUSIC model to match existing site conditions.

2.1.4 The current aquatic centre covers approximately 0.8 ha to north of Victoria Park adjacent to Deccan Street. The proposed development once stages 1 and 2 are completed will cover approximately 1.6 ha and will extend further south into Victoria Park adjacent to the existing adventure playground. As part of MUSIC Model Assessment the areas of pre-development vs post development will be made equal to provide a like for like catchment area assessment. This additional area has been modelled as parkland for both pre-development, stage 1 and existing and post development (stage 1 and 2 combined) MUSIC models to equate the overall catchment area for each assessment. This aligns for the 16,012 m2 modelled for each condition.

2.2 EXISTING CATCHMENT DESCRIPTION

2.2.1 The existing catchment area currently covers a total area of approx. 8260m^2, this is split as follows: approximately 2760m^2 as bitumen carpark, approximately 2100 m^2 as roof, approximately 3400m^2 as concourses and hard stand areas (as shown in Appendix B SK050). The drainage to the existing carparks currently follows the existing site contours which fall in a south easterly direction from Deccan Street to Faithful Street. Deccan Street has a high point currently adjacent to the skate park which then falls in two directions towards Verner Street and Clifford Street. The current natural grade across the parklands from the back of the site varies but is relatively steep at approximately 1 in 10 to 1 in 12 grades resulting in a large level difference between the existing street frontage along Deccan Street and the sweeping pedestrian paths crossing Victoria Park in a west to east direction. The current stormwater discharge to existing carparks falls towards the existing buildings and skate park with traditional kerb drains and grated inlet pits collecting run off and discharging via gravity to either the stormwater drainage across the parklands or towards Verner street. We understand there is an existing stormwater drain that runs in a west to east direction from approximately the eastern edge of existing indoor pool hall through Victoria Park, towards the opposite corner of Clifford street. The condition of existing stormwater pipework and size is currently unknown, however, existing inverts are shown on Figure 2, Appendix B. Existing Invert depths vary from 540 mm below existing ground levels to 1.27 m below existing ground levels. Roof drainage is being captured in the rainwater tanks for irrigation purposes currently, however, the other hardstand and roofs appear to discharge via the surface to the parklands in several locations.

An existing water main crosses the parklands, due south of the current site with the existing sewer running parallel with western elevation of the existing indoor pool hall.

FIGURE 1. Aerial image of site (Google Earth, 13/04/2018)

2.3 TOPOGRAPHY & SOILS

2.3.1 The site is sloping throughout with several benched platforms for the various build levels / floors and pools. Existing site levels range from 673.75 AHD in the North-Western corner of the existing carpark down to 666.08 AHD at the South-Eastern boundary with the parklands. Soils landscape mapping for the area has been determined via a Geotechnical investigation by Douglas Partners Pty Ltd dated August 2018 (Ref: 94050.00). The site in underlain by sedimentary rock, including siltstone, shale and limestone. Top soil varies in depth from 0.1 m to 0.35 m from existing ground levels, with underlying sandy Clay or Gravelly sandy Clay up to 2.7 m depths over the bedrock.

2.4 HYDROLOGY

2.4.1 The mean annual rainfall for Goulburn is approximately 1240mm and there is typically more rainfall in June, July & August than any other time of the year. Based on the existing surface levels presented in SK104 rev F in Appendix A, surface runoff will generally flow across the site in an easterly or south-easterly direction. Surface runoff flowing across the western boundary of the site will discharge directly into the adjacent stormwater drainage system along Verner Street. Surface runoff flowing to the southern boundary of the site will flow in an easterly direction adjacent to the road.

2.5 FLOODING

2.5.1 A comprehensive flood study has been completed as of September 2016 for Goulburn Mulwaree Council which addresses the mainstream flood behaviour at Goulburn due to the Wollondilly and Mulwaree Rivers. The subject site at Goulburn Aquatic Centre is located due south of the Wollondilly River and due north west of the Mulwaree River. From the comprehensive flood study undertaken it is unlikely that peak flood events for both Wollondilly and Mulwaree Rivers will occur simultaneously. The modelled peak flood level based on a 200-year ARI is approximately AHD 631.00 for both Mulwaree and Wollondilly Rivers which is substantially lower than the proposed development site. The proposed development is tiered to optimise the cut and fill levels with the entrance foyer for stage 1 set at AHD 672.425, the new 25 m pool AHD 669.700 and the basement plant room beneath the new warm water pool set at AHD 666.350. The proposed 50 m pool concourse for stage 2 is set at AHD 668.470.

2.6 COUNCIL REQUIREMENTS

2.6.1 Referring to Goulburn Mulwaree Council document "Stormwater Drainage and Rainwater Collection Systems Policy", we understand that there are requirements for rainwater tank provisions and on-site water cycle management as follows:

Normal Requirements for Stormwater Management for Development:
As stated in the Stormwater Drainage Design section of Council's Standards for Engineering works, new development must cater for stormwater by:

- *For the "major" system (100-year ARI) – provide a safe and well defined overland flow path.*
- *For the "minor" system (10-year ARI) – for industrial areas provide a system of carrying and controlling the flows, this involves a piped system.*

As part of these control measures, we are currently proposing to limit stormwater discharge to the surrounding system from the development site to pre-development flow rates, meaning the excess post developed catchment areas will be detained using detention techniques such as on site detention tanks and water sensitive urban design systems. These will capture the excess post development flow rates for a 10-year ARI 5-minute duration in accordance with AS/NZS 3500.3.
As part of this stormwater management strategy we are considering the catchment areas for the combined stages 1 and 2 development(S) to holistically capture the stormwater management proposals for the fully developed site.

These detention systems are detailed on CJCE proposed civil stormwater layout drawings , refer to Appendix C.

2.7 DEVELOPMENTS IN DRINKING WATER CATCHMENT REQUIREMENTS

2.7.1 The Water Cycle management measures implemented within our stormwater conceptual drawings comply with the requirements set out in Water NSW policy – Developments in the drinking water catchment – water quality information requirements, dated June 2018. Based on the NorBE testing criteria and the results of MUSIC model simulation, we are achieving a beneficial effect on the water quality when comparing post development criteria to pre-development.

2.8 EROSION AND SEDIMENT CONTROLS

2.8.1 Crackerjack Consulting Engineers Pty Ltd (CJCE) has been requested by Goulburn Council to prepare an erosion and sediment control plan for a proposed redevelopment to existing aquatic facilities at 85 Deccan Street, Goulburn.

2.8.2 This report intends to conceptually outline erosion and sediment control for the proposed redevelopment and with typical methodology. A "detailed" drawing should be submitted by the Principal Contractor showing their preferred construction methodology. The final documentation is beyond the scope of this report.

2.8.3 The preparation of the plan comprises the scope of services listed below:

- Undertake a site visit to confirm layout and existing infrastructure.
- Prepare an erosion and sediment control Plan detailing proposed methods of collection site generated erosion and sediment.
- Prepare a preliminary sketch plan showing possible infrastructure (Refer to Appendix C drawings SK62 and CD125.

2.8.4 In relation to erosion and sediment control measures, the conceptual design assessments have considered the proposed facility levels and tiered the building layout to optimise cut levels and minimise the disturbance of soils during the construction phase. The tiering of the development works with the existing site contours to control the areas at which the majority of excavations will occur. These are concentrated to the semi basement forming plant room beneath the new warm water pool and the excavations for the 25m pool and internal concourses during stage 1. During stage 2 the majority of excavations will apply to the new 50 m pool. It should be noted that the carpark and entry foyer/creche to stage 1 works is raised to optimise pedestrian

and vehicular transitions into the site, hence, enabling excavated materials to be used as fill beneath the suspended floor slabs. This scenario of void available for fill also applies to stage 2 suspended ground floor slabs forming the gymnasium and programme rooms.

2.8.5 Based on our assessments in accordance with Chapter 4: Erosion Control of Soils and Construction Volume 1 (4th Edition dated March 2004), the proposed development site in Goulburn has a rain erosivity factor of approx. 1500 and a site gradient of approximately 8% resulting in a low erosion hazard. This means that standard erosion control measures can be adopted for the site in accordance with the Blue book Volume 1 guidelines. The following are considered suitable planning considerations: -

- Where practical, construction work scheduled so that time of land disturbance activities to rehabilitation is less than 6 months. Restrict land disturbance to areas of workable size, lands next to waterways should remain undisturbed for as long as practical.
- Where possible do not extend land disturbance activities beyond 5 metres (preferably 2 m) from the edge of essential construction activity other than access areas. These zones of restricted access might require clear identification with barrier mesh, sediment fencing or other appropriate materials.
- For conceptual soil and erosion plan control measures refer to Appendix C drawings SK62 and CD125.

2.8.6 Timing of works shall be considered by the Principal Contractor and a detailed proposal submitted for Council Approval prior to site establishment:

- Establish a single stabilised entry/exit point (rumble pad).
- Install sediment fence(s) along the low side of the site.
- Divert up-slope water around the work site and appropriately stabilise any drainage channels.
- Clear only those areas necessary for building work to occur.
- Stockpile topsoil within the sediment-control zone.
- Stabilise exposed earth banks e.g. vegetation, erosion control blankets.
- Install on-site waste receptacles e.g. mini-skips, bins, reo cages. These should be covered to prevent waste being moved by wind.
- Commence building activities.
- Install roof downpipes as soon as practicable after the roof is laid.
- Maintain all control measures in good working order.
- Revegetate or otherwise stabilise the site.

2.8.7 Principal Contractor shall follow all recommendations and guidelines from both the "*Blue Book*" together with "Guidelines for Erosion & Sediment Control on Building Sites"

2.8.8 General erosion control measures for handling of soils should follow the guidelines in chapter 4 of Blue book Volume 1. As the site will disturb more than 1,000 m2 of land, slope lengths should not exceed 80 m immediately before forecast rainfall or during shutdown periods. Any temporary diversion should outlet to stable discharge areas. Earth embankments and abutments will be considered to reduce erosion hazards further. The detailed proposals will be submitted by the successful contractor post award of contract.

2.9 WATER CYCLE MANAGEMENT METHODOLOGY AND PROPOSED WATER RE-USE.

2.9.1 Based on the site water cycle requirements the following stormwater management methodology is proposed.

2.9.2 : Stormwater detention to capture the excess post development flow rates for a 10-year ARI 5-minute duration. The purpose of this objective is to see that the proposed development does not result in increased stormwater flows that exceed the capacity of external stormwater drainage infrastructure and/ or exacerbate flooding. The introduction of impervious surfaces and regrading of site to align with existing site contours will lead to increase in the frequency, volume and flow rate of stormwater, hence the requirement for stormwater detention. Specific details for onsite detention is detailed in Appendix C.

2.9.3 Protection of adjacent parkland ecology and surrounding water courses. Stormwater treatment measures are required to capture key pollutants. Water that flows from the development site must be captured and detained within the proposed site boundaries for 10-year ARI's with overland flow paths for 100-year ARI's. Furthermore, water that flows from the development site via overland flow to the parklands must not contain pollutants that could cause detrimental impact to the environment.

2.9.4 The proposed catchment areas when considering the combination of stages 1 and 2 does significantly increase the total catchment area to approximately 16,012 m^2, this is split as follows: approximately 4698m^2 as bitumen carpark, approximately 5500m^2 as roof, approximately 2735m^2 as concourses and hard stand areas (refer to Appendix B Proposed stage 1 and 2 catchment areas drawing SK103 rev E) and the remaining as parkland/green space.

2.9.5 There is an increase of approximately 70% of carpark catchment area which we have graded away from the front entry to minimise risks of surcharge and eliminate heavy duty slot drains adjacent to the buildings. The eastern carpark falls at varying grades at maximum 1 in 40 towards Deccan street, tying into the cross over location proposed and generally follows the grade of existing public footpath. The southern section of eastern carpark is raised up above existing contours which fall away towards Victoria park requiring retaining walls to build up the carpark. The western carpark grade follows the fall of the existing site contour towards Verner Street with grades again at maximum 1 in 40. The result of this requires level cuts adjacent to existing public footpath to Deccan Street with retaining walls up to 1.15 m high. Along the southern section of this carpark adjacent to existing skate park is relatively at grade however due to existing site contours falling towards the pedestrian footpaths, the south western corner of car park requires filling behind retaining walls to maintain suitable car park grades.

2.9.6 Our proposals for detaining the excess flow rates from the increased car park catchment areas involves adopting a water sensitive urban design solution (WSUD) utilising a lined 600 wide by average 900 deep bioretention system as agreed with 400 mm of sandy loam overlying 100mm of coarse sand over 40% voided 400mm of ballast/gravel. The extended detention depth is detailed as 200 mm. The length of 600 wide trench is approx. 206 m in length for stages 1 and 2 combined, however, CJCE have modelled 80% of this length at 164.8m in MUSIC for water treatment purposes. The flow rates out to Verner Street for the western carpark and to the existing stormwater drainage crossing Victoria Park for the eastern carpark are limited to predevelopment flow rates by installing a suitably sized orifice plate within the outfall pit discharging to the street or stormwater system. To further treat the water prior to discharging to the stormwater network we have proposed the use of Rocla First Defender High Capacity FDHC 3: one of the best GPT's to use for Car parks. Further details are shown on drawing S17_082_SK070 and SK072 in Appendix C.

2.9.7 The carpark stormwater runoff falls and drains directly to a bioretention "trench" which has been modelled in MUSIC as 50% of its actual length to simulate actual water treatment prior to entering the surrounding water tables and system. This ratio of 50% of actual length has been applied for both stages 1 and 2 works to simulate the staged construction of the bioretention "trench".

2.9.8 The catchments from the stage 1 services road, mech plant, steps, are to be drained to a Rocla First Defender High Capacity FDHC 3 GTP (900 diameter pit), prior to connecting to the below ground Rocla OSD box culverts. This enables the captured water to be treated prior to entering the OSD box culverts. We have allowed for capturing the excess 10 year ARI rainfall flows during a 5 minute duration. The external concourses surrounding the pools for Stage 2 have been excluded from the assessments due to the chemicals used to clean the concourses during operating periods hence, the catchments to these particular areas will be discharged to sewer to avoid polluting the waterways. The water captured in the OSD system has a pump chamber for re-using as irrigation across Victoria Park. The water flowing from the OSD system then discharges to a 7.2m wide by 15.0m long bio retention system with 400mm depth of loam soil mix to support densely planted native species with effective nutrient control which needs coordinating with the landscape architects proposals. The water is then filtered through a sand loam mix filter media with surface area of 11.25m2 by 400mm filter depth over lying 100mm of sandy transition layer, overlying 400mm of fine gravel drainage layer. The overflow pit from the bioretention system discharges via gravity to the existing stormwater pipe crossing Victoria Park with a new junction ox construction on the existing storm run.

2.9.9 The stormwater from the roofs in stage 1 will be drained and captured in a 118m3 below ground (plantroom) rainwater tank for irrigation re-use across the site. We have modelled 80% of this particular RWT volume in MUSIC to comply with Water NSW Current Recommended Practice "Using MUSIC in Sydney's Drinking Water Catchment". The overflow from the plantroom RWT tank connects to the in ground Rocla OSD box culverts which again have been modelled in MUSIC as 80% of the actual volume. We have allowed for capturing the excess 10-year ARI rainfall flows during a 5-minute duration within the box culvert system. The water captured in the plantroom RWT will be re-used for toilet flushing, site washdown and general irrigation requirements within the boundary of the extended leisure complex.

2.9.10 The proposed roof stormwater catchment will be piped and connected into a below ground rainwater tank (118m3) at plantroom level and plumbed for irrigation re-use. We understand from Robert Hughes (Goulburn Council) email of 26th September 2018 irrigation requirements for whole of Victoria Park equates to 1.27 ML/yr . Considering all of the above treatment trains, for the post development site conditions, we are achieving NorBE.

2.9.11 Further consideration for water re-use across the site would be to re-use the bleed off water from the UFF filters treating the pool water across the site within the plant room

for toilet flushing as part of a grey water system. Bleed off water from filters to control TDS is technically classified as grey water hence can be re-used for toilet flushing.

2.9.12 The overflow pit within the bio retention basin will discharge to the stormwater system for ARI 100 year events as well as enabling further overland flow paths to relieve ARI 100 year events. For further details refer to S17.082_SK070 to SK076 in Appendix C.

Based on survey information received and referring to Figure 2 in Appendix B, within the vicinity of the WWP extension there is an existing water main crossing the site, stormwater drainage which is servicing the existing indoor pool and changing rooms along the eastern side of the existing pool enclosure and existing sewer which runs parallel with proposed service road. The existing stormwater branch can be decommissioned and replaced with a below ground stormwater system which connects into the existing stormwater drains further downstream. The existing water main is to be diverted around the proposed stage 1 WWP enclosure and underlying basement. The existing sewer is to be lowered to suit the proposed new access road.

2.9.13 Preliminary Stormwater management plan drawings S17.082_SK070 to SK076 can be found in Appendix C.

2.10 STORMWATER DETENTION AND TREATMENT

2.10.1 To achieve the design criteria listed in section 2.6, the measures that will provide detention and treatment of stormwater need to be designed so that they provide:

- temporary storage (i.e. detention) of inflowing stormwater and then release the stored water (at a rate that mimics the pre-developed situation) so that they are ready to receive inflow from the next rain event;
- infiltration of stormwater to mimic the pre-developed quantity of infiltration; and
- treatment of stormwater to preserve the existing groundwater and surface water quality.

Given the space constraints on the site, it is efficient to provide each of the above functions within one type of stormwater management measure. For this site, separate OSD systems in the form of ballast/gravel filled trenches with bioretention "trenches"

formed to treat water run off for the car parks and a combination of below ground rainwater tanks, Rocla OSD box culverts and a bioretention basin for the main development, with pre and post water treatment devices are proposed to provide an easy to maintain and cost effective solution.

For Further details refer to Appendix C.

2.10.2 Due to the current fall across the site, a natural overland flow path already exists for ARI 100 rain events across Victoria Park.

2.11 QUANTITATIVE ASSESSMENT OF STORMWATER STRATEGY

2.11.1 The ability of the stormwater strategy to meet the design criteria listed in section 2.6 has been assessed using the MUSIC stormwater modelling software package.

2.11.2 A conceptual stormwater treatment model has been developed using the MUSIC software in order to quantify the pollutant removal provided by the proposed stormwater strategy. The Rocla GPT water treatment system is modelled including the OSD systems to reflect the proposed shown on drawings S17.082_SK070 to SK076 and are represented in the MUSIC model. Council's DCP states that runoff from roofs, carparks and paved areas needs to be treated, therefore these areas have been included in the model.

2.11.3 The Peak stormwater flows calculated in accordance with AS3500.3 are summarised in table 3 below for both pre and post development flow rates. Detention has been conceptually designed to restrict stormwater discharge to the surrounding system from the development site to pre-development flow rates, meaning the excess post developed catchment areas will be detained using detention techniques such as OSD systems and water sensitive urban design systems. These will capture the excess post development flow rates for a 10-year ARI 5-minute duration in accordance with AS/NZS 3500.3.

Table 3
Pre and Post Development Peak Flows

Reference	Rainfall event	
	ARI 10 years	ARI 100 years
Existing site catchments	l/s for 5 min	l/s for 5 min
Existing Carpark	82.1	133.8
Existing Roof	62.5	101.9
Existing Hardstand	101.2	165.0
Total	**245.8**	**400.7**
Stage 1 catchments with existing		
Proposed Carpark Stage 1	94.5	154
Proposed Roof Stage 1	147.2	239
Existing Roof remaining	24.2	39.4
Proposed Hardstand Stage 1	114.8	187.2
Existing Hardstand remaining	52.1	84.9
Total	**432.8**	**704.5**
Stage 1 and Stage 2 Catchments		
Proposed Carpark Stage 1 and 2	140	228
Proposed Roof Stage 1 and 2	156.4	254.9
Proposed Hardstand Stage 1 and 2	139.3	227.1
Total	**435.7**	**710**

2.11.4 The results from MUSIC modelling are presented in Tables 4 and 5 below. Based on the assessments completed, the predicted pollutant load reductions will meet the minimum requirements of 10% for Total Suspended Solids, Total Phosphorous and Total Nitrogen, hence achieving a beneficial effect on water quality. This is in line with the "Neutral or Beneficial Effect on Water Quality Assessment Guideline 2015' (SCA,2018).

2.11.5 The water treatment proposed for stages 1 and 2 will be constructed during Stage 1 to enable the future expansion to follow. Please refer to details on S17.082_SK070 to SK076 in Appendix C.

Table 4 Mean Annual Loads

	Pre	Post	Stage1 + Extg
Flow (ML/yr)	4.41	5.95	6.14
Peak Flow (m3/s)	0.185	0.299	0.309
Total Suspended Solids (kg/yr)	880	177	460
Total Phosphorus (kg/yr)	1.63	0.855	1.21
Total Nitrogen (kg/yr)	9.54	8.41	9.52
Gross Pollutants (kg/yr)	103	4.5	50.6

Table 5 Treatment Train Effectiveness

	Sources		Residual Load		% reduction	
	Pre	Stage 1	Pre	Stage 1	Pre	Stage 1
Flow (ML/yr)	4.45	8.2	4.41	6.14	0.899	25
Total Suspended Solids (kg/yr)	887	1.53E+03	880	460	0.789	70
Total Phosphorus (kg/yr)	1.65	3.03	1.63	1.21	1.21	59.9
Total Nitrogen (kg/yr)	9.87	18.8	9.54	9.52	3.34	49.5
Gross Pollutants (kg/yr)	123	256	103	50.6	16.3	80.2

	Sources		Residual Load		% reduction	
	Pre	Post	Pre	Post	Pre	Post
Flow (ML/yr)	4.45	8.07	4.41	5.95	0.899	26.3
Total Suspended Solids (kg/yr)	887	1.59E+03	880	177	0.789	88.9
Total Phosphorus (kg/yr)	1.65	3.06	1.63	0.855	1.21	72.1
Total Nitrogen (kg/yr)	9.87	18.6	9.54	8.41	3.34	54.8
Gross Pollutants (kg/yr)	123	251	103	4.5	16.3	98.2

2.11.6 The MUSIC model described above was also used to assess the overall water balance for the site. The model includes ten years' worth of climate data and is considered to be an appropriate tool for assessing the water balance.

The simulation of rainfall – runoff processes within the model is based on data entered for a range of soil properties.

The average annual rainfall for the ten-year period simulated by the MUSIC model is 1240mm. The proposed complex covers an area of 1.6 ha compared to 0.8 ha for the existing site. If the site was developed in accordance with the current layout plan, but

no water management measures were implemented (i.e. an 'unmitigated' scenario), the proportion of surface runoff would increase by 100 %.

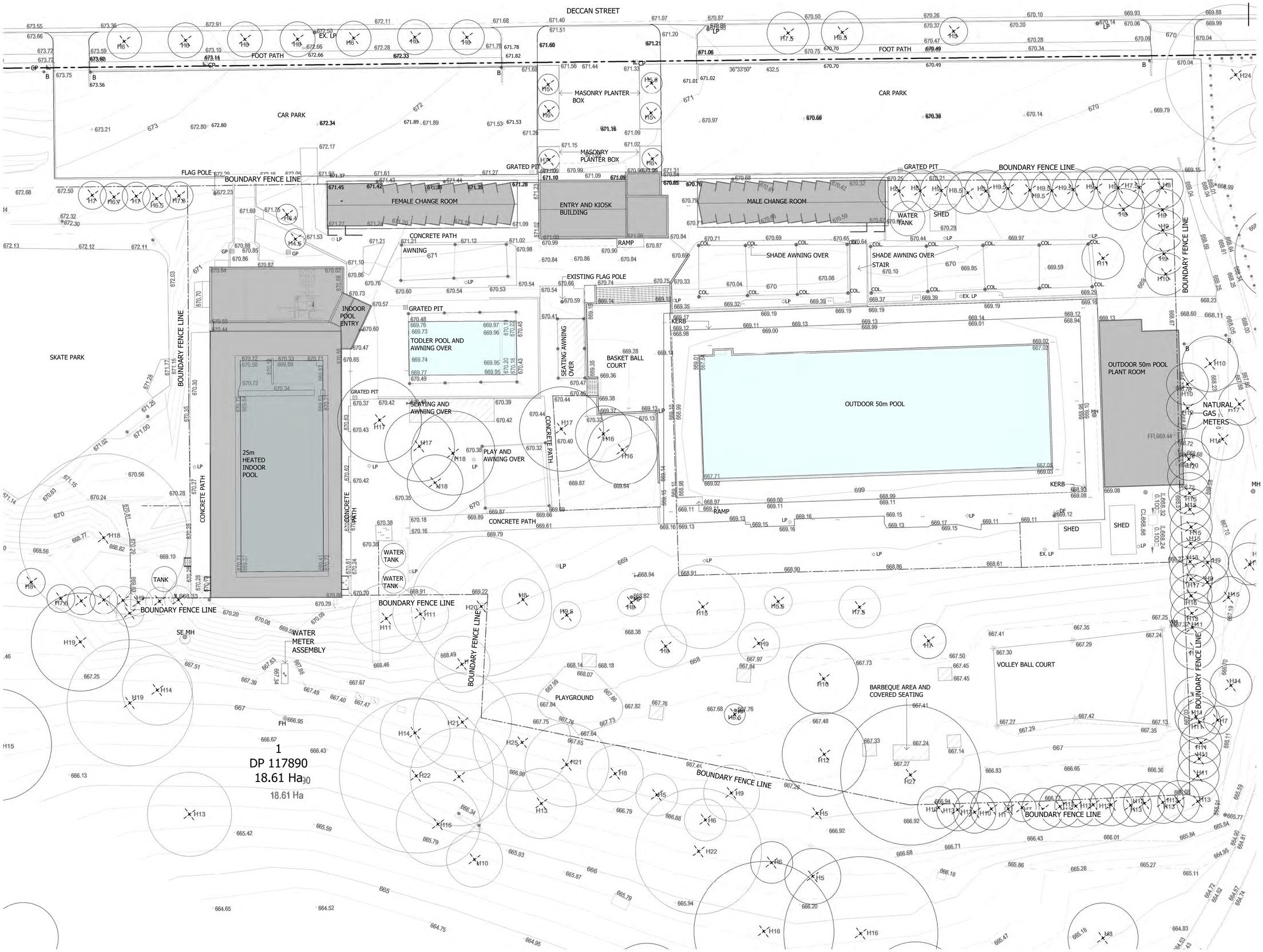
By incorporating the water management measures proposed in the current strategy, the proportion of surface runoff leaving the site would reduce to 4.90 ML/yr which is an improvement on pre development site conditions.

2.12 SUMMARY

2.12.1 The preliminary sketch plan contained within this report has been prepared to demonstrate the philosophy behind the proposed treatment of the stormwater runoff from this development. The information provided is preliminary and will be subject to finalisation of detailed design and documentation.

3.0 APPENDIX A

Existing Site Plans and Staging Plans.



Notes

SITE LEGEND

EX	EXISTING
B.	BOLLARD
	BITUMINEN SPOT
CP	COMMS - PIT
	COVER LEVEL
	GRATED PIT
V	VENT
LP	LIGHT POLE
	UTILITY
	VALVE
MH	MANHOLE
	STOP VALVE
C	COLUMN
WM	WATER METER
MP	PLAQUE
DF	DRINKING FOUNTAIN
	FIRE HYDRANT

SCHEMATIC DESIGN

NOT TO BE USED DURING CONSTRUCTION

Issue	Description	Date	Chk	Auth
F	ISSUED TO COUNCIL	21.06.18	SSH	SSH
E	ISSUED TO COUNCIL	30.05.18	SSH	SSH
D	ISSUED TO COUNCIL	12.04.18	SSH	SSH
C	ISSUED TO CONSULTANTS	05.04.18		SSH
B	LANDSCAPE ARCHITECT ISSUE	04.12.17		MM
A	PRELIMINARY ISSUE	06.11.17	KA	MM

Architect/ Designer
dwp
www.dwp.com

Client
Goulburn Mulwaree Council

Project
GOULBURN AQUATIC CENTRE REDEVELOPMENT

Location
85 DECCAN STREET, GOULBURN

Project Number
AUMEL-17-0400

Drawing
SITE PLAN - EXISTING

Scale (A1) 1 : 250
Date Printed 21-Jun-18 9:07:57 AM

Drawing Number SK104
Issue F

File Name: BIM 360://dwp_17-0400_Goulburn Aquatic Centre/AUMEL-17-0400_GAC_DA_R2018.rvt

dwp clarke keller

BRYANT ST.

DECCAN STREET

PROPOSED CROSSOVER FOR STAGE 1 - TO BE REMOVED IN STAGE 2

15 ON STREET PARKING

5 ON STREET PARKING

EXISTING CROSSOVER FOR STAGE 1 - TO BE REMOVED IN STAGE 2

18 ON STREET PARKING

STAGE 2 PROPOSED 30 CAR SPACES

STAGE 1 PROPOSED 42 CAR SPACES

PROPOSED PLAZA

STAGE 1 PROPOSED 53 CAR SPACES

STAGE 2 PROPOSED 36 CAR SPACES

PROPOSED SUBSTATION

PROPOSED ENTRY FOYER AND CRECHE

PROPOSED GYM

EXISTING SKATEPARK TO BE RETAINED

PROPOSED ACCESS

PROPOSED INDOOR POOL AND WATER PLAY

PROPOSED INDOOR POOL

PROPOSED OUTDOOR POOL

PROPOSED REFURBISHED POOL PLANT AND CHANGE ROOMS

PROPOSED WARM WATER POOL AND CAFE

PROPOSED OUTDOOR RECREATION SPACE

PROPOSED BEACH VOLLEY BALL

VERNER STREET

POTENTIAL AREA FOR EXISTING TREE RELOCATION

POTENTIAL AREA FOR EXISTING TREE RELOCATION

POTENTIAL AREA FOR EXISTING TREE RELOCATION

PATH BY OTHERS

PATH BY OTHERS

ROSE GARDEN

VICTORIA PARK

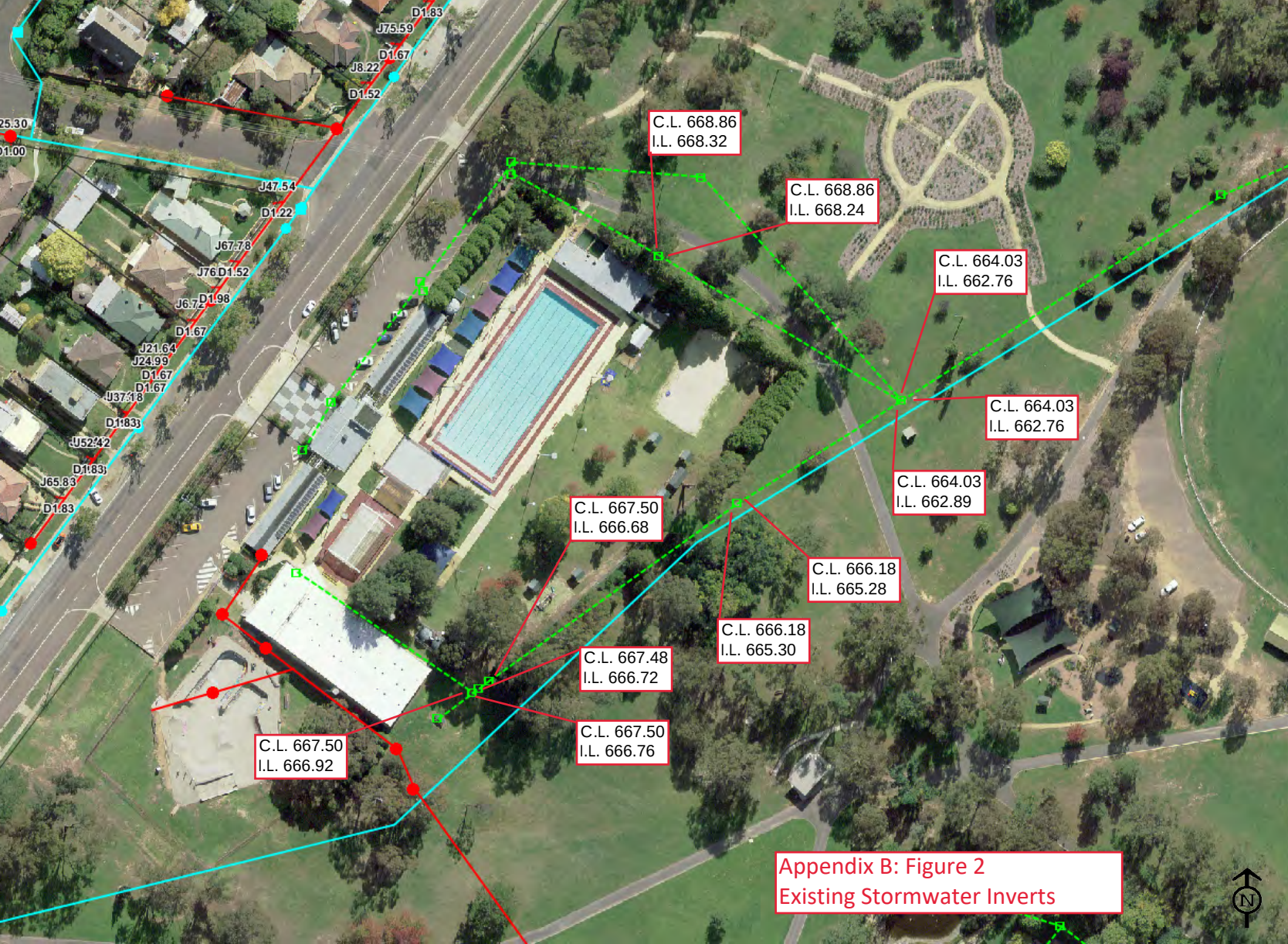
ADVENTURE PLAYGROUND

PRELL OVAL

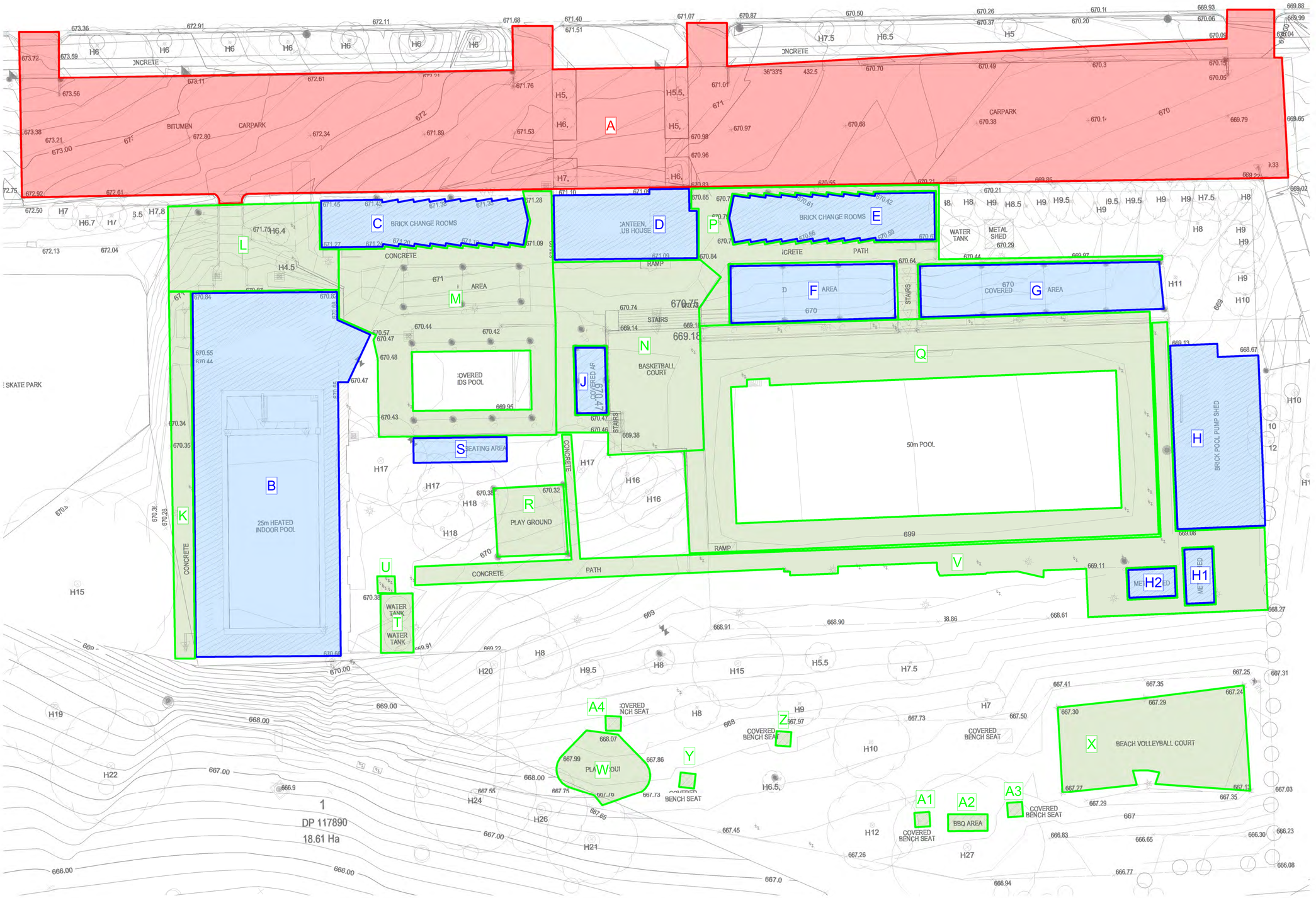
4.0 APPENDIX B

Existing site catchment plan, Proposed site catchment plan stage 1, Proposed site catchment plan stage 1 and 2 combined.

Existing stormwater layout and inverts.



Appendix B: Figure 2
Existing Stormwater Inverts



LEGEND

- ROOF CATCHMENT AREAS
- HARDSTAND CATCHMENT AREAS
- CAR PARK CATCHMENT AREAS

EXISTING CATCHMENT SCHEDULE

CATCHMENT REF.	AREA
A	2758m²
B	906m²
C	155m²
D	156m²
E	155m²
F	152m²
G	198m²
H,H1,H2	308m²
J	32m²
K	128m²
L	232m²
M	518m²
N	420m²
P	197m²
Q	847m²
R	81m²
S	39m²
T	30m²
U	4m²
V	535m²
W	80m²
X	280m²
Y	4m²
Z	4m²
A1	4m²
A2	11m²
A3	4m²
A4	4m²

NOTE:

TOTAL CAR PARK CATCHMENT = 2758m²

TOTAL ROOF CATCHMENT = 1645m²

TOTAL HARDSTAND CATCHMENT = 2423m²

EXISTING SITE CATCHMENT PLAN

1 : 250

GENERAL NOTES:

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ABN: 21 518 561 838
Level 8, 423 Bourke Street, Melbourne VIC 3000

DrawingTitle: EXISTING SITE CATCHMENT PLAN

Client/Project: GOULBURN AQUATIC CENTRE REDEVELOPMENT

Status: PRELIMINARY

Project No:	Dwg No:	Revision:	Dwg Size:
S17_082	SK050	B	A1

Drawn:	Date:	Checked:	Scale:
DL	APR 18	SH	1:250 @ A1

Rev:	Date:	Notes:	By.	Chkd
B	19.10.18	DDA SUBMISSION	DL	SH
A	25.06.18	DDA SUBMISSION	DL	SH

LEGEND

- ROOF CATCHMENT AREAS
- HARDSTAND CATCHMENT AREAS
- CAR PARK CATCHMENT AREAS
- EXISTING ROOF CATCHMENT AREAS
- EXISTING HARDSTAND CATCHMENT AREAS

PROPOSED CATCHMENT SCHEDULE - STAGE 1

CATCHMENT REF.	AREA
A	975m²
B	1446m²
C	752m²
E	816m²
F	855m²
H	1152m²
J	176m²
K	1225m²
M	55m²
N	725m²
P	1485m²
Q	725m²

EXISTING CATCHMENT SCHEDULE - STAGE 1

CATCHMENT REF.	AREA
D1	156m²
E1	155m²
F1	152m²
G1	198m²
H,H1,H2	308m²
P1	145m²
Q1	787m²
V1	379m²
X1	280m²

PROPOSED SITE CATCHMENT PLAN - STAGE 1

1 : 500

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Melbourne VIC 3000

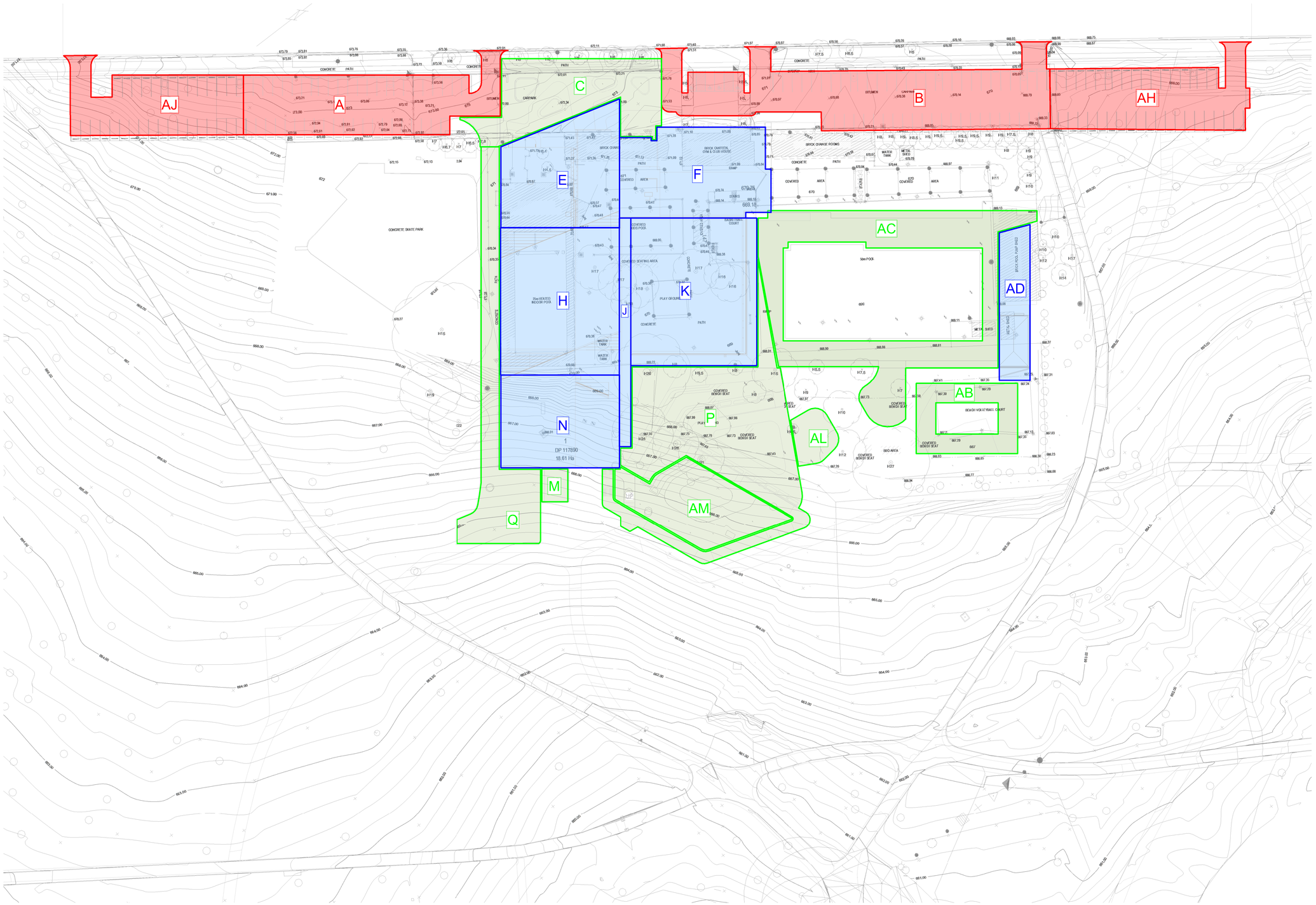
DrawingTitle: PROPOSED SITE CATCHMENT PLAN - STAGE 1

Client/Project: GOULBURN AQUATIC CENTRE REDEVELOPMENT

Status: PRELIMINARY

Project No:	Dwg No:	Revision:	Dwg Size:
S17_082	SK102	D	A1
Drawn: DL	Date: APR 18	Checked: SH	Scale: 1:500@A1

Rev:	Date:	Notes:	By.	Chkd:
D	19.12.18	DDA SUBMISSION	DL	SH
C	18.10.18	DDA SUBMISSION	DL	SH
B	26.06.18	DDA SUBMISSION	DL	SH
A	25.06.18	DDA SUBMISSION	DL	SH



LEGEND

- ROOF CATCHMENT AREAS
- HARDSTAND CATCHMENT AREAS
- CAR PARK CATCHMENT AREAS

PROPOSED CATCHMENT SCHEDULE - STAGE 1	
CATCHMENT REF.	AREA
A	975m²
B	1446m²
C	752m²
E	816m²
F	855m²
H	1152m²
J	176m²
K	1225m²
M	55m²
N	965m²
P	1485m²
Q	725m²

PROPOSED CATCHMENT SCHEDULE - STAGE 2	
CATCHMENT REF.	AREA
AA	855m²
AB	340m²
AC	1340m²
AD	310m²
AG	140m²
AH	825m²
AJ	700m²
AK	990m²
AL	130m²
AM	571m²

PROPOSED SITE CATCHMENT PLAN - STAGE 1 AND 2

1 : 500

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DrawingTitle: PROPOSED SITE CATCHMENT PLAN - STAGE 1 AND 2

Client/Project: GOULBURN AQUATIC CENTRE REDEVELOPMENT

Status: PRELIMINARY

Project No:	Dwg No:	Revision:	Dwg Size:
S17_082	SK103	E	A1
Drawn:	Date:	Checked:	Scale:
DL	APR 18	SH	1:500 @ A1

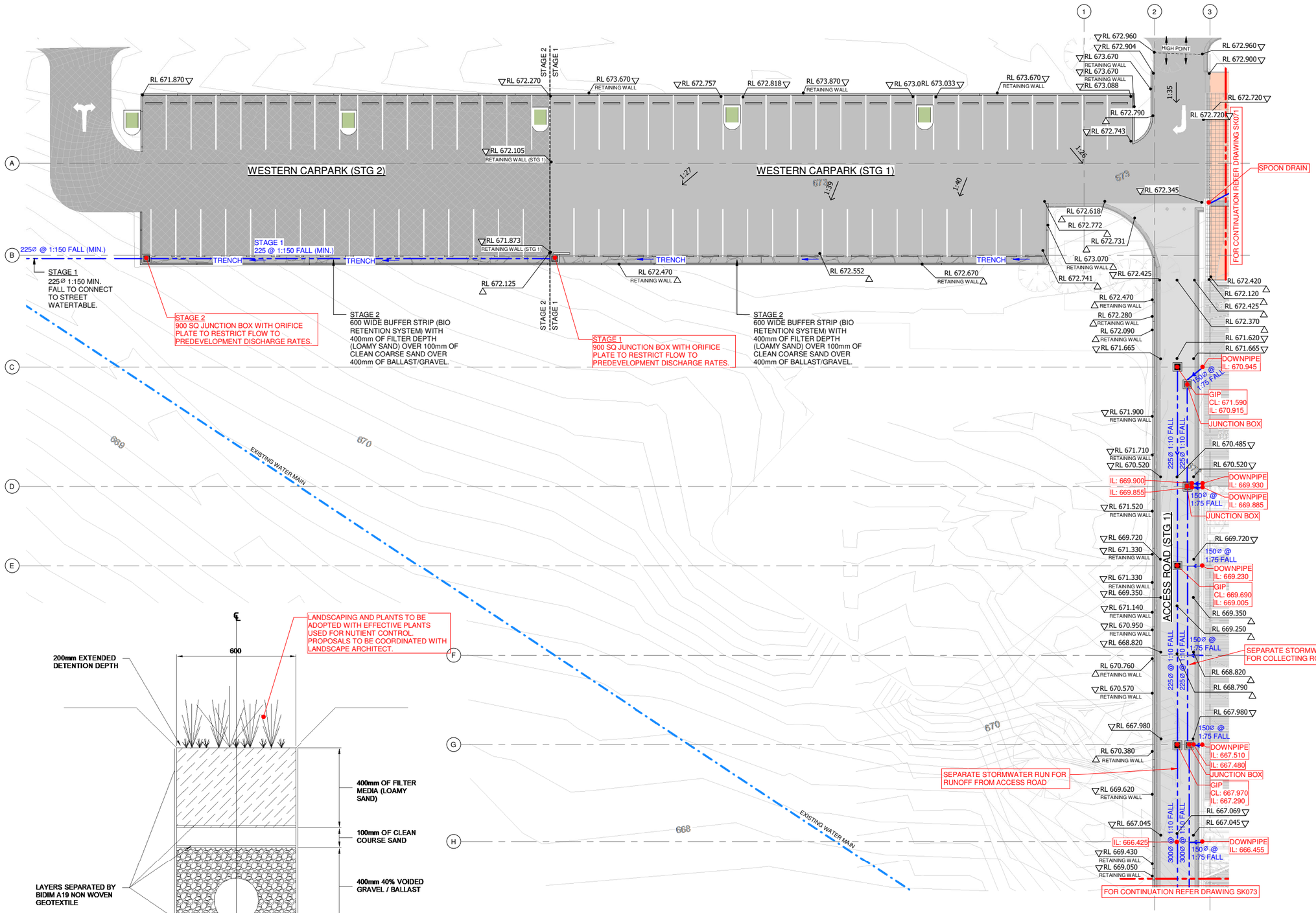
Rev:	Date:	Notes:	By.	Chkd:
E	19.12.18	DDA SUBMISSION	DL	SH
D	18.09.18	DDA SUBMISSION	DL	SH
C	14.09.18	DDA SUBMISSION	DL	SH
B	26.06.18	DDA SUBMISSION	DL	SH
A	25.06.18	DDA SUBMISSION	DL	SH

5.0 APPENDIX C

CJCE Proposed Stormwater treatment plans SK070 to SK076 and SK100.

Soil and Water Management Plan SK062 & Detail Sheet CD125,

Rocla Tech Data.



SECTION THROUGH BUFFER STRIP/BIO RETENTION SYSTEM

CIVIL LAYOUT PLAN (STAGE 1 & 2) SHEET 1 OF 5

1 : 200

LEGEND

- CAR PARK PAVEMENT (STAGE 1)
- CAR PARK PAVEMENT (STAGE 2)
- ACCESS ROAD PAVEMENT
- PLAZA AREA PAVEMENT
- LANDSCAPING
- 50m POOL CONCOURSE
- EXTERNAL PAVEMENT
- 375Ø — EXISTING STORMWATER
- EXISTING STORMWATER TO BE ABANDONED
- EXISTING WATER MAIN
- 225Ø @ 1:100 FALL — NEW STORMWATER PIPE
- 1:50 — GRADIENT DIRECTION
- GRATED INLET PIT
- JUNCTION BOX
- ENVISS PIT
- IL: 670.945 — PIPE INVERT LEVEL
- CL: 670.945 — PIT COVER LEVEL
- RL: 670.945 — DESIGN LEVEL
- 670 — EXISTING CONTOUR

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DrawingTitle: CIVIL LAYOUT (STAGE 1 & 2) SHEET 1 OF 5

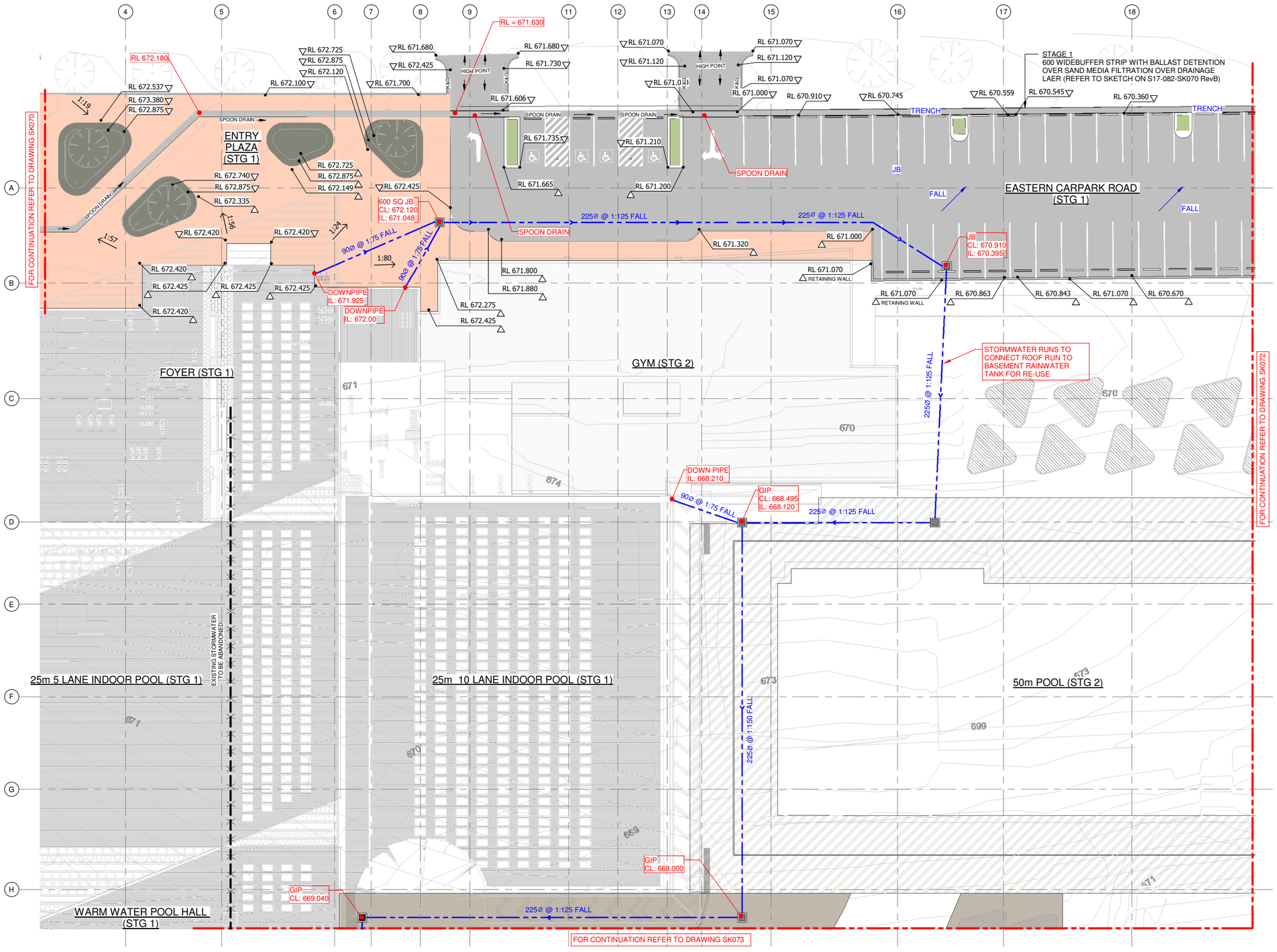
Client/Project: GOULBURN AQUATIC CENTRE REDEVELOPMENT

Status: PRELIMINARY

Project No:	Dwg No:	Revision:	Dwg Size:
S17_082	SK070	C	A1

Drawn:	Date:	Checked:	Scale:
DL	AUG 18	SH	1:200 @ A1

Rev	Date:	Notes:	By.	Chkd
C	15.05.19	STORMWATER AMENDMENTS	MK	SH
B	17.04.19	STORMWATER AMENDMENTS	JR	SH
A	01.11.18	PRELIMINARY ISSUE	DL	SH



LEGEND

- CAR PARK PAVEMENT (STAGE 1)
- CAR PARK PAVEMENT (STAGE 2)
- ACCESS ROAD PAVEMENT
- PLAZA AREA PAVEMENT
- LANDSCAPING
- 50m POOL CONCOURSE
- EXTERNAL PAVEMENT
- 375ø — EXISTING STORMWATER
- EXISTING STORMWATER TO BE ABANDONED
- EXISTING WATER MAIN
- 225ø @ 1:100 FALL — NEW STORMWATER PIPE
- 1:50 — GRADIENT DIRECTION
- GRATED INLET PIT
- JUNCTION BOX
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- CL: 670.945 — PIT COVER LEVEL
- RL: 670.945 — DESIGN LEVEL
- 670 — EXISTING CONTOUR

CIVIL LAYOUT PLAN (STAGE 1 & 2) SHEET 2 OF 5

1 : 200

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Level 8, 423 Bourke Street, Melbourne VIC 3000

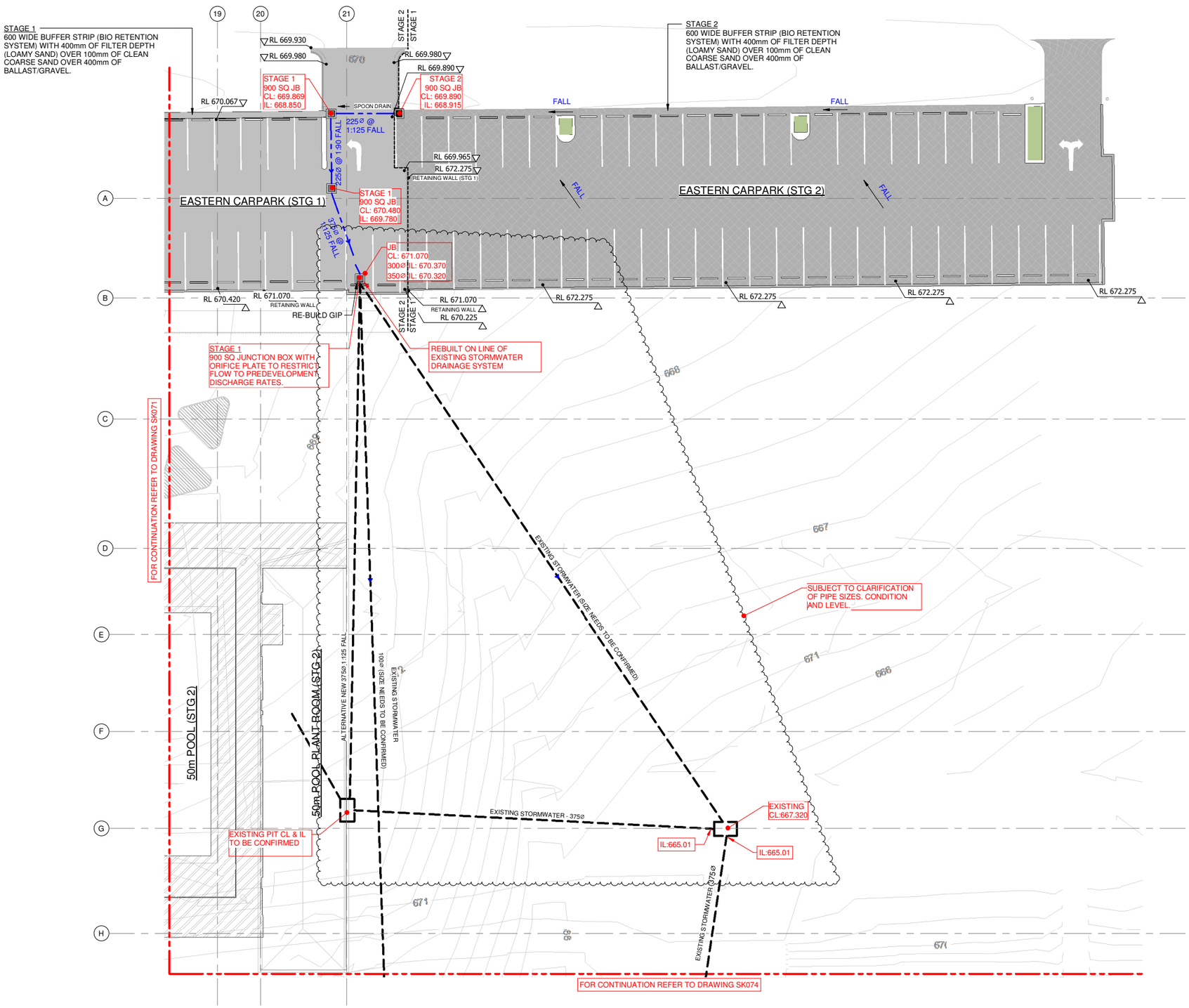
DrawingTitle: CIVIL LAYOUT (STAGE 1 & 2) SHEET 2 OF 5

Client/Project: GOULBURN AQUATIC CENTRE REDEVELOPMENT

Status: PRELIMINARY

Project No:	Dwg No:	Revision:	Dwg Size:
S17_082	SK071	C	A1
Drawn: DL	Date: AUG 18	Checked: SH	Scale: 1:200 @ A1

Rev	Date:	Notes:	By.	Chkd
C	15.05.19	STORMWATER AMENDMENTS	MK	SH
B	17.04.19	STORMWATER AMENDMENTS	JR	SH
A	01.11.18	PRELIMINARY ISSUE	DL	SH



LEGEND

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CIVIL LAYOUT PLAN (STAGE 1 & 2) SHEET 3 OF 5

1 : 200

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ABN: 21 518 561 838
Level 8, 423 Bourke Street, Melbourne VIC 3000

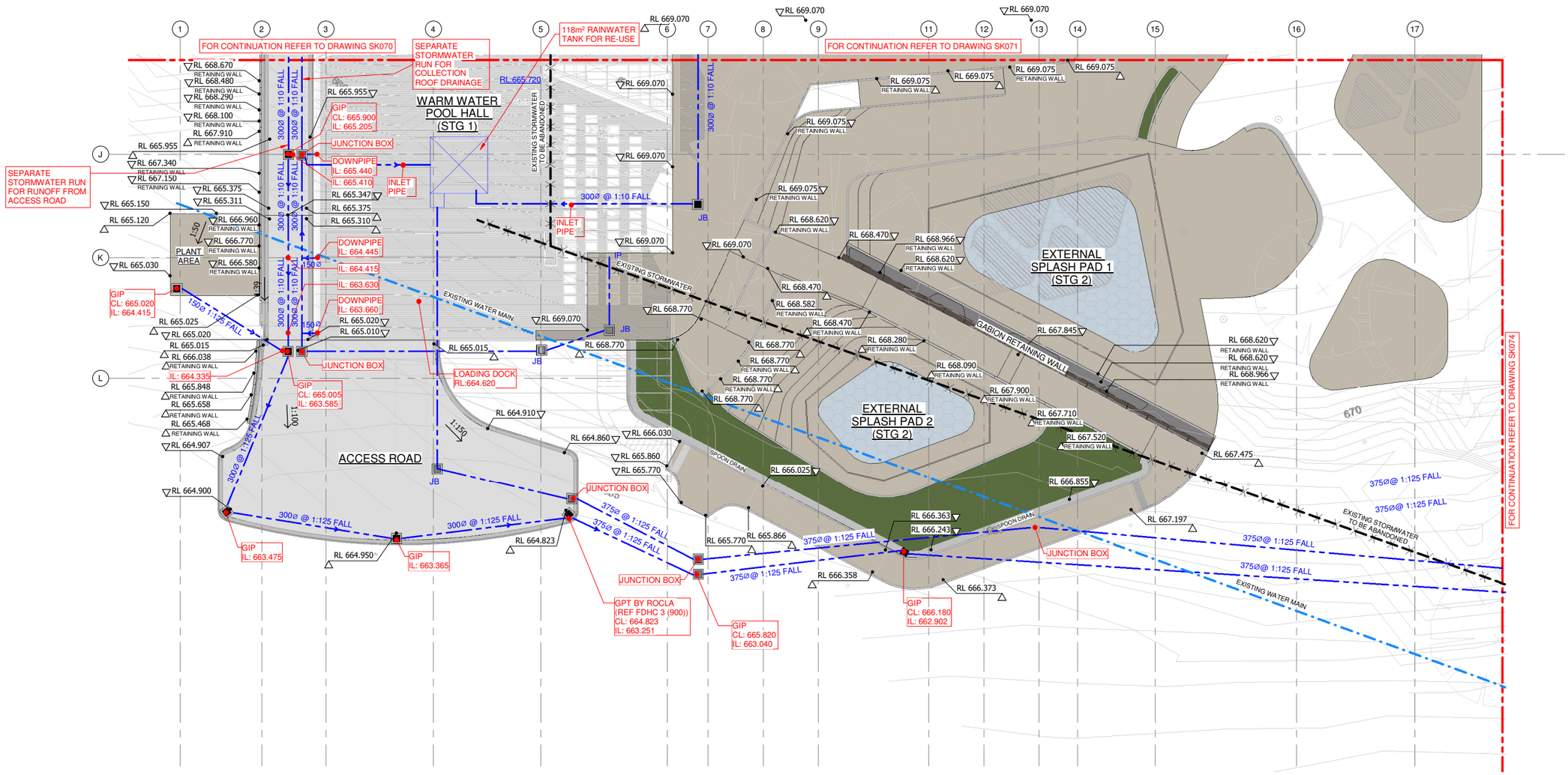
DrawingTitle: CIVIL LAYOUT (STAGE 1 & 2) SHEET 3 OF 5

Client/Project: GOULBURN AQUATIC CENTRE REDEVELOPMENT

Status: PRELIMINARY

Project No:	Dwg No:	Revision:	Dwg Size:
S17_082	SK072	D	A1
Drawn: DL	Date: AUG 18	Checked: SH	Scale: 1:200 @ A1

Rev	Date:	Notes:	By.	Chkd
D	15.05.19	STORMWATER AMENDMENTS	MK	SH
C	17.04.19	STORMWATER AMENDMENTS	JR	SH
B	05.03.19	UPDATED ISSUE	DL	SH
A	01.11.18	PRELIMINARY ISSUE	DL	SH



LEGEND

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- CAR PARK PAVEMENT (STAGE 2)
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CIVIL LAYOUT PLAN (STAGE 1 & 2) SHEET 4 OF 5

1 : 200

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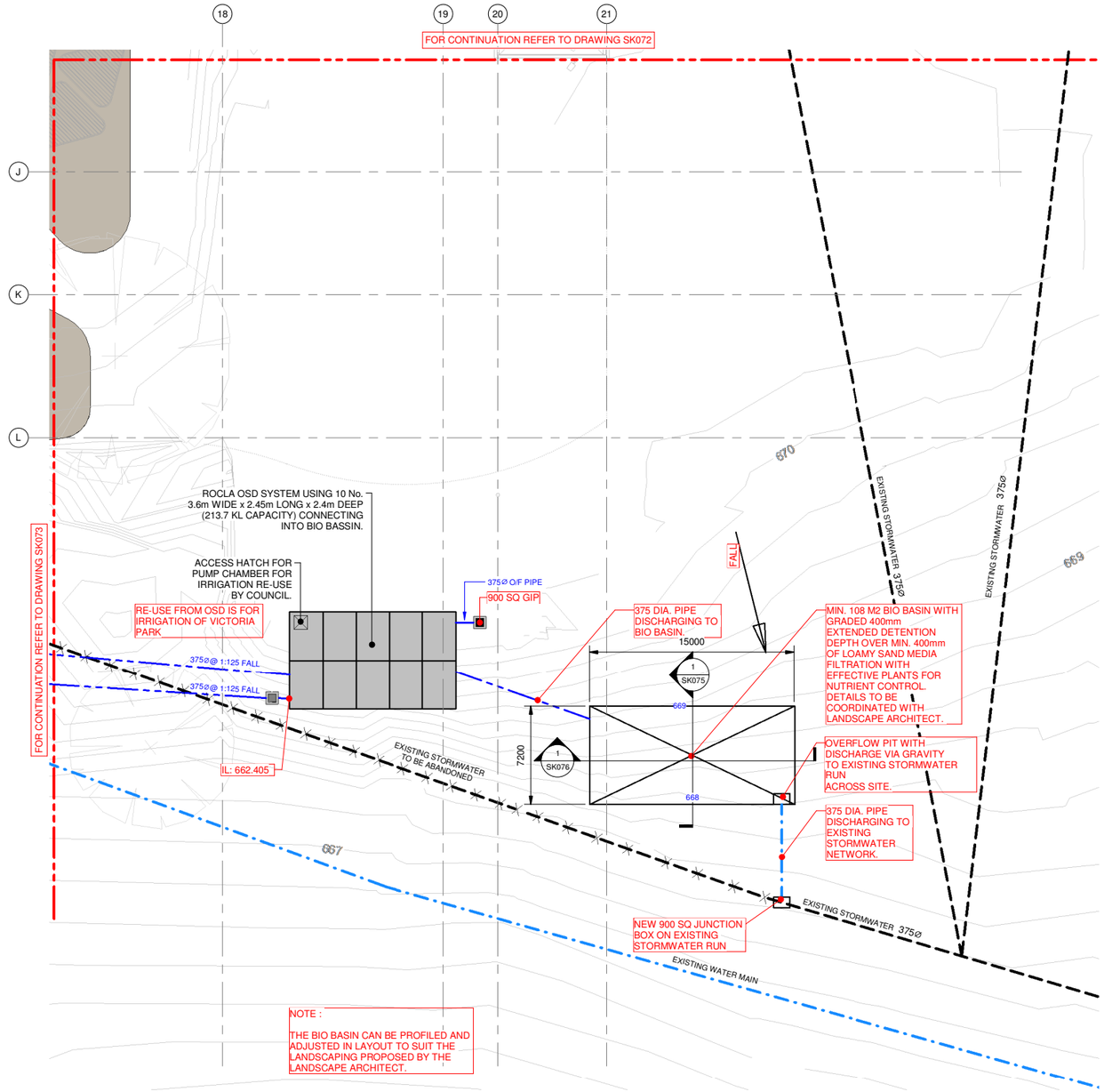
DrawingTitle: CIVIL LAYOUT (STAGE 1 & 2) SHEET 4 OF 5

Client/Project: GOULBURN AQUATIC CENTRE REDEVELOPMENT

Status: PRELIMINARY

Project No:	Dwg No:	Revision:	Dwg Size:
S17_082	SK073	C	A1
Drawn: DL	Date: AUG 18	Checked: SH	Scale: 1:200 @ A1

Rev	Date:	Notes:	By.	Chkd
C	15.05.19	STORMWATER AMENDMENTS	MK	SH
B	17.04.19	STORMWATER AMENDMENTS	JR	SH
A	01.11.18	PRELIMINARY ISSUE	DL	SH



LEGEND

- CAR PARK PAVEMENT (STAGE 1)
- CAR PARK PAVEMENT (STAGE 2)
- ACCESS ROAD PAVEMENT
- PLAZA AREA PAVEMENT
- LANDSCAPING
- 50m POOL CONCOURSE
- EXTERNAL PAVEMENT
- 375Ø — EXISTING STORMWATER
- EXISTING STORMWATER TO BE ABANDONED
- EXISTING WATER MAIN
- 225Ø @ 1:100 FALL — NEW STORMWATER PIPE
- 1:50 — GRADIENT DIRECTION
- GRATED INLET PIT
- JUNCTION BOX
- ENVISS PIT
- IL: 670.945 — PIPE INVERT LEVEL
- CL: 670.945 — PIT COVER LEVEL
- RL: 670.945 — DESIGN LEVEL
- 670 — EXISTING CONTOUR

CIVIL LAYOUT PLAN (STAGE 1 & 2) SHEET 5 OF 5

1 : 200

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DrawingTitle: CIVIL LAYOUT (STAGE 1 & 2) SHEET 5 OF 5

Client/Project: GOULBURN AQUATIC CENTRE REDEVELOPMENT

Status: PRELIMINARY

Project No:	Dwg No:	Revision:	Dwg Size:
S17_082	SK074	D	A1
Drawn: DL	Date: AUG 18	Checked: SH	Scale: 1:200 @ A1

Rev	Date:	Notes:	By.	Chkd
D	15.05.19	UPDATED ISSUE	MK	SH
C	17.04.19	UPDATED ISSUE	DL	SH
B	05.03.19	UPDATED ISSUE	DL	SH
A	01.11.18	PRELIMINARY ISSUE	DL	SH

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13. THE TRANSITION LAYER MATERIAL SHALL BE A CLEAN, WELL-GRADED SAND/COARSE SAND MATERIAL CONTAINING LITTLE OR NO FINES. IT SHALL BE A 1MM SAND WITH THE FOLLOWING GRADINGS:

SIZE	%PASSING
1.4mm	100%
1.0mm	80%
0.7mm	44%
0.5mm	8.4%

14. THE DRAINAGE LAYER IS TO BE CLEAN, FINE GRAVEL, SUCH AS A 2-5mm WASHED SCREENINGS.
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SOIL PROPERTIES: AS4419-2003 (SOILS FOR LANDSCAPING AND GARDEN USE)	
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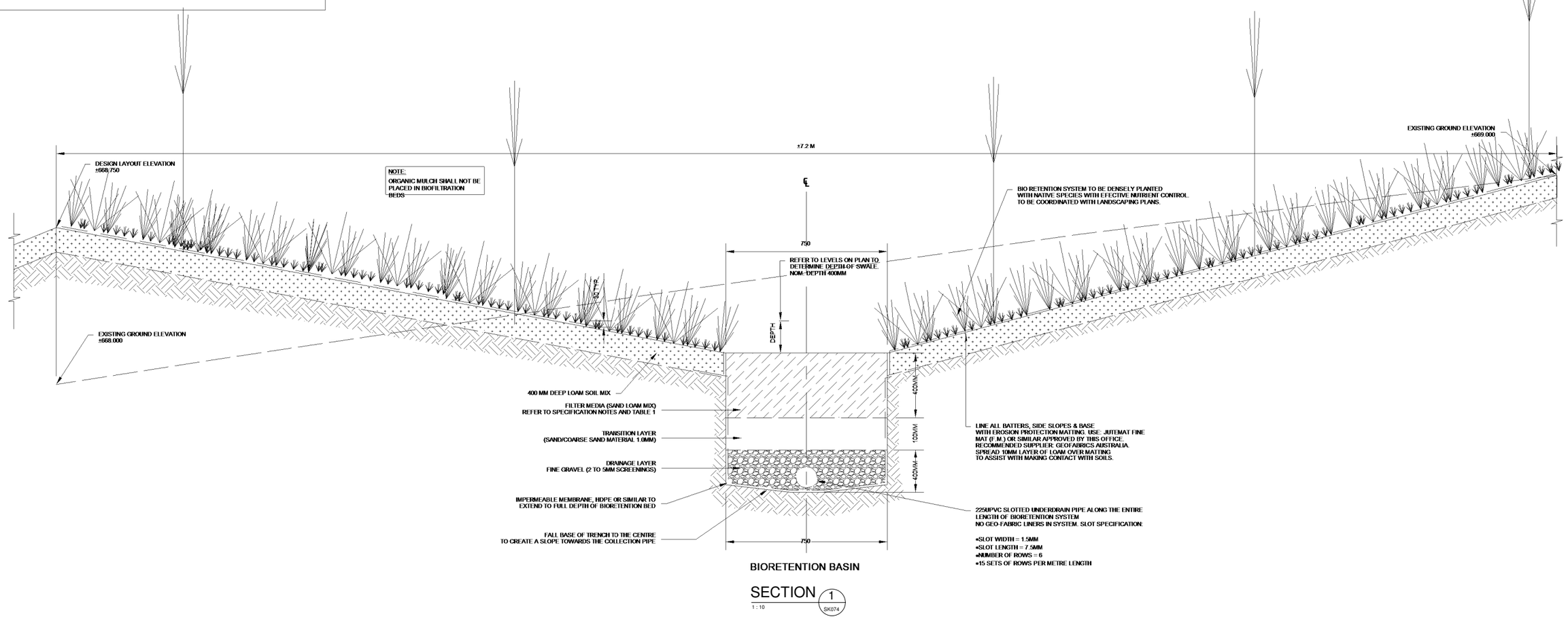
PHOSPHORUS	<55 MG/KG (NOTE: SHOULD BE <20MG/KG FOR PHOSPHORUS SENSITIVE PLANTS



BIORETENTION BASIN

SECTION 1
1 : 10
SK074

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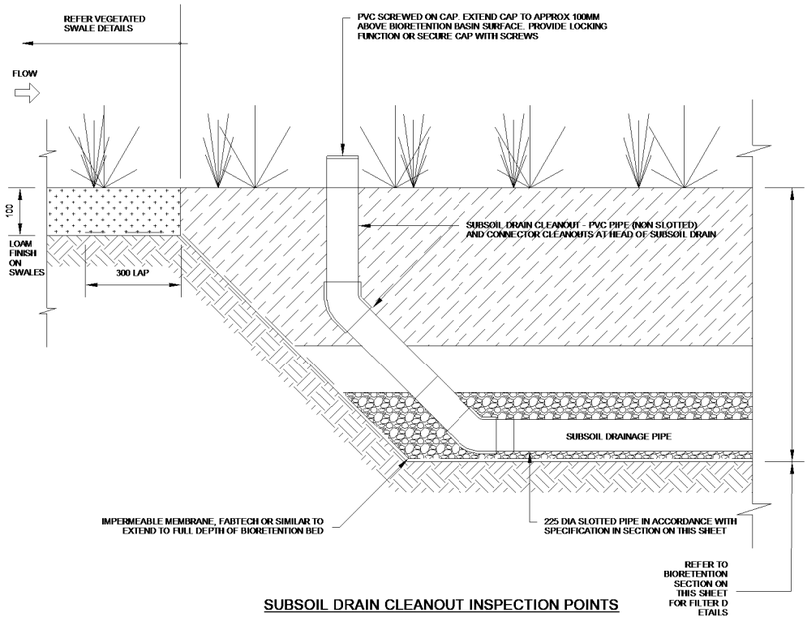
DrawingTitle: SECTION 1 - CROSS SECTION

Client/Project: GOULBURN AQUATIC CENTRE REDEVELOPMENT

Status: PRELIMINARY

Project No:	Dwg No:	Revision:	Dwg Size:
S17_082	SK075		A1
Drawn: Author	Date: AUG 18	Checked: Checker	Scale:

Rev	Date:	Notes:	By.	Chkd



SUBSOIL DRAIN CLEANOUT INSPECTION POINTS

SCALE (1:10)

(TO BE LOCATED AT UPSTREAM END OF BIORETENTION SYSTEMS)

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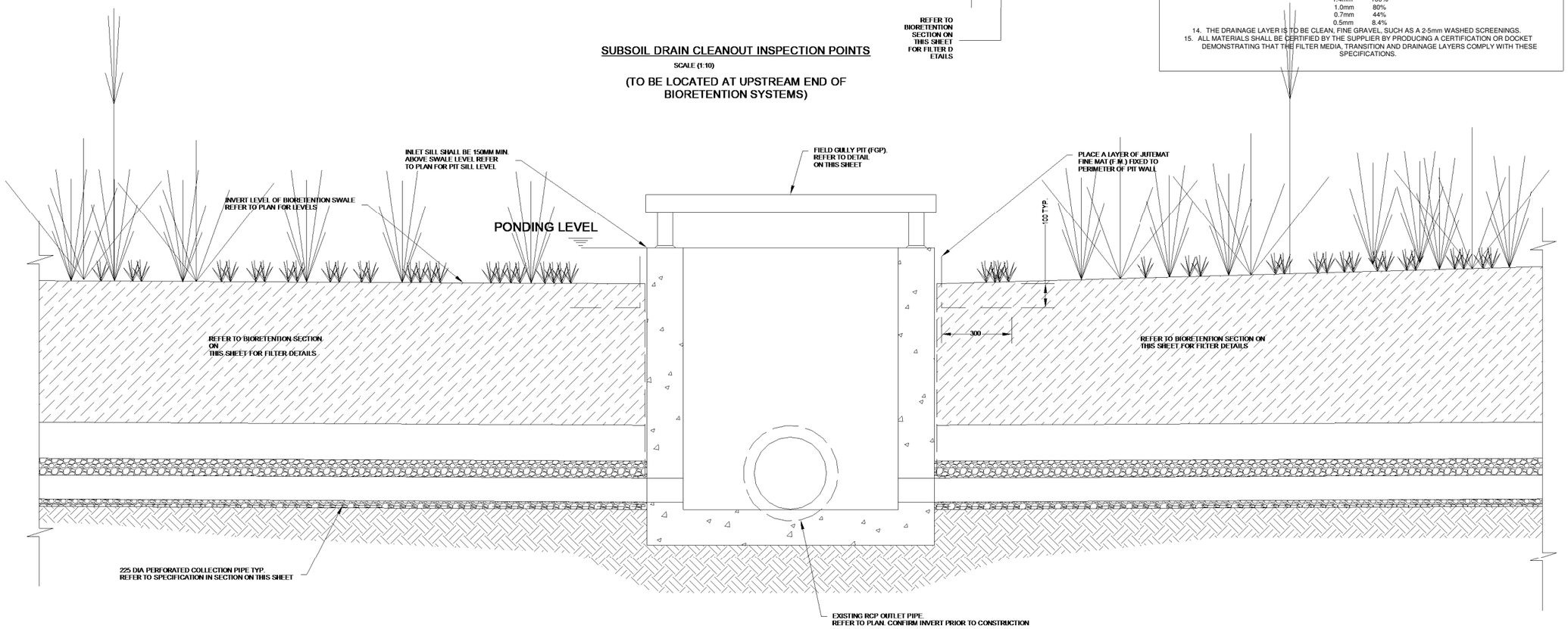

BIORETENTION SWALE TO FIELD GULLY PIT TYPICAL CONNECTION DETAIL

(1:10)

SECTION 1 — 1:10 — SK074

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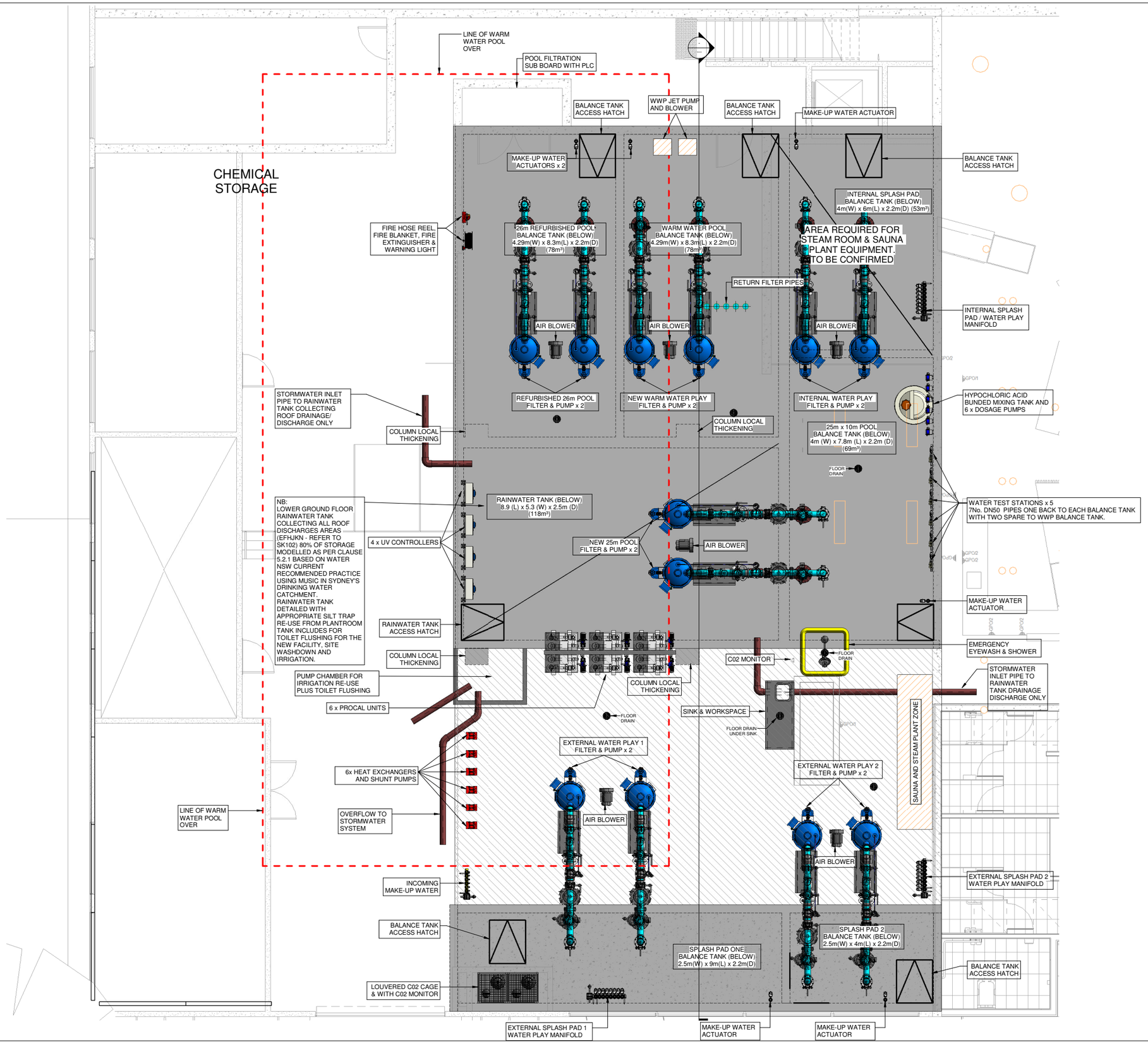
DrawingTitle: SECTION 1 - LONG. SECTION

Client/Project: GOULBURN AQUATIC CENTRE REDEVELOPMENT

Status: PRELIMINARY

Project No:	Dwg No:	Revision:	Dwg Size:
S17_082	SK076		A1
Drawn: Author	Date: AUG 18	Checked: Checker	Scale:

Rev	Date:	Notes:	By.	Chkd



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G	15.5.19	STORMWATER AMENDMENTS	MK	SH
F	17.4.19	STORMWATER AMENDMENTS	JR	SH
E	24.9.18	75% ISSUE	JM	SH
D	10.9.18	50% ISSUE	MT	SH
C	13.7.18	WIP ISSUE	JJ	SH
B	31.1.18	CONCEPT ISSUE	JJ	SH
A	24.1.18	CONCEPT ISSUE	JJ	SH
Rev	Date:	Notes:	By.	Chkd

Status:
PRELIMINARY

CRACKERJACK Consulting Engineers Pty Ltd.
Unit 3,
262 Magill Road
Beulah Park
SA 5067
e: admin@cjc-engineers.com.au
ABN. 21 518 561 838

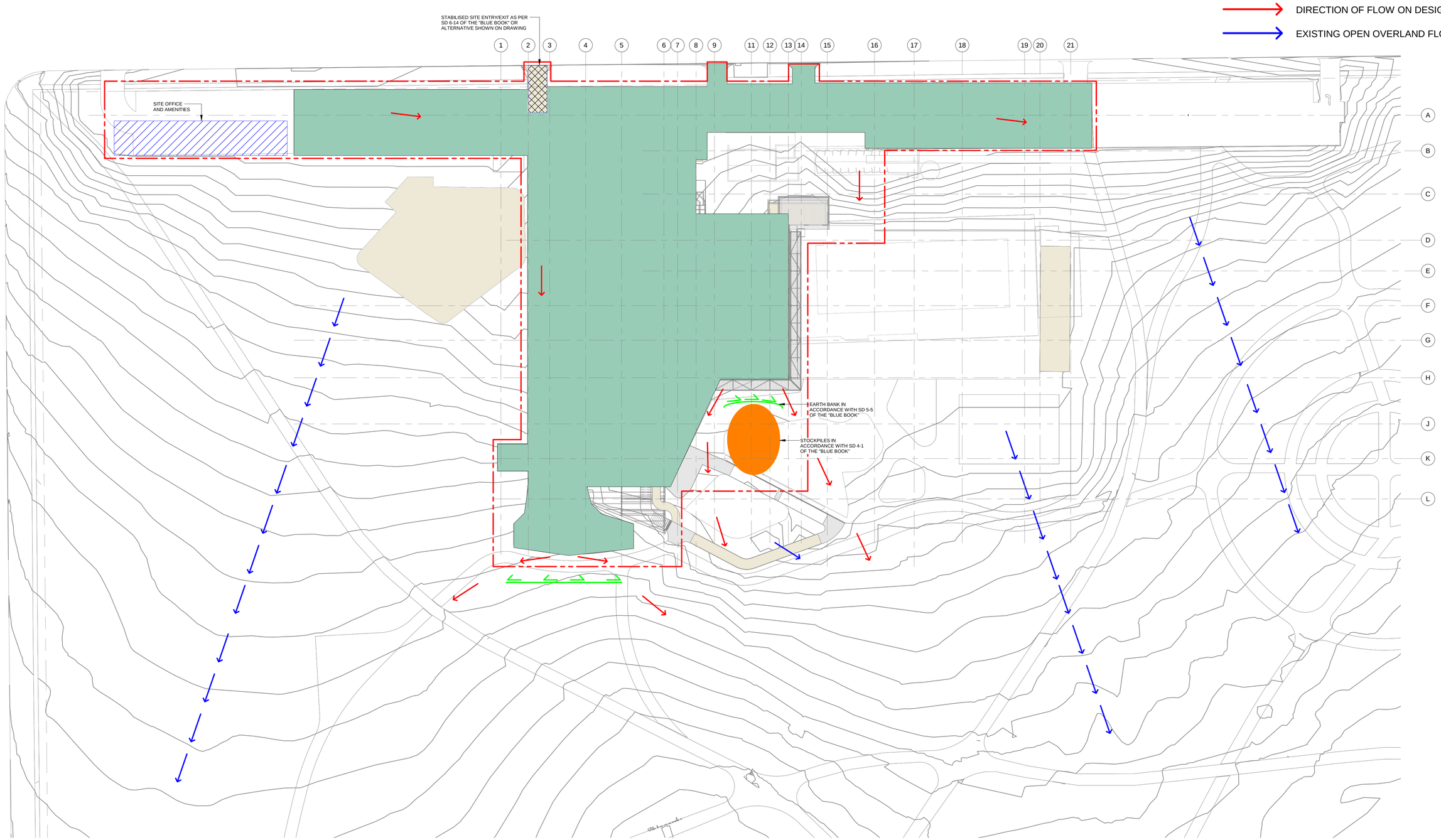
Client/Project:
GOULBURN AQUATIC CENTRE
83 DECCAN STREET, GOULBURN

DrawingTitle:
PRELIMINARY PLANT ROOM LAYOUT
ULTRA FINE FILTRATION OPTION WITH EXISTING FILTERS FOR UPGRADED POOL

S17_082	SK100	G	A1
Drawn: JJ	Date: JAN 18	Checked: ND	Scale: 1:50

LEGEND

- STAGE 1 SITE
- STOCKPILE
- DIVERSION BANK
- COMBINED SEDIMENT AND BARRIER FENCE
- DIRECTION OF FLOW ON DESIGN SURFACE
- EXISTING OPEN OVERLAND FLOW PATH



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DrawingTitle: SOIL AND WATER MANAGEMENT

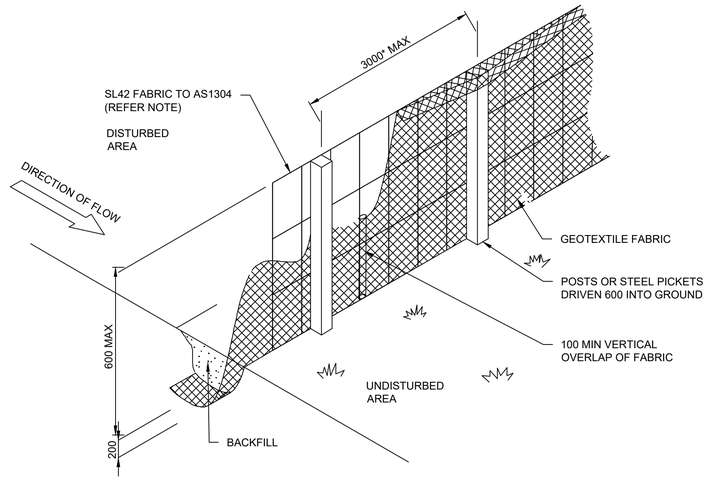
Client/Project: GOULBURN AQUATIC CENTRE REDEVELOPMENT

Status: PRELIMINARY

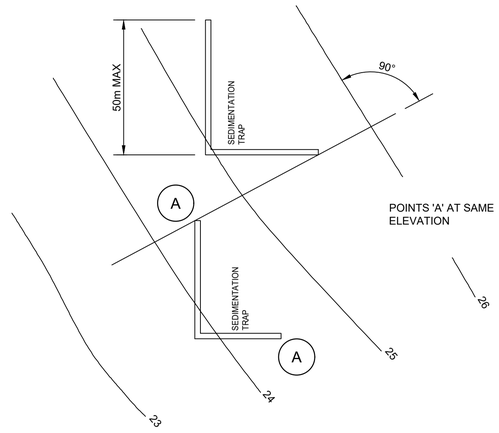
Project No:	Dwg No:	Revision:	Dwg Size:
S17_082	SK062		A3

Drawn:	Date:	Checked:	Scale:
JM	AUG 18	ND	1:500

Rev:	Date:	Notes:	By.	Chkd.



ELEVATION



TYPICAL LAYOUT ACROSS GRADE

LEGEND

APPROVED UNBOUND PAVEMENT MATERIAL (GRAVEL) EXCLUDE MATERIAL FINER THAN AS SIEVE 2.36mm

* SL42 FABRIC MAY BE OMITTED IF POST SPACING IS LESS THAN 2000 MAX

SEDIMENT FENCE

NOTES:

1. GENERAL:
a. SEDIMENT CONTROL STRUCTURES SHOWN ON THIS DRAWING ARE TYPICAL ONLY. CONTRACTOR TO SUBMIT DETAIL DRAWINGS SHOWING LOCATION AND TYPE OF STRUCTURE PROPOSED.
b. TEMPORARY DRAINAGE CONTROL. FLOWS SHOULD BE DIVERTED AROUND THE WORKSITE WHERE POSSIBLE.
c. ALL DRAINAGE, EROSION AND SEDIMENT CONTROLS TO BE INSTALLED AND BE OPERATIONAL BEFORE UP-SLOPE EARTHWORKS.
d. ALL CONTROL MEASURES TO BE INSPECTED AT LEAST WEEKLY AND AFTER SIGNIFICANT RUNOFF PRODUCING STORMS.
e. CONTROL MEASURES MAY BE REMOVED WHEN ON-SITE EROSION IS CONTROLLED AND 70% PERMANENT SOIL COVERAGE IS OBTAINED OVER ALL UPSTREAM DISTURBED LAND.
f. IN AREAS WHERE RUNOFF TURBIDITY IS TO BE CONTROLLED,, EXPOSED SURFACE TO BE EITHER MULCHED, COVERED WITH EROSION CONTROL BLANKETS OR TURFED IF EARTHWORKS ARE EXPECTED TO BE DELAYED FOR MORE THAN 14 DAYS.
g. HAY BALE SEDIMENT TRAPS ARE A SECONDARY OPTION THAT GENERALLY SHOULD NOT BE USED IF OTHER OPTIONS ARE AVAILABLE.
h. ALL VEGETATION ON THE SITE IS TO BE SLASHED.
i. EROSION AND SEDIMENT CONTROLS ARE DESIGNED TO OPERATE UP TO AND INCLUDING THE10 YEAR ARI STORM EVENT.
j. ALL EROSION AND SEDIMENT CONTROLS TO BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH MANAGING URBAN STORMWATER:SOILS AND CONSTRUCTION (THE BLUE BOOK) [LANDCOM, 2004].

2. SEDIMENT FENCE:.
a. NOT TO BE LOCATED IN AREAS OF CONCENTRATED FLOW.
b. NORMALLY LOCATED ALONG THE CONTOUR WITH A MAXIMUM CATCHMENT AREA 0.6 ha PER 100m LENGTH OF FENCE.
c. WOVEN FABRICS ARE PREFERRED, NON-WOVEN FABRICS MAY BE USED ON SMALL WORK SITES, i.e. OPERATIONAL PERIOD LESS THAN 6 MONTHS OR ON SITES WHERE SIGNIFICANT SEDIMENT RUNOFF IS NOT EXPECTED.
d. WHERE FENCES NEED TO BE LOCATED ACROSS THE CONTOUR THE LAYOUT SHALL CONFORM TO 'TYPICAL LAYOUT ACROSS GRADE'.
e. FENCES ARE REQUIRED 2m MIN FROM TOE OF CUT OR FILL BATTERS, WHERE NOT PRACTICAL, ONE FENCE CAN BE AT THE TOE WITH A SECOND FENCE 1m MIN AWAY. FENCE SHOULD NOT BE LOCATED PARALLEL WITH TOE IF CONCENTRATION OF FLOW WILL OCCUR BEHIND FENCE.

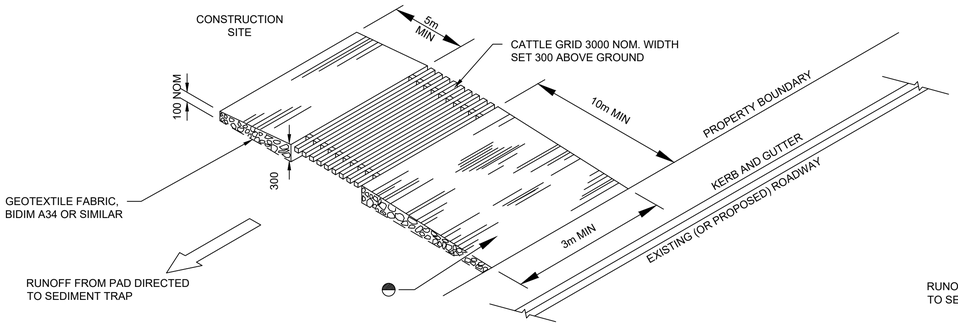
3. TEMPORARY CONSTRUCTION ENTRY/EXIT SEDIMENT TRAP:
a. ADJACENT STORMWATER RUNOFF TO BE DIVERTED AWAY FROM ENTRY/EXIT.
b. WHEEL-WASH OR SPRAY UNIT MAY BE REQUIRED DURING WET WEATHER.

4. SEDIMENT BASINS:
a. ANALYSIS OF THE SITE, INCLUDING CATCHMENTS, SOIL TYPE AND HYDROLOGIC GROUP, AND SITE-SPECIFIC SOIL ERODIBILITY AND RAINFALL EROSIVITY FACTORS, INDICATES THAT THE ANNUAL LOSS FROM THE TOTAL DISTURBED AREA IS SUFFICIENTLY LOW ENOUGH TO NEGATE THE NEED FOR ANY SEDIMENT BASINS.
b. PROPOSED BIORETENTION BASINS ARE TO BE LINED WITH A TEMPORARY IMPERMEABLE GEOTEXTILE LINER FOR THE DURATION OF THE WORKS TO ENSURE THE FILTER MEDIUM IS NOT OVERLOADED DURING THE CONSTRUCTION PERIOD. THIS LINER MAY BE REMOVED ON COMPLETION OF THE WORKS ALONG WITH ANY ACCUMULATED SEDIMENT.
c. RECEIVING WATERS ARE TO BE PROTECTED FROM SEDIMENT AS PER THE SOIL AND WATER MANAGEMENT PLAN.

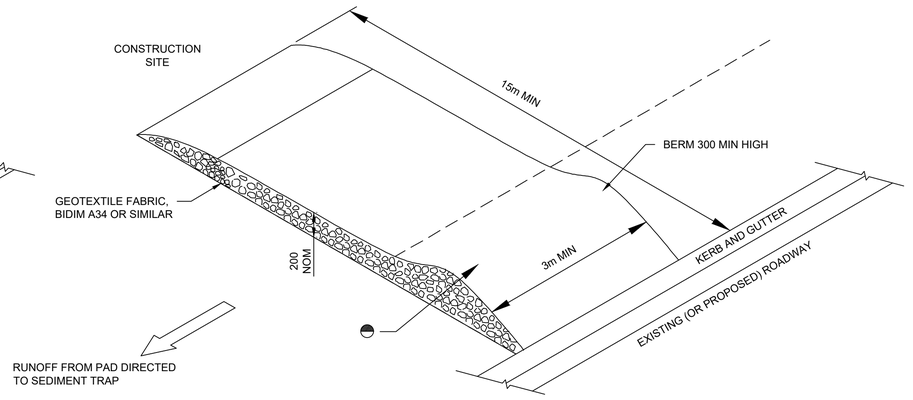
5. VARIATIONS IN CONSTRUCTION PROCESS:
AS PER *THE BLUE BOOK*, A REVISED SOIL AND WATER MANAGEMENT PLAN MIGHT BE REQUIRED WHERE:
a. CHANGES OCCUR IN SLOPE GRADIENTS AND DRAINAGE PATHS, WITH THEIR EXACT FORM FREQUENTLY UNPREDICTABLE BEFORE WORKS START;
b. WORKS CONTINUE OVER AN EXTENDED PERIOD, WITH REVISIONS BEING REQUIRED AT THE BEGINNING OF THE SECOND YEAR OF OPERATIONS AND FURTHER REVISIONS AT TWO-YEARLY INTERVALS AFTER THAT. ANY REVISED PLANS SHOULD REFLECT REASONABLE NEW STANDARDS APPLYING TO THEM; AND
c. THE DESIRED OUTCOME (e.g. PROTECTION OF RECEIVING WATERS) IS CLEARLY NOT BEING ACHIEVED. THI9S PLAN IS ONLY PART OF THE STRATEGY, WITH OTHER ASPECTS BEING APPROPRIATE IMPLEMENTATION, MONITORING AND CORRECTIVE ACTION.

6. SAFETY ISSUES MUST BE CONSIDERED AT ALL TIMES, INCORPORATE TRAFFIC CONTROL DEVICES TO THE SATISFACTION OF THE SUPERINTENDENT.

7. ALL DIMENSIONS IN MILLIMETRES UNLESS INDICATED OTHERWISE.

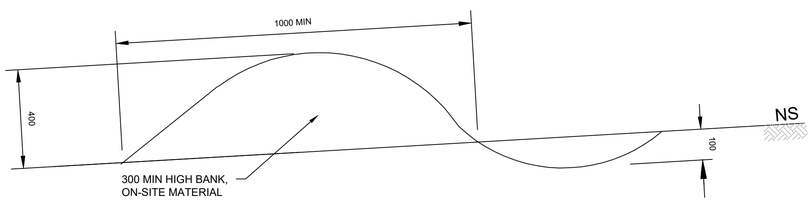


ALTERNATIVE 1 TYPICAL DETAIL

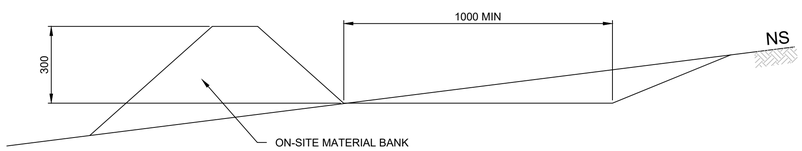


ALTERNATIVE 2 TYPICAL DETAIL

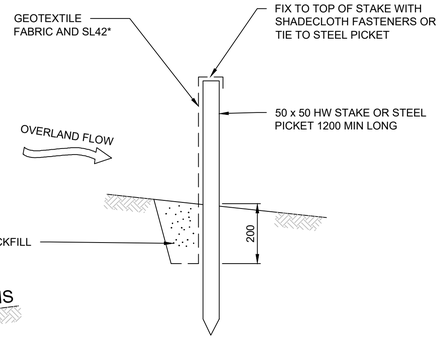
ENTRY/EXIT SEDIMENT TRAP



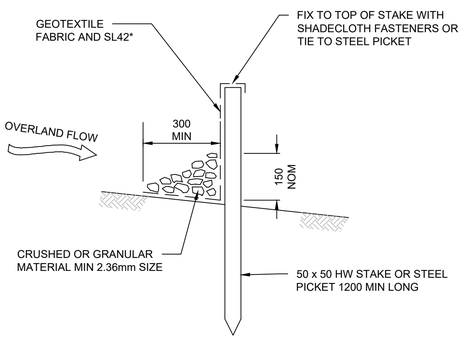
EARTH DIVERSION BANK



ALTERNATIVE EARTH DIVERSION DRAIN



ALTERNATIVE 1 TYPICAL SECTION



ALTERNATIVE 2 TYPICAL SECTION

GENERAL NOTES:

1. DO NOT SCALE THIS DRAWING. WORK ONLY TO FIGURED DIMENSIONS.
2. FOR ALL RELEVANT NOTES, REFER TO STRUCTURAL AND CIVIL ENGINEERING NOTES DRAWING AND SPECIFICATIONS.
3. REPORT ANY DISCREPANCIES TO CRACKERJACK CONSULTING ENGINEERS IMMEDIATELY.
4. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTS AND SUB-CONTRACTORS DRAWINGS AND DETAILS.
5. ALL DIMENSIONS TO BE VERIFIED ON SITE BY CONTRACTOR PRIOR TO CONSTRUCTION OR FABRICATION PROCEEDING.
6. CONTRACTOR IS RESPONSIBLE FOR ALL NECESSARY TEMPORARY WORKS TO ENSURE THE EXISTING STRUCTURE IS MAINTAINED IN A STABLE CONDITION AND NO LOCALISED PART OF STRUCTURE IS OVERSTRESSED.
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Drawing Title:
CIVIL DETAILS SHEET 6 OF 6 (STAGE 1)
SOIL AND WATER MANAGEMENT PLAN

Client/ Project:
GOULBURN AQUATIC CENTRE

85 DECCAN STREET, GOULBURN NSW 2580

Status: PRELIMINARY

Project No:	Dwg No:	Revision:	Dwg Size:
S17_082	CD125	P2	A1
Drawn:	Date:	Checked:	Scale:
WL	JAN 17	ND	AS SHOWN

Rev:	Date:	Notes:	By.	Chkd:
P2	10.9.18	50% ISSUE	MT	SH
P1	13.7.18	WORK IN PROGRESS ISSUE	JJ	ND

CDS® UNIT TECHNICAL SUMMARY

CAPABILITIES

The CDS® Unit is the most awarded stormwater treatment device. CDS® pioneered the first gross pollutant trap in Australia in 1995 and since then the vast amount of validation and testing performed in Australia and overseas has led to both local and international leadership. Rocla Water Quality has a highly skilled design team devoted to improving stormwater quality. This dedication has made the CDS® Gross Pollutant Trap (GPT) the most efficient, cost effective and easy to clean GPT on the market.

Some the key parameters of the CDS® Units are summarised below;

Features	Benefits
Continuously Deflective Screen	- This insures the screen does not block. - Screens don't require cleaning or maintenance.
Vortex force	- The vortex aids the screen cleaning and draws the waste into the centre and down to the storage sump away from the treatment area.
Screening Chamber	- The sheer plane created by the screen between the vortex flow action keeps the screen clear of trapped pollution to ensure continuous and max treatment performance. - The flow regime in the screening chamber avoids re-suspension and wash-outs of stored pollutants.
Optional Maintenance Procedures	- Can be fully isolated from flow. - Doesn't require confined space entry. - Choice of the most effective cleaning process for the application.
Fixed weir	- Guarantees maximum treatment flow is diverted into screening chamber including all neutrally buoyant material.
Design Service	- Life cycle cost analysis. - Installation supervision. - Stormwater quality assessment. - Complete hydraulic assessment.
Continuous field validation.	- Provide design information for industry on the ability of CDS® Units to meet the latest developments and future demands in stormwater quality.
Design Flexibility	- Can customise designs to suit most applications.
Off-line storage	- Does not allow stored waste to be re-suspended. - Keeps the storage area isolated from the screening area, allowing for continuous and maximum treatment.

TECHNOLOGY

The CDS® Unit utilises the energy of the inflow to create a vortex flow regime within the CDS® screening chamber.

The stormwater inflow is introduced tangentially to the screening chamber via a customised inlet chute. The vortex motion within the screen chamber provides a continuous circular flow that directs the pollutants away from the screen towards the centre. This low energy zone is where most of the pollutants lose buoyancy and sink into the storage sump below.

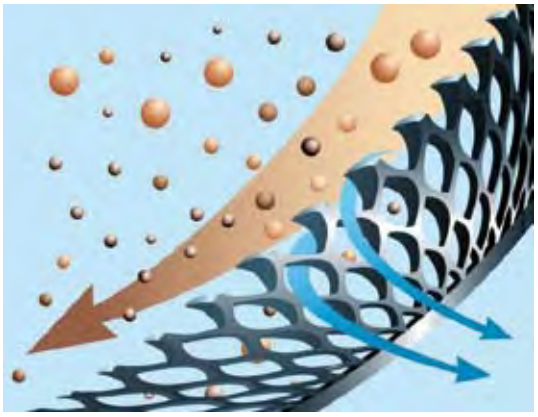


Figure 1: CDS® Unit deflective screen operation

The specially designed deflective screen shields the apertures from the pollution in rotational flow, which improves treatment operation and performance efficiency (as shown in Figure 1). The screen design along with the tangential flow and vortex forces provides all the benefits of a vortex separator and a physical filter without their limitations.

The CDS® Unit simply creates a whirlpool that draws all the deflected and settling pollutants to the centre of the screening chamber where they fall out into the storage sump below.

The pollutant storage sump located below the screening chamber allows pollutants to be removed from the flow path and away from the screens, thus maintaining a reliable treatment efficiency.

The unique CDS® technology is the most reliable way to effectively and efficiently treat gross pollutants in stormwater drainage systems.

FEATURES

The standard CDS® Unit design incorporates the key features shown in Figure 2.

Flexible Diversion chamber:

CDS® Units can be installed on pipe, culvert and open channel drainage systems.

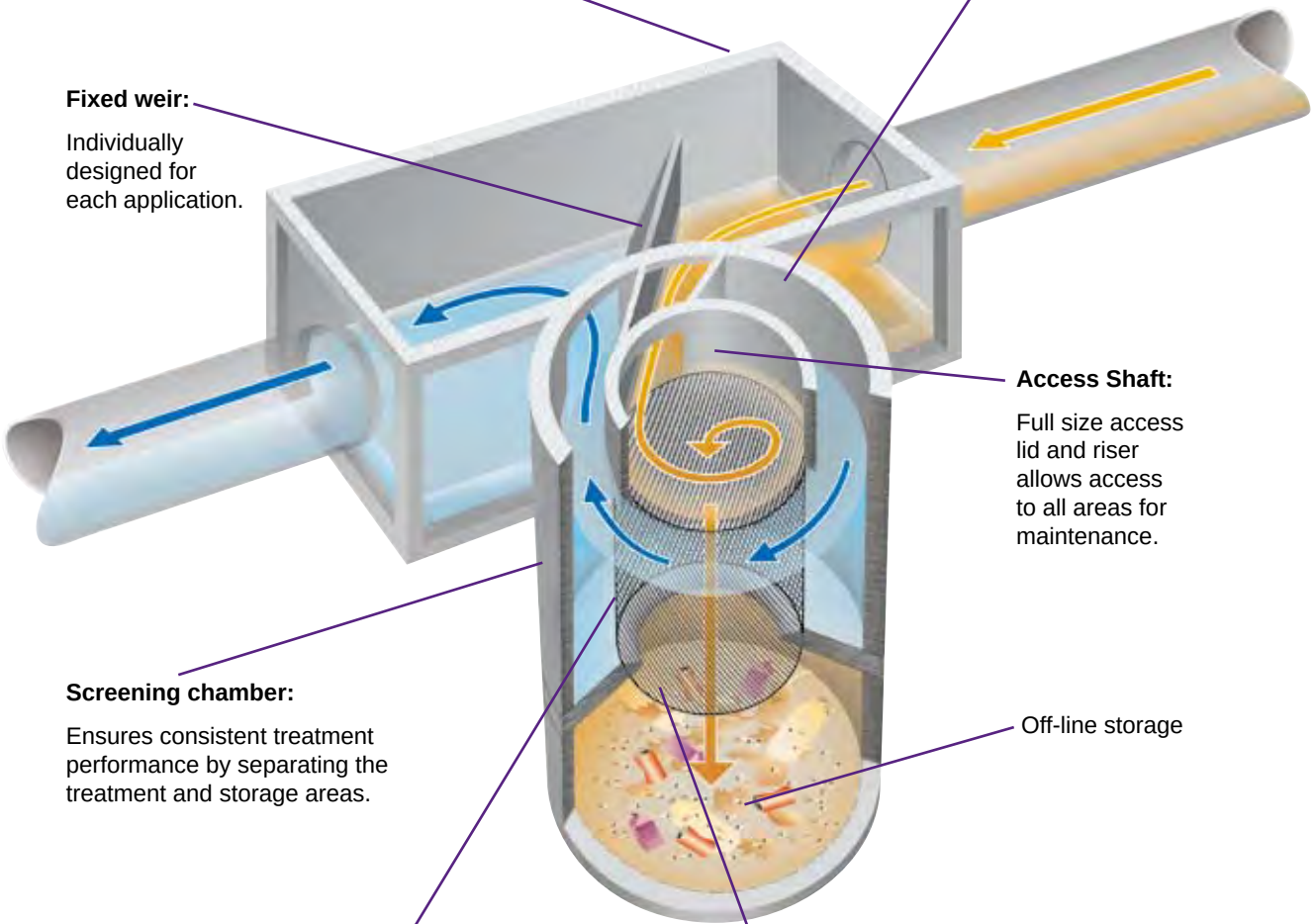
Every diversion chamber is designed to safely by-pass maximum flows.

Diversion chamber can be supplied as precast chambers, slab chambers or box culverts.

Off-line treatment

Fixed weir:

Individually designed for each application.



Access Shaft:

Full size access lid and riser allows access to all areas for maintenance.

Screening chamber:

Ensures consistent treatment performance by separating the treatment and storage areas.

Off-line storage

Deflective screens

Optional Removable Basket:

Flexible storage options allow the most economic and effective maintenance solutions to be utilised.

Figure 2: Key features of CDS® Units

CDS® UNIT PERFORMANCE

Since the inception of CDS® Units, performance has been the highest design imperative. The performance of CDS® Units has been an integral part of shaping stormwater quality standards worldwide. CDS® Units confidently achieve stormwater quality benchmarks even when markets can be focused on less important aspects of stormwater treatment. CDS® Units provide asset owners a high level of trust in stormwater treatment effectiveness and reliability. They can consistently achieve the following stormwater quality parameters:

CAPTURE EFFICIENCY

The screens in a standard CDS® Unit have a 4.7mm aperture, however, due to the deflective nature plus the vortex motion, 95% of material down to 1mm is captured. Although CDS® Units are designed as GPTs it is common to capture high volumes of particles less than 1mm as well. The specific pollutant groups targeted by a CDS® Unit are described following:

Gross pollutants (>5mm)

As per Allison 1996, “Field monitoring suggests that CDS® Units are efficient gross pollutant traps. During the 12 months of monitoring, practically all gross pollutants transported by the stormwater were trapped by the CDS® device”.

As per CRCCH 1999 “The CDS® Unit can remove nearly all gross pollutants and a significant proportion of finer pollutants, particularly during storms”.

As per CSIRO 1999: Circular Screens (CDS®) were the only category (device) to rate a Very High performance of over 90%. All other devices failed to meet this standard.

Fine particles

As per Portland State University 2002: “the experimental results show that the CDS® Unit generally removed over 95% of particles greater than 215 microns with screen apertures of both 2400microns and 4700 microns.”

As per Sansalone Summary 2004: “the CDS® Unit was trapping over 90% of particles down to 75 microns.” Also, capture of this particle size range was noted to contain approximately 80% of the heavy metals.

Suspended solids (excluding everything >1mm)

The common definition of Total Suspended Solids (TSS) excludes particles greater than 1mm. In accordance with this, TSS removal rates of CDS® Units exclude gross pollutants, organics, coarse sediment and any particles greater than 1mm. But most importantly the TSS removal rates of CDS® Units have been consistently field validated.

As per Sansalone Summary 2004: there was a notable net removal of particles less than 75 microns by the CDS® Unit. NJCAT removal of 49% TSS (better than any other GPT).

As per CRCCH 1999: “The CDS® trap removes a considerable amount of TSS above background concentrations during storm events, with a mean removal efficiency of approximately 70%”.

As per Brevard County 1997: “Monitoring has shown the CDS® Unit has provided an average 52% removal efficiency for total suspended solids”.

It is worth noting that devices which store Total Suspended Solids (TSS) in the treatment chamber are highly susceptible to re-suspension and loss.

Nutrients (Phosphorus)

Nutrient removal rates of CDS® Units show a correlation with sediment removal. Independent validation shows insoluble nutrient forms such as Phosphorous (P) are also reliably captured.

As per Brevard County 1997: “Monitoring has shown the CDS® Unit has provided…. 31% removal efficiency for phosphorus”.

CRCCH 1999: “The CDS®… consistently retains TP, thought to be because P is in particulate form, with a mean removal efficiency of approximately 30%”.

Sansalone Summary 2004: “There was a nett positive removal for TP for all events, with an averaged removal of over 30%”.

Oil grease retention

As with nutrient capture there is also a high correlation of oils and grease removal with sediment capture in CDS® Units.

UCLA have reported 50-80% of oil and grease may be attached to sediments.

Hoffman 1982: “Our data confirm the observations of the workers in that hydrocarbons are primarily associated with particulate material (83 – 93%)”.

CRCCH 1999: “Colwill found 70% of oil and approximately 85% PAH to be associated with solids in stormwater. That study subsequently demonstrated that over a period of dry weather conditions, increasing concentrations of oil become associated with particulates with the highest oil content found in the sediment range of 200µm to 400µm.

CSIRO 1999: In the category of “attached pollutants” CDS® Units were the only GPT device to even be considered capable of capturing anything.

CDS® Units can also capture free floating oil spills. However, when most of the oil is associated with fine particulates and sediments, CDS® Units remove very high levels of oils and greases due to their very high capture rate of those fine particles. Further information on oil removal can be provided upon request.

CAPTURE PERFORMANCE SUMMARY

A summary of the CDS® Unit performance parameters is outlined in Table 1 below;

Pollutant / Items	Removal Efficiency	Independent Reference Source
Suspended Solids (TSS)	70 %	CRCCH Report 99/2 Feb 1999
Total Phosphorous (TP)	30 %	CRCCH Report 99/2 Feb 1999
Total Nitrogen (TN)	0 %	Scattered results
Gross Pollutants (>5mm)	98 %	CRCCH Report 98/3 Apr 1998
Sediments>0.215mm	95 %	Portland State Uni, Oregon Oct 02
Fine sediment> 75 microns	90 %	Louisiana State University 2004
Heavy Metals	80 %	Louisiana State University 2004
Hydrocarbons, Oils & Grease	82-94 %	UCLA Report 1998

Table 1: CDS® Unit performance summary

ENVIRONMENTAL IMPACT

Anaerobic breakdown is a natural process involving the decay of organic material in drainage pipe systems. However, conventional treatment design practice prefers this process to occur in the CDS® Unit rather than the downstream drainage system. This way the decaying pollution can be more cost effectively controlled and removed from the stormwater system.

Dry sump treatment options do not remove the silts and finer sediments that contain higher stormwater contaminant loads. Therefore these treatment options do not contain the decaying process of these more volatile stormwater contaminants resulting in a less cost effective pollution removal and less environmental benefits.

The ability of the CDS® Unit to remove both coarse and fine organic material results in much better environmental and more cost-effective pollution removal gains.

The volume of a wet sump GPT is very minor in comparison to the volume of water in any one storm event. This means that together with the dilution and aeration of water in the GPT during a storm event the impact of water on a receiving stream would typically not even be measurable. Furthermore the odour generating potential of stormwater is minimal and no odour can be detected outside the CDS® Unit under normal conditions. More information on this subject can be provided upon request.

HYDRAULIC IMPEDANCE (HEAD LOSS)

Rocla Water Quality can provide hydraulic assessment for each project in order to ensure the hydraulic grade line (HGL) remains below ground level for the design storm event. If the HGL is determined to be approaching surface level, multiple options to avoid or minimise this situation are available. The worst case headloss condition is always used in hydraulic assessments of CDS® Units. The worst case K factor of a CDS® Unit is 1.3, which is equally the lowest validated K factor for a stormwater treatment device.

INDEPENDENT (MOSTLY UNSOLICITED) TESTING AND VALIDATION STUDIES OF CDS® UNITS HAVE BEEN PERFORMED BY:

- Allison, 1996
- Wong, 1997
- Brevard County, 1997
- Water Resources Management, 2003
- Cooperative Research Centre for Catchment Hydrology, 1999
- Monash University,
- Portland University, 2002
- Louisiana State University, 2004
- University of California LA
- University of NSW
- NSW Environment Protection Authority, 1997
- Willoughby Council
- Brisbane City Council
- Thiess Environmental Services

Full copies of any of the reports mentioned above are available upon request.

CDS® DESIGN

DESIGN PRINCIPLE

The design of a CDS® Unit for a specific catchment involves numerous parameters and is generally divided into two main steps. The first step in determining the suitability of a specific CDS® model is to consider the catchment and pollution load and the second is a hydraulic assessment.

STEP 1: Catchment Parameters and pollution load

The first step includes considering the following parameters:

- Catchment area;
- Site location and depth to invert;
- Tidal influence or other backwater influence;
- Treatable flow and its relation to the volumetric treatment efficiency;
- Target pollutants and land use;
- Treatment performance;
- Expected pollution loads; and
- Storage volume to minimise lifecycle costs.

Sometimes these parameters have competing project priorities and compromises are required. The CDS® Unit design can account for these and still provide high quality quantifiable treatment outcomes.

However, the CDS® Unit is generally sized on a flow volume basis, therefore the design aim is to treat a sufficient volume of the annual flow and remove a sufficient amount of pollution to meet a project's requirements.

The flow volume is based on the CDS® Unit having a reliable treatment flowrate which in turn means that the CDS® Unit will treat this flowrate in all events. The flowrate can be relied upon because of the Non-blocking functionality of the CDS® screen and the separate treatment/ storage zones which provides the ability to treat runoff continuously. Thereby ensuring the stated pollution load is removed from the drainage system.

The patented CDS® Unit offers the most reliable treatable flowrate of any GPT because of these two unique design features. Very high volumetric treatment efficiencies are maintained consistently by lowering the likelihood of blockages as well as treating and storing stormwater pollutants in separate zones.

When using MUSIC modeling the treatment efficiencies of the CDS® Unit provides the highest integrity and most reliable design for stormwater quality treatment. Therefore no safety factors need to be applied to CDS® Unit treatment performance data shown in Table 1.

STEP 2: Hydraulic Analysis

Once a suitable CDS® model has been chosen for the catchment, step two is undertaken, the hydraulic analysis. This step determines whether the CDS® model chosen based on catchment and pollution characteristics will suit the hydraulic capacity of the drainage system. This step will also determine the most suitable position of the CDS® Unit.

Due to the headlosses involved with treating stormwater through any GPT, a weir needs to be installed in the drainage system to divert flow and maintain an energy level difference between the upstream and downstream side of the treatment device. Hydraulic weirs and floating weirs do not provide reliable flow diversion, therefore Rocla Water Quality prefer fixed weirs as best practice.

The hydraulic analysis takes the following important hydraulic parameters into consideration:

- The existing capacity of the drainage system (either closed or open system);
- Physical parameters of existing drainage system such as pipe or channel size and grade etc;
- Tidal influence or other backwater influence;
- Design flow of the system (Q20 or similar);
- Flow velocity;
- Flooding at the site; and
- Other site constraints or opportunities such as multiple pipes, drops, bends or multiple outlets for stormwater harvesting.

Rocla Water Quality uses a variety of design tools to determine the impact on the chosen site of any proposed CDS® Unit. The tool chosen will depend on the drainage system characteristics such as whether or not the system is open or closed and the geometry of the system.

Generally, Manning's equation is used to determine the capacity of the system if sufficient information on drainage geometry and grade is available. In open channel systems, HEC-RAS can be used to determine hydraulic capacity if sufficient information is available to create a reliable model.

The CDS® Unit diversion weir chamber and weir can function in three general ways, these are:

1. Free weir
2. Submerged weir
3. Orifice

It should be noted that Rocla Water Quality utilises the most conservative approach when calculating the depth of water flow over a weir. Sound hydraulic theory and analysis is used to assess proposed CDS® Unit installations on drainage systems. This ensures that it has been designed with sufficient bypass for the capacity or other nominated design events at the location of the weir.

Rocla Water Quality also has the option of using a lower weir with a twin unit arrangement, drop weirs, collapsible weirs, super collapsible weirs, and flume weirs. Where possible the use of moving parts such as a collapsible weir is avoided. Rocla Water Quality do not use hydraulic weirs or weirs incorporating assumptions on kinetic energy since these have proved false and unreliable in the field.

The diversion chamber design assumes that the CDS® Unit has not been maintained and that all flow must divert over the weir. This is the worst case design condition and this K factor of 1.3 for the CDS® Unit is one of the lowest available.

CONSTRAINTS

For any given site, the opportunity to treat the stormwater could be limited by a number of factors, these include:

- Site hydraulics
- Velocity impact
- Tidal or backwater levels
- Access for construction, and/or ongoing maintenance
- Geotechnical considerations such as rock, water or acid sulphate soils
- Physical obstacles such as property boundaries, roads, services, etc
- Budgetary limitations

When any of these factors are prevalent, Rocla Water Quality has more options and solutions than any other proprietor, and always consults with the Designer to find a solution. This can commonly require some compromises, but ultimately it will offer the most cost effective solution for any given site. It is often recommended to visit proposed GPT sites to canvas all available options in consultation with clients.

Following is a list of the more common CDS® Unit design options available;

- Multiple pipe configurations
- Bends and drops
- Various weir options (as per above)
- Extended inlets
- Tidal units with dual inlets
- Stormwater harvesting units with dual outlets
- Pump-down units (dry trap)
- Ex-filtration units (dry trap)
- Sump options (width and depth)
- Baskets
- Screen sizes
- Oil baffle volumes
- Multiple lid options
- Low flow polishing device (upflow media filter at CDS® Unit outlet)
- Multiple cleaning options
- Incorporation of penstocks and drop boards
- Exclusion bars
- Multiple CDS® Unit arrangements

DESIGN CERTIFICATION

CDS® Units have no moving parts, and are manufactured from tough corrosion resistant materials.

A operational life of 50 years for the 316 grade stainless steel and 80 years for the concrete could be expected under standard operating conditions.

The pre-cast concrete components of CDS® Units comply generally with the following Australian Standards, where relevant:

- **AS3600-2001** Concrete structures
- **AS3725-1989** Loads on buried pipes
- **AS3996-1992** Metal access covers, road grates and frames
- **AS4058-1992** Precast concrete pipes (pressure and non-pressure)
- **AS5100.2-2004** Bridge design, Part 2: Design Loads
- **AS5056-2005** Polyethylene and polypropylene pipes and fittings for drainage and sewer applications.

By following these Australian Standards requirements structural integrity is ensured. Additionally, CDS® Units are not affected by ground water buoyancy effects.

Rocla Water Quality have extensive technical resources supporting the CDS® Unit product range. Each model is supplied with a technical drawing including weights and dimensions, or a site specific design usually encompassing a set of drawings, and we provide a comprehensive installation instruction and maintenance manual for each unit. Standard CDS® Unit drawings are available upon request.

CDS® Units can be modified to suit applications. Sump storage sizes are listed on technical drawings. Penstocks, dewatering options, baskets and a variety of diversion options are available on request to suit virtually any application. These modifications are designed by the Rocla Water Quality design staff to ensure peak hydraulic performance, maximum maintenance and cleaning periods and flood risk elimination.

CDS® UNITS INSTALLATION

This information is provided as general guidance to assist with the installation of CDS® Unit Gross Pollutant Traps.

It is the purchaser's responsibility to ensure that installation work is carried out by competent tradespeople in accordance with all relevant drawings, codes of practise, legislation and regulations.

MODEL IDENTIFICATION

2018 L

- **2018**: The Screen Dia is 2.0 metres
- **18**: The Screen Height is 1.8 metres
- **L**: The Circular Treatment Chamber is to the LEFT of the pipe or channel

Check that the CDS® Unit model supplied is that which is specified on the project drawing and that the relevant Rocla Water Quality Operation and Maintenance manual has been provided.

INSTALLATION SUMMARY

CDS® Unit models generally consist of two main sections, the Diversion Chamber which is on line (in relation to the drainage system), and the treatment device which is off line and situated to one side of the diversion chamber.

However, for the P0506, P0708 and P0708 MAXI CDS® Unit models the diversion chamber is an integral part of the CDS® device. Hence there is only one section for these models.

When provided, the diversion chamber may be configured in several different ways for which there are separate guides. The customer should refer to the specific project drawings provided for detailed advice on these options.

The following is a general outline of the construction procedures and relevant reference literature;

ORDER	WORK PROCEDURE	REFERENCE
1	Site works and set out	CDS® Unit Model Operation & Maintenance manual
2	Excavate for CDS® Unit	
3	Construct CDS® Unit	
4	Fitting out	
5	Excavate for diversion chamber	Diversion Chamber Guide
6	Construct diversion chamber	
7	Backfilling and lids	Both Guides
8	Waste Removal Basket (if fitted)	Basket Guide

Ensure that all of the required reference manuals and guides are provided and understood before installation is commenced.

TYPICAL COMPONENTS

Diversion Chamber

The type of diversion chamber used will vary with the type of drainage system.

Typically a pre-cast diversion chamber is supplied. However slab chambers may be supplied or an in-situ option specified for the diversion chamber. Therefore refer to the specific project drawing to ensure that all the relevant manuals have been supplied.

Typical precast components for CDS® Unit models (not including diversion chamber) are as follows:

- Sump
- Shear Cone
- Lower Separation Chamber
- Upper Separation Chamber
- Top Hat
- "L" shaped Outlet Wall

Additional pre-cast concrete items that may be required include:

- Access shaft risers (One or more of varying length may be supplied depending on depth required)
- Prefabricated Screen cage

Assembly aids which also may be required and are delivered on a pallet include:

- Fibreglass Inlet Chute
- "H" brackets for assembling major components
- Right Angle Brackets for fixing the access riser
- Angle brackets for fixing screen cage to shear cone
- Bolts and Dynabolts for all the above
- Assorted sealants as required
- Fish plate brackets

CDS® UNITS MAINTENANCE

Whilst the frequency of cleaning will be dependant upon the pollutant loads of each catchment, there are three alternative methods of removing the collected waste from CDS® Units.

The following methods of cleaning can be used individually on any CDS® Unit, even well after installation.

This is a very significant feature that allows asset owners to choose the cheapest option available for ongoing maintenance given the required cleaning frequency and the respective cleaning services and resources available.

The three maintenance options available are described following:

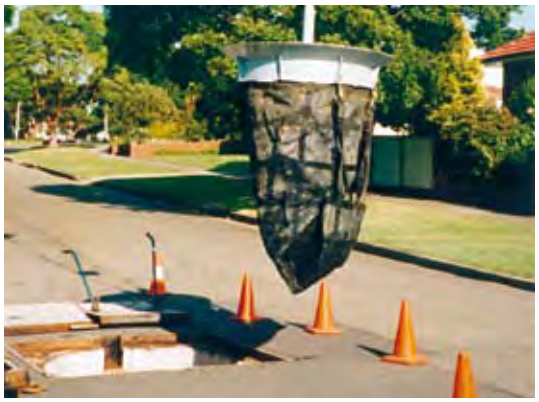
1. MECHANICAL GRAB CLEANING

Cleaning by grab can be carried out without dewatering the unit and is a single person operation in most locations.

This results in a cleaning technique which is generally faster, cheaper and safer. It also allows a visible inspection of the pollution that was captured, as opposed to suction that doesn't. No physical entry is required.

2. BASKET REMOVAL CLEANING

If a waste removal basket is fitted, it can be lifted at any time, without the need for dewatering. Also it provides a safe and cost effective method of cleaning. The cost benefit of this option depends on the CDS® Unit design and on waste disposal requirements. No physical entry is required.



3. SUCTION CLEANING

Due to the dewatering time, costs and disposal of the water, suction cleaning is generally the most expensive cleaning option. However by taking advantage of the large sump volumes available in CDS® Units, it may still be a very cost effective maintenance option.

Suction cleaning is used for most proprietary GPT's. Even if a more cost effective method is used at shorter intervals, suction cleaning is recommended for CDS® Units at one to two year intervals so that a thorough inspection of the screen and lower chambers can be carried out. Physical entry may or may not be required.

Normally a CDS® Unit would be sized with an appropriate sump volume to allow cleaning 3 or 4 times per year. These maintenance cleans would be carried out either by using a basket or a grab, with a single comprehensive clean per year completed by suction.

The best option for any particular unit will depend on tidal or backwater impact, pollution load and cleaning frequency as well as access and disposal costs for pump-down water.

CDS® Units may sometimes be required to use penstocks to isolate the unit during maintenance operations. This would be essential where a unit is affected by backwater and/or high levels of tidal inundation.

The main benefit of removable baskets is their speed and ease of cleaning, particularly in tidal zones. But the storage basket must be smaller than the screen to allow its removal. As such, the volume in a basket will be less than that of a large sump CDS® Unit volume.

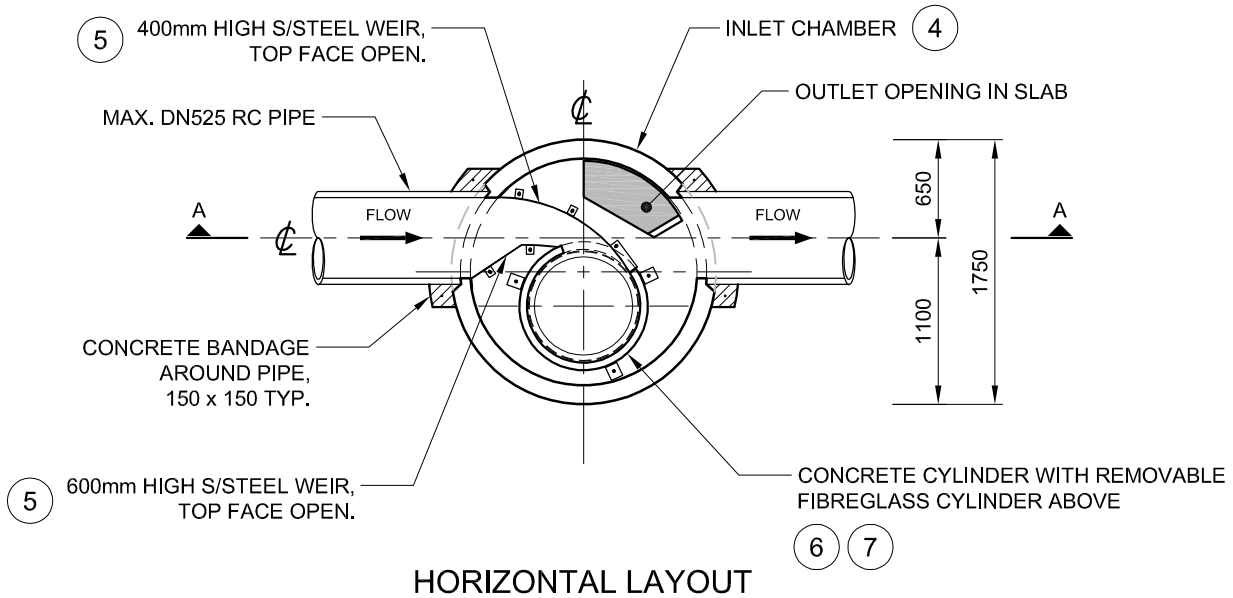
Consequently, whilst it may be cheaper, cleaning removable baskets might also be required 4 or 5 times more often.

For larger CDS® Units, the grab truck cleaning option offers the removal of 80 – 90% of the pollution stored in a sump and is subjected to similar constraints as the removable basket option.

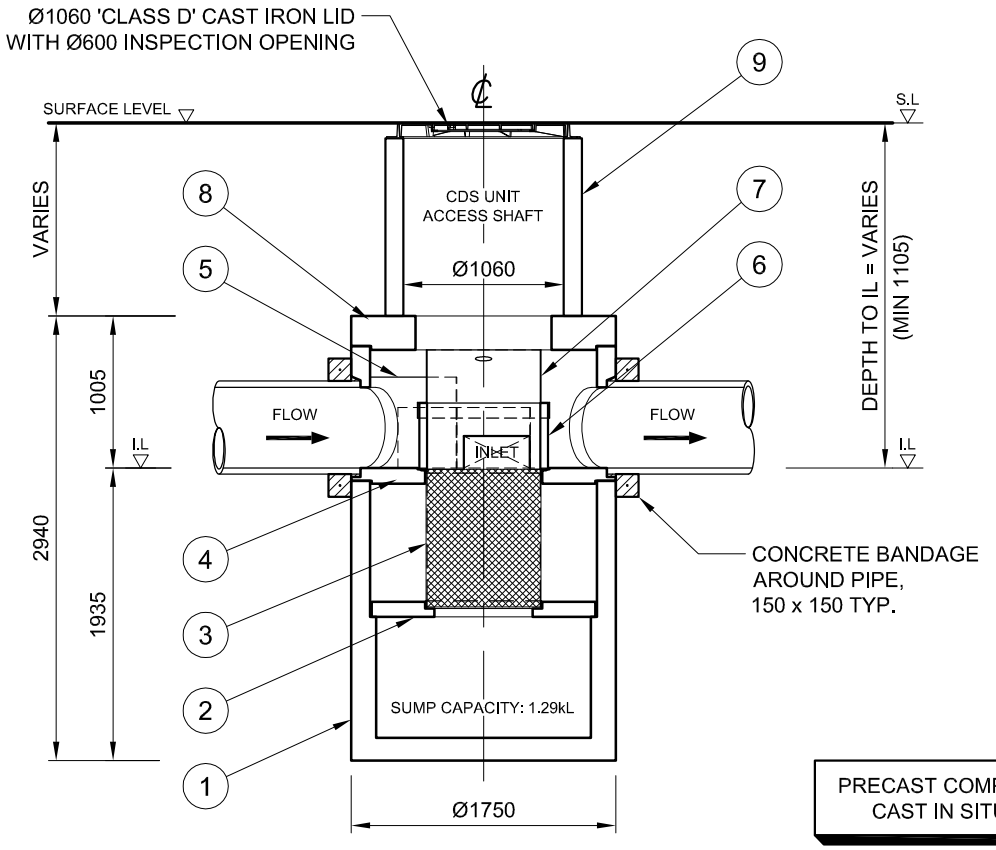
When considering GPT maintenance costs and procedures, the three maintenance options of CDS® Units offer greater operational flexibility and low life-cycle cost considerations.

More general GPT maintenance decision methodology information is available in the CDS® Unit Operation and Maintenance manuals or upon request.

DO NOT SCALE

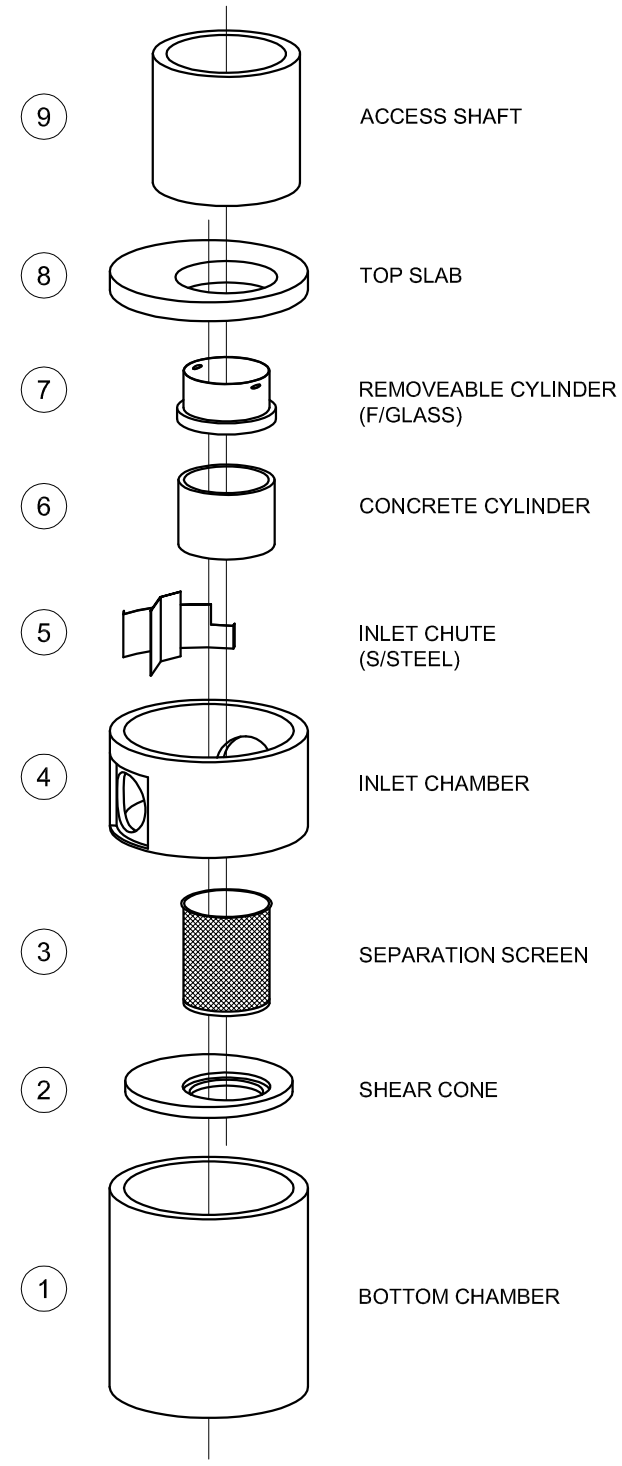


HORIZONTAL LAYOUT



VERTICAL SECTION A

PRECAST COMPONENTS
CAST IN SITU WORKS



CDS UNIT ASSEMBLY

GPT SITE DETAILS	
INLET PIPE DIA	
OUTLET PIPE DIA	
D.T.I (OUTLET)	

DRAWING APPROVAL

I/WE HAVE REVIEWED ALL DRAWINGS AND ARE SATISFIED THAT ALL INFORMATION SHOWN IS CORRECT

NAME OF PERSON AUTHORISED BY CUSTOMER _____ SIGNATURE _____ DATE __/__/__

NOTES:

1. DIMENSIONS SHOWN ARE FOR CONCRETE COMPONENTS ONLY. SEALANTS BETWEEN COMPONENTS (APPROX 10mm PER JOIN).
2. PRECAST RISER SHAFTS MAY NOT MATCH SURFACE LEVELS AND CAST INSITU FINISHING MAY BE REQUIRED.
3. INSITU CONCRETE DESIGN BY CLIENT, U.N.O (40mpa MIN.)
4. ALL LEVELS TO BE CONFIRMED PRIOR TO INSTALLATION.
5. GPT SHALL BE INSTALLED IN ACCORDANCE WITH PROJECT SPECIFICATIONS AND/OR AS.3725-2007, AND ROCLA PRODUCT INSTALLATION GUIDES.

RV	DRN	CKD	APR	DESCRIPTION	DATE
E					
D	DRC	DRC	SDB	REVISED MINIMUM DTI	2.02.10
C	DRC	DRC	SDB	ISSUED FOR INFORMATION	15.06.09
B	DRC	SDB	SDB	ISSUED FOR INFORMATION	3.11.08
A	SB	LH	PW	ISSUED FOR INFORMATION	28.06.07

CDS® TECHNOLOGIES

Rocla® Water Quality

ROCLA CDS
P0708 GPT

GENERAL ARRANGEMENT

RWQ No.	SALES
JOB No.	
SHEET	1 OF 1
SCALE	DO NOT SCALE
D	205338