Parramatta Eels

JULY 2022

Kellyville Park PNRL Eels - Centre of Excellence and Community Sports Centre

Integrated Water Management Plan

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Kellyville Park PNRL Eels - Centre of Excellence and Community Sports Centre Integrated Water Management Plan

Parramatta Eels

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WSP acknowledges that every project we work on takes place on First Peoples lands.
We recognise Aboriginal and Torres Strait Islander Peoples as the first scientists and engineers and pay our respects to Elders past and present.

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Glossary

Annual Exceedance Probability (AEP)	*Refers to the probability or risk of a flood of a given size occurring or being exceeded in a given year.*
Australian Height Datum (AHD)	*A common national surface level datum approximately corresponding to mean sea level.*
Average Recurrence Interval (ARI)	*The average or expected value of the period between exceedances of a given rainfall total accumulated over a given duration e.g. 100-year ARI flood is expected to be exceeded once every 100 years on average (taken to be equivalent to 1% AEP). It is implicit in this definition that the periods between exceedances are generally random.*
Catchment	*Area draining to a site. It always relates to a particular location and may include the catchment tributaries as well as mainstream.*
Council	*The Hills Shire Council (THSC).*
Development Control Plan (DCP)	*Council document that sets out the criteria that all developments must adhere to.*
Design Storm	*Is the probabilistic or statistical estimate, being generally based on some form of probability analysis of flood or rainfall data.*
Discharge	*The rate of flow of water measured in terms of volume over time.*
Flood	*A relatively high stream flow which overtops the natural or constructed watercourse or drainage system such as a stream, river, estuary, lake, canal or pipe drainage network.*
Fraction Impervious	*Ratio of impervious to total site area.*
Hydrograph	*A graph that shows the discharge to time relationship of a hydraulic flow at a particular location.*
Hydrology	*The term given to the study of the rainfall and runoff process as it relates to the derivation of hydrographs for given floods.*
Intensity Frequency Duration (IFD) Table	*A table which outlines the rainfall intensities for a given storm event over various storm durations.*
Major Storm Event	*The design storm event conveyed at surface level via the designated overland flow path.*
Minor Storm Event	*The design storm event conveyed undergound via the proposed stormwater pit and pipe network.*
Onsite Stormwater Detention (OSD)	*The practice of temporarily storing stormwater on site during a storm and releasing it slowly to reduce flow.*

Overland Flow Path	*The route taken by stormwater flowing over the ground surface.*
Peak Flow	*The maximum discharge during a flood event.*
Point of Stormwater Discharge	*The point at which the proposed stormwater network connects into the existing stormwater system.*
Rational Method	*Hydrological method used to assess the design peak flow rate (peak discharge) of stormwater generated onsite.*
Coefficient of Runoff	*The coefficient used in the Rational Method. Is the ratio of the peak rate of run-off to the average rainfall intensity during the critical rainfall period for the catchment area under consideration.*
Stormwater Harvesting	*The practice of capturing and storing stormwater runoff generated and reusing it on site.*
Time of Concentration	*The time required for the stormwater runoff to flow from the furthest part (relative to time) of the catchment to its outlet.*
Water Sensitive Urban Design (WSUD)	*The practice of treating and reusing stormwater runoff generated on site to improve the quality of stormwater discharge and reduce the impact on downstream waterways caused by urban developments.*

Executive Summary

This report constitutes the Integrated Water Management Plan for the 'Eels Centre of Excellence and Community Sports Hub, Kellyville' under SEARs application number SSD-24452965. The key issues in relation to stormwater drainage and water quality as outlined within the SEARs have been addressed and concurrently demonstrate compliance with all the relevant stormwater related requirements of The Hills Shire Council.

The stormwater strategy as currently proposed achieves a high standard in:

- Managing the stormwater runoff generated by the proposed development.
- Minimising the impact of the proposed development on the existing site stormwater infrastructure and downstream environments.
- Ensuring the safety of all development users.
- Protecting the new buildings from stormwater inundation.

The key items considered within the proposed stormwater strategy and how they have been addressed can be summarised as follows:

- Capturing of surface runoff – a combination of grated pits, kerbs, trench grates and swales are implemented to capture/convey surface runoff.
- Conveyance of flows from the design minor storm event – stormwater pipes have been designed to convey flows from the 10 year ARI event in the underground network.
- Conveyance of flows from the design major storm event – grading of the new carpark, footpath and landscaping has been completed to ensure adequate overland flow paths are available to convey flows at surface level safely away from the buildings. Where no adequate flow paths are available, the underground pipe network has been designed to cater for the 100 year ARI event.
- Points of stormwater discharge – two points of stormwater discharge have been nominated:
    - To the drainage being constructed as part of the field extension works project (by others).
    - To the existing 600 dia. Council drain running east to west through the site.

  The two points of stormwater discharge effectively split the flows generated by the development evenly, reducing the reliance on any single section of drainage infrastructure.
- Stormwater Quantity Management – in accordance with Council advice, onsite stormwater detention is deemed not to be required as part of this development given there is an existing online basin along Strangers Creek, immediately downstream of the site. The drainage infrastructure at the nominated points of stormwater discharge have been proven to have adequate capacity to cater for the peak flows generated by the proposed development.
- Stormwater Quality Management – in accordance with Council advice, treatment of the stormwater runoff generated on site is not required to be provided as part of this development due to the planned water quality treatment works within the existing online basin along Strangers Creek, immediately downstream of the site.
- Stormwater Harvesting – 2x25 kL above ground tanks and 2x10 kL below ground tanks are to be provided to collect and store runoff from the entire roof areas of the new buildings. Captured runoff is to be reused onsite for toilet flushing and landscape irrigation with the tanks supplying a minimum of 50% of the anticipated demand.

1 Introduction

This Integrated Water Management Plan is intended to be submitted as part of the overall State Significant Development Application (SSDA) for the proposed development at Kellyville Memorial Park in Kellyville NSW. It has been specifically prepared in response to item 15 of the developments associated Secretary's Environmental Assessment Requirements (SEARs).

While addressing this SEARs item, the report provides commentary on existing site conditions including stormwater infrastructure, topography and overland flow paths. It will then outline the stormwater management strategy for the proposed development including the proposed points of stormwater discharge as well as commentary surrounding stormwater quantity and quality requirements that are applicable to this development as advised by Council.

1.1 Design Response to SEARs

The following design responses are provided to the key issues required to be addressed in relation to stormwater drainage and water quality (item 15) as outlined within the SEARs:

Table 1.1: Design Response to SEARs

(Source: SEARs Application No. SSD-24452965, dated 15/08/21)

15. STORMWATER DRAINAGE AND WATER QUALITY	
Key Issues to be Addressed	**Design Response**
The EIS must include an Integrated Water Management Plan that:	
Is prepared in consultation with Council and any relevant drainage authority.	This report constitutes the Integrated Water Management Plan and has been prepared in accordance with Council's requirements.
Details the proposed drainage design for the site including on-site detention facilities, water quality measures and the nominated discharge point(s).	Section 4 of this report discusses the proposed stormwater strategy for this development including points of discharge, stormwater quality and quantity. Detailed Civil drawings are also included in Appendix A.
Demonstrates compliance with relevant provisions of the Sydney Drinking Water Catchment SEPP with Council or other drainage authority requirements and avoids adverse impacts on any downstream properties.	The development is not located within the Sydney Drinking Water Catchment SEPP. The stormwater drainage strategy has been developed as per the requirements within The Hills Shire Council DCP and/or advice provided by Council officers.
Where drainage infrastructure works are required to be handed over to Council, provide full hydraulic details and detailed plans and specifications of proposed works that have been prepared in consultation with Council and comply with Council's relevant standards.	No new stormwater drains are required to be handed over to Council as part of this development. A new stormwater junction pit may be installed on the existing Council 600 dia. Council drain to provide a connection point for the harvesting tank overflow. This proposed new pit is shown on the Civil Works Plans included with the Civil drawings in Appendix A and noted to be constructed in accordance with the relevant Council standard drawing.

1.1.1 Design Response to External Referral Authorities

Sydney Water provided additional input on the SEARs in a letter dated 28th of July 2021. The following design responses are provided to the Civil/stormwater drainage related requirements as outlined by Sydney Water:

Table 1.2: Design Response to Sydney Water Requirements

(Source: Sydney Water Letter, dated 28/07/2021)

Key Issues to be Addressed	**Design Response**
The proponent of the development should determine service demands following servicing investigations and demonstrate that satisfactory arrangements for drinking water, wastewater, and recycled water (if required) services have been made.	Rainwater harvesting requirements for the development have been provided by The Hills Shire Council and have been incorporated within the overall design. Refer Section 4.4.1.
The proponent must obtain endorsement and/or approval from Sydney Water to ensure that the proposed development does not adversely impact on any existing water, wastewater or stormwater main, or other Sydney Water asset, including any easement or property. When determining landscaping options, the proponent should take into account that certain tree species can cause cracking or blockage of Sydney Water pipes and therefore should be avoided.	The development will not have an adverse impact on any Sydney Water stormwater assets as there are none located in close proximity to the proposed works.
Strict requirements for Sydney Water's stormwater assets (for certain types of development) may apply to this site. The proponent should ensure that satisfactory steps/measures been taken to protect existing stormwater assets, such as avoiding building over and/or adjacent to stormwater assets and building bridges over stormwater assets. The proponent should consider taking measures to minimise or eliminate potential flooding, degradation of water quality, and avoid adverse impacts on any heritage items, and create pipeline easements where required.	No works are proposed in close proximity to any Sydney Water stormwater asset. Stormwater generated by the proposed development shall discharge to existing stormwater pipes running through the site which are owned and maintained by The Hills Shire Council. Stormwater quality and quantity requirements have been provided by The Hills Shire Council and incorporated within the overall design. Refer Section 4.
The proponent should outline any sustainability initiatives that will minimise/reduce the demand for drinking water, including any alternative water supply and end uses of drinking and non-drinking water that may be proposed, and demonstrate water sensitive urban design (principles are used), and any water conservation measures that are likely to be proposed. This will allow Sydney Water to determine the impact of the proposed development on our existing services and required system capacity to service the development.	Water Sensitive Urban Design (WSUD) requirements for the development have been provided by The Hills Shire Council and have been incorporated within the overall design. Refer Section 4.4.
Proposed development has the common boundary with Sydney Water's Basin 35 on the western side. This common boundary has the dam wall which is part of the Basin 35. The proposal must ensure any earth work or building work, including piling work, excavation etc. should not cause any adverse impact on structural stability of the dam wall. It is recommended that the proponent provides details of their building works, earth works and construction methodology with the Specialised Engineering Report to ascertain that the proposed development work has no impact on dam wall of Basin 35.	No works are proposed in close proximity to Sydney Water's Strangers Creek Reserve or Basin 35 and therefore the development will not have an adverse impact on the existing dam wall of Basin 35. Refer to Figure 2.1 and Figure 2.2 showing the significant distance between the proposed development and Sydney Water's Reserve (approx 165m). Notes will be incorporated onto Construction Drawings communicating this condition to the Contractor.
If the development requires direct stormwater discharge into Sydney Water's Stranger Creek, it is recommended that the proponent liaises with Sydney Water as soon as possible to determine the suitable location of the point of	No direct stormwater connection is proposed to Sydney Water drainage assets. Runoff from the new development will discharge into existing stormwater

discharge in line with the meeting outcomes held between The Hills Council and Sydney Water on 26 March 2021 at the site.	pipes owned and maintained by The Hills Shire Council.

2 The Site

Kellyville Park is situated at 8 Memorial Avenue in Kellyville within The Hills Shire Council Local Government Area. The site borders Memorial Avenue to the north, Stone Mason Drive to the east, residential developments to the South and Strangers Creek to the West. Access to the site is via Memorial Avenue and Stone Mason Drive.

The current developed state of this site mostly consists of various sporting fields (some currently in construction) with surrounding access roads and carparks. A temporary construction compound currently occupies the north-eastern corner of the site.

The works to be completed as part of this proposed development are consigned to the north-eastern section of the site.

Figure 2.1: Locality and Extent of Works Plan

(Source: Nearmap, 06/10/2021)

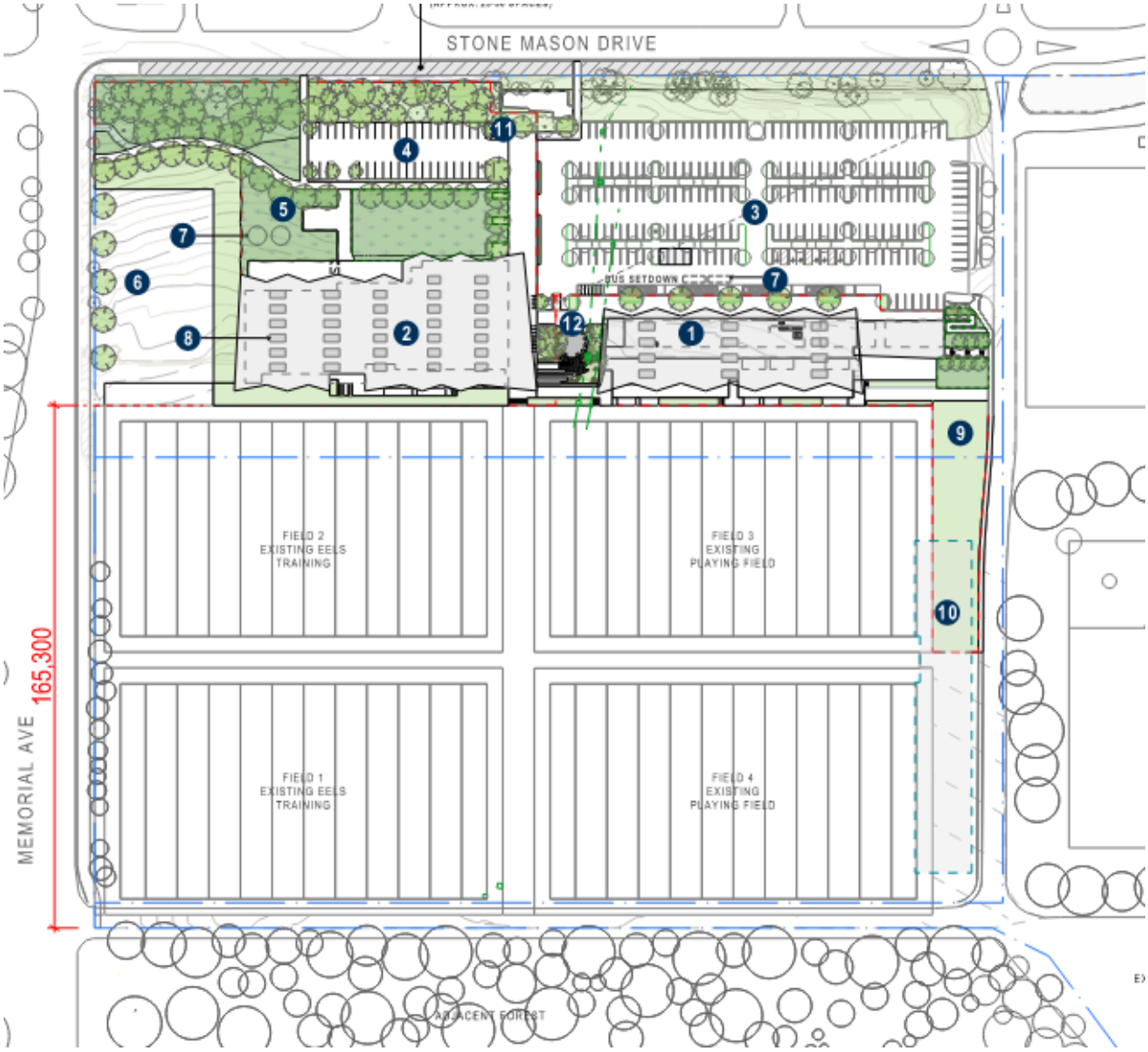

Figure 2.2: New Site Works Plan

2.1 Existing Conditions

2.1.1 Existing Topography and Overland Flow Paths

The site generally falls in an east to westerly direction. The existing contours through the subject site fall from a high point of approximately RL70.00 AHD at the interface with Stone Mason Drive along the eastern boundary to a low point of approximately RL60.00 AHD at the interface with Strangers Creek along the western boundary.

The site is subject to overland flows from the residential subdivision to the east. Based on construction drawings provided by Council (refer Appendix B), the external catchment is estimated to be approximately 8.53 hectares in size.

Runoff from this catchment will generally be conveyed within an existing Council underground stormwater network discharging to Strangers Creek (refer Section 2.1.2). In major storm events, where the capacity of the existing Council stormwater network is exceeded, flows from the external catchment will run overland through the site from Stone Mason Drive to Strangers Creek.

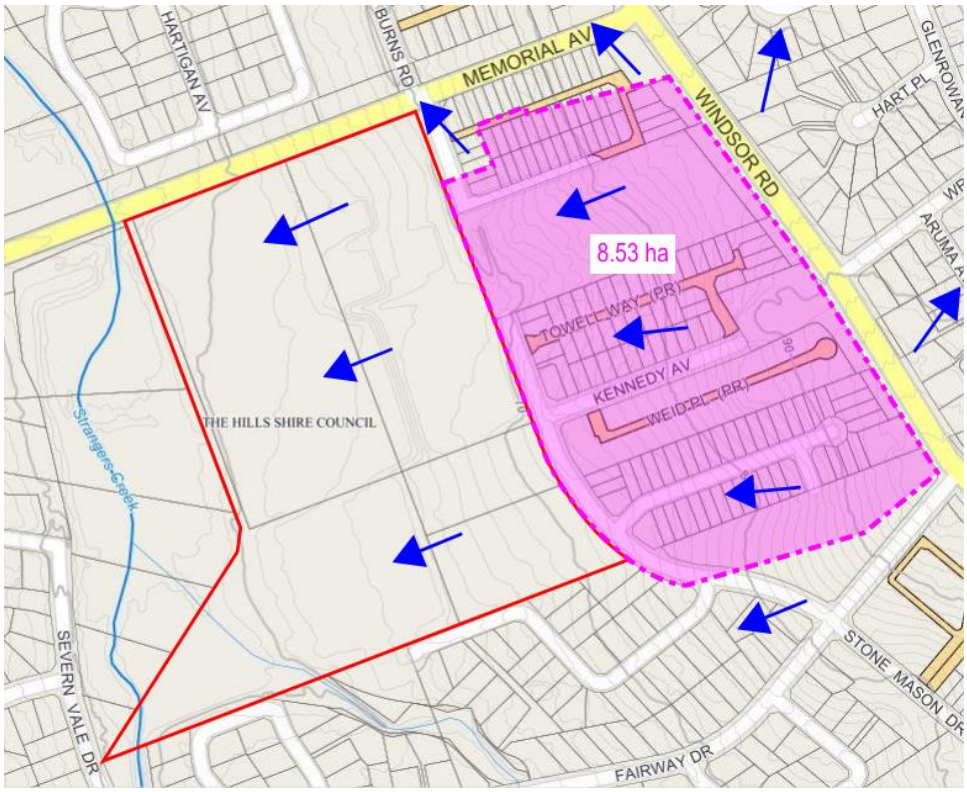

Figure 2.3: Topography Map

(Source: The Hills Shire Council Interactive Map, 19/10/2021)

2.1.2 Existing Stormwater Infrastructure

A feature and level survey of the site was completed in March of 2021 which discovered the presence of both a 600 dia. and 900 dia. drainage lines which run east to west through the site. The survey data has been cross-referenced with historical construction drawings received from Council to develop an understanding as to what the existing drainage lines are servicing.

From these drawings it is understood that the 900 dia. drain services the residential catchment to the east of the site with the drain running from Stone Mason Drive and discharging to Strangers Creek. The 600 dia. drain services the existing carpark within the site and similarly discharges to Strangers Creek.

Neither of these drains are currently shown on the Council GIS mapping database. With regards to the 900 dia. drain this is due to the fact that the upstream catchment for which it relates has not yet been completed.

Additional surveying including CCTV is currently being organised to confirm the details and conditions of these drains.

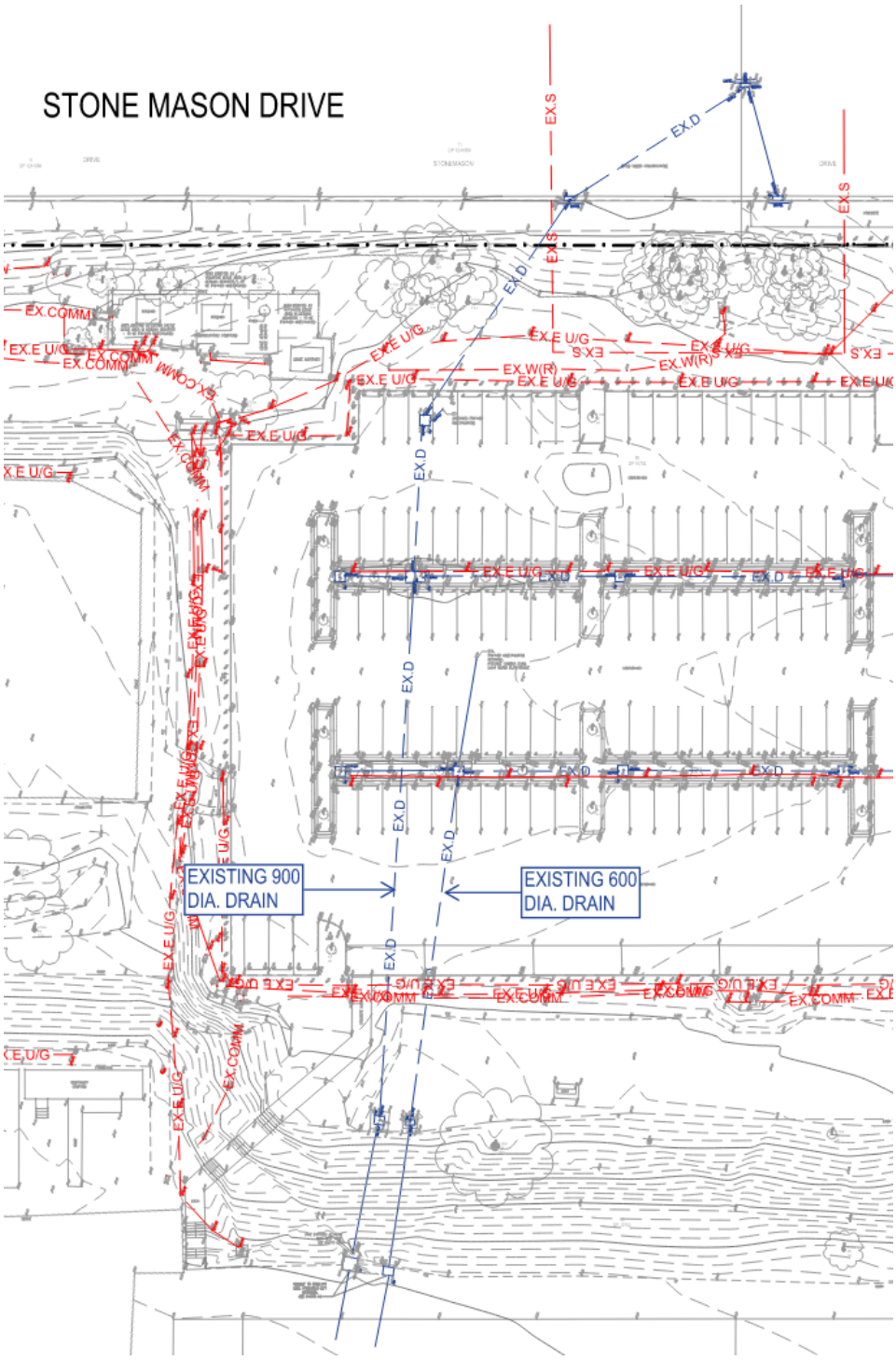

Figure 2.4: Existing Stormwater Infrastructure

(Source: Feature and Levels Survey by Cardno, Drawing No. 11930501001 Rev. 02, dated 29/03/21)

3 Proposed Development

The proposed development will provide state of the art facilities which enable physical recreation opportunities in conjunction with improved facilities for staff, players and existing users of the site. The proposed development will be integrated with the existing recreational landscape of the site and complement the upgrades to the existing playing fields being undertaken by Council. The proposed development is defined as a Recreation facility (major), and includes the following components:

- Construction of high-performance Centre of Excellence in the northeast of the site adjacent to Training Field 2:
    - Elite level gymnasium.
    - Medical and rehabilitation facilities.
    - Aquatic recovery and rehabilitation pools.
    - Lecture theatre and meeting rooms.
    - Player education and study areas.
    - Administrative offices for the Paramatta Eels.
    - New female facilities including a dedicated female change room, cubicle toilets and shower.
    - Balcony and terrace area.
    - End of Trip Facilities and bicycle parking.
    - Refuse Area.
- Construction of a Community Facility, including a grandstand with approximately 1,500 seats in the centre of the site adjacent to the Main Playing Field 3:
    - Unisex changerooms and amenities.
    - Referee changeroom and amenities.
    - First Aid/Medical room.
    - Community gymnasium.
    - Café/kiosk.
    - Concourse terrace.
    - Multipurpose community function room with kitchen and amenities.
    - Refuse Area.
    - Bicycle parking.
- Solar arrays will be included on the roof of both the Centre of Excellence and Community Facility.
- Additional 40 car parking spaces for the proposed facility to operate in conjunction with existing at grade car parking already constructed by Council.
- Additional landscaping throughout the development footprints.
- Removal of a small number of trees internal to the site, however noting perimeter trees will be retained where not affected by the proposed building footprints.

- Hours of operation for the Centre of Excellence and Community Facility are 5:00am to 12:00am, however the following key times are likely:
    - Centre of Excellence: 7.00am – 7.00pm.
    - Community Facility: 7.00am – 10.00pm.

4 Proposed Stormwater Strategy

4.1 Design Guidelines

The following list of documents/sources have been utilised to inform the stormwater quantity management strategy of the development:

- The Hills Development Control Plan (DCP) 2012
    - Part D, Section 7 – Balmoral Road Release Area
    - Appendix B – Water Sensitive Urban Design
- The Hills Shire Council Design Guidelines Subdivision/Developments (September 2011)
- Australian Rainfall and Runoff (AR&R) 1998
- AS3500.3:2018 Plumbing and Drainage Part 3: Stormwater Drainage
- The Hills Shire Council Site Specific Advice

4.2 Design Criteria

Referencing the document/sources listed in Section 4.1, the following key criteria have informed the stormwater management strategy:

- The stormwater drainage system shall be designed in accordance with Chapter 14 of the AR&R (1998).
- Overland flow paths shall be provided, capable of conveying the maximum discharge up to the 100 year ARI event, in excess of the capacity of the underground stormwater network, safely away from the proposed buildings towards the closest existing external overland flow path (Strangers Creek).
- The underground stormwater pit and pipe network shall be designed to cater for the minor storm event identified as the 10 year ARI event. Where no suitable overland flow paths are present, the underground system will be designed to convey the 100 year ARI event.
- The proposed stormwater pit and pipe network shall connect to existing stormwater infrastructure deemed to be a ‘Lawful Point of Discharge’ by Council by adhering to the following:
    - The point of stormwater discharge(s) is under the lawful control of Council or other statutory authority whose permission to discharge has been received.
    - The point of stormwater discharge(s) will not cause an actionable nuisance to the neighbouring sites.
- Should Onsite Stormwater Detention (OSD) be required, it shall be provided using the same principles as that of the Upper Parramatta River Catchment Trust (UPRCT) ‘On-site Stormwater Detention Handbook’ adjusted as per the design parameters of the Hawkesbury River Catchment which the development is situated in.
- Should Water Sensitive Urban Design (WSUD) be required, it shall be designed and constructed to comply with the requirements of Council, Water Sensitive Urban Design Technical Guidelines for Western Sydney (NSW Government Stormwater Trust and UPRCT, May 2004) and Australian Runoff Quality (Engineers Australia 2005).

4.3 Stormwater Quantity Management

As per correspondence received from The Hills Shire Council, onsite stormwater detention is not required to be provided as part of this development. This is provided the existing drainage proposed to act as the points of stormwater discharge can be demonstrated to have sufficient capacity to cater for the design flows from the minor storm event. The reason for this being that there is an existing online basin along Strangers Creek immediately downstream of the site. Refer to Appendix D for correspondence from The Hills Shire Council.

4.3.1 Hydrological Model

The Rational Method has been utilised to assess the peak design flow rate for the catchments within the development for the minor storm event as well as the major storm event where an overland flow path is not available. Within this method the following design parameters have been adopted in accordance with the Council design guidelines:

- The coefficient of runoffs are computed using the principles set out in AR&R.
- A time of concentration of 5 minutes.
- The rainfall intensities utilized are for that of the Hawkesbury catchment area as shown below.

Table 4.1: Intensity-Frequency-Duration (IFD) Rainfall for the Hawkesbury Catchment

(Source: The Hills Shire Council Design Guidelines Subdivision/Developments, September 2011)

DURATION (MIN.)	AVERAGE STORM RECURRENCE INTERVAL						
	1 Year (mm/hr)	2 Year (mm/hr)	5 Year (mm/hr)	10 Year (mm/hr)	20 Year (mm/hr)	50 Year (mm/hr)	100 Year (mm/hr)
5	79.76	102.36	130.81	147.22	169.01	197.45	219.06
6	74.73	95.90	122.52	137.88	158.27	184.88	205.10
10	61.12	78.40	100.10	112.59	129.21	150.88	167.33
12	56.49	72.46	92.49	104.02	119.35	139.35	154.53
15	51.06	65.49	83.55	93.95	107.78	125.81	139.50
18	46.83	60.05	76.59	86.11	98.11	115.29	127.82
20	44.48	57.03	72.73	81.76	93.77	109.44	121.33
24	40.58	52.03	66.33	74.55	85.50	99.76	110.59
30	36.13	46.32	59.02	66.32	76.04	88.71	98.32
45	28.96	31.11	47.25	53.07	60.82	70.93	78.59
60	24.59	31.50	40.08	45.00	51.57	60.12	66.60
90	19.33	24.80	31.66	35.61	40.86	47.71	52.91

4.3.2 Points of Stormwater Discharge

Based on the size of the development and the topography of the land, the area of works has been separated into two catchments. The North catchment includes the Centre of Excellence (COE) building, the new carpark and surrounding landscaping. The South catchment includes the new Community Facilities (CF) building, Tenancy Building, Grandstand, the surrounding pavement and landscaping as well as a section of the existing carpark.

Suitable points of connection have been nominated at the downstream ends of each catchment which allow for the flows generated by the proposed development to be discharged to Council requirements. The North catchment (Point of Discharge #1) will discharge to a new drainage line at the north-west corner of the COE building currently in construction as part of the 'Field Extension Works' project by others. The South catchment (Point of Discharge #2) will discharge to the existing 600 dia. Council drain running east to west through the site.

The existing 900 dia. Council drain would also be a suitable point of discharge for the South catchment based on available capacity. Refer to the Stormwater Layout and Catchment Plan contained within the Civil drawings in Appendix A.

4.3.3 Catchment Analysis

To determine the runoff coefficient for each catchment, the total areas have been further broken down into landscaping (pervious) and pavement and roof (impervious) sub-areas. The North catchment is observed to be the significantly larger catchment by total area, however it consists of more than 60% of pervious landscaping and it therefore converts only 57% of rainfall into runoff for the design minor storm event. Conversely, the South catchment predominantly consists of impervious roof and pavement areas and as such converts 83% of its rainfall into runoff for the design minor storm event.

Table 4.2: Catchment Area Breakdowns

CATCHMENT	TOTAL AREA (SQ.M)	LANDSCAPE AREA (SQ.M)	TOTAL PERVIOUS AREA (SQ.M)	PAVEMENT AREA (SQ.M)	ROOF AREA (SQ.M)	TOTAL IMPERVIOUS AREA (SQ.M)
North	12,988	7,950	7,950	1,545	3,493	5,038
South	8,661	1,108	1,108	5,339	2,214	7,553

Table 4.3: Catchment Runoff Coefficients

CATCHMENT	IMPERVIOUS FRACTION, F	PERVIOUS 10 YR ARI RUNOFF COEFFICIENT, C'10	10 YR ARI RUNOFF COEFFICIENT, C10
North	0.39	0.37	0.57
South	0.87	0.37	0.83

The Rational Method was then utilised to assess the peak flow rate of each catchment for the minor design storm event. The table below shows that the peak discharge rate generated by the proposed development is approximately even for the two catchments.

Table 4.4: Catchment Peak Discharge Rate

CATCHMENT	10 YR ARI RUNOFF COEFFICIENT, C10	TIME OF CONCENTRATION, T_C (MINS.)	10 YR ARI RAINFALL INTENSITY, I^{10} (MM/HR)	10 YR ARI PEAK DISCHARGE RATE, Q_P (L/S)
North	0.57	5	147.22	304.41
South	0.83	5	147.22	294.57

4.3.4 Onsite Stormwater Detention (OSD)

Drawings received from Council for the 'Kellyville Memorial Park Field Extension Civil Engineering Works' (refer Appendix C) reveal that the soon to be constructed drainage nominated as the point of connection for the North catchment (Point of Discharge #1), has been designed based on an incoming flow rate of 307.17 L/s for the 10 year ARI storm event and therefore has capacity for the North catchment.

Construction drawings of the 600 dia. drain nominated as the point of connection for the South catchment (Point of Discharge #2) have not been made available. In lieu of this, the slope of the drain has been assumed to match that of the existing ground surface at approximately 1:60 grade. Utilising this grade, the pipe capacity of the existing 600 dia. reinforced concrete pipe has been estimated using Manning's Equation to be 828.41 L/s and therefore has ample capacity to service the South catchment.

Construction drawings of the 900 dia. drain running east to west through the site (refer Appendix B) indicate that the Council drain has 191.40 L/s of 'spare' capacity in excess of the design flows from the catchment it services for the 10 year ARI event. This supports the proposal to act as an optional point of stormwater discharge should it be required.

Based on the above and in line with Council advice (refer Appendix D), no onsite detention is required to be provided for this development for either catchment and thus none is proposed.

4.3.5 Overland Flow

The 900 dia. Council drain passing between the two new buildings has been designed to convey the 10 year ARI storm event without surcharge. An overland flow path has been provided between the two new buildings to safely convey overland flow associated with larger events or blockage scenarios. Overland flow is expected to surcharge into the existing carpark before overtopping between the two buildings and running down towards the creek.

The proposed strategy will be assessed within the Flood Impact Assessment Report being prepared in response to item 14 of the SEARs.

4.4 Stormwater Quality Management

As per correspondence received from The Hills Shire Council, treatment of the stormwater runoff generated on site is not required to be provided as part of this development. This is due to planned water quality treatment works within the existing online basin along Strangers Creek immediately downstream of the site. Refer to Appendix D for correspondence from The Hills Shire Council.

4.4.1 Rainwater Harvesting

In accordance with guidelines surrounding developments within the Balmoral Road Release Area contained within Part D, Section 7 of the Council DCP, rainwater harvesting tanks are being provided. The development will incorporate separate rainwater harvesting tanks for each new building collecting and storing runoff from the entire roof areas and reusing onsite for toilet flushing and landscape irrigation.

Sydney Water's online rainwater tank calculator can be used to assess the performance of various tank sizes in meeting the demand needs of a development. The Hydraulic consultant has utilised this tool to model the roof catchment areas and estimated reuse demand rates. The volumes they have proposed have been based on ensuring a minimum 50% of the demand can be met through the harvesting tanks. The table below summarises the proposed harvesting strategy for each of the buildings. Refer to Appendix E for the rainwater harvesting tank calculations.

Table 4.5: Rainwater Harvesting Strategy

BUILDING	PROPOSED TANK VOLUME (KL)	ROOF AREA CAPTURED (SQ.M)	REUSE PURPOSES	LOCATION	DEMAND MET (%)
Centre of Excellence (COE)	2x25	3300	Toilet Flushing & Landscape Irrigation	Above ground, external to the building within the landscaping.	56
Community Facilities (CF) and Tenancy	2x10	2200	Toilet Flushing & Landscape Irrigation	Below ground, external to the building within the existing carpark.	81

5 Conclusion

This report constituting the Integrated Water Management Plan (IWMP) outlined the proposed stormwater management strategy of the proposed development. It has addressed each point within item 15 ‘Stormwater Drainage and Water Quality’ of the SEARs, as well as demonstrating compliance with all the relevant stormwater related requirements of The Hills Shire Council. A summary of the key proposals are as follows:

- New stormwater pits and pipes on site will be sized to convey the 10 year ARI storm event. Where no overland flow path is available, the pits and pipes will be sized to cater for the 100 year ARI storm event.
- Overland flow paths will be provided to convey flows in excess of the capacity of the underground stormwater network at surface level safely away from the buildings.
- Runoff generated from the proposed development will discharge to the existing and soon to be constructed (as part of separate works) drainage infrastructure.
- Onsite stormwater detention will not be provided given the drainage at the proposed points of connection have been proven to have adequate capacity to cater for the peak discharge generated by the development.
- No stormwater quality treatment measures will be implemented as part of this development. This is due to the planned water quality treatment works within the existing online basin along Strangers Creek immediately downstream of the site
- Stormwater harvesting tanks will be provided to each of the new buildings to capture runoff from the roof areas and reuse onsite for toilet flushing and landscape irrigation.

6 Limitations

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Except as otherwise stated in the Report and to the extent that statements, opinions, facts, conclusion and/or recommendations in the Report *(Conclusions)* are based in whole or in part on information provided by the Client and other parties identified in the report *(Information)*, those Conclusions are based on assumptions by WSP of the reliability, adequacy, accuracy and completeness of the Information and have not been verified. WSP accepts no responsibility for the Information.

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Appendix A

Civil Drawings

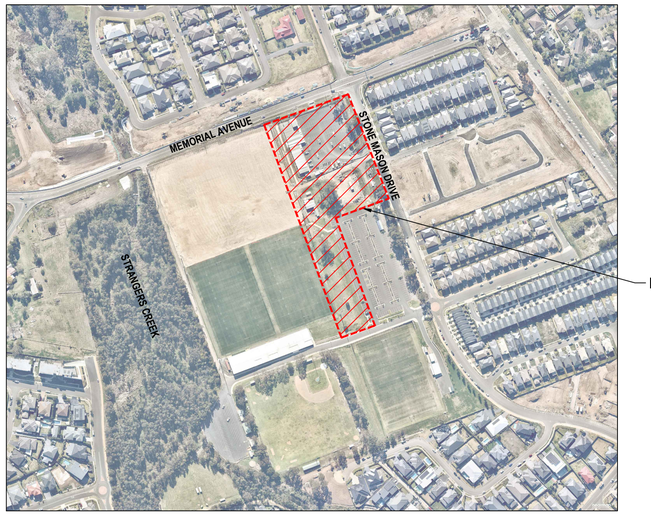
Contained within this appendix are drawings documenting the proposed Civil works relating to the ‘Kellyville Park PNRL Eels – Centre of Excellence and Community Sports Centre’ development under SEARs Application No. SSD-24452965 that this report has been prepared in response to.

KELLYVILLE PARK

CENTRE OF EXCELLENCE & SPORTS HUB

CIVIL DRAWINGS

DRAWING INDEX	
DRAWING NUMBER	**DRAWING TITLE**
CV-000	FACE SHEET, DRAWING INDEX AND LOCALITY PLAN
CV-005	EXISTING CONDITIONS PLAN
CV-015	STORMWATER LAYOUT AND CATCHMENT PLAN
CV-030	CIVIL WORKS PLAN SHEET 1 OF 3
CV-031	CIVIL WORKS PLAN SHEET 2 OF 3
CV-032	CIVIL WORKS PLAN SHEET 3 OF 3



LOCALITY PLAN

N.T.S.

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P2	10/12/2021	A.K	50% DD ISSUE	T.B	
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PROJECT: KELLYVILLE PARK
CENTRE OF EXCELLENCE & SPORTS HUB

TITLE: FACE SHEET, DRAWING INDEX
AND LOCALITY PLAN

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PROJECT NUMBER:	DRAWN:	DATE:
PS123790	R.B	15/09/2021
DRAWING No:		REV:
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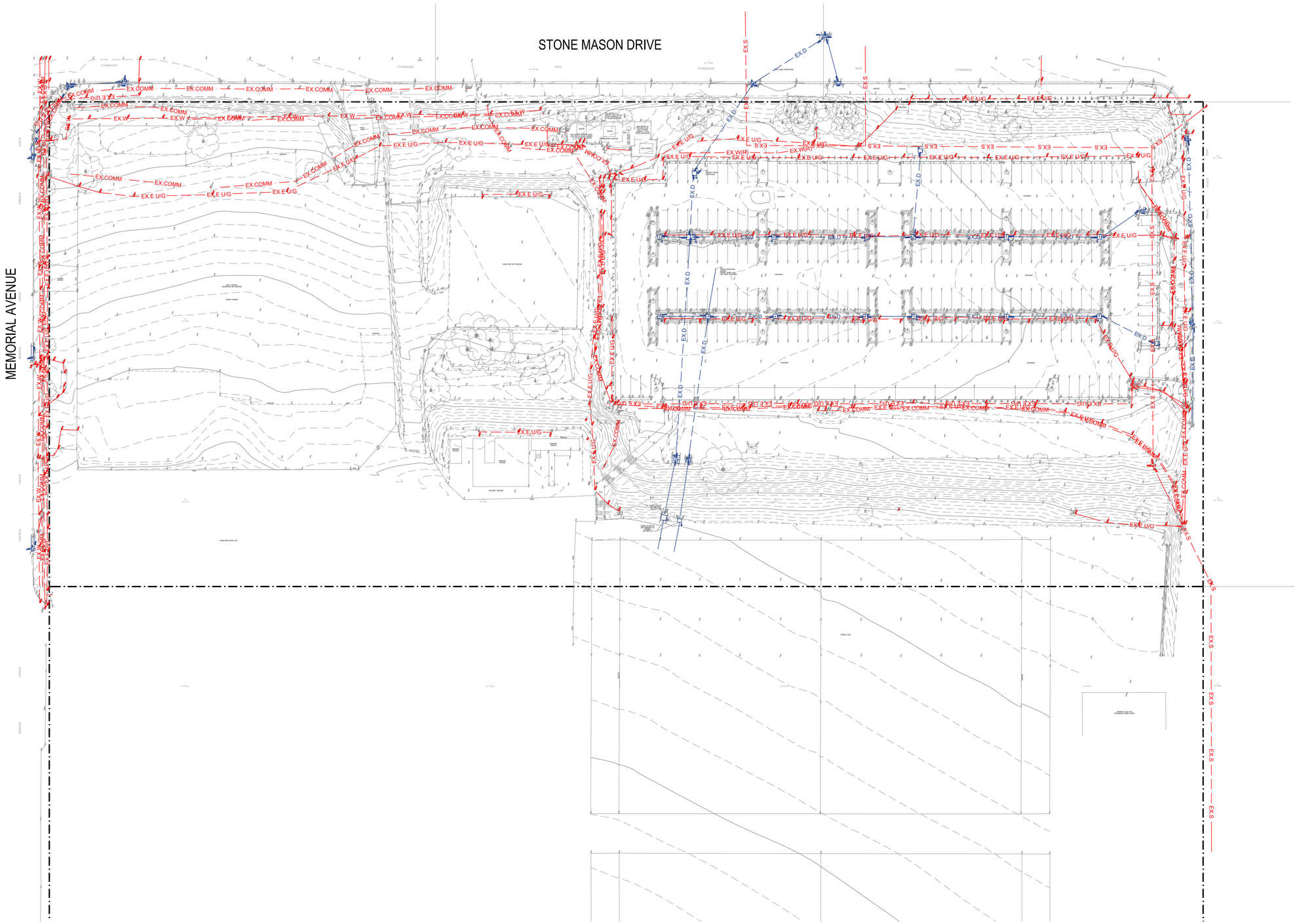

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NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL DRAWINGS AS REFERENCED ON C000. FOR GENERAL NOTES REFER TO DRAWING C001.
2. THE SITE FEATURE AND LEVEL SURVEY WAS PROVIDED BY CARDNO AND REFLECTS THE EXISTING CONDITIONS CURRENT TO 29/03/2021. CAD DRAWING NO. 119305D1001 REV. 02, LEVELS SHOWN ARE TO A.H.D VIDE SSM165380 WITH A STATED VALUE OF RL 70.086. FOR FURTHER INFORMATION RELATING TO SURVEY CONTACT CARDNO ON (02) 9597 9700.
3. WARNING: THE LOCATION OF UNDERGROUND SERVICES ARE APPROXIMATE ONLY AND THE EXACT POSITION SHOULD BE PROVEN ON SITE. NO GUARANTEE IS GIVEN THAT ALL EXISTING SERVICES ARE SHOWN.
4. ALL EXISTING DRAINAGE CHANNELS ARE LIVE. THE CONTRACTOR MUST MAKE ADEQUATE PROVISIONS TO MAINTAIN THESE DURING THE WORKS INCLUDING TEMPORARY RE ROUTING ETC.

LEGEND

- EX.D — EXISTING DRAINAGE
- EX.W — EXISTING WATER
- EX.W(R) — EXISTING RECYCLED WATER
- EX.E U/G — EXISTING ELECTRICAL UNDERGROUND
- EX.G — EXISTING GAS
- EX.COMM — EXISTING COMMUNICATIONS
- EX.S — EXISTING SEWER
- TITLE BOUNDARY

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CENTRE OF EXCELLENCE & SPORTS HUB

TITLE: EXISTING CONDITIONS PLAN

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DRAWING No:		REV:
CV-005		P3

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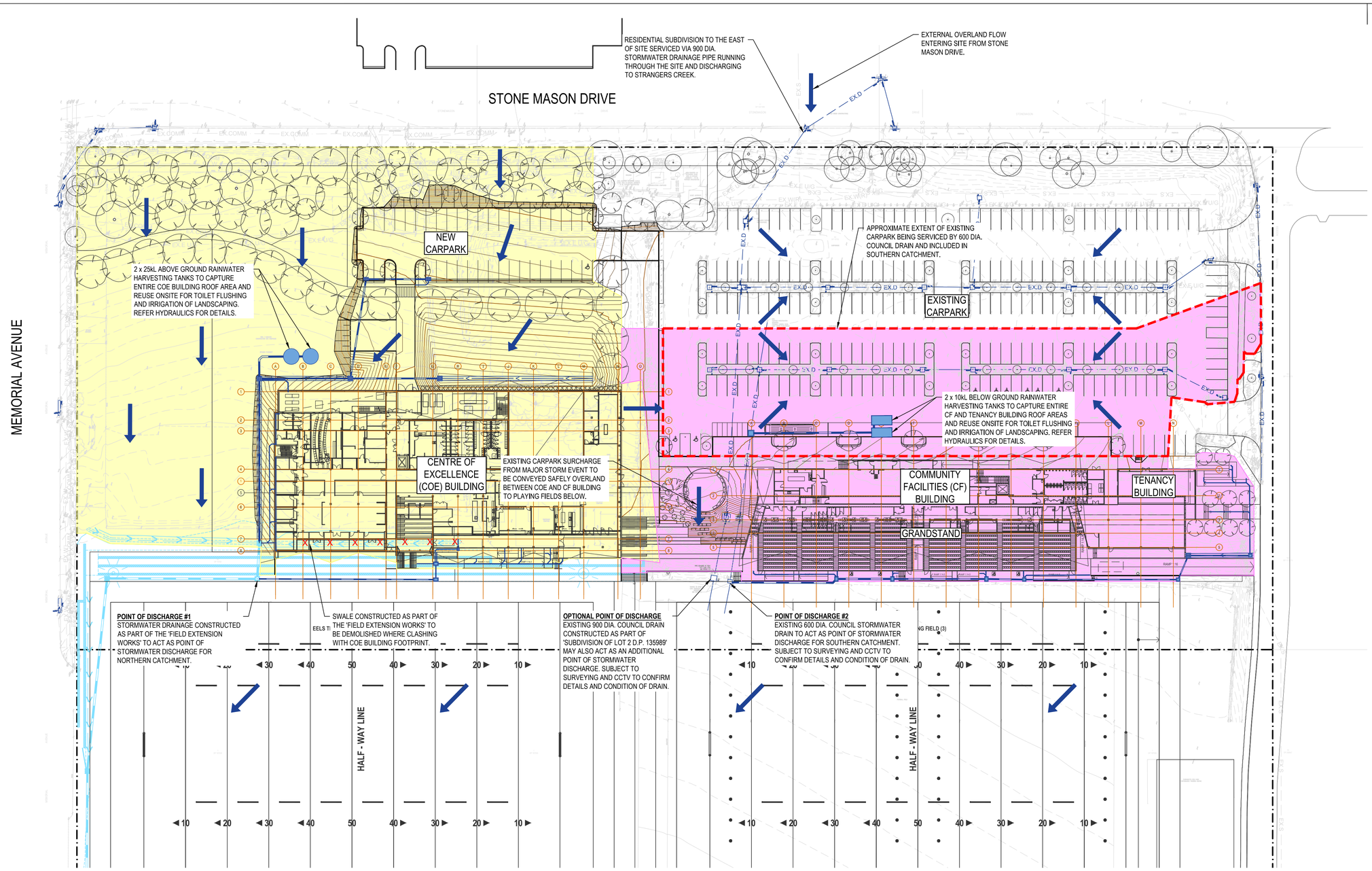

NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL DRAWINGS AS REFERENCED ON DRAWING CV-000.
2. DRAWING SHOWS TRUNK STORMWATER ONLY. REFER TO CIVIL WORKS PLANS OF DRAWINGS CV-030 TO CV-032 FOR MINOR DRAINAGE ELEMENTS.

LEGEND

- TITLE BOUNDARY
- EX.D — EXISTING STORMWATER DRAINAGE
- 'FIELD EXTENSION' STORMWATER DRAINAGE PIPE BY OTHERS
- 'FIELD EXTENSION' STORMWATER DRAINAGE PITS BY OTHERS
- 'FIELD EXTENSION' SWALE BY OTHERS
- PROPOSED STORMWATER DRAINAGE PIPE
- PROPOSED GRATED PIT
- PROPOSED JUNCTION PIT
- PROPOSED SWALE
- PROPOSED CONTOURS
- PROPOSED BATTER
- NORTHERN CATCHMENT TO POINT OF STORMWATER DISCHARGE #1
- SOUTHERN CATCHMENT TO POINT OF STORMWATER DISCHARGE #2
- OVERLAND FLOW PATH

AREA BREAKDOWN				
	LANDSCAPE AREA (m^2)	PAVEMENT AREA (m^2)	ROOF AREA (m^2)	TOTAL AREA (m^2)
NORTH CATCHMENT	7944	1550	3493	12987
SOUTH CATCHMENT	1015	5434	2214	8663

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P2	10/12/2021	A.K	50% DD ISSUE	T.B	
P1	25/10/2021	A.K	DRAFT SSDA ISSUE	T.B	

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ARCHITECT: HB ARCHITECTS PTY LTD

PROJECT: KELLYVILLE PARK CENTRE OF EXCELLENCE & SPORTS HUB

TITLE: STORMWATER LAYOUT AND CATCHMENT PLAN

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CV-015		P3

CAD FILE: PS123790-CV-015.DWG

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NOTES:

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2. ADDITIONAL SURVEYING AND CCTV TO BE COMPLETED ON EXISTING 600 & 900 DIA. COUNCIL DRAINS TO CONFIRM DETAILS AND CONDITION.
3. LOCATIONS OF DOWNPIPE CONNECTIONS FROM BALCONY AND TERRACES (NOT DISCHARGING TO THE RAINWATER HARVESTING TANKS) TO BE CONFIRMED BY THE HYDRAULIC CONSULTANT.
4. PIPE CONNECTIONS FROM AGI DRAINS, TRENCH GRATES, DOWNPIPES, ETC. TO BE 100 DIA. UPVC AT MIN. 1:100 GRADE UNO.

LEGEND

- EX.D — EXISTING STORMWATER DRAINAGE
- 'FIELD EXTENSION' STORMWATER DRAINAGE PIPE BY OTHERS
- 'FIELD EXTENSION' STORMWATER DRAINAGE PITS BY OTHERS
- 'FIELD EXTENSION' SWALE BY OTHERS
- 'FIELD EXTENSION' RETAINING WALL BY OTHERS
- EX.W — EXISTING WATER
- EX.W(R) — EXISTING RECYCLED WATER
- EX.S — EXISTING SEWER
- EX.COMM — EXISTING COMMUNICATIONS
- EX.E U/G — EXISTING ELECTRICAL UNDERGROUND
- EX.G — EXISTING GAS
- TITLE BOUNDARY
- 225Ø — DRAINAGE PIPE
- GP — GRATED PIT
- JP — JUNCTION PIT
- AG — AG DRAIN
- GRASSED SWALE
- TRENCH GRATE
- FO — FLUSH OUT
- FW — SPOON DRAIN WITH FLOOR WASTE AND CONNECTION
- FW — SQUARE FLOOR WASTE
- 1:100 — SLOPE ARROW
- × P66.00 — PROPOSED LEVEL
- 66.50 — PROPOSED CONTOURS
- RW — RETAINING WALL
- ES — EDGE STRIP - TYPE ES
- B1 — BARRIER KERB - TYPE B1
- B2 — BARRIER KERB AND CHANNEL - TYPE B2
- PROPOSED BATTER
- PEDESTRIAN CONCRETE PAVEMENT
- VEHICULAR CONCRETE PAVEMENT
- ASPHALT PAVEMENT
- SAWCUT LINE

REFER TO SERVICES DRAWINGS FOR UNDERGROUND SERVICES TO BE RETAINED / REMOVED / DIVERTED. TYP.

100 DIA. UPVC SLOTTED AGI DRAIN WRAPPED IN GEOSOCK BEHIND ALL NEW KERBING. TYP.

TRANSITION FROM FULL HEIGHT BARRIER KERB TO FLUSH EDGE STRIP.

MATCH NEW B1 KERB NEATLY INTO EXISTING.

TRANSITION FROM FULL HEIGHT BARRIER KERB TO FLUSH EDGE.

REFER TO SERVICES DRAWINGS FOR SERVICE PITS TO BE RETAINED / REMOVED. WHERE RETAINED RAISE / LOWER PITS TO MATCH DESIGN SURFACE LEVEL. TYP.

P1.05 GP 900x600 CL67.32 CLASS D LID

300Ø RCP @ 1:100

P1.06 GP 900x600 CL67.48 CLASS D LID

100mm WIDE CLASS D, HEEL-SAFE, NON-SLIP, STAINLESS STEEL TRENCH GRATE.

SAWCUT EXISTING PAVEMENT 500mm FROM EXISTING KERB AND MATCH NEW ASPHALT NEATLY INTO EXISTING. TYP.

2 x 25kL ABOVE GROUND RAINWATER HARVESTING TANKS TO CAPTURE ENTIRE COE BUILDING ROOF AREA AND REUSE ONSITE FOR TOILET FLUSHING AND IRRIGATION OF LANDSCAPING. OVERFLOW PIPE TO DISCHARGE TO GRATED PIT. REFER HYDRAULICS FOR DETAILS.

P1.03 GP 900x900 CL65.20 CLASS B LID

300Ø RCP @ 1:32

P1.04 GP 900x900 CL66.13 CLASS B LID

300Ø RCP @ 1:100

P66.40 GP 900x900 CL66.32 CLASS B LID

MATCH LINE

RETAIN / REPLACE EXISTING BOLLARDS OR PROVIDE NEW BOLLARDS WHERE NEW FLUSH EDGE STRIPS ARE NOMINATED WITHIN CARPARK. TYP.

TRANSITION FROM FLUSH EDGE STRIP TO FULL HEIGHT BARRIER KERB.

FOR CONTINUATION REFER TO CV-032

PROVIDE NON-RETURN VALVE PRIOR TO CONNECTION OF TRENCH GRATE OUTLET TO P1.03 TO MITIGATE AGAINST BACKFLOW SURCHARGE INTO EXTERNAL MECHANICAL/AQUATIC PLANT AREA.

200mm WIDE, CLASS D, HEEL-SAFE, NON-SLIP, STAINLESS STEEL TRENCH GRATE CAST WITHIN STRUCTURAL SLAB AT LOWER GROUND LEVEL WITHIN UNCOVERED EXTERNAL MECHANICAL/AQUATIC PLANT AREA. FALL BASE OF TRENCH TO OUTLET PIPE.

100 DIA. UPVC SLOTTED AGI DRAIN WRAPPED IN GEOSOCK AT BASE OF BUILDING RETAINING WALL AT LOWER GROUND LEVEL. TYP.

PROVIDE 900mm WIDE CUT OFF SWALE ADJACENT BUILDING. BATTER DOWN AT MAX. 1:3 FROM EDGE OF BUILDING / PAVEMENT / LANDSCAPING TO INVERT OF SWALE. DEPTH OF SWALE VARIES (MIN. 300mm). FALL SWALE INVERT AT MIN. GRADE OF 1:200, 100 DIA. UPVC SLOTTED AGI DRAIN WRAPPED IN GEOSOCK TO RUN BELOW INVERT OF SWALE AND DISCHARGE TO GRATED PIT. TYP.

CENTRE OF EXCELLENCE (COE) BUILDING

EXISTING KERB TO BE REMOVED. TYP.

MAX. 800mm HIGH EXTERNAL RETAINING WALL TO FUTURE DETAIL.

CONCRETE SPOON DRAINS TO BE CAST WITHIN THE STRUCTURAL SLAB AT LOWER GROUND LEVEL. FALL AT MIN. 1:200 GRADE TOWARDS FLOOR WASTE (FW) OUTLETS. TYP.

LOWER GROUND LEVEL RL 63.60
UPPER GROUND LEVEL RL 67.60

PROVIDE 'DRAINAGE BLANKET' CONSISTING OF NETWORK OF 100 DIA. UPVC SLOTTED AGI DRAINS WRAPPED IN GEOSOCK BELOW THE INTERNAL LOWER GROUND LEVEL SLAB. AGI DRAINS TO BE SURROUNDED BY A 150mm THICK LAYER OF 20mm N.S. CRUSHED ROCK AGGREGATE WITH GEOTEXTILE MEMBRANE PROVIDED BELOW. AGI GRID TO BE INSTALLED AT 5-10m SPACING AND COORDINATED AROUND STRUCTURAL FOOTINGS. CONNECT TO PERIMETER AGI DRAIN. TYP.

100 DIA. UPVC SLOTTED AGI DRAIN WRAPPED IN GEOSOCK BEHIND ALL NEW EXTERNAL RETAINING WALLS. TYP.

P1.02 GSIP 900x900 CL63.14 CLASS C LID (BY OTHERS)

SWALE AND ANY ASSOCIATED SUBSOIL DRAINAGE CONSTRUCTED AS PART OF THE 'FIELD EXTENSION WORKS' TO BE DEMOLISHED WHERE CLASHING WITH COE BUILDING FOOTPRINT.

SANDSTONE LOG TIERED RETAINING WALLS AND ANY ASSOCIATED SUBSOIL DRAINAGE CONSTRUCTED AS PART OF THE 'FIELD EXTENSION WORKS' TO BE REMOVED BEYOND THE NORTHERN FACE OF THE COE BUILDING. TYP.

P3.02 JP 900x600 CL~61.60 (MATCH TO PLAYING FIELD SURFACE) CLASS B RECESSED INFILL LID

100mm WIDE, CLASS B, HEEL-SAFE, NON-SLIP, STAINLESS STEEL TRENCH GRATES CAST WITHIN STRUCTURAL SLAB AT LOWER GROUND LEVEL WITHIN OUTDOOR TERRACE AREA. TYP.

BALCONY/OUTDOOR TERRACE
LOWER GROUND LEVEL RL 63.50
UPPER GROUND LEVEL RL 67.50

MATCH LINE

MATCH NEW SWALE TO EXISTING.

FOR CONTINUATION REFER TO CV-031

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PROJECT: KELLYVILLE PARK
CENTRE OF EXCELLENCE & SPORTS HUB

TITLE: CIVIL WORKS PLAN
SHEET 1 OF 3

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CV-030		P3

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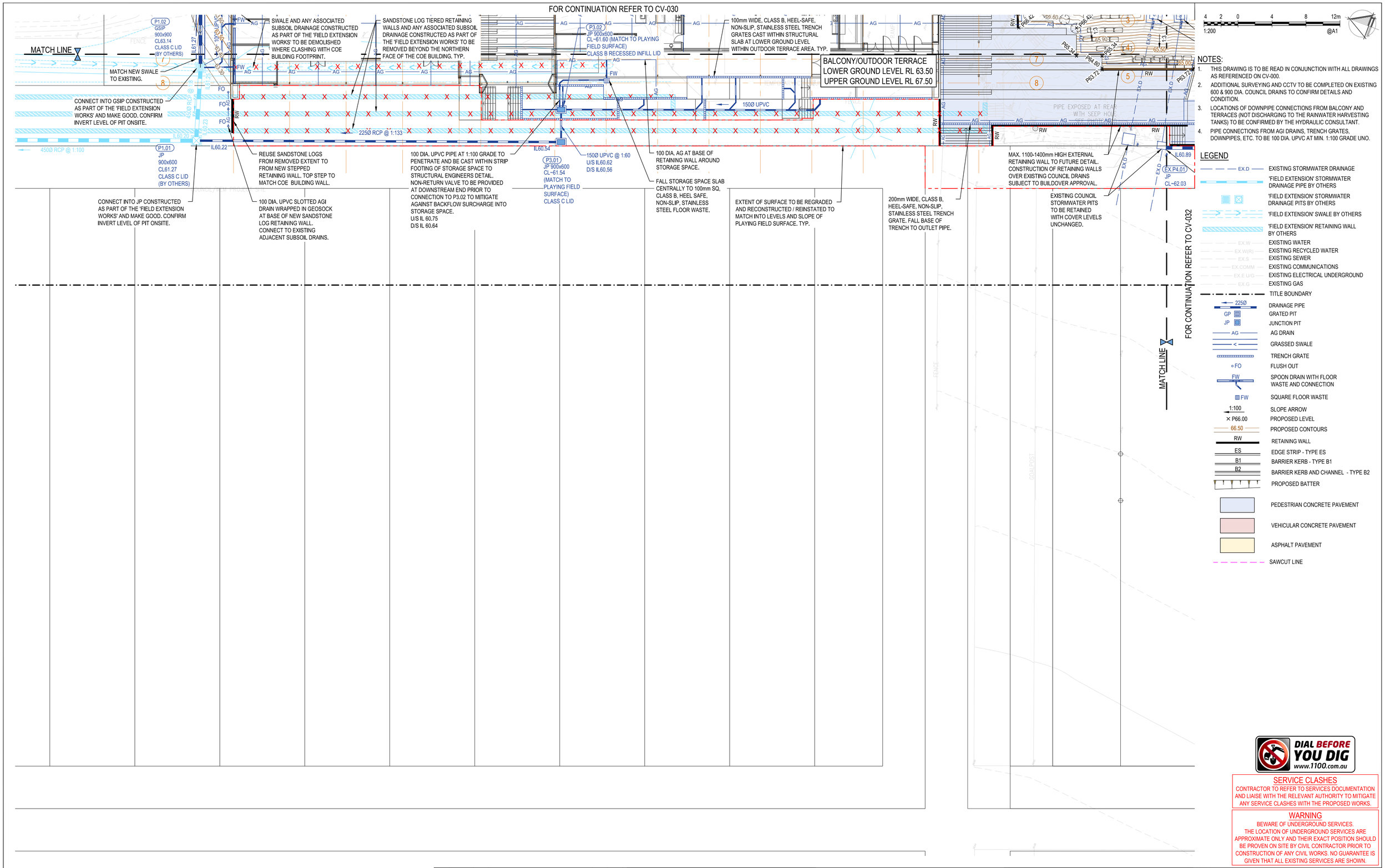

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PROJECT: KELLYVILLE PARK
CENTRE OF EXCELLENCE & SPORTS HUB

TITLE: CIVIL WORKS PLAN
SHEET 2 OF 3

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CAD FILE: P:\123790-CV-030-CV-032.DWG
DATE PLOTTED: 23/03/2022 1:42:38 PM BY : DESSMANN, PETER

FOR CONTINUATION REFER TO CV-030

MATCH LINE

2 x 10kL BELOW GROUND RAINWATER HARVESTING TANKS TO CAPTURE ENTIRE CF AND TENANCY BUILDING ROOF AREAS AND REUSE ONSITE FOR TOILET FLUSHING AND IRRIGATION OF LANDSCAPING. OVERFLOW PIPE TO DISCHARGE TO JUNCTION PIT. REFER HYDRAULICS FOR DETAILS. REINSTATE EXISTING CARPARK PAVEMENT AS REQUIRED TO FACILITATE INSTALLATION OF HARVESTING TANKS AND OVERFLOW PIPE OUTLET.

CONSTRUCT NEW HAUNCHED JUNCTION PIT OVER EXISTING 600 DIA. COUNCIL DRAIN AS PER THE HILLS SHIRE COUNCIL STANDARD DRAWING SD.7. MAKE GOOD CONNECTION TO EXISTING DRAIN. REINSTATE EXISTING CARPARK PAVEMENT AS REQUIRED TO FACILITATE CONSTRUCTION OF NEW STORMWATER PIT.
CL~67.32
IL~63.90
DEPTH~3.42m
CLASS D LID

TRANSITION FROM FLUSH EDGE STRIP TO FULL HEIGHT BARRIER KERB.

100 DIA. UPVC SLOTTED AGI DRAIN WRAPPED IN GEOSOCK BEHIND ALL NEW KERBING. TYP.

SAWCUT EXISTING PAVEMENT 500mm FROM NEW BARRIER KERB AND MATCH NEW ASPHALT NEATLY INTO EXISTING. TYP.

INSTALL NEW BARRIER KERB ADJACENT BUS PARKING BAYS. MATCH TO EXISTING CARPARK PAVEMENT LEVELS. TYP.

REFER TO SERVICES DRAWINGS FOR UNDERGROUND SERVICES TO BE RETAINED / REMOVED / DIVERTED. TYP.

EXISTING KERB TO BE REMOVED. TYP.

NEW KERB RAMP TO EXISTING CARPARK.

MATCH NEW PEDESTRIAN CONCRETE PAVEMENT TO EXISTING BACK OF KERB LEVELS.

375Ø RCP @ 1:100

RL69.25 | RL68.25 | RL68.55

COMMUNITY FACILITIES (CF) BUILDING

TENANCY BUILDING

MATCH NEW B1 KERB NEATLY INTO EXISTING.

LOWER GROUND LEVEL RL 63.95
UPPER GROUND LEVEL VARIES AS SHOWN

100 DIA. UPVC SLOTTED AGI DRAIN WRAPPED IN GEOSOCK AT BASE OF BUILDING RETAINING WALL AT LOWER GROUND LEVEL. TYP.

100mm WIDE, CLASS B, HEEL-SAFE, NON-SLIP, STAINLESS STEEL TRENCH GRATES AT BASE OF PEDESTRIAN RAMPS AND STAIRS. TYP.

TIE NEW PEDESTRIAN CONCRETE PAVEMENT TO EXISTING FOOTPATH.

REFER TO SERVICES DRAWINGS FOR SERVICE PITS TO BE RETAINED / REMOVED. WHERE RETAINED RAISE / LOWER PITS TO MATCH DESIGN SURFACE LEVEL. TYP.

EXISTING COUNCIL STORMWATER PITS TO BE RETAINED WITH COVER LEVELS UNCHANGED.

GRANDSTAND

200mm WIDE CLASS B, HEEL-SAFE, NON-SLIP, STAINLESS STEEL TRENCH GRATES CAST WITHIN STRUCTURAL SLAB AT BASE OF GRANDSTAND. FALL BASE OF TRENCH TO OUTLET PIPES. TYP.

100mm WIDE, CLASS D, HEEL-SAFE, NON-SLIP, STAINLESS STEEL TRENCH GRATES AT BASE OF VEHICULAR RAMPS. TYP.

BALCONY RL63.90

P4.07 GP 900x900 CL65.02 CLASS B LID

P4.08 JP 600x600 CL~65.85 CLASS B LID

225Ø @ 1:12

225Ø RCP @ 1:10 U/S IL62.69 D/S IL62.07

TIE NEW VEHICULAR CONCRETE PAVEMENT TO EXISTING FOOTPATH.

150Ø UPVC | 375Ø RCP @ 1:100 | 300Ø RCP @ 1:100 | 225Ø RCP @ 1:100

P4.02 JP 900x600 CL~62.18 (MATCH TO PLAYING FIELD SURFACE) CLASS C LID

P4.03 JP 900x600 CL~62.28 (MATCH TO PLAYING FIELD SURFACE) CLASS C LID

P4.04 JP 900x600 CL~62.46 (MATCH TO PLAYING FIELD SURFACE) CLASS C LID

P4.05 JP 600x600 CL~62.55 (MATCH TO PLAYING FIELD SURFACE) CLASS C LID

P4.06 JP 600x600 CL~62.90 (MATCH TO PLAYING FIELD SURFACE) CLASS C LID

EX.P4.01 JP CL~62.03

CONNECT INTO EXISTING COUNCIL JUNCTION PIT AND MAKE GOOD. CONFIRM INVERT LEVEL OF PIT ONSITE.

MAX. 1000mm HIGH EXTERNAL RETAINING WALLS/DOWN TURN EDGES ALONG PLAYING FIELD TO FUTURE DETAIL. TYP.

100 DIA. UPVC SLOTTED AGI DRAINS WRAPPED IN GEOSOCK BEHIND ALL NEW EXTERNAL RETAINING WALLS. TYP.

EXTENT OF SURFACE TO BE REGRADED AND RECONSTRUCTED / REINSTATED TO MATCH INTO LEVELS AND SLOPE OF PLAYING FIELD SURFACE. TYP.

UNDERSIDE OF LOWER GROUND LEVEL SLAB TO BE TANKED. PROVIDE 'DRAINAGE BLANKET' CONSISTING OF NETWORK OF 100 DIA. UPVC SLOTTED AGI DRAINS WRAPPED IN GEOSOCK BELOW. AGI DRAINS TO BE SURROUNDED BY A 150mm THICK LAYER OF 20mm N.S. CRUSHED ROCK AGGREGATE WITH GEOTEXTILE MEMBRANE PROVIDED BELOW. AGI GRID TO BE INSTALLED AT 5-10m SPACING AND COORDINATED AROUND STRUCTURAL FOOTINGS. CONNECT TO PERIMETER AGI DRAIN. TYP.

PROVIDE 900mm WIDE CUT OFF SWALE ADJACENT VEHICULAR RAMP. BATTER DOWN AT MAX. 1:3 FROM EDGE OF PAVEMENT / LANDSCAPING TO INVERT OF SWALE. DEPTH OF SWALE VARIES (MIN. 150mm). FALL SWALE INVERT AT MIN. GRADE OF 1:200. 100 DIA. UPVC SLOTTED AGI DRAIN WRAPPED IN GEOSOCK TO RUN BELOW INVERT OF SWALE AND DISCHARGE TO GRATED PIT. TYP.

FOR CONTINUATION REFER TO CV-031

MATCH LINE

4 2 0 4 8 12m
1:200 @A1

NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL DRAWINGS AS REFERENCED ON CV-000.
2. ADDITIONAL SURVEYING AND CCTV TO BE COMPLETED ON EXISTING 600 & 900 DIA. COUNCIL DRAINS TO CONFIRM DETAILS AND CONDITION.
3. LOCATIONS OF DOWNPIPE CONNECTIONS FROM BALCONY AND TERRACES (NOT DISCHARGING TO THE RAINWATER HARVESTING TANKS) TO BE CONFIRMED BY THE HYDRAULIC CONSULTANT.
4. PIPE CONNECTIONS FROM AGI DRAINS, TRENCH GRATES, DOWNPIPES, ETC. TO BE 100 DIA. UPVC AT MIN. 1:100 GRADE UNO.

LEGEND

- EX.D — EXISTING STORMWATER DRAINAGE
- 'FIELD EXTENSION' STORMWATER DRAINAGE PIPE BY OTHERS
- 'FIELD EXTENSION' STORMWATER DRAINAGE PITS BY OTHERS
- 'FIELD EXTENSION' SWALE BY OTHERS
- 'FIELD EXTENSION' RETAINING WALL BY OTHERS
- EX.W — EXISTING WATER
- EX.W(R) — EXISTING RECYCLED WATER
- EX.S — EXISTING SEWER
- EX.COMM — EXISTING COMMUNICATIONS
- EX.E.U/G — EXISTING ELECTRICAL UNDERGROUND
- EX.G — EXISTING GAS
- TITLE BOUNDARY
- 225Ø — DRAINAGE PIPE
- GP — GRATED PIT
- JP — JUNCTION PIT
- AG — AG DRAIN
- GRASSED SWALE
- TRENCH GRATE
- FO — FLUSH OUT
- FW — SPOON DRAIN WITH FLOOR WASTE AND CONNECTION
- FW — SQUARE FLOOR WASTE
- 1:100 — SLOPE ARROW
- P66.00 — PROPOSED LEVEL
- 66.50 — PROPOSED CONTOURS
- RW — RETAINING WALL
- ES — EDGE STRIP - TYPE ES
- B1 — BARRIER KERB - TYPE B1
- B2 — BARRIER KERB AND CHANNEL - TYPE B2
- PROPOSED BATTER
- PEDESTRIAN CONCRETE PAVEMENT
- VEHICULAR CONCRETE PAVEMENT
- ASPHALT PAVEMENT
- SAWCUT LINE

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SERVICE CLASHES

CONTRACTOR TO REFER TO SERVICES DOCUMENTATION AND LIAISE WITH THE RELEVANT AUTHORITY TO MITIGATE ANY SERVICE CLASHES WITH THE PROPOSED WORKS.

WARNING

BEWARE OF UNDERGROUND SERVICES.
THE LOCATION OF UNDERGROUND SERVICES ARE APPROXIMATE ONLY AND THEIR EXACT POSITION SHOULD BE PROVEN ON SITE BY CIVIL CONTRACTOR PRIOR TO CONSTRUCTION OF ANY CIVIL WORKS. NO GUARANTEE IS GIVEN THAT ALL EXISTING SERVICES ARE SHOWN.

REV	DATE	BY	DESCRIPTION	CHK	APP
P3	23/03/2022	A.K	FOR SSDA APPROVAL	T.B	
P2	10/12/2021	A.K	50% DD ISSUE	T.B	
P1	25/10/2021	A.K	DRAFT SSDA ISSUE	T.B	

DRAWING STATUS: **PRELIMINARY ISSUE**
NOT TO BE USED FOR CONSTRUCTION

wsp
http://www.wsp.com

CLIENT: PARRAMATTA EELS

ARCHITECT: HB ARCHITECTS PTY LTD

PROJECT: KELLYVILLE PARK
CENTRE OF EXCELLENCE & SPORTS HUB

TITLE: CIVIL WORKS PLAN
SHEET 3 OF 3

SCALE @ A1:	CHECKED:	APPROVED:
1:200	T.B	
PROJECT NUMBER:	DRAWN:	DATE:
PS123790	R.B	15/09/2021
DRAWING No:		REV:
CV-032		P3

CAD FILE: PS123790-CV-030-CV-032.DWG

DATE PLOTTED: 23/03/2022 1:44:07 PM BY : DESSMANN, PETER

Appendix B

Civil Works Plans for Residential Subdivision

Contained within this appendix are an excerpt of drawings provided by The Hills Shire Council for the ‘Plan of Civil Works for the Subdivision of Lot 2 D.P. 135989 at Windsor Road, Kellyville L.G.A. Baulkham Hills’ by North Western Surveys.

Project Reference: 13180

Revision: FF

Dated: 16/12/2016

THE HILLS SHIRE COUNCIL

CONSTRUCTION CERTIFICATE

DA ....980/2016/ZD.....

CC ....52/2017/EC.....

CC APPROVED ON

28/02/2017

WRITTEN APPROVAL REQUIRED FOR WORKS AND ACCESS FROM ADJACENT PROPERTY

LEGEND OF LINES AND SYMBOLS

PROPOSED	DESCRIPTION	EXISTING
	KERB & GUTTER WITH VEHICULAR CROSSING	
	EDGE OF SEAL	
	TABLEDRAIN	
30.00 15.00 0.00	ROAD CENTRELINE, CHAINAGE	
	CONCRETE FOOTPATH/DRIVEWAY	
	ROAD PAVEMENT	
	DRAINAGE LINE, PIT, HEADWALL	
	COMMON DRAINAGE LINE, SLOPE JUNCTION, PIT	
62	SURFACE CONTOURS	62.00
90.4+	SURFACE LEVEL	× 31.7
	AREAS OF CUT	
	AREAS OF FILL	
	LIMIT OF WORKS	
	STREET SIGNS	
E E	POWER POLE	E E
PW PW	HYDRANT / STOP VALVE	PW
	TELECOMMUNICATION CABLE, PIT	T T
S S	SEWER LINE, PIT	S S
	MASONRY RETAINING WALL	
	TOP OF BANK	
	TOE OF BANK	

BM SSM 165381
RL 70.609 (AHD)
(ORIGIN)

BREAK INTO EXISTING PIT. MAKE SMOOTH JUNCTION WITH EXISTING.

LIMIT OF WORK SAW CUT EXISTING AC KERBING PROVIDE SMOOTH JUNCTION WITH EXISTING

BREAK INTO EXISTING PIT. MAKE SMOOTH JUNCTION WITH EXISTING.

EXISTING EDGE OF BITUMEN

LIMIT OF WORK SAW CUT EXISTING AC PROVIDE SMOOTH JUNCTION WITH EXISTING

LIMIT OF WORK SAW CUT EXISTING AC PROVIDE SMOOTH JUNCTION WITH EXISTING

EXISTING EDGE OF BITUMEN

EXISTING KERB

ROAD 1 · ROAD 2 · ROAD 3 · ROAD 4 · ROAD 5 · ROAD

WINDSOR ROAD

GRATED DRAINAGE CHANNEL

PROVIDE 1% REVERSE CROSSFALL (SEE WEIR CALCULATION).

REPLACE EXISTING PITS AND PIPES

REPLACE EXISTING HEADWALL WITH GRATED PIT.
MAKE SMOOTH JUNCTION WITH EXISTING.
Top Headwall R.L. 67.42
Invert R.L. 66.20

PROPOSED EASEMENT FOR SUBSTATION. SEE SHEET 21

LIMIT OF WORK SAW CUT EXISTING AC PROVIDE SMOOTH JUNCTION WITH EXISTING ERECT GUIDEPOSTS TO 1.5M CENTRES

900mm RCP STUB TO BOUNDARY AT 1%

450mm RCP STUB TO BOUNDARY AT 1%

EXISTING DRAINAGE PIT Grate
R.L. 59.28
Invert In R.L. 58.31
Invert Out R.L. 57.83

OUTLET HEADWALL
Top Headwall R.L. 58.26
Invert R.L. 57.46

REPLACE EXISTING PITS AND PIPES

AUSTRALIAN RULES FIELD

EXISTING DRAINAGE PIT Grate
R.L. 62.09
Invert In R.L. 60.84
Invert Out R.L. 60.77

EXISTING DRAINAGE PIT Grate R.L. 66.44
Invert In R.L. 63.41
Invert Out R.L. 63.39

BOUNDARY

WSP: OPTIONAL ADDITIONAL POINT OF STORMWATER DISCHARGE

REPLACE EXISTING PITS AND PIPES

NOTES:

> PROVIDE COUNCILS STANDARD INDUSTRIAL/COMMERCIAL CONCRETE LAYBACK & FOOTWAY CROSSINGS.

> # ALL STUBS TO BE 375mm RCP 1% TO BOUNDARY UNLESS OTHERWISE SPECIFIED.

>REPLACE EXISTING PITS AT LOCATIONS 2/101 , 3/101, 4/101 WITH NEW PITS. SEE SHEETS 15 FOR PIT SCHEDULE AND SHEET 17 FOR LONGSECTIONS.

>REPLACE EXISTING HEADWALL AT 5/101 WITH NEW.

REV.	DESCRIPTION	DATE	APPR.
EE	PIPE UPSIZED	15/12/2016	
DD	DRAINAGE LINE 1 MOVED	3/11/2016	-
CC	DRAINAGE LINE 1 PIPES UPSIZED	27/10/2016	-
BB	AMENDED TO COUNCILS REQUIREMENTS	7/09/2016	-
AA	ENGINEERING CC DRAWINGS	2/08/2016	-

BAR SCALE
1:500 10 5 0 10 20 A1
1:1000 A3

CLIENT/ PROJECT
J&M MCNAMEE HOLDINGS PTY LTD

THIS PLAN MUST NOT BE USED FOR CONSTRUCTION UNLESS SIGNED AS APPROVED BY PRINCIPAL CERTIFYING AUTHORITY

North Western Surveys
Surveyors, Engineers & Water Servicing Coordinators
1/11 Romford Road, P.O. Box 1045, Blacktown N.S.W. 2148
Phone: 9831-2040 Fax: 9622-5716 Email: nws@nwsurveys.com.au

SURVEYED: ----	GRID: M.G.A.	DATUM: AHD	
DRAWN: F.H	DRAFTING CHECK: B.M	HORIZONTAL RATIO: 1:500	
DESIGNED: B.M	DESIGN CHECK: -	VERTICAL RATIO: -	

TITLE
PROPOSED CIVIL WORKS
FOR LOT 102 IN A SUBDIVISION OF LOT 2 IN DP 135989
AT WINDSOR RD, KELLYVILLE
L.G.A THE HILLS SHIRE

PROJECT MANAGER:	DATE:	REVISION:	PROJECT REFERENCE:
A.L.	15/12/2016	EE	13180

SHEET 2 OF 21 SHEETS

THE HILLS SHIRE COUNCIL

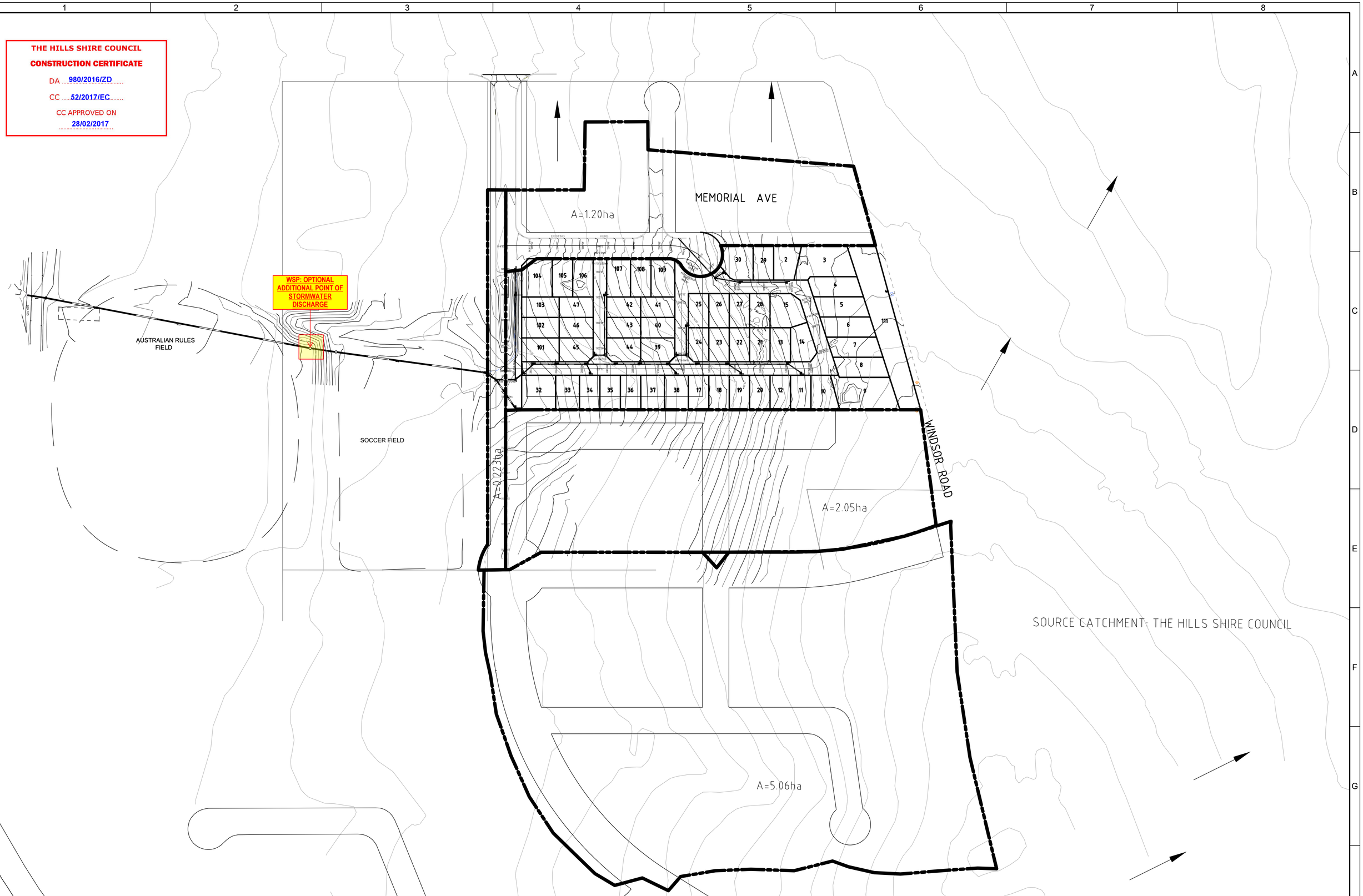
CONSTRUCTION CERTIFICATE

DA ..... 980/2016/ZD .....

CC ..... 52/2017/EC .....

CC APPROVED ON

..... 28/02/2017 .....



REV.	DESCRIPTION	DATE	APPR.
BB	OVERALL CATCHMENT UPDATED	16/12/2016	
AA	OVERALL CATCHMENT SHOWN	07/09/2016	-

BAR SCALE

1:500 10 5 0 10 20 A1

1:1000 A3

CLIENT/ PROJECT

J&M MCNAMEE HOLDINGS PTY LTD

North Western Surveys
Surveyors, Engineers & Water Servicing Coordinators
1/11 Romford Road, P.O. Box 1045, Blacktown N.S.W. 2148
Phone: 9831-2040 Fax: 9622-5716 Email: nws@nwsurveys.com.au

SURVEYED:	GRID:	DATUM:
----	M.G.A.	AHD
DRAWN:	DRAFTING CHECK:	HORIZONTAL RATIO:
F.H	B.M	1:500
DESIGNED:	DESIGN CHECK:	VERTICAL RATIO:
B.M	-	-

TITLE

OVERALL CATCHMENT BDY
FOR LOT 102 IN A SUBDIVISION OF LOT 2 IN DP 135989
AT WINDSOR RD, KELLYVILLE
L.G.A THE HILLS SHIRE

PROJECT MANAGER:	DATE:	REVISION:	PROJECT REFERENCE:
A.L.	16/12/2016	BB	13180

SHEET 14 OF 21 SHEETS

10 YR HYDRAULICS

Pipe ID	Pipe Type	Pipe Length	Pipe Size	Full Pipe Af	Pipe Grade	Full-area Tct	Full-area I	Full-area Sum CA	Full-area Qc=CIA	Part-area Tct	Part-area I	Part-area Sum CA	Part-area Qc=CIA	Pipe Flow Q	Capacity Flow Qcap	Q/Qcap Ratio	Full Pipe Vel Vf=Q/Af	Norm Depth Vel Vn=Q/An	Crit Depth Vel Vc=Q/Ac	Capacity Vel Vcap=Qcap/Af	US Pit Grate RL	Pipe US IL	Pipe DS IL	DS Pit Grate RL	Pipe DS Bend	US Pit HGL	Pipe US HGL	Pipe DS HGL	DS Pit HGL	HGL Grade	F'board US
(-)	(-)	(m)	(mm)	(sq.m)	(%)	(min)	(mm/hr)	(ha)	(L/s)	(min)	(mm/hr)	(ha)	(L/s)	(L/s)	(L/s)	(-)	(m/s)	(m/s)	(m/s)	(m/s)	(m)	(m)	(m)	(m)	(deg)	(m)	(m)	(m)	(m)	(%)	(m)
1/1 to 2/1	RCP	9.56	375	0.110	6.55	10.00	112.00	0.0904	28.1	6.00	137.00	0.0857	32.6	32.6	583.4	0.06	0.30	2.85	0.96	5.28	81.68	80.18	79.56	80.93	-34.3	80.57	80.56	79.88	79.88	7.12	1.12
2/1 to 3/1	RCP	35.91	375	0.110	8.55	10.08	111.75	0.1325	41.1	6.08	136.50	0.1258	47.7	47.7	666.7	0.07	0.43	3.50	1.08	6.04	80.93	79.48	76.41	77.78	-0.0	79.88	79.86	76.77	76.77	8.61	1.06
3/1 to 4/1	RCP	17.83	375	0.110	8.24	10.38	110.83	0.2606	80.2	6.38	134.63	0.2479	92.7	92.7	654.7	0.14	0.84	4.19	1.35	5.93	77.78	76.32	74.85	76.22	0.0	76.77	76.70	75.23	75.23	8.20	1.02
4/1 to 5/1	RCP	17.02	375	0.110	8.30	10.53	110.36	0.2878	88.2	6.53	133.70	0.2739	101.7	101.7	656.9	0.15	0.92	4.32	1.40	5.95	76.22	74.77	73.36	74.73	-0.0	75.23	75.15	73.89	73.89	7.40	0.99
5/1 to 6/1	RCP	17.22	375	0.110	8.31	10.67	109.93	0.4721	144.2	6.59	133.31	0.4484	166.0	166.0	657.5	0.25	1.50	4.96	1.76	5.95	74.73	73.28	71.85	73.22	0.0	73.89	73.66	72.48	72.48	6.81	0.84
6/1 to 7/1	RCP	13.51	375	0.110	8.18	10.81	109.48	0.5748	174.8	6.73	132.42	0.5467	201.1	201.1	652.4	0.31	1.82	5.20	1.98	5.91	73.22	71.77	70.66	72.03	0.0	72.48	72.14	71.25	71.25	6.60	0.74
7/1 to 8/1	RCP	17.33	375	0.110	7.71	10.93	109.13	0.5800	175.8	6.85	131.71	0.5518	201.9	201.9	633.2	0.32	1.83	5.09	1.98	5.73	72.03	70.54	69.20	70.63	-0.0	71.25	70.91	69.80	69.80	6.43	0.78
8/1 to 9/1	RCP	17.39	450	0.159	4.87	11.07	108.68	0.7906	238.7	6.77	132.16	0.7475	274.4	274.4	818.6	0.34	1.73	4.64	1.98	5.15	70.63	69.04	68.20	69.73	0.1	69.80	69.49	68.72	68.72	4.43	0.83
9/1 to 10/1	RCP	13.66	450	0.159	2.71	11.21	108.23	0.8994	270.4	6.84	131.78	0.8488	310.7	310.7	610.1	0.51	1.95	3.85	2.14	3.84	69.73	68.18	67.81	69.28	-41.5	68.72	68.63	68.39	68.39	1.72	1.01
10/1 to 11/1	RCP	7.70	450	0.159	2.11	11.33	107.88	0.9065	271.6	6.95	131.06	0.8556	311.5	311.5	539.2	0.58	1.96	3.51	2.14	3.39	69.28	67.79	67.62	69.10	3.4	68.39	68.31	68.26	68.26	0.71	0.89
11/1 to 12/1	RCP	6.54	600	0.283	1.75	11.39	107.68	0.9767	292.1	7.01	130.66	0.9231	335.0	335.0	1055.5	0.32	1.18	3.31	1.78	3.73	69.10	67.50	67.38	68.94	38.0	68.26	68.23	68.22	68.22	0.18	0.84
12/1 to 13/1	RCP	11.10	675	0.358	1.00	11.45	107.51	2.3052	688.4	6.78	132.13	2.1693	796.2	796.2	1093.2	0.73	2.23	3.33	2.50	3.06	68.94	67.36	67.25	68.94	32.2	68.22	68.07	68.01	68.01	0.53	0.72
13/1 to 1/101	RCP	7.89	900	0.636	1.00	11.54	107.23	8.7399	2603.2	6.51	133.83	8.2391	3062.9	3062.9	2354.4	1.30	4.81	4.81	4.81	3.70	68.94	66.58	66.50	68.95	-24.3	68.01	67.53	67.40	67.28	1.69	0.93
1/101 to 2/101	RCP	88.23	900	0.636	3.02	11.61	107.02	8.7399	2598.3	6.57	133.42	8.2391	3053.5	3053.5	4088.6	0.75	4.80	7.04	4.83	6.43	68.95	66.09	63.43	66.42	0.4	67.28	66.99	64.63	64.63	2.68	1.66
2/101 to 3/101	RCP	15.33	900	0.636	19.12	12.34	104.74	8.7399	2542.9	7.31	128.83	8.2391	2948.4	2948.4	10296.2	0.29	4.63	13.96	4.67	16.18	66.42	63.42	60.49	62.09	2.5	64.63	64.32	61.67	61.67	17.28	1.79
3/101 to 4/101	RCP	158.16	900	0.636	1.76	12.47	104.35	8.7399	2533.3	7.44	128.03	8.2391	2930.1	2930.1	3121.5	0.94	4.61	5.58	4.64	4.91	62.09	60.47	57.69	59.29	-2.2	61.67	61.37	58.87	58.87	1.58	0.42
4/101 to 5/101	RCP	11.12	900	0.598	1.87	13.79	100.26	8.7399	2434.1	8.57	120.93	8.1652	2742.8	2742.8	3411.4	0.80	4.59	5.68	4.59	5.71	59.29	57.67	57.46	58.26	0.0	58.87	58.57	58.10	58.10	4.22	0.42
1/2 to 2/2	RCP	15.64	525	0.216	1.49	10.00	112.00	1.0530	327.6	6.00	137.00	0.9990	380.2	380.2	682.3	0.56	1.76	3.24	2.06	3.15	70.46	69.13	68.90	70.16	-0.8	69.97	69.66	69.45	69.45	1.36	0.48
2/2 to 12/1	RCP	49.73	600	0.283	2.44	10.13	111.60	1.2355	383.0	6.13	136.19	1.1725	443.5	443.5	1247.8	0.36	1.57	4.04	2.01	4.41	70.16	68.60	67.38	68.94	90.0	69.45	69.20	68.22	68.22	1.97	0.72
1/3 to 2/3	RCP	28.82	375	0.110	7.07	10.00	112.00	0.0518	16.1	6.00	137.00	0.0491	18.7	18.7	606.4	0.03	0.17	2.48	0.82	5.49	83.09	81.66	79.62	81.00	11.8	82.04	82.03	79.79	79.79	7.80	1.06
2/3 to 3/3	RCP	13.84	375	0.110	7.42	10.24	111.26	0.0518	16.0	6.24	135.50	0.0491	18.5	18.5	621.3	0.03	0.17	2.51	0.82	5.63	81.00	79.41	78.38	79.92	36.7	79.79	79.78	78.72	78.72	7.69	1.21
3/3 to 4/3	RCP	30.38	375	0.110	4.20	10.36	110.90	0.1395	43.0	6.36	134.78	0.1328	49.7	49.7	467.3	0.11	0.45	2.75	1.09	4.23	79.92	78.32	77.05	78.62	0.0	78.72	78.70	77.13	77.13	5.16	1.21
1/5 to 2/5	RCP	35.46	375	0.110	6.17	10.00	112.00	0.0544	16.9	6.00	137.00	0.0516	19.6	19.6	566.5	0.03	0.18	2.40	0.83	5.13	73.49	71.79	69.60	71.29	90.2	72.16	72.16	69.96	69.96	6.19	1.33
2/5 to 3/5	RCP	5.10	375	0.110	1.00	10.30	111.08	0.1071	33.0	6.30	135.15	0.1018	38.2	38.2	228.0	0.17	0.35	1.53	1.01	2.06	71.29	69.58	69.53	71.13	-44.6	69.96	69.95	69.90	69.90	1.06	1.33
3/5 to 8/1	RCP	7.57	375	0.110	2.68	10.34	110.95	0.1264	38.9	6.34	134.89	0.1202	45.0	45.0	373.3	0.12	0.41	2.28	1.06	3.38	71.13	69.51	69.30	70.63	44.3	69.90	69.88	69.80	69.80	1.10	1.23
1/9 to 2/9	RCP	17.45	375	0.110	6.15	10.00	112.00	0.0790	24.6	6.00	137.00	0.0749	28.5	28.5	565.6	0.05	0.26	2.67	0.93	5.12	76.67	74.95	73.88	75.56	89.4	75.34	75.33	74.25	74.25	6.19	1.33
2/9 to 3/9	RCP	5.10	375	0.110	1.00	10.15	111.55	0.1097	34.0	6.15	136.09	0.1041	39.4	39.4	228.0	0.17	0.36	1.55	1.02	2.06	75.56	73.86	73.81	75.35	-44.7	74.25	74.24	74.18	74.18	1.05	1.31
3/9 to 5/1	RCP	7.53	375	0.110	5.04	10.19	111.42	0.1272	39.4	6.19	135.83	0.1208	45.6	45.6	511.9	0.09	0.41	2.86	1.07	4.63	75.35	73.79	73.41	74.73	44.6	74.18	74.17	73.89	73.89	3.71	1.17
1/19 to 8/1	RCP	5.77	375	0.110	3.10	10.00	112.00	0.0790	24.6	6.00	137.00	0.0749	28.5	28.5	401.8	0.07	0.26	2.10	0.93	3.64	70.82	69.40	69.22	70.63	-62.1	69.81	69.80	69.80	69.80	0.02	1.01
1/20 to 5/1	RCP	7.19	375	0.110	5.90	10.00	112.00	0.0526	16.4	6.00	137.00	0.0499	19.0	19.0	553.9	0.03	0.17	2.34	0.83	5.02	75.17	73.74	73.32	74.73	-45.3	74.12	74.12	73.89	73.89	3.25	1.05
1/21 to 3/1	RCP	9.96	375	0.110	7.42	10.00	112.00	0.0526	16.4	6.00	137.00	0.0499	19.0	19.0	621.2	0.03	0.17	2.53	0.83	5.62	78.57	77.08	76.34	77.78	-32.3	77.46	77.45	76.77	76.77	6.90	1.11
1/88 to 13/1	RCP	21.14	900	0.636	1.00	10.00	112.00	6.2390	1941.0	6.00	137.00	5.9191	2252.5	2252.5	2357.9	0.96	3.54	4.22	3.65	3.71	69.17	67.19	66.98	68.94	-24.7	68.39	68.20	68.01	68.01	0.92	0.78

WSP: 191.4 L/s 'SPARE' CAPACITY IN 900 DIA. DRAIN AT OPTIONAL ADDITIONAL POINT OF STORMWATER DISCHARGE.

PIT SCHEDULE

Pit Name	Pit Type	Setout Easting	Setout Northing
(-)	(-)	(m)	(m)
1/1	RM10 1.8 m lintel	311081.20	6267289.63
2/1	RM10 1.8 m lintel	311071.91	6267291.88
3/1	RM10 1.8 m lintel	311038.30	6267279.23
4/1	RM10 1.8 m lintel	311021.61	6267272.95
5/1	RM10 1.8 m lintel	311005.69	6267266.95
6/1	RM10 1.8 m lintel	310989.57	6267260.88
7/1	RM10 1.8 m lintel	310976.94	6267256.12
8/1	RM10 1.8 m lintel	310960.72	6267250.02
9/1	RM10 1.8 m lintel	310944.45	6267243.88
10/1	RM10 1.8 m lintel	310931.66	6267239.07
11/1	RM10 1.8 m lintel	310928.05	6267232.27
12/1	2.4 m Lintel SAG	310924.65	6267226.68
13/1	2.4 m Lintel SAG	310914.26	6267222.77
1/101	G.S.I.P.	310906.54	6267224.35
2/101	G.S.I.P.	310820.50	6267204.83
3/101	G.S.I.P.	310805.52	6267201.55
4/101	G.S.I.P.	310649.70	6267174.46
5/101	HW	310638.83	6267172.14
1/2	RM10 1.8 m lintel	310901.82	6267289.63
2/2	RM10 1.8 m lintel	310907.12	6267273.22
3/1	RM10 1.8 m lintel	311038.30	6267279.23
4/1	RM10 1.8 m lintel	311021.61	6267272.95
5/1	RM10 1.8 m lintel	311005.69	6267266.95
6/1	RM10 1.8 m lintel	310989.57	6267260.88
7/1	RM10 1.8 m lintel	310976.94	6267256.12
8/1	RM10 1.8 m lintel	310960.72	6267250.02
9/1	RM10 1.8 m lintel	310944.45	6267243.88
10/1	RM10 1.8 m lintel	310931.66	6267239.07
11/1	RM10 1.8 m lintel	310928.05	6267232.27
12/1	2.4 m Lintel SAG	310924.65	6267226.68
13/1	2.4 m Lintel SAG	310914.26	6267222.77
1/101	G.S.I.P.	310906.54	6267224.35
2/101	G.S.I.P.	310820.50	6267204.83
3/101	G.S.I.P.	310805.52	6267201.55
4/101	G.S.I.P.	310649.70	6267174.46
5/101	HW	310638.83	6267172.14

10 YR HYDROLOGY

Pit Name	Pit Type	Setout Easting	Setout Northing	Setout RL	Grate RL	Catch ID	Time Tc	Intensity I	Runoff C	Area A	Full CA	Full Sum CA	Full Qc=CIA	Partial CA	Partial Sum CA	Partial Qc=CIA	Approach Flow Qa
(-)	(-)	(m)	(m)	(m)	(m)	(-)	(min)	(mm/hr)	(-)	(ha)	(ha)	(ha)	(L/s)	(ha)	(ha)	(L/s)	(L/s)
1/1	RM10 1.8 m lintel	311081.20	6267289.63	81.68	81.68	1P	10.00	112.00	0.75	0.0155	0.0116	0.0904	28.1	0.0070	0.0857	32.6	32.6
						1I	6.00	137.00	0.90	0.0875	0.0788			0.0788			
2/1	RM10 1.8 m lintel	311071.91	6267291.88	80.93	80.93	1P	10.00	112.00	0.75	0.0072	0.0054	0.0421	13.1	0.0032	0.0400	15.2	15.2
						1I	6.00	137.00	0.90	0.0408	0.0367			0.0367			
3/1	RM10 1.8 m lintel	311038.30	6267279.23	77.78	77.78	1P	10.00	112.00	0.75	0.0129	0.0097	0.0755	23.5	0.0058	0.0716	27.2	27.2
						1I	6.00	137.00	0.90	0.0731	0.0658			0.0658			
4/1	RM10 1.8 m lintel	311021.61	6267272.95	76.22	76.22	1P	10.00	112.00	0.75	0.0047	0.0035	0.0272	8.5	0.0021	0.0258	9.8	9.8
						1I	6.00	137.00	0.90	0.0263	0.0237			0.0237			
5/1	RM10 1.8 m lintel	311005.69	6267266.95	74.73	74.73	1P	10.00	112.00	0.75	0.0007	0.0006	0.0044	1.4	0.0003	0.0042	1.6	1.6
						1I	6.00	137.00	0.90	0.0043	0.0038			0.0038			
6/1	RM10 1.8 m lintel	310989.57	6267260.88	73.22	73.22	1P	10.00	112.00	0.75	0.0176	0.0132	0.1027	31.9	0.0079	0.0974	37.1	37.1
						1I	6.00	137.00	0.90	0.0994	0.0895			0.0895			
7/1	RM10 1.8 m lintel	310976.94	6267256.12	72.03	72.03	1P	10.00	112.00	0.75	0.0009	0.0007	0.0053	1.6	0.0004	0.0050	1.9	1.9
						1I	6.00	137.00	0.90	0.0051	0.0046			0.0046			
8/1	RM10 1.8 m lintel	310960.72	6267250.02	70.63	70.63	1P	10.00	112.00	0.75	0.0009	0.0007	0.0053	1.6	0.0004	0.0050	1.9	1.9
						1I	6.00	137.00	0.90	0.0051	0.0046			0.0046			
9/1	RM10 1.8 m lintel	310944.45	6267243.88	69.73	69.73	1P	10.00	112.00	0.75	0.0186	0.0140	0.1088	33.9	0.0084	0.1032	39.3	39.3
						1I	6.00	137.00	0.90	0.1054	0.0949			0.0949			
10/1	RM10 1.8 m lintel	310931.66	6267239.07	69.28	69.28	1P	10.00	112.00	0.75	0.0012	0.0009	0.0070	2.2	0.0005	0.0067	2.5	2.5
						1I	6.00	137.00	0.90	0.0068	0.0061			0.0061			
11/1	RM10 1.8 m lintel	310928.05	6267232.27	69.10	69.10	1P	10.00	112.00	0.75	0.0120	0.0090	0.0702	21.8	0.0054	0.0666	25.3	25.3
						1I	6.00	137.00	0.90	0.0680	0.0612			0.0612			
12/1	RM10 1.8 m lintel	310924.65	6267226.68	68.94	68.94	1P	10.00	112.00	0.75	0.0159	0.0119	0.0930	28.9	0.0072	0.0882	33.6	33.6
						1I	6.00	137.00	0.90	0.0901	0.0811			0.0811			
13/1	RM10 1.8 m lintel	310914.26	6267222.77	68.94	68.94	1P	10.00	112.00	0.75	0.0335	0.0251	0.1957	60.9	0.0151	0.1856	70.6	70.6
						1I	6.00	137.00	0.90	0.1896	0.1706			0.1706			
1/101	G.S.I.P.	310906.54	6267224.35	68.95	68.95												0.0
2/101	G.S.I.P.	310820.50	6267204.83	66.42	66.42												0.0
3/101	G.S.I.P.	310805.52	6267201.55	62.10	62.09												0.0
4/101	G.S.I.P.	310649.70	6267174.46	59.29	59.29												0.0
5/101	HW	310638.83	6267172.14	58.26	58.26												0.0
1/2	RM10 1.8 m lintel	310901.82	6267287.93	70.46	70.46	1P	10.00	112.00	0.75	0.1800	0.1350	1.0530	327.6	0.0810	0.9990	380.2	380.2
						1I	6.00	137.00	0.90	1.0200	0.9180			0.9180			
2/2	RM10 1.8 m lintel	310907.12	6267273.22	70.16	70.16	1P	10.00	112.00	0.75	0.0312	0.0234	0.1825	56.8	0.0140	0.1732	65.9	65.9
						1I	6.00	137.00	0.90	0.1768	0.1591			0.1591			
1/3	RM10 1.8 m lintel	311054.54	6267336.63	83.09	83.09	1P	10.00	112.00	0.75	0.0089	0.0066	0.0518	16.1	0.0040	0.0491	18.7	18.7
						1I	6.00	137.00	0.90	0.0501	0.0451			0.0451			
2/3	RM10 1.8 m lintel	311027.57	6267326.48	81.00	81.00												0.0
3/3	RM10 1.8 m lintel	311013.89	6267324.34	79.92	79.92	1P	10.00	112.00	0.75	0.0150	0.0113	0.0878	27.3	0.0067	0.0833	31.7	31.7
						1I	6.00	137.00	0.90	0.0850	0.0765			0.0765			
4/3	RM10 1.8 m lintel	310987.01	6267338.50	78.62	78.62												
1/5	RM10 1.8 m lintel	310956.21	6267291.84	73.49	73.49	1P	10.00	112.00	0.75	0.0093	0.0070	0.0544	16.9	0.0042	0.0516	19.6	19.6
						1I	6.00	137.00	0.90	0.0527	0.0474			0.0474			
2/5	RM10 1.8 m lintel	310968.71	6267258.66	71.29	71.29	1P	10.00	112.00	0.75	0.0090	0.0068	0.0526	16.4	0.0041	0.0499	19.0	19.0
						1I	6.00	137.00	0.90	0.0510	0.0459			0.0459			
3/5	RM10 1.8 m lintel	310963.93	6267256.88	71.13	71.13	1P	10.00	112.00	0.75	0.0033	0.0025	0.0193	6.0	0.0015	0.0183	7.0	7.0
						1I	6.00	137.00	0.90	0.0187	0.0168			0.0168			
1/9	RM10 1.8 m lintel	311007.67	6267291.98	76.67	76.67	1P	10.00	112.00	0.75	0.0135	0.0101	0.0790	24.6	0.0061	0.0749	28.5	28.5
						1I	6.00	137.00	0.90	0.0765	0.0688			0.0688			
2/9	RM10 1.8 m lintel	311013.63	6267275.58	75.56	75.56	1P	10.00	112.00	0.75	0.0053	0.0039	0.0307	9.6	0.0024	0.0291	11.1	11.1
						1I	6.00	137.00	0.90	0.0298	0.0268			0.0268			
3/9	RM10 1.8 m lintel	311008.85	6267273.79	75.35	75.35	1P	10.00	112.00	0.75	0.0030	0.0022	0.0176	5.5	0.0013	0.0167	6.3	6.3
						1I	6.00	137.00	0.90	0.0170	0.0153			0.0153			
1/19	RM10 1.8 m lintel	310965.04	6267246.19	70.82	70.82	1P	10.00	112.00	0.75	0.0135	0.0101	0.0790	24.6	0.0061	0.0749	28.5	28.5
						1I	6.00	137.00	0.90	0.0765	0.0688			0.0688			
1/20	RM10 1.8 m lintel	311012.22	6267263.96	75.17	75.17	1P	10.00	112.00	0.75	0.0090	0.0068	0.0526	16.4	0.0041	0.0499	19.0	19.0
						1I	6.00	137.00	0.90	0.0510	0.0459			0.0459			
1/21	RM10 1.8 m lintel	311048.05	6267277.21	78.57	78.57	1P	10.00	112.00	0.75	0.0090	0.0068	0.0526	16.4	0.0041	0.0499	19.0	19.0
						1I	6.00	137.00	0.90	0.0510	0.0459			0.0459			
1/88	RM10 1.8 m lintel	310931.31	6267210.27	69.17	69.17	1P	10.00	112.00	0.75	1.0665	0.7999	6.2390	1941.0	0.4799	5.9191	2252.5	2252.5
						1I	6.00	137.00	0.90	6.0435	5.4391			5.4391			

THE HILLS SHIRE COUNCIL
CONSTRUCTION CERTIFICATE
DA ....980/2016/ZD.....
CC ....52/2017/EC.....
CC APPROVED ON
28/02/2017

REV.	DESCRIPTION	DATE	APPR.
FF	UPDATED ANALYSIS	15/12/2016	
EE	UPDATED ANALYSIS	3/11/2016	-
DD	DRAINAGE LINE 1 UPSIZED AND ANALYSIS	27/10/2016	-
CC	NOTE ADDED, 14/1 CHANGED TO GSIP	18/10/2016	-
BB	DRAINAGE TABLE UPDATED	8/09/2016	-
AA	ENGINEERING CC DRAWINGS	2/08/2016	-

BAR SCALE
1:500 10 5 0 10 20 A1
1:1000 A3

CLIENT/ PROJECT
J&M MCNAMEE HOLDINGS PTY LTD

THIS PLAN MUST NOT BE USED FOR CONSTRUCTION UNLESS SIGNED AS APPROVED BY PRINCIPAL CERTIFYING AUTHORITY

North Western Surveys
Surveyors, Engineers & Water Servicing Coordinators
1/11 Romford Road, P.O. Box 1045, Blacktown N.S.W. 2148
Phone: 9831-2040 Fax: 9622-5716 Email: nws@nwsurveys.com.au

SURVEYED:	GRID:	DATUM:
----	M.G.A.	AHD
DRAWN:	DRAFTING CHECK:	HORIZONTAL RATIO:
F.H	B.M	
DESIGNED:	DESIGN CHECK:	VERTICAL RATIO:
B.M	-	-

TITLE
10 YR DRAINAGE ANALYSIS AND PIT SCHEDULE
FOR LOT 102 IN A SUBDIVISION OF LOT 2 IN DP 135989
AT WINDSOR RD, KELLYVILLE
L.G.A THE HILLS SHIRE

PROJECT MANAGER:	DATE:	REVISION:	PROJECT REFERENCE:
A.L.	15/12/2016	FF	13180

SHEET 15 OF 21 SHEETS

Appendix C

Civil Works Plans for Kellyville Park Field Extension

Contained within this appendix are an excerpt of drawings provided by The Hills Shire Council for the ‘Kellyville Memorial Park Field Extension Civil Engineering Works’ by C & M Consulting Engineers.

Project Reference: 02081

Revision: A

Dated: 20/09/2020

A1

FOR CONTINUATION REFER DRG. 203

SCALE 1:250

RMS MEMORIAL AVENUE CONSTRUCTION
COMPOUND AREA = 8001m²

AVENUE

MEMORIAL

2m WIDE TURF LINED CATCH DRAIN

3m WIDE TURFED MAINTAINENCE ACCESS RAMP

R5 503

SANDSTONE LOG TIERED RETAINING WALL. REFER DRG 503 & 504

900SQ GSIP WITH RAISED GRATE & FRAME GRL63.14 (A 6)

EXISTING BUILDINGS TO REMAIN

R6 503

SANDSTONE LOG RETAINING WALL No.4 REFER DRG 504

STAIRS AND FOOTPATH (BY OTHERS)

RL63.22
RL62.54
RL61.86
RL61.36
RL63.20
RL62.18
RL61.68
RL63.20
RL62.29
RL61.79
RL63.43
RL62.38
RL61.88
RL61.84

WSP: POINT OF STORMWATER DISCHARGE #1

900SQ GSIP GRL61.04 (A 4)

900SQ JP LID61.27 (A 5)

S3 351

SANDSTONE LOG RETAINING WALL No.3 REFER DRG 502

SANDSTONE LOG RETAINING WALL No.2 REFER DRG 502

900SQ GSIP GRL60.44 (A 3)

RUN-OFF - 3m LOCAL
RUN-OFF - 4m REGIONAL
RUN-OFF - 5m STATE

FUTURE EDGE OF FIELD No.1 (5m RUN-OFF LINE)
TOTAL FIELD SHIFT = 5.67m TO SOUTH
REFER MASTERPLAN DRG. 120 FOR FINAL FIELD LOCATIONS

5.67

10 20 30 40 50 40 30 20 10

LIMIT OF WORK. MAKE SMOOTH CONNECTION TO EXISTING PLAYING FIELD

LIMIT OF WORK

EXISTING PLAYING FIELD No.2 TO REMAIN

FUTURE EDGE OF FIELD No.2 (5m RUN-OFF LINE)
TOTAL FIELD SHIFT = 15.67m TO SOUTH
REFER MASTERPLAN DRG. 120 FOR FINAL FIELD LOCATIONS

10.00

FOR CONTINUATION REFER DRG. 202

FOR CONTINUATION REFER DRG. 202

CAD FILENAME: C:\WAZ\Wollongong Projects\02081\ACAD - Field Extension\02081_FE_201.dwg

REV.	DES.	DATE	VER.	DESCRIPTION
A	W.M.	20/09/2020	A.M.	TENDER ISSUE

CLIENT

THE HILLS Sydney's Garden Shire

C&M CONSULTING ENGINEERS

CIVIL AND HYDRAULIC ENGINEERING DESIGN AND PROJECT MANAGEMENT

SUITE 26
11 - 13 BROOKHOLLOW AVE
NORWEST NSW 2153

PHONE: (02) 9680 3100
FAX: (02) 9634 6989

ABN 21 118 134 240

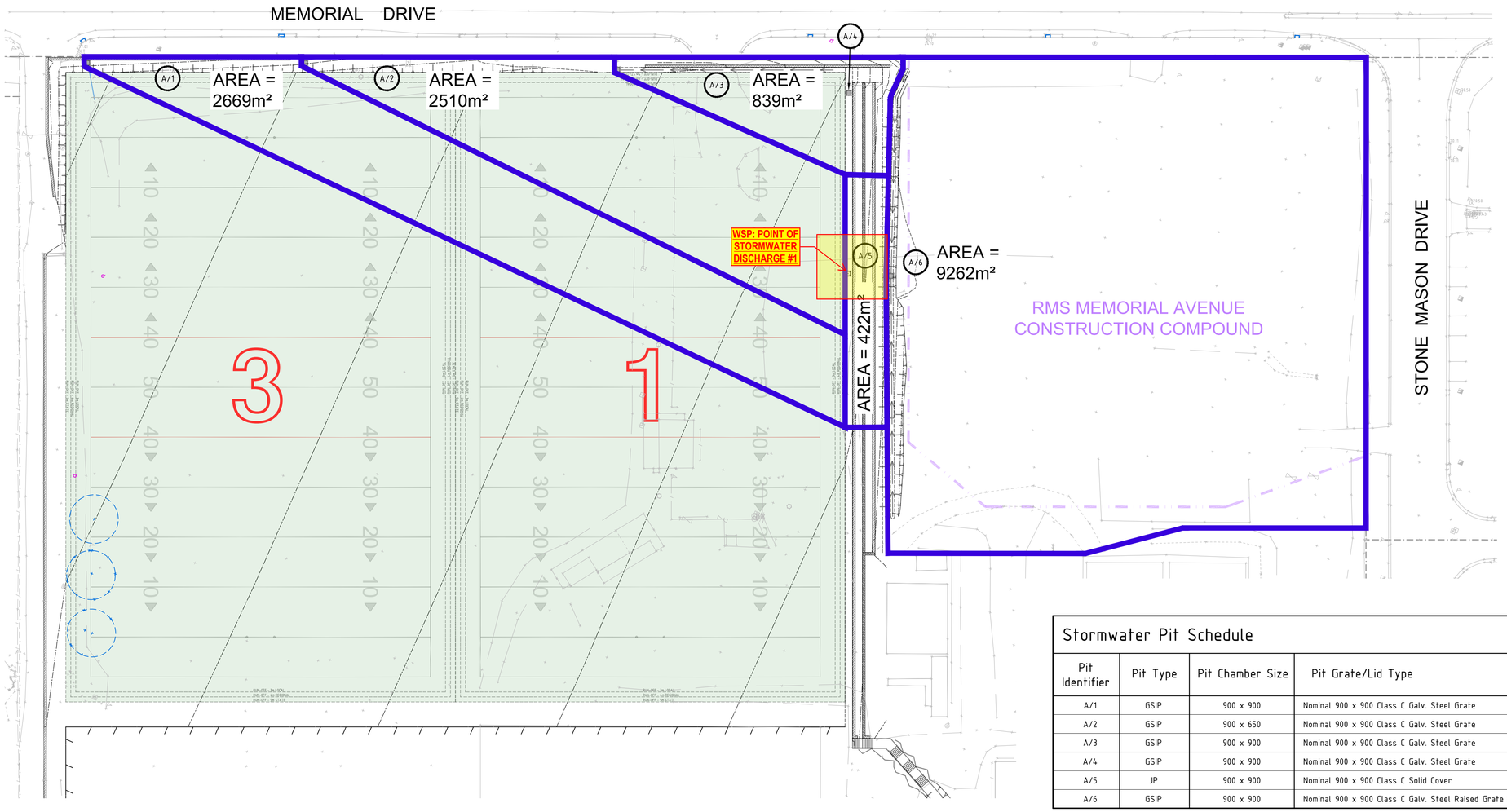
DESIGNER	W.M	DATE	JUNE 2020
ENGINEER	A.M.	LGA	THE HILLS
VERIFIER	A.M	SCALE @ A1	1:250

KELLYVILLE MEMORIAL PARK- FIELD EXTENSION

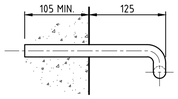
GENERAL ARRANGEMENT PLAN - SHEET 1

STATUS	DRAWING No.	REVISION
TENDER	02081_FE_201	A

A1



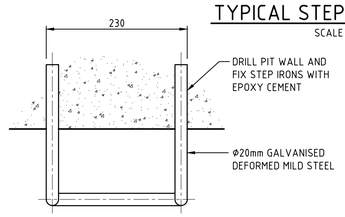
FRONT ELEVATION
SCALE 1:5



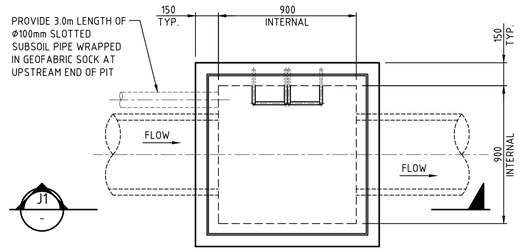
SIDE ELEVATION
SCALE 1:5

TYPICAL STEP IRON DETAIL

SCALE 1:5



PLAN
SCALE 1:5

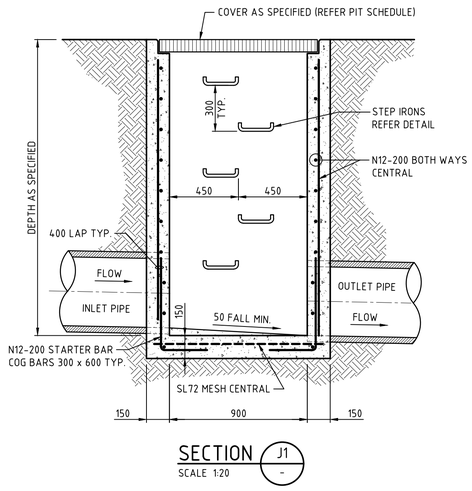


TYPICAL STORMWATER PIT - PLAN

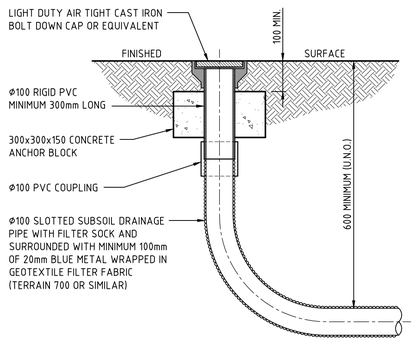
SCALE 1:20

Stormwater Pit Schedule

Pit Identifier	Pit Type	Pit Chamber Size	Pit Grate/Lid Type
A/1	GSIP	900 x 900	Nominal 900 x 900 Class C Galv. Steel Grate
A/2	GSIP	900 x 650	Nominal 900 x 900 Class C Galv. Steel Grate
A/3	GSIP	900 x 900	Nominal 900 x 900 Class C Galv. Steel Grate
A/4	GSIP	900 x 900	Nominal 900 x 900 Class C Galv. Steel Grate
A/5	JP	900 x 900	Nominal 900 x 900 Class C Solid Cover
A/6	GSIP	900 x 900	Nominal 900 x 900 Class C Galv. Steel Raised Grate & Frame

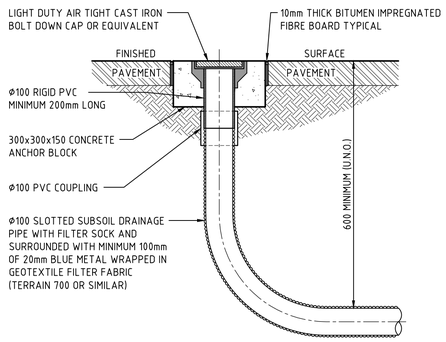


SECTION J1
SCALE 1:20



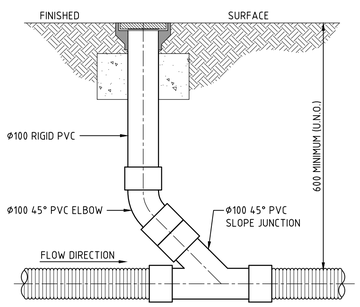
TYPICAL SUBSOIL FLUSHING POINT DETAIL FOR LANDSCAPED AREAS

SCALE 1:10



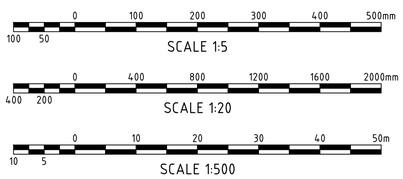
TYPICAL SUBSOIL FLUSHING POINT DETAIL FOR PAVED AREAS

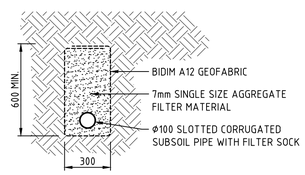
SCALE 1:10



TYPICAL SUBSOIL INTERMIDATE FLUSHING POINT

SCALE 1:10





SUBSOIL DRAINAGE DETAIL

SCALE 1:20

STORMWATER PIT NOTES:

1. PROVIDE STEP IRONS FOR PITS DEEPER THAN 1.20m.
2. COMPRESSIVE STRENGTH (Fc) FOR CAST INSITU CONCRETE SHALL BE A MINIMUM 25MPa @ 28 DAYS.
3. Φ100 SLOTTED SUBSOIL DRAINAGE PIPE 3.0m LONG WRAPPED IN GEOFABRIC FILTER SOCK TO BE PROVIDED ADJACENT ALL INLET PIPES.
4. ALL PITS TO BE ADEQUATELY STREAMLINED AND BENCHED.
5. GRATES TO BE PROVIDED WITH ADEQUATE LOCKING CLIPS OR 'J' BOLTS.
6. ALL GRATES TO BE HINGED TO FRAME
7. PITS DEEPER THAN 1.80m TO HAVE 200mm THICK WALLS AND BASE WITH SL81 MESH CENTRALLY PLACED. N12 CORNER BARS @ 400 C/C 450 LEGS IN BASE & SIDE.
8. ALL REINFORCEMENT TO HAVE MINIMUM 40mm COVER.
9. PITS MUST BE FINISHED AS PER THE DETAILS SHOWN ON THE DRAWINGS. i.e. PITS MUST BE BENCHED, PIPES MUST BE CUT FLUSH WITH PIT WALLS, STEP IRONS MUST BE INSTALLED etc.
10. PIPE PENETRATIONS ARE TO BE PROPERLY FINISHED WITH CONCRETE GROUT, RENDER etc.

CAD FILENAME: C:\WAZ\Wollongong Projects\02081\ACAD - Field Extension\02081_FE_601.dwg

REV.	DES.	DATE	VER.	DESCRIPTION
A	W.M.	20/09/2020	A.M.	TENDER ISSUE

CLIENT: THE HILLS Sydney's Garden Shire

C&M CONSULTING ENGINEERS
CIVIL AND HYDRAULIC ENGINEERING DESIGN AND PROJECT MANAGEMENT
SUITE 26
11 - 13 BROOKHOLLOW AVE
NORWEST NSW 2153
PHONE: (02) 9680 3100
FAX: (02) 9634 6989
ABN 21 118 134 240

DESIGNER	W.M	DATE	JUNE 2020
ENGINEER	A.M.	LGA	THE HILLS
VERIFIER	A.M	SCALE @ A1	AS NOTED

KELLYVILLE MEMORIAL PARK- FIELD EXTENSION

STORMWATER DRAINAGE CATCHMENT PLAN & DETAILS

STATUS	DRAWING No.	REVISION
TENDER	02081_601	A

A1

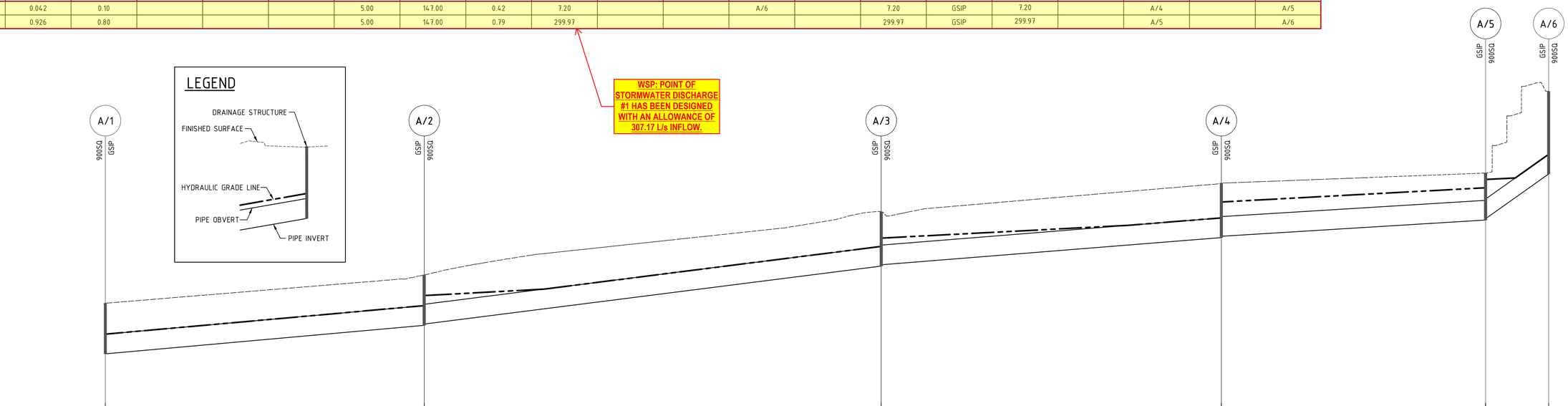
CALCULATION TABLE - HYDRAULICS - 1 IN 10 YEAR ARI

PIPE ID	PIPE U/S TOTAL CATCHMENT	PIPE U/S DRAINAGE TIME	PIPE U/S ToC	PIPE U/S INTENSITY	PIPE FLOW	PIPE TYPE & CLASS	PIPE DIAMETER	PIPE LENGTH	PIPE GRADE	COLEBROOK - WHITE 'k'	PIPE D/S INVERT	PIPE U/S INVERT	U/S PIT LOSS COEFFICIENT	PIPE VELOCITY	PIPE FRICTION LOSS	PIPE FRICTION SLOPE	PIPE D/S HGL	PIPE U/S HGL	PIT LOSS	WATER SURFACE ELEVATION	PIPE SURFACE FLOW	PIPE ID
	(Ha)	(min)	(min)	(mm/hr)	(L/s)		(mm)	(m)	(%)	(mm)	(mRL)	(m/RL)	(ku)	(m/s)	(m)	(%)	(m/RL)	(m/RL)	(m)	(m/RL)	(L/s)	
A/1-A/2	1.303	0.343	6.343	135.857	337.0	RCP2-RRJ	450	43.62	1.5	0.60	57.15	57.80	1.0	2.12	0.47	0.01	57.60	58.25	0.23	58.48	0.00	A/1-A/2
A/2-A/3	1.052	0.542	5.801	139.791	305.8	RCP2-RRJ	450	62.52	2.1	0.60	57.83	59.15	1.0	1.92	0.56	0.01	58.48	59.60	0.19	59.79	0.00	A/2-A/3
A/3-A/4	0.968	0.411	5.390	143.494	299.8	RCP2-RRJ	450	46.53	1.3	0.60	59.18	59.80	2.0	1.89	0.40	0.01	59.79	60.25	0.36	60.61	0.00	A/3-A/4
A/4-A/5	0.968	0.313	5.076	146.314	305.7	RCP2	450	36.15	1.0	0.60	59.83	60.20	1.0	1.92	0.32	0.01	60.61	60.94	0.19	61.12	0.00	A/4-A/5
A/5-A/6	0.926	0.076	5.000	147.000	300.0	RCP2-RRJ	450	8.62	11.8	0.60	60.23	61.25	1.0	1.89	0.07	0.01	61.12	61.70	0.18	61.88	0.00	A/5-A/6

CALCULATION TABLE - HYDROLOGY - 1 IN 10 YEAR ARI

PIT ID	LOCAL CATCHMENT AREA	FRACTION IMPERVIOUS	FLOW LENGTH	FLOW SLOPE	CATCHMENT ROUGHNESS	CRITICAL TC	RAINFALL INTENSITY	ROUGHNESS COEFFICIENT	LOCAL SURFACE INFLOW	LOCAL PIPE INFLOW	LOCAL SPECIFIED INFLOW	BYPASS FROM PIT	BYPASS FLOW RECIEVED	TOTAL PIT INFLOW	PIT TYPE	PIT INLET CAPACITY	BYPASS OUTFLOW	BYPASS TO PIT	GUTTER FLOW WIDTH	PIT ID
	(ha)		(m)	%	n	(min)	(mm/hr)	C	(L/s)	(L/s)	(L/s)		(L/s)	(L/s)		(L/s)	(L/s)		(m)	
A/1												A/2			GSIP					A/1
A/2	0.251	0.10				5.00	147.00	0.42	43.04			A/3		43.04	GSIP	43.04		A/1		A/2
A/3	0.084	0.10				5.00	147.00	0.42	14.40			A/4		14.40	GSIP	14.40		A/2		A/3
A/4							147.00					A/5			GSIP	0.00		A/3		A/4
A/5	0.042	0.10				5.00	147.00	0.42	7.20			A/6		7.20	GSIP	7.20		A/4		A/5
A/6	0.926	0.80				5.00	147.00	0.79	299.97					299.97	GSIP	299.97		A/5		A/6

WSP: POINT OF STORMWATER DISCHARGE #1 HAS BEEN DESIGNED WITH AN ALLOWANCE OF 307.17 L/s INFLOW.



PIPE FLOW (l/s) / PIPE VELOCITY (m/s)	337 / 2.12	306 / 1.92	300 / 1.89	306 / 1.92	300 / 1.89	
PIPE DIAMETER / PIPE TYPE & CLASS	DN450mm RCP2-RRJ	DN450mm RCP2-RRJ	DN450mm RCP2-RRJ	DN450mm RCP2	DN450mm RCP2-RRJ	
PIPE GRADE	1.5%	2.1%	1.3%	1.0%	11.8%	
RL 54m						
HGL (10yr ARI)	57.60	58.25 / 58.48	59.60 / 59.79	60.25 / 60.61	60.94	61.12 / 61.88
DEPTH TO INVERT	1.15	1.15 / 1.12	1.24 / 1.21	1.24 / 1.21	1.07	1.04 / 1.89
INVERT LEVEL	57.15	57.80 / 57.83	59.15 / 59.18	59.80 / 59.83	60.20	60.23 / 61.25
SURFACE LEVEL	58.30	58.95	60.39	61.04	61.27	63.14
CHAINAGE	0.00	43.62	106.14	152.67	188.82	197.44
	43.62m	62.52m	46.53m	36.15m	8.62m	

LINE A
1:300(H) & 1:50(V)

SCALE 1:50

SCALE 1:300

CAD FILENAME: C:\WA2\Wollongong Projects\02081\ACAD - Field Extension\02081_FE_601.dwg

REV.	DES.	DATE	VER.	DESCRIPTION
A	W.M.	20/09/2020	A.M.	TENDER ISSUE

CLIENT

THE HILLS Sydney's Garden Shire

C&M CONSULTING ENGINEERS

CIVIL AND HYDRAULIC ENGINEERING DESIGN AND PROJECT MANAGEMENT

SUITE 26
11 - 13 BROOKHOLLOW AVE
NORWEST NSW 2153

PHONE: (02) 9680 3100
FAX: (02) 9634 6989

ABN 21 118 134 240

DESIGNER	W.M	DATE	JUNE 2020
ENGINEER	A.M.	LGA	THE HILLS
VERIFIER	A.M	SCALE @ A1	AS NOTED

KELLYVILLE MEMORIAL PARK- FIELD EXTENSION

STORMWATER DRAINAGE PROFILE & CALCULATION TABLES

STATUS	DRAWING No.	REVISION
TENDER	02081_602	A

Appendix D

Council Correspondence

Contained within this appendix is correspondence received from The Hills Shire Council on the 28/05/2021. This correspondence specifies site specific requirements in relation to stormwater quality and quantity for the 'Kellyville Park PNRL Eels – Centre of Excellence and Community Sports Centre' development under SEARs Application No. SSD-24452965 that this report has been prepared in response to.

Khoshaba, Alex

From: Benjamin Hawkins <bhawkins@thehills.nsw.gov.au>
Sent: Friday, 28 May 2021 4:14 PM
To: Khoshaba, Alex
Cc: Bell, Tyran; Gray Barton; Eric Ruiz; Robert DiNatale; Coskun Nadiroglu; Anisul Huq
Subject: RE: Attention Subdivision Team - Kellyville Park Centre of Excellence and Community Facilities [Filed 29 May 2021 17:51]
Attachments: PS123790-20210527-AK5-Existing SW Markup.pdf

Hi Alex

See responses in red below.

This should negate the need for a meeting but let me know if you still need to discuss anything.

Thanks

Ben H

From: Khoshaba, Alex [mailto:Alex.Khoshaba@wsp.com]
Sent: Friday, 28 May 2021 3:27 PM
To: Coskun Nadiroglu; Anisul Huq
Cc: Bell, Tyran; Gray Barton; Eric Ruiz; Robert DiNatale; Benjamin Hawkins
Subject: RE: Attention Subdivision Team - Kellyville Park Centre of Excellence and Community Facilities

Hi Coskun & Anisul,

Further to my last sentence in my email from yesterday, we believe it is a good idea to setup a teams meeting to discuss the below. This will enable us to clearly communicate and discuss the items we are requesting preliminary Council advice on which should save us some time rather than going back and forth via email.

Can you please advise a day and time that suits you for a brief meeting next week? I will forward through an invite once received.

Kind Regards,

Alex Khoshaba
Project Engineer - Civil

T: +61 3 9622 9795

Alex.Khoshaba@wsp.com

WSP Australia Pty Limited
Level 15, 28 Freshwater Place
Southbank, VIC
3006 Australia

wsp.com

From: Khoshaba, Alex
Sent: Thursday, 27 May 2021 2:20 PM
To: Coskun Nadiroglu <cnadiroglu@thehills.nsw.gov.au>; Anisul Huq <ahuq@thehills.nsw.gov.au>

Cc: Bell, Tyran <Tyran.Bell@wsp.com>; Gray Barton <barton@hbarch.com.au>; Eric Ruiz <jruiz@thehills.nsw.gov.au>; Robert DiNatale <rdinatale@thehills.nsw.gov.au>; Benjamin Hawkins <bhawkins@thehills.nsw.gov.au>
Subject: RE: Attention Subdivision Team - Kellyville Park Centre of Excellence and Community Facilities

Hi Coskun and Anisul,

As we have now confirmed the presence of an existing council drain conveying flows through our site (Kellyville Park) from Stone Masons Drive (refer previous correspondence below), we request your preliminary advice on each of the below items to assist with our civil/stormwater design ahead of our formal SEARs request.

- What are Council's build-over requirements for this drain?
- Would council object to permanent building structure spanning laterally over the drain assuming that the pipe below the building was upgraded to convey the major design storm with blockage allowance and could be readily maintained from upstream and downstream pits?
    - Does Council have a preference as to which option we move forward with as shown on the stormwater markup available at the link below?
- Horizontal and vertical clearance requirements?
- Restrictions of pavement types, concrete staircases, planting etc.

Option two (relocation) is preferred. Our specifications do not allow for structures over pipes and so option one would need to be considered as a variation on merit at the development application stage and us unlikely to be supported when there is an obvious alternative.

If you are seeking to upgrade the existing twin pipes to convey the major/ 100 year design storm anyway it makes even more sense to just relocate them clear of the proposed building. The current twin pipes are designed to convey flows associated with the minor/ 10 year design storm. If you increase the size of the pipes you need to extend it all the way to the outlet/ you cannot connect a big pipe into a smaller pipe at the downstream extent of your works for example.

Alternatively you could amend the building to locate the gap where the pipes are located.

Whatever major flows are not contained to the pipes need to be conveyed overland. If the pipes are upsized to convey major flows you still to shape the land around the buildings to protect them from flooding/ in the event of a blockage.

- If the drain requires diversion around the new building footprint, what degree of modelling, documentation and reporting is required to be reviewed by Council for approval of the stormwater diversion?

Basic stormwater calculations as part of the civil design will do. You will need to quantify the volume of overland flow in the major storm to ensure overland flow around the building is catered for.

- Will Council permit the stormwater generated from the new development to discharge to the existing 900 dia. stormwater drain running below the training fields?

Yes, so long as you can demonstrate capacity with your calculations (above).

- Will Council impose their standard onsite detention requirements as outlined in the DCP on this development?
    - In our opinion a dispensation should be provided with regards to the general OSD requirement as there are no properties immediately downstream of the site and the existing stormwater network discharges directly to Strangers Creek. In addition to this the recent council projects on-site including the carpark and upstream residential development were not required to restrict stormwater discharge.

No OSD or stormwater quality treatment is required. There is an existing basin and planned water quality treatment works within the online basin along Strangers Creek immediately downstream. You do need to include stormwater or rainwater reuse in your development (similar to all other development in the precinct as per the Balmoral Road section from our Development Control Plan).

- Will Council impose their standard water sensitive urban design requirements as outlined in the DCP on this development?

See above.

The following documents are available for download at the link below for your reference:

- Feature and services survey.
- Approved construction drawings for the lot 2 subdivision civil works which include the design of the existing 900 dia. drain running through the development site.
- Work-in-Progress architectural concept plan for the proposed development to give context on what is being proposed.
- Stormwater markup of the existing drainage illustrating two options as to how these can be integrated within the proposed development.

https://spaces.hightail.com/space/0pvFOkO8Dm

We kindly request your preliminary advice with respect to the above items by Friday June 4th. We are happy to discuss this over a short teams meeting with you next week to provide further detail/clarity if you feel this would assist.

Kind Regards,

Alex Khoshaba
Project Engineer - Civil

T: +61 3 9622 9795

Alex.Khoshaba@wsp.com

WSP Australia Pty Limited
Level 15, 28 Freshwater Place
Southbank, VIC
3006 Australia

wsp.com

Appendix E

Rainwater Harvesting Tank Calculations

Contained within this appendix are rainwater harvesting tank calculations completed by Erbas, dated 15/10/2021, for the 'Kellyville Park PNRL Eels – Centre of Excellence and Community Sports Centre' development under SEARs Application No. SSD-24452965 that this report has been prepared in response to.

COMMUNITY FACILITIES (CF) & TENANCY BUILDINGS

Rainwater tank calculator

Calculate how much water a rainwater tank could save your business and what size tank is the most suitable for your needs.

Postcode

2155

Roof area that will be connected to the rainwater tank

Enter my own roof area

2200 m^2

Planned rainwater tank size

Enter my own rainwater tank size

20000 litres

Where will you use rainwater?

Describe where you will use rainwater in your business. Leave a section blank if you do not intend to supply rainwater to that area.

1. Toilet

Number of employees

150

Number of operating days a year

365

2. Irrigation

Flow rate

3 L/min

Hours/week

14

Enter information about other water using processes in your business. Use section 3 for processes with fixed water use and section 4 when the water use varies over the year, eg cooling towers

3. Other water use (fixed)

Item demand

kL/day

4. Other water use (variable)

January

kL/day

Febuary

kL/day

March

kL/day

April

kL/day

May

kL/day

June

kL/day

July

kL/day

August

kL/day

September

kL/day

October

kL/day

November

kL/day

December

kL/day

Rainwater tank calculator results

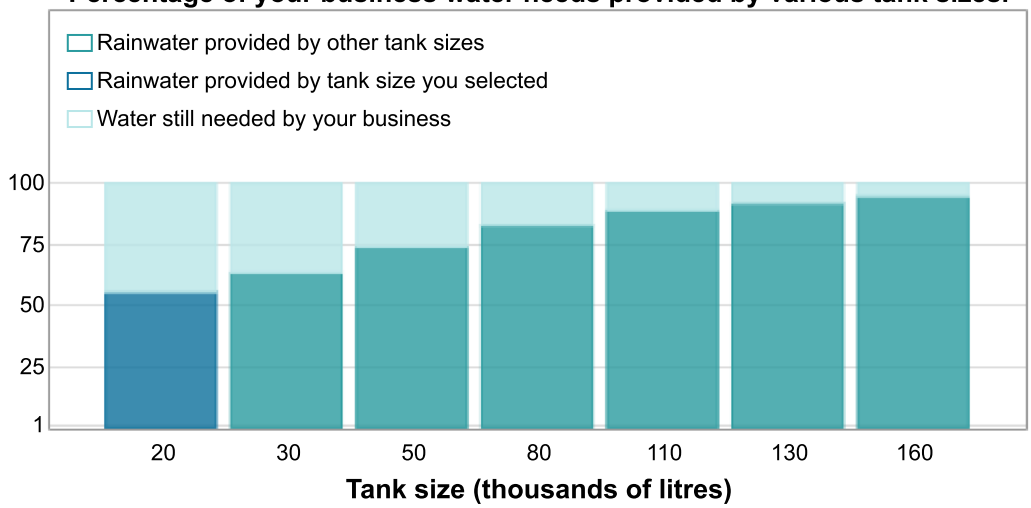
Summary

You selected a tank size of **20000 litres**

This sized tank could provide up to **56%** of the rainwater you need each day.

Some additional tank sizes are displayed in the chart below to help you select the most suitable rainwater tank for your business

Percentage of your business water needs provided by various tank sizes.



Tank size (kL)	% rainwater provided	Drinking water saved each day (litres)
20	56	1,924
30	63	2,214
50	74	2,611
80	83	2,943
110	89	3,166
130	92	3,276
160	95	3,386

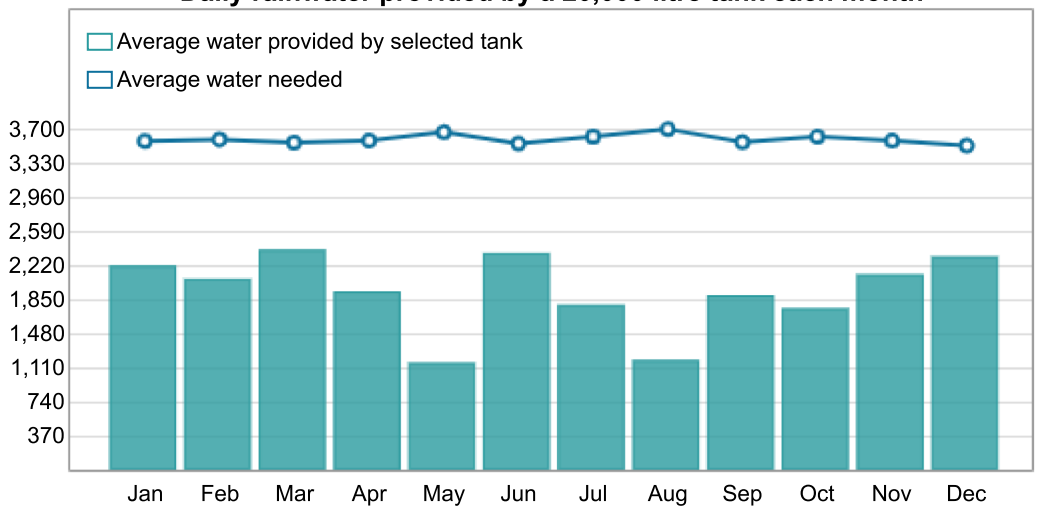
Interpreting the results

The range of tank sizes shown is based on the water needs of your business. The benefits may reduce when you reach a certain tank size.

The best tank size will be the one that balances increased water savings with cost effectiveness. Use the information in the table above with quotations from your rainwater tank supplier to determine the best tank for your business.

Water savings depend on rainfall, roof area and tank size. If your water needs are not being met by any of the tank sizes shown, your roof area may be too small or the rainfall in your area too low.

Daily rainwater provided by a 20,000 litre tank each month



Toilets
3,375.00 L/day

Irrigation
2,520.00 L/week

Other (fixed)
0.00 kl/day

Other (variable)
0.00 kl/day

Rainfall information

Five years of rainfall data (2005 to 2009) from the **PARAMATTA NORTH (MASONS DRIVE)** was used in the calculations.

Printed on: 15/10/21 13:01

URL: http://www.sydneywater.com.au/SW/your-business/managing-your-water-use/water-efficiency-tips/rainwater-tank-calculator/index.htm

CENTRE OF EXCELLENCE (COE) BUILDING

Rainwater tank calculator

Calculate how much water a rainwater tank could save your business and what size tank is the most suitable for your needs.

Postcode

2155

Roof area that will be connected to the rainwater tank

Enter my own roof area

3300 m^2

Planned rainwater tank size

Enter my own rainwater tank size

50000 litres

Where will you use rainwater?

Describe where you will use rainwater in your business. Leave a section blank if you do not intend to supply rainwater to that area.

1. Toilet

Number of employees

150

Number of operating days a year

365

2. Irrigation

Flow rate

3 L/min

Hours/week

14

Enter information about other water using processes in your business. Use section 3 for processes with fixed water use and section 4 when the water use varies over the year, eg cooling towers

3. Other water use (fixed)

Item demand

kL/day

4. Other water use (variable)

January

kL/day

Febuary

kL/day

March

kL/day

April

kL/day

May

kL/day

June

kL/day

July

kL/day

August

kL/day

September

kL/day

October

kL/day

November

kL/day

December

kL/day

Rainwater tank calculator results

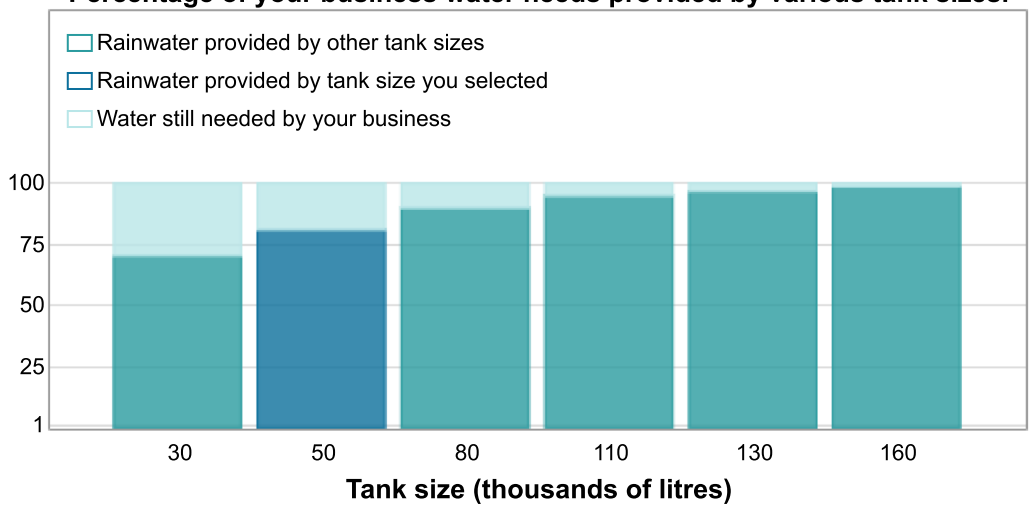
Summary

You selected a tank size of **50000 litres**

This sized tank could provide up to **81%** of the rainwater you need each day.

Some additional tank sizes are displayed in the chart below to help you select the most suitable rainwater tank for your business

Percentage of your business water needs provided by various tank sizes.



Tank size (kL)	% rainwater provided	Drinking water saved each day (litres)
30	70	2,471
50	81	2,871
80	90	3,205
110	95	3,391
130	97	3,462
160	98	3,532

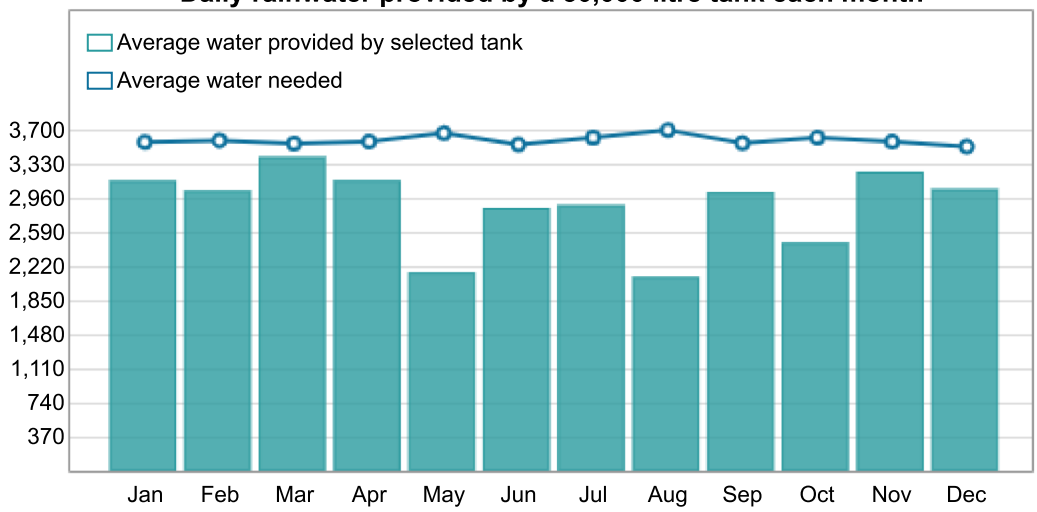
Interpreting the results

The range of tank sizes shown is based on the water needs of your business. The benefits may reduce when you reach a certain tank size.

The best tank size will be the one that balances increased water savings with cost effectiveness. Use the information in the table above with quotations from your rainwater tank supplier to determine the best tank for your business.

Water savings depend on rainfall, roof area and tank size. If your water needs are not being met by any of the tank sizes shown, your roof area may be too small or the rainfall in your area too low.

Daily rainwater provided by a 50,000 litre tank each month



Toilets
3,375.00 L/day

Irrigation
2,520.00 L/week

Other (fixed)
0.00 kl/day

Other (variable)
0.00 kl/day

Rainfall information

Five years of rainfall data (2005 to 2009) from the **PARAMATTA NORTH (MASONS DRIVE)** was used in the calculations.

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URL: http://www.sydneywater.com.au/SW/your-business/managing-your-water-use/water-efficiency-tips/rainwater-tank-calculator/index.htm