NORTHROP

Concept Stormwater Management Plan

for

118 Cary Street, Toronto

for Toronto Developments Pty Ltd

Level 1, 215 Pacific Highway
Charlestown NSW 2290
02 4943 1777
newcastle@northrop.com.au
ABN 81 094 433 100

6 April 2022

NL171556

Toronto Investments
Fay Vranas

Dear Fay,

Re: 118 Cary Street, Toronto

Northrop Consulting Engineers have been engaged by Toronto Developments Pty Ltd to provide concept design plans suitable for Development Approval submission for the proposed mixed-use development located at 118 Cary Street, Toronto (Lot 4-10 DP 2505, Lot 100 DP847314 and Lot 101 DP1110774).

The purpose of this engineering report is to address civil engineering and stormwater items associated with the proposed development of the site, in particular:

- Water cycle management, including:
  - Stormwater collection.
  - Water quantity control.
  - Water quality control.

The proposed management plan has been developed in accordance with Lake Macquarie City Council's (LMCC's) 2014 Development Control Plan (DCP), LMCC's Water Cycle Management Guidelines and relevant Australian Standards. This management plan should be read in conjunction with the attached drawings prepared by Northrop Consulting Engineers, C00DA – C30DA.

Contained herein is a description of the subject site and development, proposed stormwater management methodology and a summary of the water quality and quantity. This document should be read in accordance with the engineering drawings NL171556/DA Series. This report intends to discuss items relating to the site at a level appropriate for a Development Application submission. It does not attempt to provide detailed design solutions to all issues; rather it will investigate the feasibility of solutions based on information that we have gathered to date from various sources and provide outcomes which will be developed further at Construction Certificate and Construction phases of the project.

		Date
Prepared by	CS	06/04/2022
Checked by	RJ	06/04/2022
Admin	BBR	06/04/2022

Site and Project Description

The site has a total area of 5,950 m^2 and at the time of this reports preparation consisted of undeveloped grassed lots and a decommissioned road formation which generally fall to a low point on the western boundary fronting Cary Street. A schematic of the area is shown in Figure 1, with the proposed site highlighted in white.

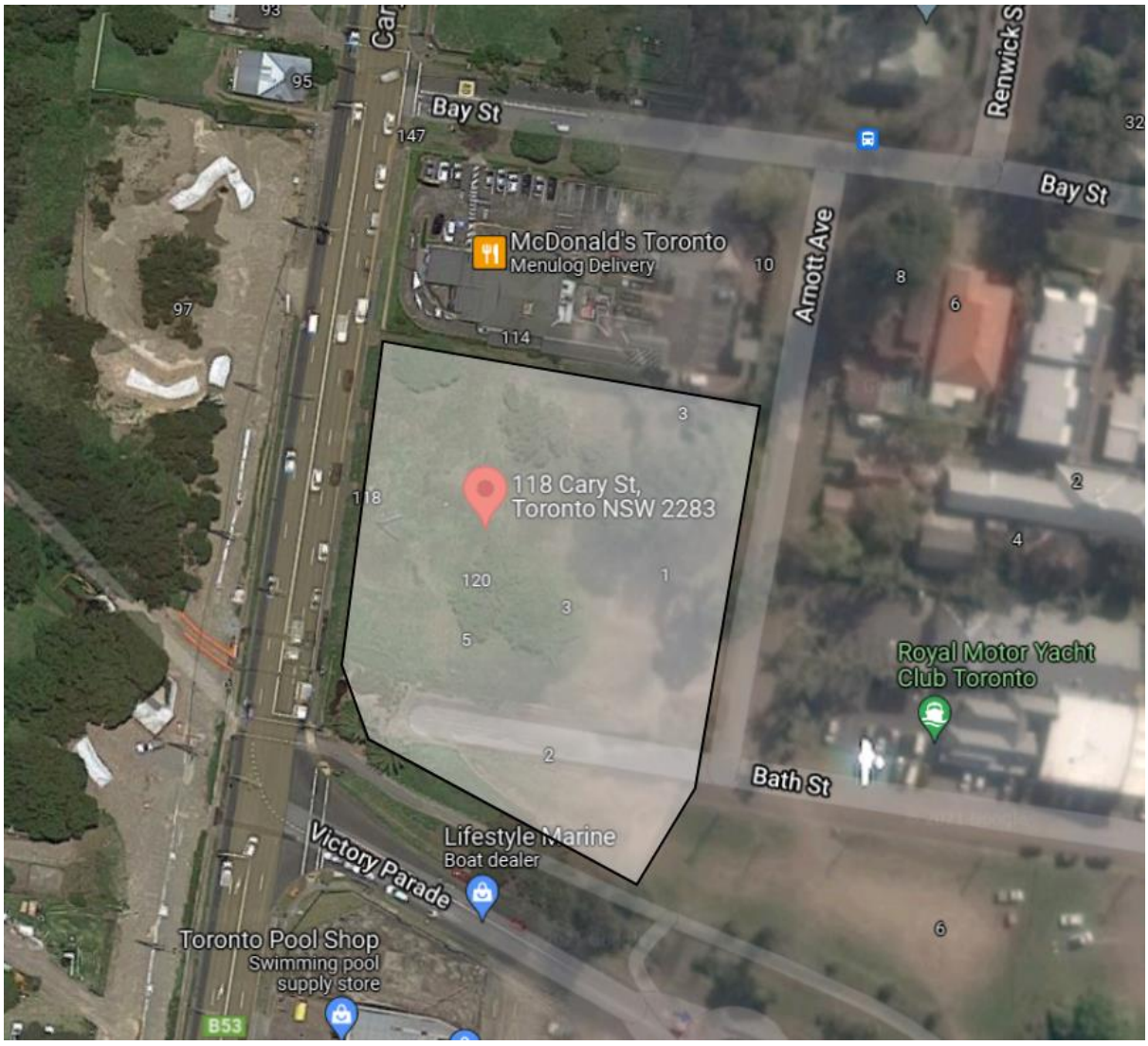


Figure 1 – Site Schematic

The development proposes the construction of a multi storey mixed-use building (both basement and above ground residential) incorporating car parking, commercial space and residential apartments, with primary vehicle access from Arnott Avenue and a service vehicle exit onto Cary Street. Pedestrian access is proposed from Cary Street, Arnott Avenue and the footpath adjacent to Victory Parade. The general development proposal is detailed on the attached stormwater plans reference NL171556/DA Series.

Stormwater Management

It is proposed that drip water from cars in the basement level carpark (levels B1 and B2) will be collected within a series of floor wastes that discharge to a pump out pit on Basement Level 2. Water collected in the pump out pit will be conveyed to the proposed gravity fed stormwater line on Ground Level. The podium stormwater runoff is proposed to be captured by a series of floor wastes and conveyed to the below ground on-site detention (OSD) tank located adjacent to Basement Level 1.

Roof runoff is proposed to be collected and discharged to a 40KL rainwater reuse tank located on the podium level, where captured water will be reused for landscaping irrigation and toilet flushing throughout the development. Overflow from the reuse tank is proposed to be conveyed to the proposed OSD tank below the Arnott Street access ramp. It is proposed to provide a series of water quality treatment devices will also be provided to improve stormwater quality prior to discharging to Council stormwater assets.

A low point exists at the intersection of Bath and Arnott Street which results in localised ponding due to the absence of any existing Council stormwater infrastructure at this location. In order to mitigate existing deficiencies due to the non-existing Council stormwater network, it is proposed to install new stormwater infrastructure in this location to convey stormwater runoff from Councils road network to the east and south east (Arnott Ave and Bath St) to the existing pit and pipe network currently located at the western end of Bath Street. Pipework can be installed by adjusting the existing HWC easement within Lot 100 on Bath Street (refer to Figure 2 below). An overland flow path is to be provided from this low point in case of pipe blockage – refer to drawing C30DA for further details.

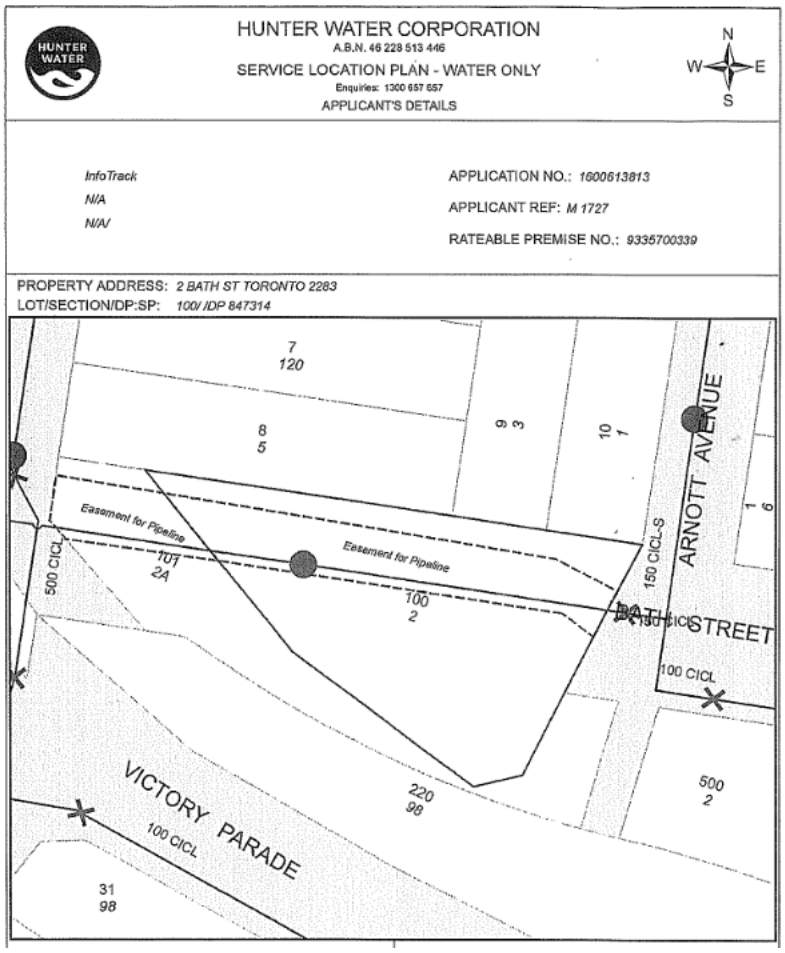


Figure 2 – HWC Service Location Extract

Site Analysis

The proposed development areas consist of:

- Total site area = 5,754 m^2
- Total roof area to reuse tank = 2,487m^2
- Total Podium level to OSD tank = 946 m^2
- Podium level percent impervious = 50%
- Ground level area by-passing OSD = 2,140 m^2
- Ground level area by-passing OSD percent impervious = 59%
- Service Lane Area = 181 m^2
- Total Site Percent Impervious = 73%

In accordance with LMCC's water cycle management guidelines the Site Discharge Index:

- Directly-connected impermeable area (DC) = 0.39 X 966
  = 377 m^2
- Site Discharge Index (SDI) = 377 / 5950
  = 0.06

Stormwater Quantity

A lumped-node DRAINS model was developed to appropriately size an on-site detention tank to match post developed peak flows to that of the pre-developed scenario. A time of concentration of 15 minutes and 100% pervious area for the pre-developed scenario was used. Storm durations ranging from 5 minutes to 270 minutes were investigated. Figure below shows the DRAINS model schematic.

We understand that water levels within Cary Street fronting the development have been observed at approximately RL 2.5. Tailwater conditions were therefore added to the DRAINS model for both the minor and major storm events, and the floor of the OSD tank raised to RL2.85 to ensure adequate attenuation through all modelled storm events.

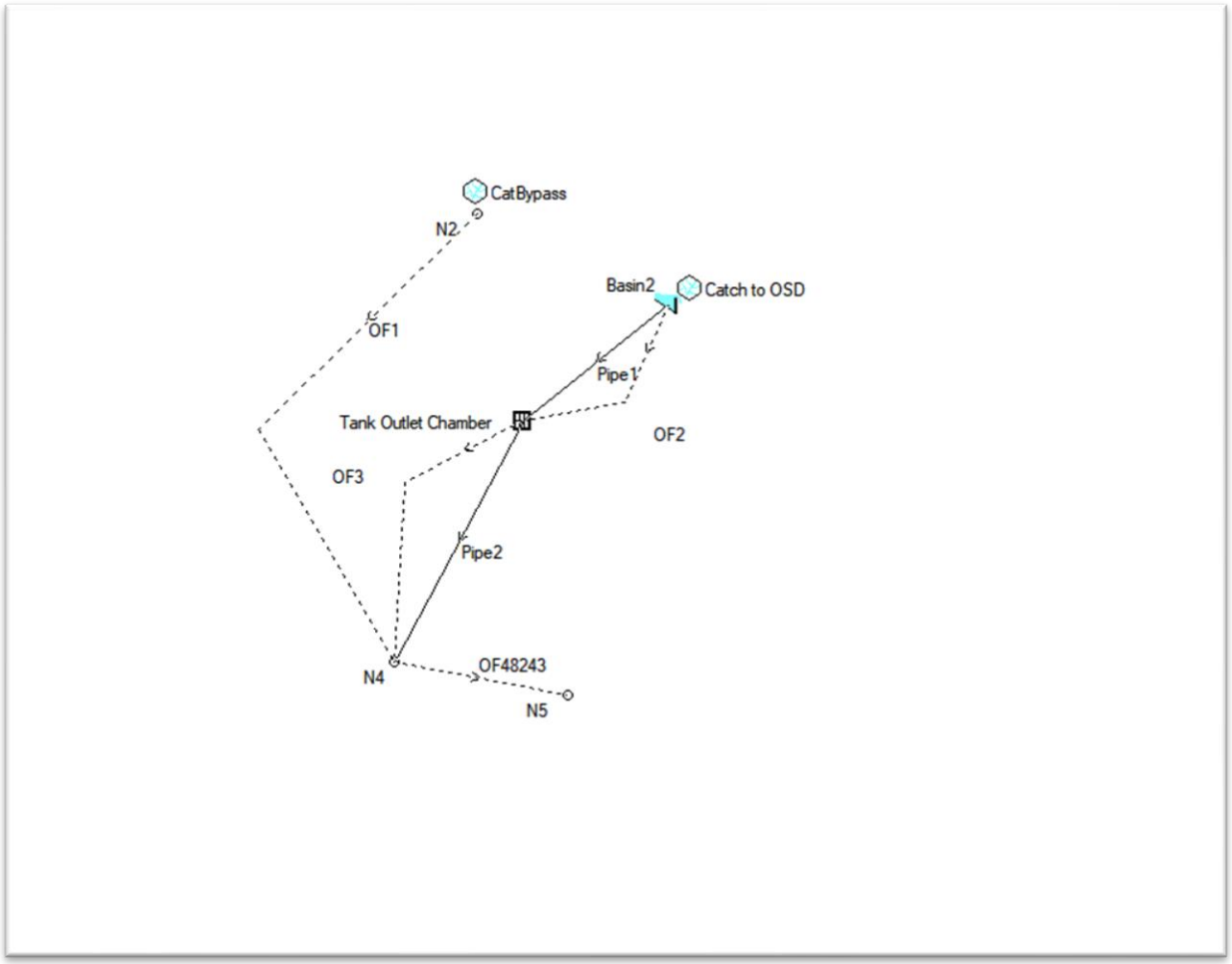


Figure 3 - DRAINS model schematic

The model's results are shown below in Table 1.

Table 1 - DRAINS Model Result Summary

AEP %	ARI	Pre-development Peak Flows (m^3/s)	Post-development Peak Flows (m^3/s)
0.2 EY	**5**	0.089	0.085
10	**10**	0.132	0.121
5	**20**	0.175	0.170
2	**50**	0.242	0.230
1	**100**	0.296	0.268

The DRAINS model set-up indicates the proposed 123m^3 detention tank and staged orifice discharge reduces post-developed peak flows to that of the pre-developed scenario, up to and including the 100-year ARI storm event.

DRAINS model can be provided at Council request.

Stormwater Quality

It is our understanding that the receiving waters downstream of the site are environmentally sensitive, comprising an existing coastal wetland. In order to minimise the developments impact on the existing wetland in accordance with the Coastal Wetland SEPP, water quality objectives required for Neutral or Beneficial Effect (NorBE) have been considered.

As such, stormwater treatment devices have been incorporated into the design of the development such that the works can provide a Neutral or Beneficial Effect (NorBe) to the downstream environment. Refer to design documentation for specific water quality treatment facilities

The performance of the proposed stormwater management strategy was assessed against these targets using the conceptual software MUSIC (Version 6.3.0). The MUSIC model was developed using recommended parameters presented in the document “Draft NSW MUSIC Modelling Guidelines” (WBM, 2015) while complying with LMCC’s MUSIC Link parameters. A schematic of the proposed treatment train can be seen below in

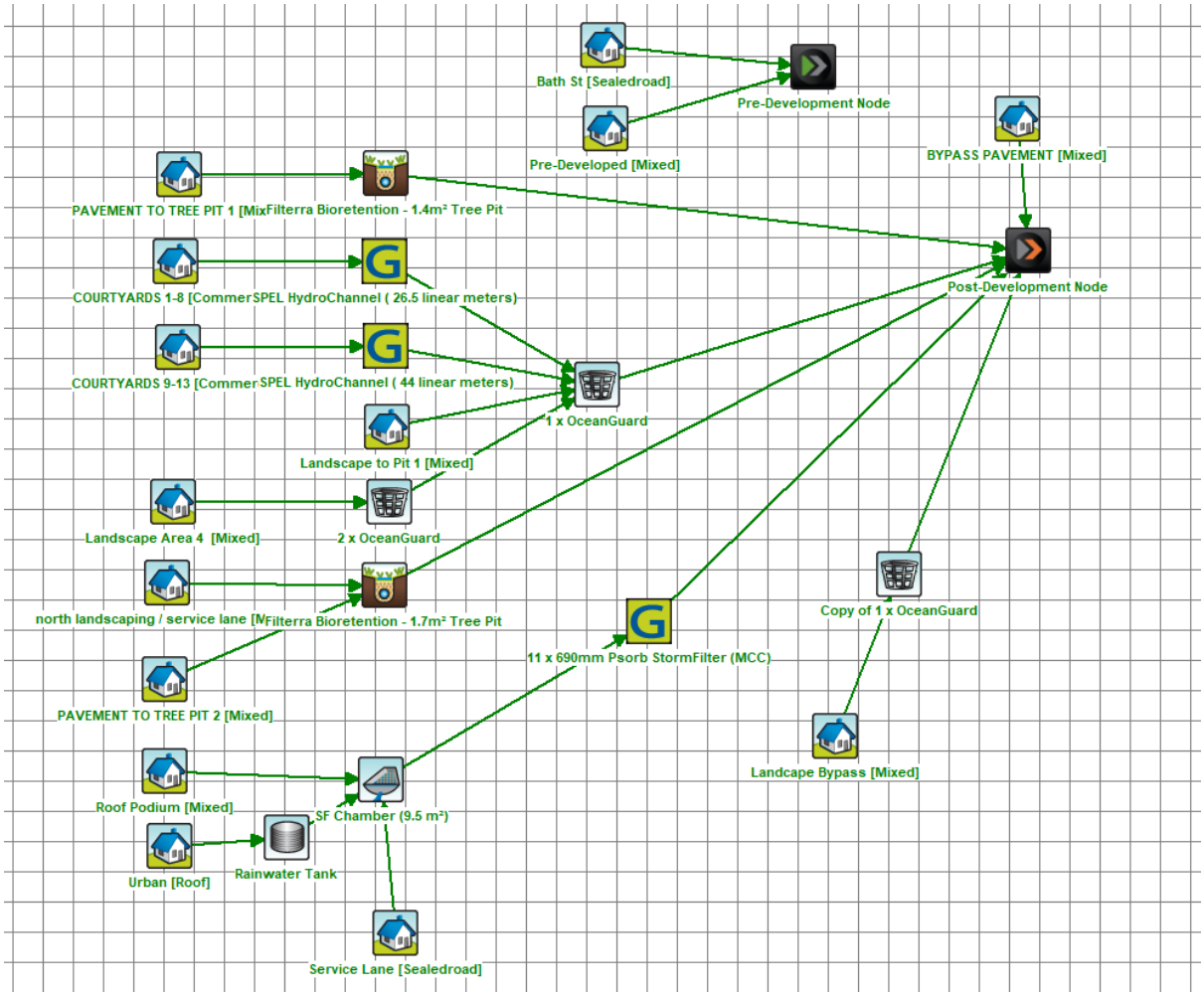


Figure 4 - MUSIC Model schematic

The results of the proposed treatment train can be seen below in Table 2.

Treatment train node summary:

- Rainwater tank – Proposed 40kL reuse tank. For the MUSIC model it has been assumed the full roof catchment is connected to the tank. A re-use demand of 140 kL/year has been assumed for landscaping irrigation and 13kL/day for toilet flushing.
- OceanProtect PSorb in-tank Filter Cartridges – cartridge filter system (10 cartridges) or approved equivalent.
- Oceanprotect Oceanguard filter pit inserts.
- Ocean Protect Filterra Biofiltration areas.
- SPEL Hydrochannel – Grated trench drain proprietary filter system or approved equivalent.

Table 2 - MUSIC model results

	Pre-Development Load (kg/yr)	Post Development Load (kg/yr)	% Pre. Vs Post Reduction
Flow (ML/yr)	1.25	2.41	-92.8%
Total Suspended Solids (kg/yr)	258	36.7	85.8%
Total Phosphorus (kg/yr)	0.47	0.133	71.7%
Total Nitrogen (kg/yr)	2.62	2.55	2.7%
Gross Pollutants (kg/yr)	13.6	0.438	99.6%

Table 2 shows that the proposed stormwater management strategy is predicted to achieve the load reduction targets set out in the LMCC DCP 2014, as estimated by MUSIC. It is noted that there is an average increase in stormwater runoff quantity from the post development site, which can be expected due to the increase in hardstand (as the site is currently predominantly undeveloped). Northrop have maximised the reuse opportunity for the site, by reticulating to all proposed apartments, and it is not expected that any further reduction in post development flows is feasible without increasing apartment yield. Furthermore, it is our understanding that the development site is underlaid by moderately to highly reactive clays, and as such infiltration of excess runoff is also not feasible. It is our opinion that the proposal represents the most reasonable outcome possible for the current land zoning and associated planning controls.

It is noted that the downstream wetland is populated by freshwater plant species, and as such the increase in fresh water runoff is anticipated to have a negligible effect. A quantitative assessment of the water level in the wetland suggests that the average increased water level within the wetland during rainfall events post development would be less than 2mm, suggesting that there will be no increase in local flooding risk as a result of the proposed development.

MUSIC Link report has been submitted with this report and MUSIC model can be provided upon Council request. We note that there are some failing parameters within the MUSIC link report, as summarized below:

- Soil conditions - We have adopted site specific soil parameters rather than Councils standard requirements as it provides a more conservative result and reflects real world data.
- Proprietary data – This item is typical to supplied proprietary nodes
- Reuse % demand met – There is insufficient roof area to service the required reuse demand, so a reuse volume appropriate for the development has been adopted.

Upstream Runoff

The design plans nominate realignment of the existing kerb and gutter in Arnott Avenue between Bay Street and Bath Street, including extension across the redundant Bath Street pavement formation which traverses the subject site. Concept road adjustment plans are included within the appended drawings providing an overview of the proposed works.

The new kerb and gutter will collect upstream stormwater runoff and divert it to a formed low point at the corner of Arnott Ave and Bath Street where it will be collected and conveyed past the site to the existing Council drainage infrastructure located to the west. The below ground pipe shall be sized to accommodate the 1% AEP runoff from the upstream catchment (estimated to be approximately 0.59m^3/s) to minimise the potential for overland flow from upstream catchments through the site. In

addition, it is also proposed to provide an overland flow path from Arnott Avenue to Cary Street through the southern corner of the site capable of conveying 50% of the 1% AEP runoff from upstream catchments. Preliminary calculations indicate a swale approximately 4m wide x 0.2m deep will accommodate the required overland flow.

The above provisions are considered adequate in addressing upstream stormwater runoff conveyance through the site.

Localised Flooding

As per information received from Council on 6th June 2018, during storm events in excess of the design major event (100-year ARI), flooding has been observed within Cary Street adjacent to the proposed development.

The existing inlet pit within Cary Street has been identified as a localised low point and therefore ponding is expected in these larger events. The relief point for this area is seen to be the traffic island centrally located in Cary Street. The IL for this relief point has been estimated below.

- Pit CL 2.85
- 7.5m wide carriageway X 3.5% cross fall
- 0.15m traffic island kerb height
- = 2.85 + 0.26 + 0.15
- = 3.26

The development front along Cary Street is therefore recommended to utilise a flood proof layout and flood materials 200mm above the spill crest, up to approximately RL 3.46. Further investigation and details to be provided during CC stage.

Conclusion

Given the results of the above investigations, it is reasoned that the development meets LMCC's requirements. In particular:

- Calculated Site Discharge Index of 0.06 satisfies LMCC's performance criteria of 0.1.
- In order to limit post-developed peak discharge rates to that of the pre-developed scenario and 123m^3 detention tank is proposed. The proposed storage volume was modelled in the run-off routing software DRAINS.
- The treatment of stormwater runoff for waterborne pollutants is achieved through the proposed treatment train as modelled by MUSIC. This includes the use of a rainwater tank, a proprietary gross pollutant trap, grated trench drain pit inserts, Filterra Ocean Protect biofiltration media and a cartridge treatment system.
- Localised flooding within Cary Street is to be considered during the detailed design stage as to allow ponded water to preferentially spill across the Cary Street traffic island before entering any proposed basement levels or habitable floor levels.

I trust the above meets your requirements; however, should you have any queries, please feel free to contact the undersigned on (02) 4943 1777.

Yours faithfully,

Ross Jeans
Civil Engineer
BEng (Environmental) MIEAust

Chris Smith
Principal | Civil Engineer
BEng (Civil) MIEAust CPEng NER

Limitation statement

Northrop Consulting Engineers Pty Ltd (Northrop) has been retained to prepare this report based on specific instructions, scope of work and purpose pursuant to a contract with its client. It has been prepared in accordance with the usual care and thoroughness of the consulting profession for the use by Toronto Developments Pty Ltd. The report is based on generally accepted practices and standards applicable to the scope of work at the time it was prepared. No other warranty, express or implied, is made as to the professional advice included in this report.

Except where expressly permitted in writing or required by law, no third party may use or rely on this report unless otherwise agreed in writing by Northrop.

Where this report indicates that information has been provided to Northrop by third parties, Northrop has made no independent verification of this information except as expressly stated in the report. Northrop is not liable for any inaccuracies in or omissions to that information.

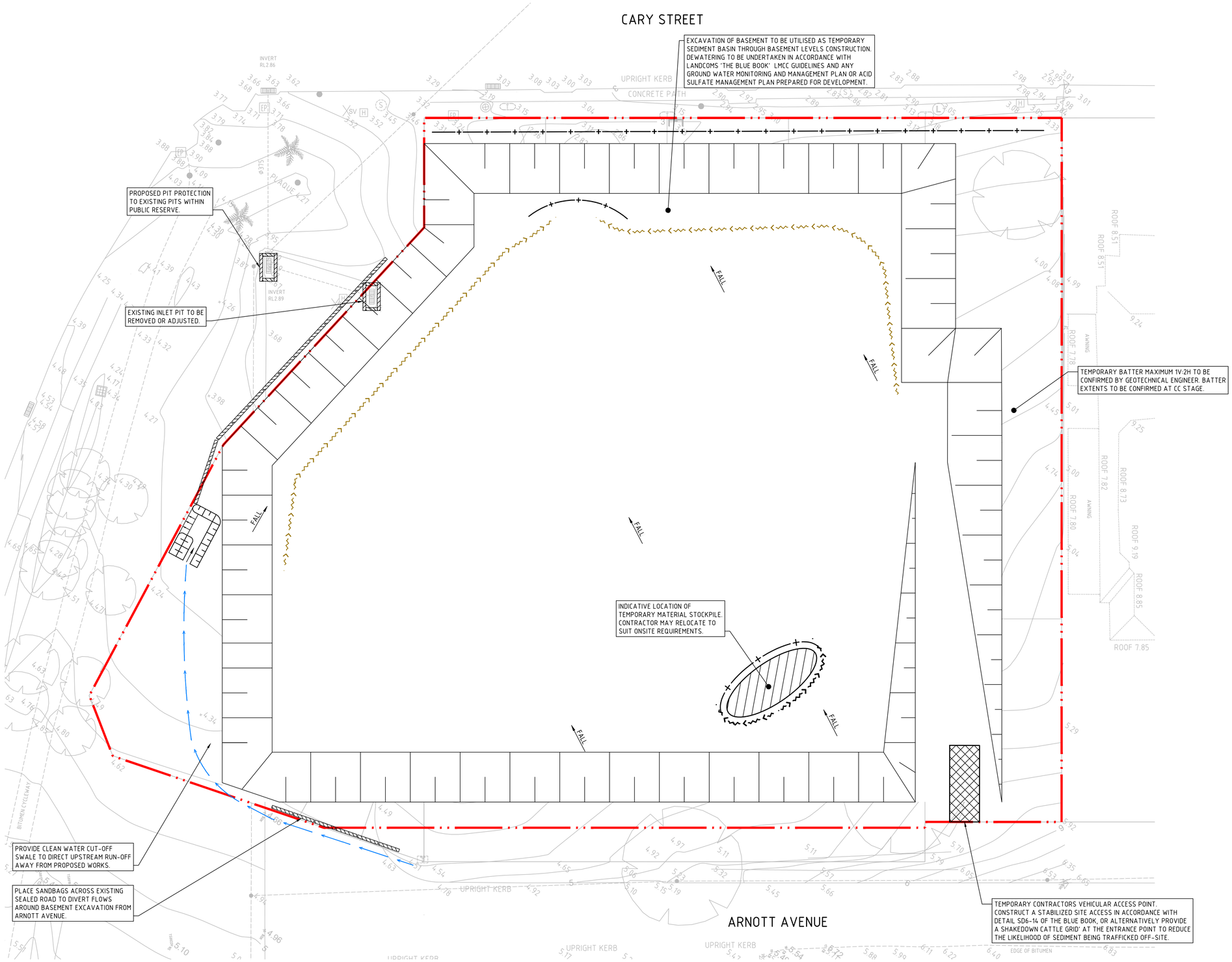
The report was prepared on the dates shown and is based on the conditions and information received at the time of preparation.

This report should be read in full, with reference made to all sources. No responsibility is accepted for use of any part of this report in any other context or for any other purpose. Northrop does not purport to give legal advice or financial advice. Appropriate specialist advice should be obtained where required.

To the extent permitted by law, Northrop expressly excludes any liability for any loss, damage, cost or expenses suffered by any third party relating to or resulting from the use of, or reliance on, any information contained in this report.

Attachment A – Design Plans

CARY STREET



LEGEND

- DENOTES BOUNDARY LINE
- DENOTES EXISTING CONTOURS
- DENOTES SEDIMENT FENCE, REFER TO DRAWING C02DA FOR DETAIL.
- DENOTES CLEAN WATER SWALE.
- DENOTES DIRTY WATER SWALE.
- DENOTES STABILISED SITE ACCESS, REFER TO DRAWING C02DA FOR DETAIL.
- DENOTES STOCKPILE, REFER TO DRAWING C02DA FOR DETAIL.
- DENOTES SANDBAG OR GEOTEXTILE SOCK FILLED WITH NO FINES GRAVEL, PLACED IN INVERT OF GUTTER., REFER TO DRAWING C02DA FOR DETAIL.
- FALL — DENOTES DIRECTION OF GRADE
- DENOTES LEVEL SPREADER, REFER TO DRAWING C02DA FOR DETAIL.

THIS SITE IS LOCATED WITHIN THE DOYALSON SOIL LANDSCAPE UNIT, WHICH HAS THE FOLLOWING PROPERTIES IN ACCORDANCE WITH TABLE C17 OF THE BLUEBOOK AND BASED ON THE SITE SPECIFIC GEOTECHNICAL REPORT BY CHAMELEON GEOSCIENCES PTD LTD REF: GS8030-1A-REV01.

SITE PARAMETERS	
CONSTRAINT	VALUE
SEDIMENT TYPE	D
SOIL HYDROLOGY GROUP	D
K = SOIL ERODIBILITY (K-FACTOR)	0.018
R = RAINFALL EROSIVITY (R-FACTOR)	2720
S = 2 YEAR, 6 HOUR STORM INTENSITY	11.2mm/hr
LS = SLOPE LENGTH/GRADIENT	0.65 (80m SLOPE @ 3% GRADE)
P = EROSION CONTROL PRACTICE (P-FACTOR)	1.3 (TYPICAL)
C = GROUND COVER (C-FACTOR)	1.0 (TYPICAL FOR STRIPPED SITE)
SOIL LOSS (RUSLE METHOD) (tonnes/ha/yr)	41
EROSION HAZARD (TABLE 4.2 BLUE BOOK)	VERY LOW
SOIL HYDRAULIC GROUP	C/D
USCS CLASS	CH (SM/SC RULED OUT DUE TO THE BORE LOGS)
K FACTOR	0.0180

DUE TO AVERAGE ANNUAL SOIL LOSS BEING LESS THAN 150 TONNES/ha/YEAR. NO FORMALISED SEDIMENT BASIN REQUIRED (THE BLUE BOOK SECTION 6.3.2(D))

DRAWN: A.GRIFFIN
DESIGNED: R.JEANS
JOB MANAGER: K.SINCLAIR
VERIFIER: C.SMITH

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR DA APPROVAL	BD	CS	RJ	27.10.21
2	REVISED FOR DA APPROVAL	BD	CS	RJ	25.02.22

CLIENT
TORONTO INVESTMENTS NO.1

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT
Mark Lawler Architects
DIRECTOR + NOMINATED ARCHITECT: MARK LAWLER (4706)
ASSOCIATE: STEPHEN COOK
33 SMITH STREET, CHARLESTOWN NSW 2290
ABN: 32 376 853 830
P: (02) 4942 3222
F: (02) 4942 3233
E: reception@marklawlerarchitects.com.au
W: markla wlerarchitects.com.au

ALL SETOUT TO ARCHITECT'S DRAWINGS, DIMENSIONS TO BE VERIFIED WITH THE ARCHITECT AND ON SITE BEFORE MAKING SHOP DRAWINGS OR COMMENCING WORK.
NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.

PLANS 1:200 — 0 2 4 6 8 10m

NORTHROP
Newcastle
Suite 4, 215 Pacific Hwy, Charlestown NSW 2290
P.O. Box 180, Charlestown NSW 2290
Ph (02) 4943 1777 Fax (02) 4943 1577
Email newcastle@northrop.com.au ABN 81 094 433 100

PROJECT
118 CARY STREET
TORONTO, NSW, 2283

DRAWING TITLE
EROSION AND SEDIMENT CONTROL PLAN

JOB NUMBER **NL171556**
DRAWING NUMBER **C00DA**
REVISION **2**
DRAWING SHEET SIZE = A1

EROSION AND SEDIMENT CONTROL NOTES

THE FOLLOWING NOTES MAY NOT BE RELEVANT TO EACH DEVELOPMENT.

General

1. ESCP refers to Erosion and Sediment Control Plan or a Soil and Water Management Plan (SWMP).
2. ESC refers to erosion and sediment control.
3. Sediment, includes, but is not limited to, clay, silt, sand, gravel, soil, mud, cement, and ceramic waste.
4. Any reference to the Blue Book refers to Managing Urban Stormwater – Soils and Construction. Landcom, 2004.
5. Any reference to the IECA White Books (2008) refers to IECA 2008. Best Practice Erosion and Sediment Control. Books 1-6. International Erosion Control Association (Australasia). Picton NSW.
6. Any material deposited in any conservation area from works associated with the development shall be removed immediately by measures involving minimal ground and/or vegetation disturbance and no machinery, or following directions by Council and/or within a timeframe advised by Council.

The ESCP

7. The ESCP and its associated ESC measures shall be constantly monitored, reviewed, and modified as required to correct deficiencies. Council has the right to direct changes if, in its opinion, the measures that are proposed or have been installed are inadequate to prevent pollution.
8. Prior to any activities onsite, the responsible person(s) is to be nominated. The responsible person(s) shall be responsible for the ESC measures onsite. The name, address and 24 hour contact details of the person(s) shall be provided to Council in writing. Council shall be advised within 48 hours of any changes to the responsible person(s), or their contact details, in writing.
9. At least 14 days before the natural surface is disturbed in any new stage, the contractor shall submit to the Certifier, a plan showing ESC measures for that Stage. The degree of design detail shall be based on the disturbed area.
10. At any time, the ESC measures onsite shall be appropriate for the area of disturbance and its characteristics including soils (in accordance with those required for the site as per DCP).
11. The implementation of the ESCP shall be supervised by personnel with appropriate qualifications and/or experience in ESC on construction sites.
12. The approved ESCP shall be available on-site for inspection by Council officers while work activities are occurring.
13. The approved ESCP shall be up to date and show a timeline of installation, maintenance and removal of ESC measures.
14. All ESC measures shall be appropriate for the Sediment Type(s) of the soils onsite, in accordance with the Blue Book, IECA White Books or other current recognised industry standard for ESC for Australian conditions.
15. Adequate site data, including soil data from a NATA approved Laboratory, shall be obtained to allow the preparation of an appropriate ESCP, and allow the selection, design and specification of required ESC measures.
16. All works shall be carried out in accordance with the approved ESCP (as amended from time to time) unless circumstances arise where:
    a) compliance with the ESCP would increase the potential for environmental harm; or
    b) circumstances change during construction and those circumstances could not have been foreseen; or
    c) Council determines that unacceptable off-site sedimentation is occurring as a result of a land-disturbing activity. In either case, the person(s) responsible may be required to take additional, or alternative protective action, and/or undertake reasonable restoration works within the timeframe specified by the Council.
17. Additional ESC measures shall be implemented, and a revised ESCP submitted for approval to the certifier (within five business days of any such amendment/s) in the event that:
    a) there is a high probability that serious or material environmental harm may occur as a result of sediment leaving the site; or
    b) the implemented works fail to achieve Council's water quality objectives specified in these conditions; or
    c) site conditions significantly change; or
    d) site inspections indicate that the implemented works are failing to achieve the "objective" of the ESCP.
18. A copy of any amended ESCP shall be forwarded to an appropriate Council Officer, within five business days of any such amendments.

Site establishment including clearing and mulching

19. No land clearing shall be undertaken unless preceded by the installation of adequate drainage and sediment control measures, unless such clearing is required for the purpose of installing such measures, in which case, only the minimum clearing required to install such measures shall occur.
20. Bulk tree clearing and grubbing of the site shall be immediately followed by specified temporary erosion control measures (e.g. temporary grassing or mulching) prior to commencement of each stage of construction works.
21. Trees and vegetation cleared from the site shall be mulched onsite within 7 days of clearing.
22. Appropriate measures shall be undertaken to control any dust originating due to the mulching of vegetation onsite.
23. All office facilities and operational activities shall be located such that any effluent, including wash-down water, can be totally contained and treated within the site.
24. All reasonable and practicable measures shall be taken to ensure stormwater runoff from access roads and stabilised entry/exit systems, drains to an appropriate sediment control device.
25. Site exit points shall be appropriately managed to minimise the risk of sediment being tracked onto sealed, public roadways.
26. Stormwater runoff from access roads and stabilised entry/exit points shall drain to an appropriate sediment control device.
27. The Applicant shall ensure an adequate supply of ESC, and appropriate pollution clean-up materials are available on-site at all times.
28. All temporary earth banks, flow diversion systems, and sediment basin embankments shall be machine-compacted, seeded and mulched within ten (10) days of formation for the purpose of establishing a vegetative cover, or lined appropriately.
29. Sediment deposited off site as a result of on-site activities shall be collected and the area cleaned/rehabilitated as soon as reasonable and practicable.
30. Concrete waste and chemical products, including petroleum and oil-based products, shall be prevented from entering any internal or external water body, or any external drainage system, excluding those on-site water bodies specifically designed to contain and/or treat such material. Appropriate measures shall be installed to trap these materials onsite.
31. Brick, tile or masonry cutting shall be carried out on a pervious surface (e.g. grass or open soil) and in such a manner that any resulting sediment-laden runoff is prevented from discharging into a gutter, drain or water. Appropriate measures shall be installed to trap these materials onsite.
32. Newly sealed hard-stand areas (e.g. roads, driveways and car parks) shall be swept thoroughly as soon as practicable after sealing/surfacing to minimise the risk of components of the surfacing compound entering stormwater drains.
33. Stockpiles of erodible material shall be provided with an appropriate protective cover (synthetic or organic) if the materials are likely to be stockpiled for more than 10 days.
34. Stockpiles, temporary or permanent, shall not be located in areas identified as no-go zones (including, but not limited to, restricted access areas, buffer zones, or areas of non-disturbance) on the ESCP.
35. No more than 150m of a stormwater, sewer line or other service trench shall to be open at any one time.
36. Site spoil shall be lawfully disposed of in a manner that does not result in ongoing soil erosion or environmental harm.
37. Wherever reasonable and practicable, stormwater runoff entering the site from external areas, and non-sediment laden (clean) stormwater runoff entering a work area or area of soil disturbance, shall be diverted around or through that area in a manner that minimises soil erosion and the contamination of that water for all discharges up to the specified design storm discharge.

EROSION AND SEDIMENT CONTROL NOTES (cont)

Site Management including Dust

38. Priority shall be given to the prevention, or at least the minimisation, of soil erosion, rather than the trapping of displaced sediment. Such a clause shall not reduce the responsibility to apply and maintain, at all times, all necessary ESC measures.
39. Measures used to control wind erosion shall be appropriate for the location and prevent soil erosion at all times, including working hours, out of hours, weekends, public holidays, and during any other shutdown periods.
40. The application of liquid or chemical-based dust suppression measures shall ensure that sediment-laden runoff resulting from such measures does not create a traffic or environmental hazard.
41. All cut and fill earth batters less than 3m in elevation shall be topsoiled, and grass seeded/hydromulched within 10 days of completion of grading in consultation with Council.
42. Once cut/fill operations have been finalised in a section, all disturbed areas that are not being worked on shall be stabilised in accordance with time lines in the Blue Book.
43. All reasonable and practicable measures shall be taken to prevent, or at least minimise, the release of sediment from the site.
44. Suitable all-weather maintenance access shall be provided to all sediment control devices.
45. Sediment control devices, other than sediment basins, shall be de-silted and made fully operational as soon as reasonable and practicable after a sediment-producing event, whether natural or artificial, if the device's sediment retention capacity falls below 75% of its design retention capacity.
46. All erosion and sediment control measures, including drainage control measures, shall be maintained in proper working order at all times during their operational lives.
47. Washing/flushing of sealed roadways shall only occur where sweeping has failed to remove sufficient sediment and there is a compelling need to remove the remaining sediment (e.g. for safety reasons). In such circumstances, all reasonable and practicable sediment control measures shall be used to prevent, or at least minimise, the release of sediment into receiving waters. Only those measures that will not cause safety and property flooding issues shall be employed. Sediment removed from roadways shall be disposed of in a lawful manner that does not cause ongoing soil erosion or environmental harm.
48. Sediment removed from sediment traps and places of sediment deposition shall be disposed of in a lawful manner that does not cause ongoing soil erosion or environmental harm.

Sediment Basins – installation, maintenance and removal including sediment traps

49. As-Constructed plans shall be prepared for all constructed Sediment Basins and associated emergency spillways. Such plans shall verify the basin's dimensions, levels and volumes comply with the approved design drawings. These plans may be requested by the Certifier or Council.
50. Sediment basins shall be constructed and fully operational prior to any other soil disturbance in their catchment.
51. Install an internal gated valve, or similar, in any outlet pipe once pipes installed, or install a sacrificial pipe from basin through wall to external outlet point. The valve shall be connected to a riser made from slotted pipe in the basin. The valve may be opened once captured water meets water quality requirements. The final setup for temporary internal outlet structures to be confirmed prior to construction with Council. This setup will enable discharge of treated water from site without need for pumping.
52. A sediment storage level marker post shall be with a cross member set just below the top of the sediment storage zone (as specified on the approved ESCP). At least a 75mm wide post shall be firmly set into the basin floor.
53. The Site Manager shall obtain the relevant approvals from the relevant organisations to discharge treated water from any existing basins. Organisations may include, but not be limited to, Hunter Water, and Council.
54. Where more than one stage is to be developed at one time, or before the preceding stage is complete, the sediment basin(s) for these stages shall have sufficient capacity to cater for all area directed to the basin(s).
55. Prior to any forecast weather event likely to result in runoff, any basins/traps shall be dewatered to provide sufficient capacity to capture sediment laden water from the site.
56. Sufficient quantities of chemicals/agents to treat captured water shall be placed such that water entering the basin mixes with the chemical/agents and is carried into the basin to speed up clarification.
57. Any basin shall be dewatered within the X-day rainfall depth used to calculate the capacity of the basin, after a rainfall event.
58. Sufficient quantities of chemicals/agents to treat turbid water shall be securely stored on-site to provide for at least three complete treatments of all basins requiring chemically treatment onsite.
59. Prior to the controlled discharge (e.g. de-watering activities) from site including excavations and/or sediment basins, the following water quality objectives shall be achieved:
    a) Total Suspended Solids (TSS) to a maximum 50 milligrams/L;
    b) water pH between 6.5 and 8.5, unless otherwise required by the Council;
    c) Turbidity (measured in NTUs) to a maximum of 60 NTU); and
    d) EC levels no greater than background levels.
60. The Development Approval may require testing of additional water quality elements prior to discharge. E.g. metals, organic substances, chemicals or bacteriological indicators.
61. A sample of the released treated water shall be kept onsite in a clear container with the sample date recorded on it.
62. Water quality samples shall be taken at a depth no less than 200mm below the water surface of the basin.
63. No Aluminium based products may be used treat captured water onsite without the prior written permission from an appropriate Council Officer. The applicant shall have a demonstrated ability to use such products correctly and without environmental harm prior to any approval.
64. The chemical/agent used in Type D and Type F basins to treat captured water captured in the basin shall be applied in concentrations sufficient to achieve Council's water quality objectives within the X-day rainfall depth used to calculate the capacity of the basin, after a rainfall event.
65. All Manufacturers' Instructions shall be followed for any chemicals/agents used onsite, except where approved by the Responsible Person or an appropriate Council Officer.
66. The Applicant shall ensure that on each occasion a Type F or Type D basin was not de-watered prior to being surcharged by a following rainfall event, a report is presented to an appropriate Council officer within 5 days identifying the circumstances and proposed amendments, if any, to the basin's operating procedures.
67. Settled sediment shall be removed as soon as reasonable and practicable from any sediment basin if:
    a) it is anticipated that the next storm event is likely to cause sediment to settle above the basin's sediment storage zone; or
    b) the elevation of settled sediment is above the top of the basin's sediment storage zone; or
    c) the elevation of settled sediment is above the basins sediment marker line.
68. Scour protection measures placed on sediment basin emergency spillways shall appropriately protect the spillway chute and its side batters from scour, and shall extend a minimum of 3m beyond the downstream toe of the basin's embankment.
69. Suitable all-weather maintenance access shall be provided to all sediment control devices.
70. Materials, whether liquid or solid, removed from any ESC measure or excavation during maintenance or decommissioning, shall be disposed of in a manner that does not cause ongoing soil erosion, water pollution or environmental harm.
71. All sediment basins shall remain fully operational at all times until the basin's design catchment achieves 70% ground cover or surface stabilisation acceptable to Council.
72. The ESC measures installed during the decommissioning and rehabilitation of a sediment basin shall comply with same standards specified for the normal construction works.
73. A sediment basin shall not be decommissioned until all up-slope site stabilisation measures have been implemented and are appropriately working to control soil erosion and sediment runoff..
74. Immediately prior to the construction of the permanent stormwater treatment device, appropriate flow bypass conditions shall be established to prevent sediment-laden water entering the device.

EROSION AND SEDIMENT CONTROL NOTES (cont)

Revegetation/Stabilisation

75. Temporary Stabilisation may be attained using vegetation, non rewettable soil polymers, or pneumatically applied erosion controls.
76. All cut and fill earth batters less than 3m in elevation shall be topsoiled, and grass seeded/hydromulched within 10 days of completion of grading in consultation with Council.
77. Once cut/fill operations have been finalised in a section, all disturbed areas that are not being worked on shall be stabilised in accordance with time lines in the Blue Book.
78. The LMCC Seed mix shall be used unless stated on the ESCP/SWMP.
79. The pH level of topsoil shall be appropriate to enable establishment and growth of specified vegetation prior to initiating the establishment of vegetation.
80. Non rewettable binder shall be used in all hydromulch/hydroseed/polymer mixes on slopes or works adjacent to a water course.
81. Soil ameliorants shall be added to the soil in accordance with an approved Landscape Plan, Vegetation Management Plan, and/or soil analysis.
82. Surface soil density, compaction and surface roughness shall be adjusted prior to seeding/planting in accordance with an approved Landscape Plan, Vegetation Management Plan, and/or soil analysis.
83. Procedures for initiating a site shutdown, whether programmed or un-programmed, shall incorporate revegetation of all soil disturbances unless otherwise approved by Council. The stabilisation works shall not rely upon the longevity of non-vegetated erosion control blankets, or temporary soil binders.

Site Monitoring and Maintenance

84. The Applicant shall ensure that appropriate procedures and suitably qualified personnel are engaged to plan and conduct site inspections and water quality monitoring throughout the construction and maintenance phase.
85. All ESC measures shall be inspected and any maintenance undertaken immediately:
    a) at least daily (when work is occurring on-site); and
    b) at least weekly (when work is not occurring on-site); and
    c) within 24hrs of expected rainfall; and
    d) within 18hrs of a rainfall event that causes runoff on the site.
86. Written records shall be kept onsite of ESC monitoring and maintenance activities conducted during the construction and maintenance periods, and be available to Council officers on request.
87. All environmentally relevant incidents shall be recorded in a field log that shall remain accessible to all relevant regulatory authorities.
88. All water quality data, including dates of rainfall, dates of testing, testing results and dates of water release, shall be kept in an on-site register. The register is to be maintained up to date for the duration of the approved works and be available on-site for inspection by [insert name of regulatory authority] on request.
89. At nominated instream water monitoring sites, a minimum of 3 water samples shall be taken and analysed, and the average result used to determine quality.

Instream Works

90. All instream works (including in or adjacent to watercourses natural or manmade, flowing or not) shall be carried out in accordance with the IECA White Books.

DRAWN: A.GRIFFIN DESIGNED: R.JEANS JOB MANAGER: K.SINCLAIR VERIFIER: C.SMITH

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR DA APPROVAL	BD	CS	RJ	27.10.21
2	REVISED FOR DA APPROVAL	BD	CS	RJ	25.02.22

CLIENT
TORONTO INVESTMENTS NO.1

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT
Mark Lawler Architects
DIRECTOR + NOMINATED ARCHITECT: MARK LAWLER (4766)
ASSOCIATE: STEPHEN COOK
33 SMITH STREET, CHARLESTOWN NSW 2290
ABN: 32 374 833 830
T: P. (02) 4942 2222
F: F. (02) 4942 2233
E: E. reception@marklawlerarchitects.com.au
W: W. markllawlerarchitects.com.au

THE COPYRIGHT OF THIS DRAWING REMAINS WITH NORTHROP CONSULTING ENGINEERS PTY LTD.

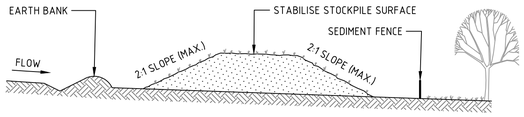
ALL SETOUT TO ARCHITECT'S DRAWINGS. DIMENSIONS TO BE VERIFIED WITH THE ARCHITECT AND ON SITE BEFORE MAKING SHOP DRAWINGS OR COMMENCING WORK.
NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.

NORTHROP
Newcastle
Suite 4, 215 Pacific Hwy, Charlestown NSW 2290
P.O. Box 180, Charlestown NSW 2290
Ph (02) 4943 1777 Fax (02) 4943 1577
Email newcastle@northrop.com.au ABN 81 094 433 100

PROJECT
118 CARY STREET
TORONTO, NSW, 2283

DRAWING TITLE
EROSION AND SEDIMENT CONTROL NOTES

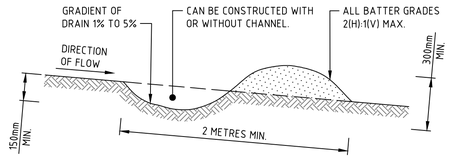
JOB NUMBER **NL171556**
DRAWING NUMBER **C01DA**
REVISION **2**
DRAWING SHEET SIZE = A1



CONSTRUCTION NOTES

1. PLACE STOCKPILES MORE THAN 2m (PREFERABLY 5m) FROM EXISTING VEGETATION, CONCENTRATED WATER FLOW, ROADS AND HAZARD AREAS.
2. CONSTRUCT ON THE CONTOUR AS LOW, FLAT, ELONGATED MOUNDS.
3. WHERE THERE IS SUFFICIENT AREA, TOPSOIL STOCKPILES SHALL BE LESS THAN 2m IN HEIGHT.
4. WHERE THEY ARE TO BE IN PLACE FOR MORE THAN 10 DAYS, STABILISE FOLLOWING THE APPROVED ESCP OR SWMP TO REDUCE THE C-FACTOR TO LESS THAN 0.10.
5. CONSTRUCT EARTH BANKS (STANDARD DRAWING 5-5) ON THE UPSLOPE SIDE TO DIVERT WATER AROUND STOCKPILES AND SEDIMENT FENCES (STANDARD DRAWING 6-8) 1 TO 2m DOWNSLOPE.

STOCKPILES (SD 4-1)

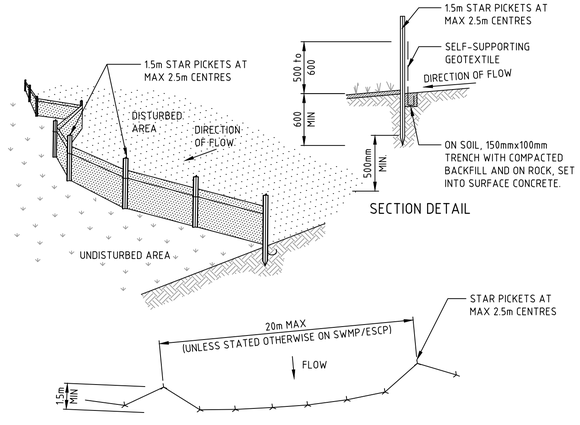


CONSTRUCTION NOTES

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

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

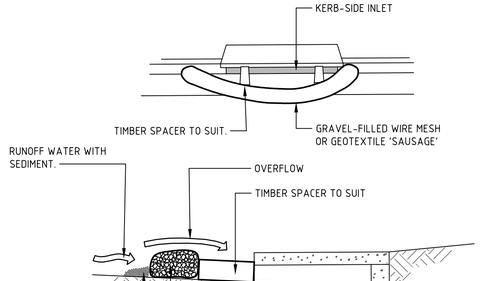
EARTH BANK - LOW FLOW (SD 5-5)



CONSTRUCTION NOTES

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

SEDIMENT FENCE (SD 6-8)

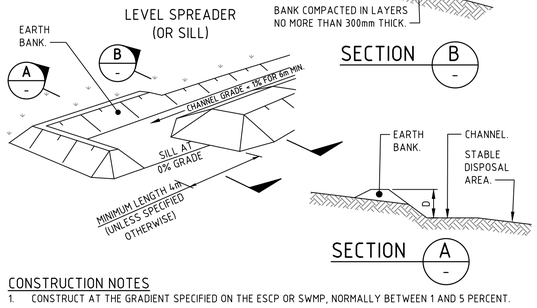


NOTE:THIS PRACTICE ONLY TO BE USED WHERE SPECIFIED IN APPROVED SWMP/ESCP.

CONSTRUCTION NOTES

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

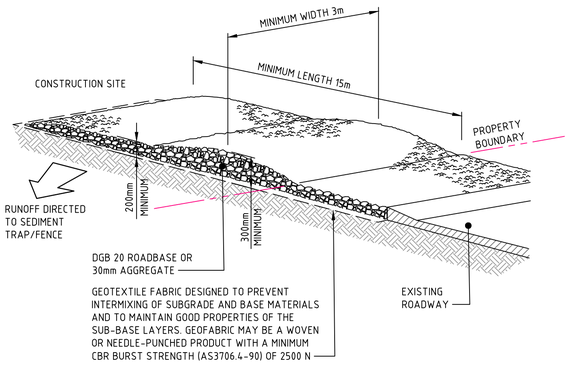
MESH AND GRAVEL INLET FILTER (SD 6-11)



CONSTRUCTION NOTES

1. CONSTRUCT AT THE GRADIENT SPECIFIED ON THE ESCP OR SWMP, NORMALLY BETWEEN 1 AND 5 PERCENT.
2. AVOID REMOVING TREES AND SHRUBS IF POSSIBLE - WORK AROUND THEM.
3. ENSURE THE STRUCTURES ARE FREE OF PROJECTIONS OR OTHER IRREGULARITIES THAT COULD IMPEDE WATER FLOW.
4. BUILD THE DRAINS WITH CIRCULAR, PARABOLIC OR TRAPEZOIDAL CROSS SECTIONS, NOT V-SHAPED, AT THE DIMENSIONS SHOWN ON THE SWMP.
5. ENSURE THE BANKS ARE PROPERLY COMPACTED TO PREVENT FAILURE.
6. COMPLETE PERMANENT OR TEMPORARY STABILISATION WITHIN 10 DAYS OF CONSTRUCTION FOLLOWING TABLE 5.2 IN LANDCOM (2004).
7. WHERE DISCHARGING TO ERODIBLE LANDS, ENSURE THEY OUTLET THROUGH A PROPERLY CONSTRUCTED LEVEL SPREADER.
8. CONSTRUCT THE LEVEL SPREADER AT THE GRADIENT SPECIFIED ON THE ESCP OR SWMP, NORMALLY LESS THAN 1 PERCENT OR LEVEL.
9. WHERE POSSIBLE, ENSURE THEY DISCHARGE WATERS ONTO EITHER STABILISED OR UNDISTURBED DISPOSAL SITES WITHIN THE SAME SUBCATCHMENT AREA FROM WHICH THE WATER ORIGINATED. APPROVAL MIGHT BE REQUIRED TO DISCHARGE INTO OTHER SUBCATCHMENTS.

EARTH BANK - HIGH FLOWS (SD 5-6)



CONSTRUCTION NOTES

1. STRIP THE TOPSOIL, LEVEL THE SITE AND COMPACT THE SUBGRADE.
2. COVER THE AREA WITH NEEDLE-PUNCHED GEOTEXTILE.
3. CONSTRUCT A 200mm THICK PAD OVER THE GEOTEXTILE USING ROAD BASE OR 30mm AGGREGATE.
4. ENSURE THE STRUCTURE IS AT LEAST 15 METRES LONG OR TO BUILDING ALIGNMENT AND AT LEAST 3 METRES WIDE.
5. WHERE A SEDIMENT FENCE JOINS ONTO THE STABILISED ACCESS, CONSTRUCT A HUMP IN THE STABILISED ACCESS TO DIVERT WATER TO THE SEDIMENT FENCE.

STABILISED SITE ACCESS (SD 6-14)

VERIFIER: C.SMITH
JOB MANAGER: K.SINCLAIR
DESIGNED: R.JEANS
DRAWN: A.GRIFFIN

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR DA APPROVAL	BD	CS	RJ	27.10.21
2	REVISED FOR DA APPROVAL	BD	CS	RJ	25.02.22

CLIENT
TORONTO INVESTMENTS NO.1

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT
Mark Lawler Architects
DIRECTOR + NOMINATED ARCHITECT: MARK LAWLER (4766)
ASSOCIATE: STEPHEN COON
16 SMITH STREET, CHARLESTOWN NSW 2290
ABN: 32 376 853 830
T: P. (02) 4942 2222
T: F. (02) 4942 5233
T: W. recognition@markllawlerarchitects.com.au
markllawlerarchitects.com.au

ALL SETOUT TO ARCHITECT'S DRAWINGS. DIMENSIONS TO BE VERIFIED WITH THE ARCHITECT AND ON SITE BEFORE MAKING SHOP DRAWINGS OR COMMENCING WORK. NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.

NORTHROP
Newcastle
Suite 4, 215 Pacific Hwy, Charlestown NSW 2290
P.O. Box 180, Charlestown NSW 2290
Ph (02) 4943 1777 Fax (02) 4943 1577
Email newcastle@northrop.com.au ABN 81 094 433 100

PROJECT
118 CARY STREET
TORONTO, NSW, 2283

DRAWING TITLE
EROSION AND SEDIMENT CONTROL DETAILS

JOB NUMBER **NL171556**
DRAWING NUMBER **C02DA**
REVISION **2**
DRAWING SHEET SIZE = A1

CARY STREET

ARNOTT AVENUE

LEGEND

- PROPOSED BOUNDARY LINE
- DENOTES PROPOSED CARPARK PAVEMENT. DETAILS TO BE PROVIDED AT CC STAGE.
- DENOTES BUILDING. REFER TO ARCHITECTS DRAWINGS FOR DETAILS.
- DENOTES PROPOSED STORMWATER PIPE. DETAILS TO BE PROVIDED AT CC STAGE.
- DENOTES PROPOSED PUMP OUT PIT. DETAILS TO BE PROVIDED AT CC STAGE.
- DENOTES EXISTING KERB INLET PIT
- FW CL-1.55 — DENOTES PROPOSED FLOOR WASTE AND COVER LEVEL. DETAILS TO BE PROVIDED AT CC STAGE.
- VR — DENOTES PROPOSED VERTICAL RISER. DETAILS TO BE PROVIDED AT CC STAGE.
- RL4.50 — PROPOSED SPOT HEIGHT
- FALL — PROPOSED DIRECTION OF GRADE

CARPARK PAVEMENT TO BE GRADED TO FLOOR WASTES AT 0.5% MINIMUM (TYPICAL).

PROVIDE BELOW GROUND PUMP OUT PIT WITH MINIMUM STORAGE VOLUME OF 3m³. OUTLET PIPE TO BE CONVEYED TO OSD TANK ABOVE.

INDICATIVE LOCATION OF VERTICAL RISER FROM BASEMENT LEVEL 1 ABOVE. ACTUAL LOCATIONS TO BE CONFIRMED AT CC STAGE.

VERIFIER: C.SMITH
JOB MANAGER: K.SINCLAIR
DESIGNED: R.JEANS
DRAWN: A.GRIFFIN

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR DA APPROVAL	BD	CS	RJ	27.10.21
2	REVISED FOR DA APPROVAL	BD	CS	RJ	25.02.22

CLIENT
TORONTO INVESTMENTS NO.1

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT
Mark Lawler Architects.
DIRECTOR + NOMINATED ARCHITECT: MARK LAWLER (4766)
ASSOCIATE: STEPHEN COOK
33 SMITH STREET, CHARLESTOWN NSW 2290
ABN: 32 374 833 830
P: (02) 4942 2222
F: (02) 4942 2333
E: reception@marklawlerarchitects.com.au
W: marklawlerarchitects.com.au

ALL SETOUT TO ARCHITECT'S DRAWINGS, DIMENSIONS TO BE VERIFIED WITH THE ARCHITECT AND ON SITE BEFORE MAKING SHOP DRAWINGS OR COMMENCING WORK.
NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.

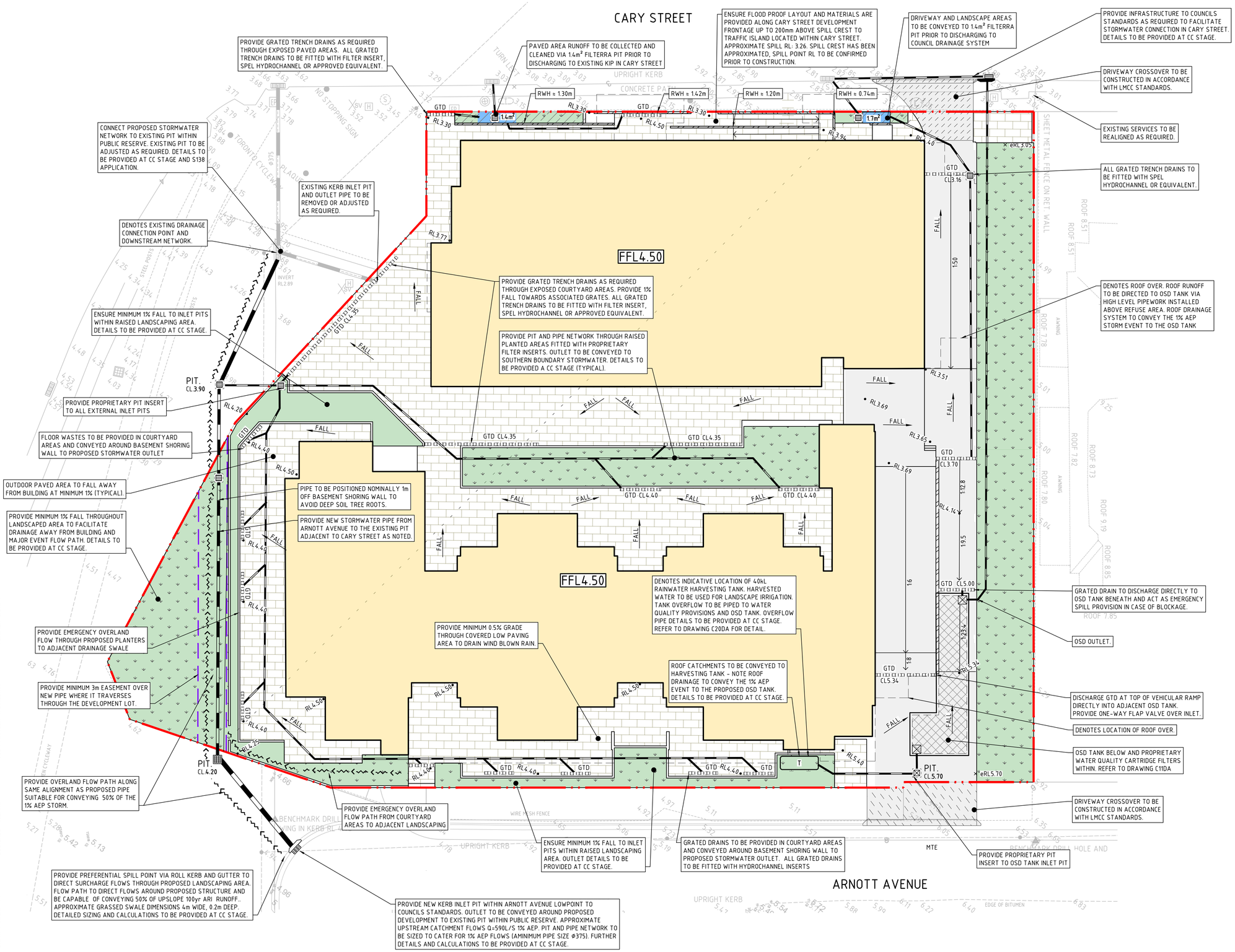
PLANS 1:200 0 2 4 6 8 10m

NORTHROP
Newcastle
Suite 4, 215 Pacific Hwy, Charlestown NSW 2290
P.O. Box 180, Charlestown NSW 2290
Ph (02) 4943 1777 Fax (02) 4943 1577
Email newcastle@northrop.com.au ABN 81 094 433 100

PROJECT
118 CARY STREET
TORONTO, NSW, 2283

DRAWING TITLE
STORMWATER MANAGEMENT AND LEVELS PLAN - BASEMENT 2

JOB NUMBER **NL171556**
DRAWING NUMBER **C10DA**
REVISION **2**
DRAWING SHEET SIZE = A1



LEGEND

- PROPOSED BOUNDARY LINE
- DENOTES PROPOSED CARPARK PAVEMENT. DETAILS TO BE PROVIDED AT CC STAGE.
- DENOTES DRIVEWAY CROSSOVER TO BE CONSTRUCTED IN ACCORDANCE WITH LMCC STANDARDS.
- DENOTES BUILDING. REFER TO ARCHITECTS DRAWINGS FOR DETAILS.
- DENOTES PROPOSED PEDESTRIAN PAVEMENT.
- DENOTES PROPOSED LANDSCAPING. REFER TO LANDSCAPE ARCHITECTS DRAWINGS FOR DETAILS.
- DENOTES PROPOSED STORMWATER PIPE. DETAILS TO BE PROVIDED AT CC STAGE.
- DENOTES EXISTING STORMWATER PIPE.
- PIT. CL 4.25 — DENOTES PROPOSED GRATED INLET PIT. DETAILS TO BE PROVIDED AT CC STAGE.
- DENOTES PROPOSED ACCESS HATCH
- DENOTES EXISTING KERB INLET PIT
- VR — DENOTES PROPOSED VERTICAL RISER. DETAILS TO BE PROVIDED AT CC STAGE.
- GTD — DENOTES PROPOSED GRATED TRENCH DRAIN. DETAILS TO BE PROVIDED AT CC STAGE
- DENOTES PROPOSED ON-SITE DETENTION TANK. DETAILS TO BE PROVIDED AT CC STAGE.
- RL4.50 — PROPOSED SPOT HEIGHT
- eRL5.58 — EXISTING SPOT HEIGHT
- FALL — PROPOSED DIRECTION OF GRADE
- DENOTES PROPOSED RETAINING WALL. DETAILS TO BE PROVIDED AT CC STAGE.
- FFL4.50 — DENOTES PROPOSED FINISHED FLOOR LEVEL.
- RWH = 1.00m — DENOTES APPROXIMATE PROPOSED RETAINING WALL HEIGHT.
- DENOTES EXISTING DISH DRAIN
- DENOTES EASEMENT
- DENOTES OVERLAND FLOW PATH
- T — DENOTES PROPOSED RAINWATER HARVESTING TANK. REFER TO DRAWING C20DA FOR DETAIL.
- DENOTES FILTERA FILTER. REFER TO MANUFACTURERS SPECIFICATIONS FOR DETAIL

VERIFIER C.SMITH
JOB MANAGER K.SINCLAIR
DESIGNED R.JEANS
DRAWN A.GRIFFIN

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR DA APPROVAL	BD	CS	RJ	27.10.21
2	REVISED FOR DA APPROVAL	BD	CS	RJ	25.02.22

CLIENT
TORONTO INVESTMENTS NO.1

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT
Mark Lawler Architects
DIRECTOR + NOMINATED ARCHITECT: MARK LAWLER (4766)
ASSOCIATE: STEPHEN COOK
55 SMITH STREET, CHARLESTOWN NSW 2290
ABN: 32 376 853 830
T: A.
T: B.
E:
W:
(02) 4942 3222
(02) 4942 3232
reception@marklawlerarchitects.com.au
marklawlerarchitects.com.au

PLANS 1:200 — 0 2 4 6 8 10m

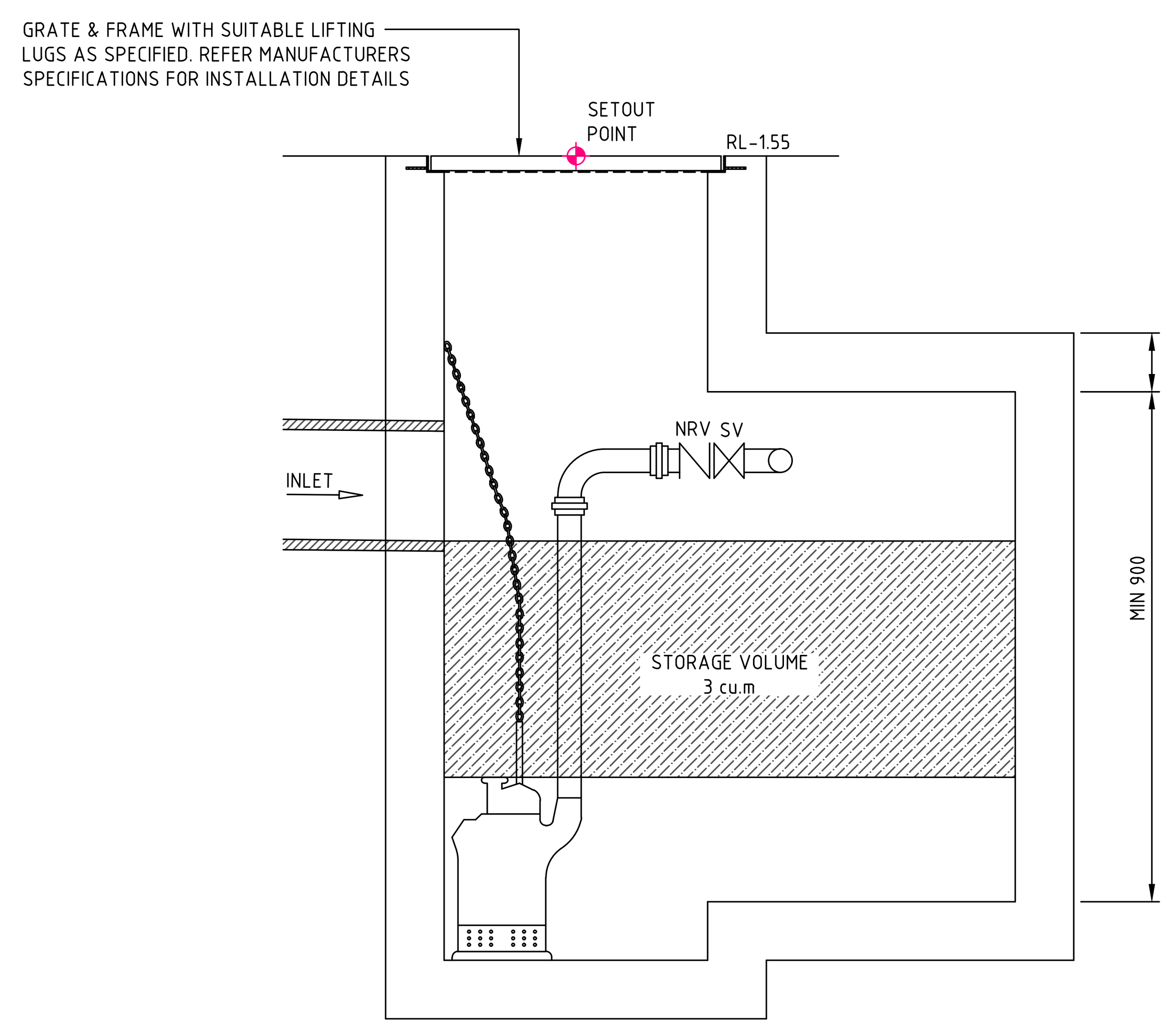
ALL SETOUT TO ARCHITECT'S DRAWINGS, DIMENSIONS TO BE VERIFIED WITH THE ARCHITECT AND ON SITE BEFORE MAKING SHOP DRAWINGS OR COMMENCING WORK.
NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.

NORTHROP
Newcastle
Suite 4, 215 Pacific Hwy, Charlestown NSW 2290
P.O. Box 180, Charlestown NSW 2290
Ph (02) 4943 1777 Fax (02) 4943 1577
Email newcastle@northrop.com.au ABN 81 094 433 100

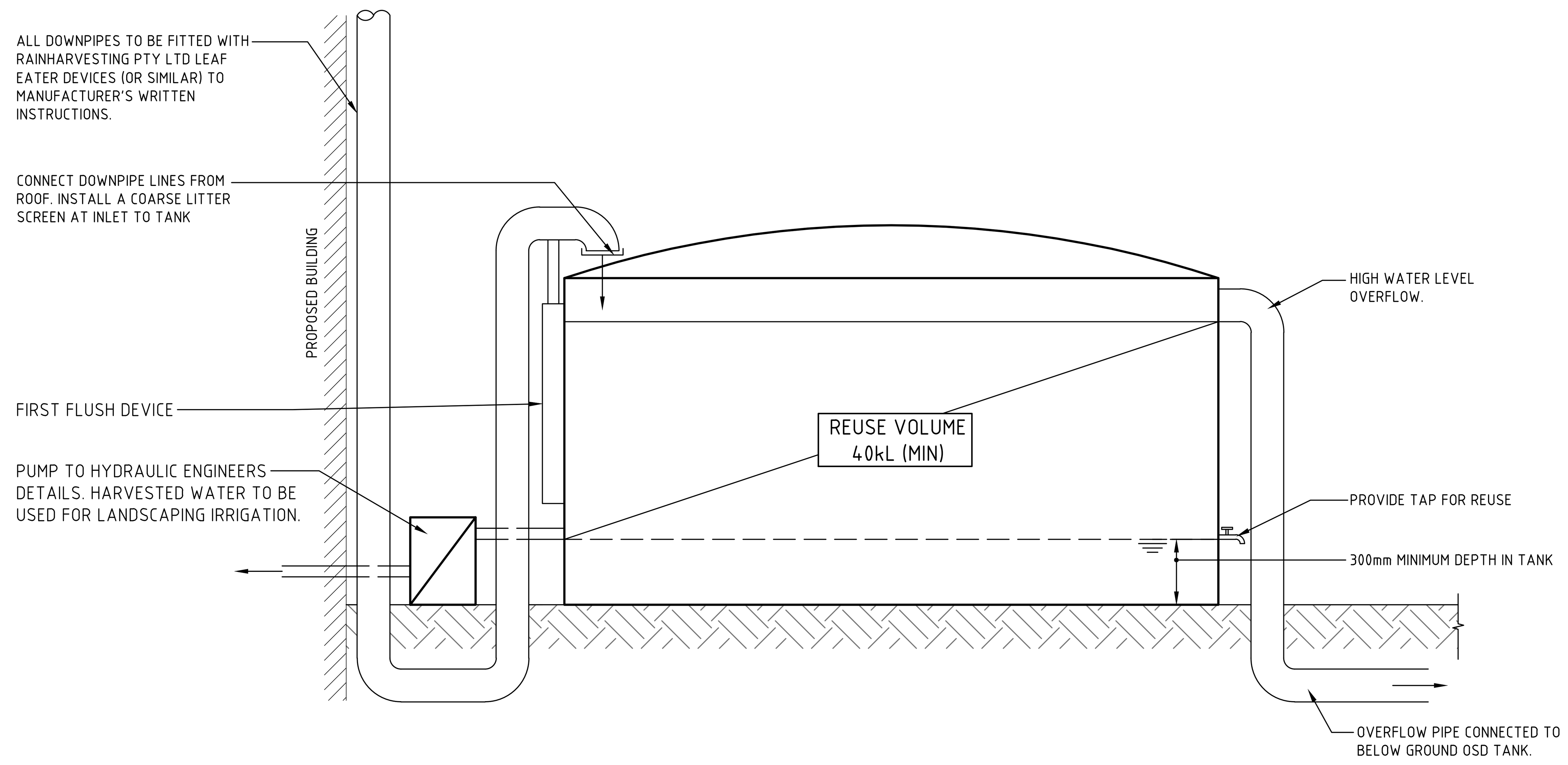
PROJECT
118 CARY STREET
TORONTO, NSW, 2283

DRAWING TITLE
STORMWATER MANAGEMENT AND LEVELS PLAN - GROUND FLOOR

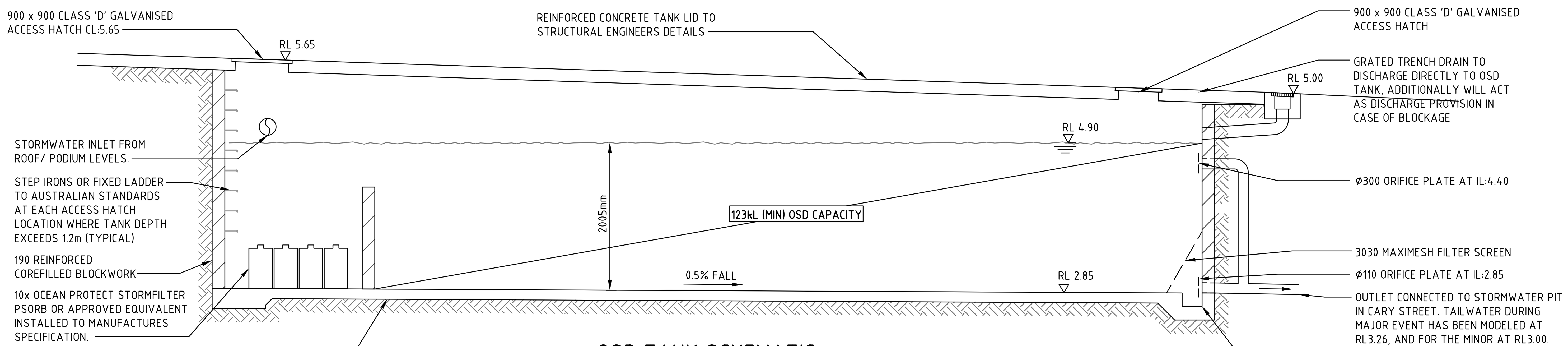
JOB NUMBER **NL171556**
DRAWING NUMBER **C12DA**
REVISION **2**
DRAWING SHEET SIZE = A1



PUMP-OUT PIT STRUCTURE



RAINWATER HARVESTING TANK



OSD TANK SCHEMATIC

DRAWN A.GRIFFIN · DESIGNED R.JEANS · JOB MANAGER K.SINCLAIR · VERIFIER C.SMITH

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR DA APPROVAL	BD	CS	RJ	27.10.21
2	REVISED FOR DA APPROVAL	BD	CS	RJ	25.02.22

CLIENT: TORONTO INVESTMENTS NO.1

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT: Mark Lawler Architects

ALL SETOUT TO ARCHITECT'S DRAWINGS, DIMENSIONS TO BE VERIFIED WITH THE ARCHITECT AND ON SITE BEFORE MAKING SHOP DRAWINGS OR COMMENCING WORK.
NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.

DETAILS 1:20 0 200 400 600 800 1000
DETAILS 1:50 0 0.5 1 1.5 2 2.5m

NORTHROP
Newcastle
Suite 4, 215 Pacific Hwy, Charlestown NSW 2290
P.O. Box 180, Charlestown NSW 2290
Ph (02) 4943 1777 Fax (02) 4943 1577
Email newcastle@northrop.com.au ABN 81 094 433 100

PROJECT: 118 CARY STREET TORONTO, NSW, 2283

DRAWING TITLE: CIVIL DETAILS

JOB NUMBER: NL171556

DRAWING NUMBER: C20DA · REVISION: 2

DRAWING SHEET SIZE = A1

NEW MEDIAN EXTENSION TO MATCH NEATLY INTO EXISTING.

7.25m

ONLY

R2-14A(L)

CARY STREET

UPRIGHT KERB

VC

EXTENT NEW PIPE TO EXISTING COUNCIL DRAINAGE PIT.

EXISTING PIT AND PIPE TO BE REMOVED.

INTERNAL DEVELOPMENT

REFER TO PLANS PREPARED BY NORTHROP.

ROOF 9.10

ROOF 8.83

ROOF 8.51

ROOF 8.38

ROOF 10.68

ROOF 7.82

ROOF 7.80

ROOF 7.85

BACK OF UPRIGHT KERB

BAY STREET

MINIMUM 4m WIDE OVERLAND FLOW PATH. REGRADE ADJACENT LAND AS REQUIRED.

NO STOPPING

R5-400(L&R)

A C31DA

B C31DA

EXISTING POWER POLES TO BE RELOCATED TO AUSGRID REQUIREMENTS.

EXISTING POWER POLES TO BE RELOCATED BEHIND BACK OF KERB TO AUSGRID REQUIREMENTS.

R12.0m

RKG

R8.0m

KG

KR

R5.0m

2.9m

1.5m

4.6m

8.0m

3.6m

ARNOTT STREET

PROVIDE ROLL KERB AROUND CORNER TO PROVIDE VEHICLE ACCESS TO COUNCIL LAND FOR MAINTENANCE PURPOSES. ROLL KERB TO ALSO FACILITATE OVERLAND FLOW IN THE EVENT OF PIPE BLOCKAGE.

EXISTING SCHOOL ZONE SIGNAGE TO BE REPLACED BEHIND NEW KERB.

NEW DRIVEWAY LAYBACKS TO BE PROVIDED AT EXISTING DRIVEWAY LOCATIONS.

LEGEND

- PROPOSED BOUNDARY LINE.
- DENOTES DRIVEWAY CROSSOVER TO BE CONSTRUCTED IN ACCORDANCE WITH LMCC STANDARDS.
- DENOTES FOOTPATH PAVEMENT TO BE CONSTRUCTED IN ACCORDANCE WITH LMCC STANDARDS.
- DENOTES MEDIAN EXTENSION PAVEMENT IN ACCORDANCE WITH LMCC STANDARDS.
- DENOTES EXISTING STORMWATER PIT.
- DENOTES EXISTING STORMWATER PIPE.
- DENOTES EXISTING STORMWATER PIPE TO BE REMOVED.
- DENOTES PROPOSED STORMWATER PIT
- DENOTES PROPOSED STORMWATER PIPE.
- DENOTES MINIMUM 4m OVERLAND FLOW PATH.
- DENOTES PROPOSED STREET SIGN.
- KG — DENOTES PROPOSED NEW KERB AND GUTTER TO BE CONSTRUCTED IN ACCORDANCE WITH LMCC.
- RKG — DENOTES PROPOSED NEW ROLL KERB AND GUTTER TO BE CONSTRUCTED IN ACCORDANCE WITH LMCC.
- KR — DENOTES PROPOSED NEW KERB RAMP TO BE CONSTRUCTED IN ACCORDANCE WITH LMCC.
- VC — DENOTES PROPOSED NEW VEHICLE CROSSING CONSTRUCTED IN ACCORDANCE WITH LMCC.

VERIFIER C.SMITH

JOB MANAGER K.SINCLAIR

DESIGNED R.JEANS

DRAWN L.STEEL

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR DA APPROVAL	LS	CS	RJ	27.10.21
2	REVISED FOR DA APPROVAL	BD	CS	RJ	25.02.22

CLIENT

TORONTO INVESTMENTS NO.1

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT

Mark Lawler Architects.

DIRECTOR + NOMINATED ARCHITECT: MARK LAWLER (4766)
ASSOCIATE: STEPHEN COOK
30 SMITH STREET, CHARLESTOWN NSW 2290
ABN: 32 374 833 830

P: (02) 4942 3222
F: (02) 4942 3333
E: reception@marklawlerarchitects.com.au
W: marklawlerarchitects.com.au

ALL SETOUT TO ARCHITECT'S DRAWINGS. DIMENSIONS TO BE VERIFIED WITH THE ARCHITECT AND ON SITE BEFORE MAKING SHOP DRAWINGS OR COMMENCING WORK. NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.

PLANS 1:250 0 2.5 5 7.5 10 12.5m

NORTHROP

Newcastle
Suite 4, 215 Pacific Hwy, Charlestown NSW 2290
P.O. Box 180, Charlestown NSW 2290
Ph (02) 4943 1777 Fax (02) 4943 1577
Email newcastle@northrop.com.au ABN 81 094 433 100

PROJECT

118 CARY STREET TORONTO, NSW, 2283

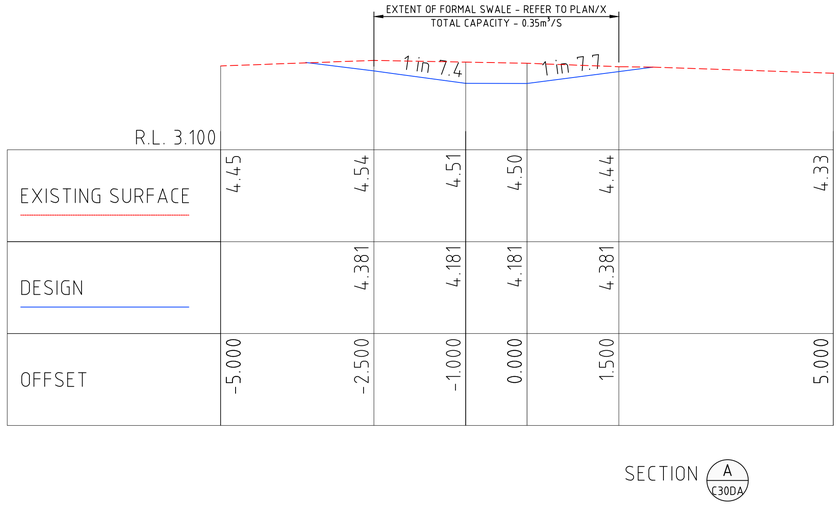
DRAWING TITLE

CONCEPT EXTERNAL WORKS PLAN

JOB NUMBER **NL171556**

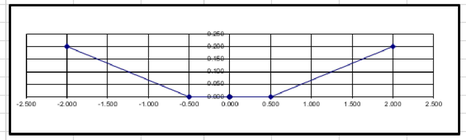
DRAWING NUMBER **C30DA** REVISION **2**

DRAWING SHEET SIZE = A1



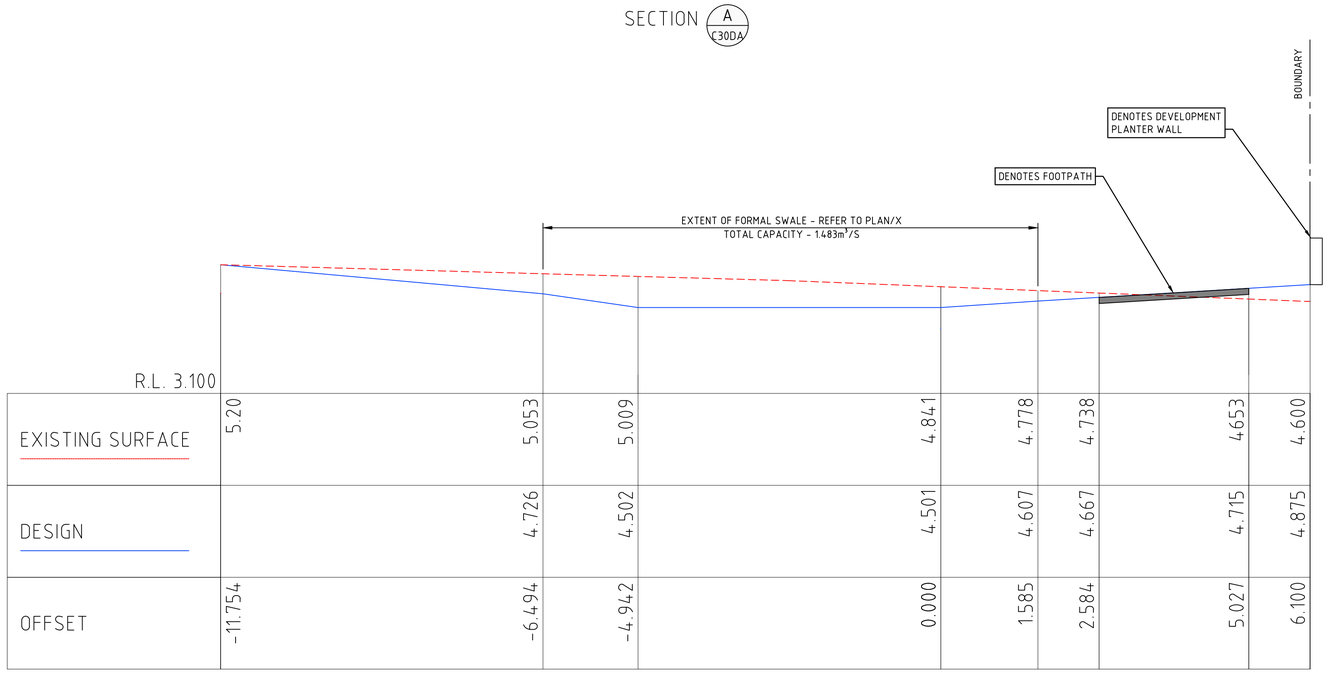
SECTION A C30DA

Channel Name =	**Section A**
AREA sq.m =	0.50
WETTED PERIMETER m =	4.03
VELOCITY m/s =	0.70
VELOCITY HEAD m =	0.03
VxD =	0.14
MANNINGS "n" =	0.035
GRADE % =	1.0
CAPACITY cu.m/s =	**0.352**



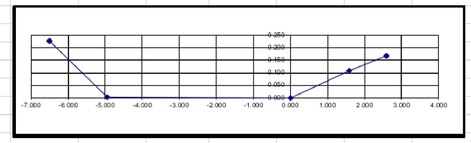
CHANNEL PROFILE

	Left offsets (-m)				Centre				Right offsets (+m)
Offsets	-2.000	-0.500	0.000	0.000	0.000	0.000	0.000	0.500	2.000
Depth (-m)	0.200	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.200



SECTION B C30DA

Channel Name =	**Section B**
AREA sq.m =	1.63
WETTED PERIMETER m =	9.10
VELOCITY m/s =	0.91
VELOCITY HEAD m =	0.04
VxD =	0.21
MANNINGS "n" =	0.035
GRADE % =	1.0
CAPACITY cu.m/s =	**1.483**



CHANNEL PROFILE

	Left offsets (-m)				Centre				Right offsets (+m)
Offsets	-6.494	-6.494	-6.494	-4.942	0.000	1.585	2.584	2.584	2.584
Depth (-m)	0.226	0.226	0.226	0.002	0.001	0.107	0.167	0.167	0.167

VERIFIER C.SMITH
JOB MANAGER K.SINCLAIR
DESIGNED R.JEANS
DRAWN L.STEEL

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR INFORMATION	LS	CS	RJ	16.08.21
2	REVISED FOR DA APPROVAL	BD	CS	RJ	25.02.22

CLIENT
TORONTO INVESTMENTS NO.1

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT
Mark Lawler Architects
DIRECTOR + NOMINATED ARCHITECT: MARK LAWLER (4766)
ASSOCIATE: STEPHEN COOK
20 SMITH STREET, CHARLESTOWN NSW 2290
ABN: 32 374 853 830
P: (02) 4942 2222
A: (02) 4942 2333
E: reception@marklawlerarchitects.com.au
W: marklawlerarchitects.com.au

THE COPYRIGHT OF THIS DRAWING REMAINS WITH NORTHROP CONSULTING ENGINEERS PTY LTD.

ALL SETOUT TO ARCHITECT'S DRAWINGS. DIMENSIONS TO BE VERIFIED WITH THE ARCHITECT AND ON SITE BEFORE MAKING SHOP DRAWINGS OR COMMENCING WORK.
NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.

PLANS 1:100 0 1 2 3 4 5m

NORTHROP
Newcastle
Suite 4, 215 Pacific Hwy, Charlestown NSW 2290
P.O. Box 180, Charlestown NSW 2290
Ph (02) 4943 1777 Fax (02) 4943 1577
Email newcastle@northrop.com.au ABN 81 094 433 100

PROJECT
118 CARY STREET
TORONTO, NSW, 2283

DRAWING TITLE
CONCEPT EXTERNAL SWALE CROSS SECTIONS

JOB NUMBER **NL171556**
DRAWING NUMBER **C31DA**
REVISION **2**
DRAWING SHEET SIZE = A1

CARY STREET

ARNOTT AVENUE

EXISTING REDUNDANT STORMWATER PIPE TO BE REMOVED

PROPOSED SEWER DIVERSION TO BE CONNECTED TO EXISTING SEWER MAIN LOCATED DOWNSTREAM OF THE SITE. REDUNDANT PIPEWORK TO BE REMOVED

PROPOSED WATER MAIN DIVERSION TO CONNECT BACK INTO THE EXISTING HWC WATER MAIN TO THE SOUTH OF THE SITE. REDUNDANT PIPEWORK TO BE REMOVED

PROPOSED SEWER AND WATER MAIN ADJUSTMENTS TO BE INSTALLED WITHIN PROPOSED 3M WIDE EASEMENT

EXISTING WATER MAIN TO BE INTERCEPTED ADJACENT TO BATH STREET AND DIVERTED AROUND THE PROPOSED DEVELOPMENT

EXISTING SEWER TO BE INTERCEPTED AT EXISTING SEWER MANHOLE LOCATION AND DIVERTED AROUND THE PROPOSED DEVELOPMENT

EXISTING SEWER TO BE INTERCEPTED AT EXISTING SEWER MANHOLE LOCATION AND DIVERTED AROUND THE PROPOSED DEVELOPMENT

PIT. CL 3.90

PIT. CL 4.20

BENCHMARK DRILL HOLE AND WING IN KERB RL 4.78

BENCHMARK DRILL HOLE AND WING IN KERB RL6.61

LOT 8 DP 2505 607.0m²

LOT 7 DP 2505 607.0m²

LOT 6 DP 2505 607.0m²

LOT 5 DP 2505 689.2m²

LOT 4 DP 2505 689.2m²

LOT 9 DP 2505 607.0m²

LOT 10 DP 2505 607.0m²

LOT 101 DP1110774 279.5m²

"A" "B" "C"

UPRIGHT KERB

CONCRETE PATH

NO STOPPING SIGN

TURN LEFT

PARKING SIGN

TORONTO CYCLEWAY

PLAQUE

SHEET METAL FENCE ON RET WALL

CONCRETE RET WALL

BITUMEN ROAD

BITUMEN CYCLEWAY

EDGE OF BITUMEN

AWNING

ROOF 8.51

ROOF 7.78

ROOF 7.82

ROOF 8.73

ROOF 7.80

ROOF 8.85

ROOF 7.85

INVERT RL2.86

INVERT RL2.89

NOT LOCATED

LEGEND

- PROPOSED BOUNDARY LINE
- DENOTES NEW STORMWATER PIPE.
- DENOTES EXISTING STORMWATER PIPE.
- DENOTES NEW GRATED INLET PIT.
- DENOTES EXISTING KERB INLET PIT
- DENOTES EASEMENT
- DENOTES PROPOSED SEWER.
- W DENOTES PROPOSED WATER.

VERIFIER:

JOB MANAGER:

DESIGNED:

DRAWN:

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR DA APPROVAL	LS		CS	27.10.21

CLIENT

TORONTO INVESTMENTS NO.1

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT

Mark Lawler Architects

DIRECTOR + NOMINATED ARCHITECT: MARK LAWLER (4766)
ASSOCIATE: STEPHEN COON
33 SMITH STREET, CHARLESTOWN NSW 2290
ABN: 32 376 853 830

P. (02) 4942 3222
F. (02) 4942 3232
E. reception@marklawlerarchitects.com.au
W. marklawlerarchitects.com.au

ALL SETOUT TO ARCHITECT'S DRAWINGS, DIMENSIONS TO BE VERIFIED WITH THE ARCHITECT AND ON SITE BEFORE MAKING SHOP DRAWINGS OR COMMENCING WORK.
NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.

PLANS 1:200 0 2 4 6 8 10m

NORTHROP

Newcastle
Suite 4, 215 Pacific Hwy, Charlestown NSW 2290
P.O. Box 180, Charlestown NSW 2290
Ph (02) 4943 1777 Fax (02) 4943 1577
Email newcastle@northrop.com.au ABN 81 094 433 100

PROJECT

118 CARY STREET
TORONTO, NSW, 2283

DRAWING TITLE

SERVICES DIVERSION PLAN

JOB NUMBER **NL171556**

DRAWING NUMBER **C32DA**

REVISION **1**

DRAWING SHEET SIZE = A1

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR DA APPROVAL	BD	CS	RJ	27.10.21
2	REVISED FOR DA APPROVAL	BD	CS	RJ	25.02.22

CLIENT
TORONTO INVESTMENTS NO.1

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT
Mark Lawler Architects
DIRECTOR + NOMINATED ARCHITECT: MARK LAWLER (4766)
ASSOCIATE: STEPHEN COOK
35 SMITH STREET, CHARLESTOWN NSW 2290
ABN: 32 374 833 830
P: (02) 4942 3222
A: (02) 4942 3333
E: reception@marklawlerarchitects.com.au
W: marklawlerarchitects.com.au

ALL SETOUT TO ARCHITECT'S DRAWINGS. DIMENSIONS TO BE VERIFIED WITH THE ARCHITECT AND ON SITE BEFORE MAKING SHOP DRAWINGS OR COMMENCING WORK. NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.

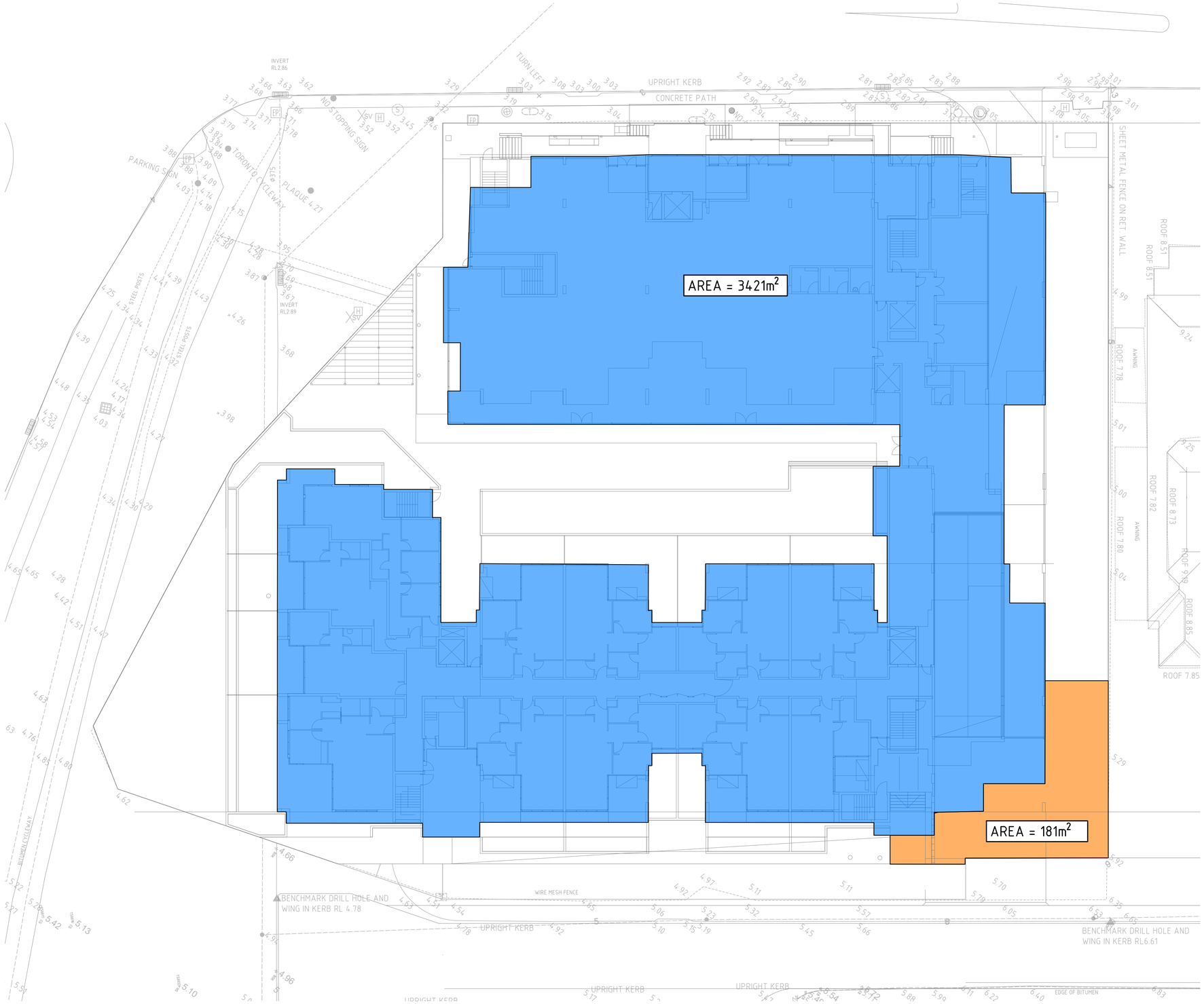
PLANS 1:200 0 2 4 6 8 10m

NORTHROP
Newcastle
Suite 4, 215 Pacific Hwy, Charlestown NSW 2290
P.O. Box 180, Charlestown NSW 2290
Ph (02) 4943 1777 Fax (02) 4943 1577
Email newcastle@northrop.com.au ABN 81 094 433 100

PROJECT
118 CARY STREET
TORONTO, NSW, 2283

DRAWING TITLE
CATCHMENT PLAN
MUSIC

JOB NUMBER **NL171556**
DRAWING NUMBER **CSK2.0**
REVISION **2**
DRAWING SHEET SIZE = A1



LEGEND

- DENOTES ROOF TO OSD CATCHMENT
- DENOTES GROUND FLOOR TO OSD CATCHMENT
- NO HATCH DENOTES BYPASSING OSD CATCHMENT

VERIFIER

JOB MANAGER

DESIGNED

DRAWN

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR DA APPROVAL	BD	CS	RJ	27.10.21
2	REVISED FOR DA APPROVAL	BD	CS	RJ	25.02.22

CLIENT

TORONTO INVESTMENTS NO.1

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT

Mark Lawler Architects

DIRECTOR = NOMINATED ARCHITECT: MARK LAWLER (4766)
ASSOCIATE: STEPHEN COON
33 SMITH STREET, CHARLESTOWN NSW 2290
ABN: 32 376 853 830

T: P. (02) 4942 3222
T: F. (02) 4942 3232
T: E. reception@marklawlerarchitects.com.au
T: W. marklawlerarchitects.com.au

THE COPYRIGHT OF THIS DRAWING REMAINS WITH NORTHROP CONSULTING ENGINEERS PTY LTD.

ALL SETOUT TO ARCHITECT'S DRAWINGS, DIMENSIONS TO BE VERIFIED WITH THE ARCHITECT AND ON SITE BEFORE MAKING SHOP DRAWINGS OR COMMENCING WORK.
NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.

PLANS 1:200 0 2 4 6 8 10m

NORTHROP

Newcastle
Suite 4, 215 Pacific Hwy, Charlestown NSW 2290
P.O. Box 180, Charlestown NSW 2290
Ph (02) 4943 1777 Fax (02) 4943 1577
Email newcastle@northrop.com.au ABN 81 094 433 100

PROJECT

118 CARY STREET
TORONTO, NSW, 2283

DRAWING TITLE

CATCHMENT PLAN
DRAINS

JOB NUMBER **NL171556**

DRAWING NUMBER **CSK2.1**

REVISION **2**

DRAWING SHEET SIZE = A1

Attachment B – MUSIC-Link Report

LAKE MACQUARIE CITY COUNCIL

MUSIC-*link* Report

Project Details		Company Details	
Project:	NL171556	**Company:**	Northrop Consulting Engineers
Report Export Date:	28/02/2022	**Contact:**	Chris Smith
Catchment Name:	NL171556 - 220211	**Address:**	Level 1, 215 Pacific Highway Charlestown, NSW, 2290
Catchment Area:	0.573ha	**Phone:**	02 4943 1777
Impervious Area*:	73.55%	**Email:**	csmith@northrop.com.au
Rainfall Station:			
Modelling Time-step:	6 Minutes		
Modelling Period:	1/01/1999 - 31/12/2008 11:54:00 PM		
Mean Annual Rainfall:	902mm		
Evapotranspiration:	1408mm		
MUSIC Version:	6.3.0		
MUSIC-link data Version:	6.33		
Study Area:	North Region		
Scenario:	North Region		

* takes into account area from all source nodes that link to the chosen reporting node, excluding Import Data Nodes

Treatment Train Effectiveness

Node: Post-Development Node	Reduction
Flow	32.9%
TSS	89.6%
TP	83.2%
TN	67.5%
GP	99.6%

Treatment Nodes

Node Type	Number
Sedimentation Basin Node	1
Rain Water Tank Node	1
Bio Retention Node	2
Generic Node	3
GPT Node	3

Source Nodes

Node Type	Number
Urban Source Node	14

Comments

Passing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Bio	Filterra Bioretention - 1.4m² Tree Pit	Hi-flow bypass rate (cum/sec)	None	None	100
Bio	Filterra Bioretention - 1.4m² Tree Pit	PET Scaling Factor	2.1	2.1	2.1
Bio	Filterra Bioretention - 1.7m² Tree Pit	Hi-flow bypass rate (cum/sec)	None	None	100
Bio	Filterra Bioretention - 1.7m² Tree Pit	PET Scaling Factor	2.1	2.1	2.1
GPT	1 x OceanGuard	Hi-flow bypass rate (cum/sec)	None	None	0.02
GPT	2 x OceanGuard	Hi-flow bypass rate (cum/sec)	None	None	0.04
GPT	Copy of 1 x OceanGuard	Hi-flow bypass rate (cum/sec)	None	None	0.02
Post	Post-Development Node	% Load Reduction	None	None	32.9
Post	Post-Development Node	GP % Load Reduction	70	None	99.6
Post	Post-Development Node	TN % Load Reduction	45	None	67.5
Post	Post-Development Node	TP % Load Reduction	45	None	83.2
Post	Post-Development Node	TSS % Load Reduction	80	None	89.6
Pre	Pre-Development Node	% Load Reduction	None	None	0
Pre	Pre-Development Node	GP % Load Reduction	None	None	0
Pre	Pre-Development Node	TN % Load Reduction	None	None	0
Pre	Pre-Development Node	TP % Load Reduction	None	None	0
Pre	Pre-Development Node	TSS % Load Reduction	None	None	0
Sedimentation	SF Chamber (9.5 m²)	% Reuse Demand Met	None	None	0
Sedimentation	SF Chamber (9.5 m²)	High Flow Bypass Out (ML/yr)	None	None	0
Urban	Bath St	Area Impervious (ha)	None	None	0.062
Urban	Bath St	Area Pervious (ha)	None	None	0
Urban	Bath St	Total Area (ha)	None	None	0.062
Urban	BYPASS PAVEMENT	Area Impervious (ha)	None	None	0.002
Urban	BYPASS PAVEMENT	Area Pervious (ha)	None	None	0
Urban	BYPASS PAVEMENT	Total Area (ha)	None	None	0.002
Urban	COURTYARDS 1-8	Area Impervious (ha)	None	None	0.025
Urban	COURTYARDS 1-8	Area Pervious (ha)	None	None	0
Urban	COURTYARDS 1-8	Total Area (ha)	None	None	0.025
Urban	COURTYARDS 9-13	Area Impervious (ha)	None	None	0.063
Urban	COURTYARDS 9-13	Area Pervious (ha)	None	None	0
Urban	COURTYARDS 9-13	Total Area (ha)	None	None	0.063
Urban	Landcape Bypass	Area Impervious (ha)	None	None	0.003
Urban	Landcape Bypass	Area Pervious (ha)	None	None	0.028
Urban	Landcape Bypass	Total Area (ha)	None	None	0.032
Urban	Landscape Area 4	Area Impervious (ha)	None	None	0
Urban	Landscape Area 4	Area Pervious (ha)	None	None	0.017
Urban	Landscape Area 4	Total Area (ha)	None	None	0.017
Urban	Landscape to Pit 1	Area Impervious (ha)	None	None	0
Urban	Landscape to Pit 1	Area Pervious (ha)	None	None	0.012
Urban	Landscape to Pit 1	Total Area (ha)	None	None	0.012

Only certain parameters are reported when they pass validation

Node Type	Node Name	Parameter	Min	Max	Actual
Urban	north landscaping / service lane	Area Impervious (ha)	None	None	0.008
Urban	north landscaping / service lane	Area Pervious (ha)	None	None	0.039
Urban	north landscaping / service lane	Total Area (ha)	None	None	0.048
Urban	PAVEMENT TO TREE PIT 1	Area Impervious (ha)	None	None	0.012
Urban	PAVEMENT TO TREE PIT 1	Area Pervious (ha)	None	None	0
Urban	PAVEMENT TO TREE PIT 1	Total Area (ha)	None	None	0.012
Urban	PAVEMENT TO TREE PIT 2	Area Impervious (ha)	None	None	0.009
Urban	PAVEMENT TO TREE PIT 2	Area Pervious (ha)	None	None	0
Urban	PAVEMENT TO TREE PIT 2	Total Area (ha)	None	None	0.009
Urban	Pre-Developed	Area Impervious (ha)	None	None	0
Urban	Pre-Developed	Area Pervious (ha)	None	None	0.541
Urban	Pre-Developed	Total Area (ha)	None	None	0.541
Urban	Roof Podium	Area Impervious (ha)	None	None	0.042
Urban	Roof Podium	Area Pervious (ha)	None	None	0.052
Urban	Roof Podium	Total Area (ha)	None	None	0.095
Urban	Service Lane	Area Impervious (ha)	None	None	0.008
Urban	Service Lane	Area Pervious (ha)	None	None	0.001
Urban	Service Lane	Total Area (ha)	None	None	0.01
Urban	Urban	Area Impervious (ha)	None	None	0.248
Urban	Urban	Area Pervious (ha)	None	None	0
Urban	Urban	Total Area (ha)	None	None	0.248

Only certain parameters are reported when they pass validation

Failing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Bio	Filterra Bioretention - 1.4m² Tree Pit	Saturated Hydraulic Conductivity (mm/hr)	50	200	3550
Bio	Filterra Bioretention - 1.7m² Tree Pit	Saturated Hydraulic Conductivity (mm/hr)	50	200	3550
Rain	Rainwater Tank	% Reuse Demand Met	80	None	24.1151
Sedimentation	SF Chamber (9.5 m²)	Notional Detention Time (hrs)	8	12	0.129
Sedimentation	SF Chamber (9.5 m²)	Total Nitrogen - k (m/yr)	500	500	1
Sedimentation	SF Chamber (9.5 m²)	Total Phosphorus - k (m/yr)	6000	6000	1
Sedimentation	SF Chamber (9.5 m²)	Total Suspended Solids - k (m/yr)	8000	8000	1
Urban	Bath St	Field Capacity (mm)	55	80	51
Urban	Bath St	Groundwater Daily Baseflow Rate (%)	5	20	25
Urban	Bath St	Groundwater Daily Recharge Rate (%)	35	55	25
Urban	Bath St	Pervious Area Soil Storage Capacity (mm)	170	210	54
Urban	Landscape Area 4	Field Capacity (mm)	55	80	89
Urban	Landscape Area 4	Groundwater Daily Baseflow Rate (%)	5	20	25
Urban	Landscape Area 4	Groundwater Daily Recharge Rate (%)	35	55	25
Urban	Landscape Area 4	Pervious Area Soil Storage Capacity (mm)	170	210	133
Urban	Landscape to Pit 1	Field Capacity (mm)	55	80	89
Urban	Landscape to Pit 1	Groundwater Daily Baseflow Rate (%)	5	20	25
Urban	Landscape to Pit 1	Groundwater Daily Recharge Rate (%)	35	55	25
Urban	Landscape to Pit 1	Pervious Area Soil Storage Capacity (mm)	170	210	133
Urban	north landscaping / service lane	Field Capacity (mm)	55	80	89
Urban	north landscaping / service lane	Groundwater Daily Baseflow Rate (%)	5	20	25
Urban	north landscaping / service lane	Groundwater Daily Recharge Rate (%)	35	55	25
Urban	north landscaping / service lane	Pervious Area Soil Storage Capacity (mm)	170	210	133
Urban	PAVEMENT TO TREE PIT 2	Field Capacity (mm)	55	80	89
Urban	PAVEMENT TO TREE PIT 2	Groundwater Daily Baseflow Rate (%)	5	20	25
Urban	PAVEMENT TO TREE PIT 2	Groundwater Daily Recharge Rate (%)	35	55	25
Urban	PAVEMENT TO TREE PIT 2	Pervious Area Soil Storage Capacity (mm)	170	210	133
Urban	Pre-Developed	Field Capacity (mm)	55	80	89
Urban	Pre-Developed	Groundwater Daily Baseflow Rate (%)	5	20	25
Urban	Pre-Developed	Groundwater Daily Recharge Rate (%)	35	55	25
Urban	Pre-Developed	Pervious Area Soil Storage Capacity (mm)	170	210	133
Urban	Roof Podium	Field Capacity (mm)	55	80	89
Urban	Roof Podium	Groundwater Daily Baseflow Rate (%)	5	20	0
Urban	Roof Podium	Groundwater Daily Recharge Rate (%)	35	55	0
Urban	Roof Podium	Groundwater Initial Depth (mm)	10	10	0
Urban	Roof Podium	Pervious Area Soil Storage Capacity (mm)	170	210	133

Only certain parameters are reported when they pass validation