NORTHROP

Civil Design Report and Structural Statement

for

John Hunter Health and Innovation Precinct - State Significant Development Application

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Contents

Table 1 – SEARS Requirements

Item	SEARS Requirement	Relevant Section of Report
1.0	*Stormwater Drainage.* • *Provide:* o *A preliminary stormwater management strategy for the development that:* ▪ *Is prepared by a suitably qualified person in consultation with Council and any other relevant drainage authority* ▪ *Includes a preliminary design of the stormwater system, including on-site detention facilities, water quality measures and the nominated discharge point without impacting on downstream properties* ▪ *Demonstrates compliance with Council or other drainage authority requirements* ▪ *Stormwater plans detailing the proposed methods of drainage without impacting on the downstream properties.* ▪ *Where drainage infrastructure works are required that would 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*.	14
2.0	*Flooding.* • *Identify any flood risk on-site in consultation with Council and having regard to the most recent flood studies for the project area and the potential effects of climate change, sea level rise and increase in rainfall intensity* • *Assess the impacts of the development, including any changes to the flood risk on-site or off-site, site runoff during the one per cent Annual Exceedance Probability flood event and detail design solutions to mitigate flood risk where required.*	15
3.0	*Soil, Water and Air.* • *Provide:* o *An assessment of potential impacts on surface and groundwater (quality and quantity), soil hydrology, related infrastructure, adjacent licensed water users, riparian land groundwater dependant ecosystems and watercourse(s) where relevant and the measures to reduce and mitigate these impacts* o *Details of measures and procedures to minimise and manage the generation and off-site transmission of sediment, dust and fine particles* o *Provide a detailed and consolidated site water balance*	16

1. Introduction

1.1. Overview

In June 2019, the NSW Government announced a significant expansion of the John Hunter and John Hunter Children's Hospitals with the $780 million John Hunter Health and Innovation Precinct (JHHIP) project.

The JHHIP will transform healthcare services for Newcastle, the greater Hunter region and northern NSW communities. The infrastructure will provide additional inpatient capacity to the John Hunter and John Hunter Children's Hospitals and create further opportunities for partnerships with industry and higher education providers.

The JHHIP will deliver an innovative and integrated precinct with industry-leading facilities working in collaboration with health, education and research partners to meet the current and future needs of the Greater Newcastle, Hunter New England and Northern NSW regions.

The John Hunter Health and Innovation Precinct Project is being planned and designed with ongoing communication and engagement with clinical staff, operational staff, the community and other key stakeholders with a strong focus on the following:

- Patient-centred care
- Contemporary models of care
- Future economic, health and innovation development opportunities
- Environmental sustainability

1.2. Subject Site

The John Hunter Health Campus (JHHC) is located on Lookout Road, Lambton Heights, within the City of Newcastle Local Government Area (LGA), approximately 8km west of the Newcastle CBD. The hospital campus is located approximately 3.5km north of Kotara railway station.

The JHHC comprises the John Hunter Hospital (JHH), John Hunter Children's Hospital (JHCH), Royal Newcastle Centre (RNC), the Rankin Park Rehabilitation Unit and the Nexus Unit (Children & Adolescent Mental Health). JHHC is a Level 6 Principal Referral and tertiary Hospital, providing the clinical hub for medical, surgical, child and maternity services within the Hunter New England Local Health District (HNELHD) and across northern NSW through established referral networks. Other services at the campus include the Hunter Medical Research Institute (HMRI), Newcastle Private Hospital and the HNELHD Headquarters.

An aerial photograph of the JHHC is shown in Figure 1.

Figure 1 – John Hunter Health Campus

1.3. SSDA Proposal

Approval is being sought for a new Acute Services Building and refurbishment of existing hospital facilities at John Hunter Hospital comprising:

- Construction and operation of a new seven-storey Acute Services Building (plus 4 semi-basement levels) to provide:
  - An expanded and enhanced Emergency Department.
  - Expanded and enhanced medical imaging services.
  - Expanded and enhanced intensive care services - Adult, Paediatric and Neonatal.
  - Expanded and enhanced Operating Theatres including Interventional Suites.
  - An expanded Clinical Sterilising Department.
  - Women's Services including Birthing Unit, Day Assessment Unit and Inpatient Units.
  - Integrated flexible education and teaching spaces.
  - Expanded support services.
  - Associated retail spaces.
  - New rooftop helipads.

- New semi-basement car parking.

- Refurbishment of existing buildings to provide:
  - Additional Inpatient Units.
  - Expanded support services.
- A new Hospital entry canopy and works to the existing drop off.
- Link bridge to the Hunter Medical Research Institute (HMRI).
- Campus wayfinding and signage.
- Landscape works.
- Site preparation including bulk earthworks, tree removal, environmental clearing, cut and fill.
- Mines grouting remediation works.
- Construction of internal roads network and construction access roads and works to existing at-grade carparking.
- Connection to the future Newcastle Inner City Bypass.
- Inground building services works and utility adjustments.

2. Existing and Proposed Development

The new ASB is to be located to the north of the existing John Hunter Hospital and to the southeast of the existing HMRI building, refer to Figure 2 below. The existing Kookaburra Circuit road formation will be located between the existing hospital and the ASB, maintaining the existing road geometry at this location and widening the formation to assist with traffic movements around the site.

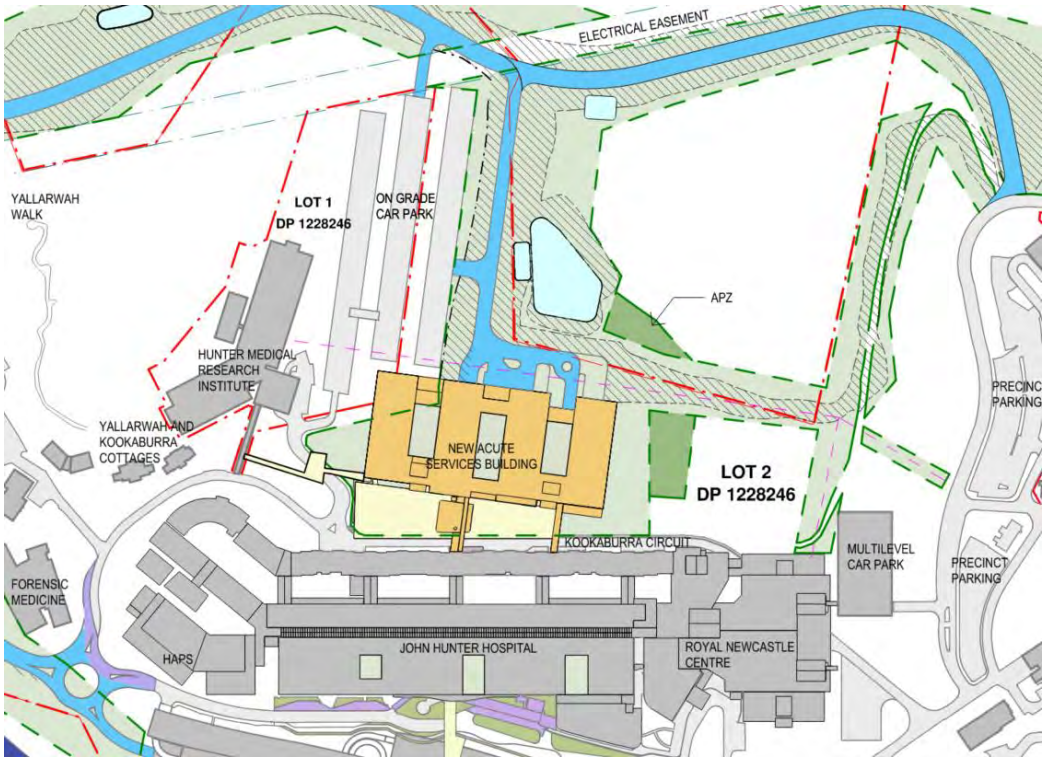

Figure 2 – Proposed ASB location

Topographically the site for the new ASB is nestled between two ridge lines, sloping down from the south towards the north at slopes between 15-20%. The location of the proposed ASB currently supports a scattered tree and shrub vegetation coverage, whilst zones to the north contain medium dense to dense woodlands.

Stormwater runoff from the proposed development area is conveyed to the north via overland flow before discharging into an existing overland flow path which traverses the site. The overland flow path continues north through bushlands before ultimately discharging to existing drainage channel in Jesmond Park. Existing stormwater infrastructure is also present in the proposed ASB location, all of which will require diversion as part of the proposed works (refer to Section 5 for further details).

Vehicular access to the John Hunter Hospital Precinct is currently provided from one of two intersections on Lookout Road. The primary site access is via a signalised intersection at Kookaburra Circuit, whilst a secondary access is available at Jacaranda Drive. Internally Kookaburra Circuit functions as a local road that provides access to existing parking facilities for staff and visitors. The road circulates around John Hunter Hospital before converging at an existing roundabout on the eastern side of the existing hospital, adjacent to the Kookaburra Circuit/ Lookout road intersection. Jacaranda Drive traverses the northern and western sides of the existing Newcastle Private Hospital, before connecting to the above-mentioned roundabout on Kookaburra Circuit. A new/ upgraded road network is proposed to support the new ASB and improve traffic circulation around the site, further details are provided in Section 3.

3. Proposed Road Network

Access to and through the site is a primary consideration of the development, to manage both existing and post development traffic flows. To facilitate vehicular access, the JHHIP development proposes significant infrastructure upgrades, comprising new and upgraded roads, new and modified existing car parking and associated in-ground services in various locations across the site.

In addition, delivery of the new ASB is set to coincide with the construction of the Rankin Park to Jesmond section of the Newcastle Inner City Bypass which is currently being delivered by Transport for NSW (TfNSW). Delivery of the bypass includes construction of an interchange at the northern site boundary, providing the opportunity to construct a new road network around the site to improve traffic circulation around the site.

Construction of the Newcastle Inner City Bypass and JHHIP interchange will change the way vehicles access the site, and integration of the new road network will be an important element for the traffic circulation both to the new ASB and around the greater precinct. Taking advantage of the proposed access from the west that the Newcastle Inner-City Bypass offers, the proposed road network establishes the ability to consider the various types of users accessing the site, and separating user flows to provide the best possible experience for all.

The proposed site wide road network considers the precinct vision that includes delivery of new primary western and northern access roads to improve traffic circulation around the site. Alignment of the proposed roads has been considered in detail, with various options considered by the design team for inclusion. The preferred option being nominated within the design documentation offers a balance of rider comfort, good sight lines and limited environmental impact. The provision of additional roads also provides a greater level of site safety, offering porosity via various routes in and out of the precinct, the roadworks anticipated to be delivered in conjunction with the ASB are discussed in further detail below.

3.1. Northern Link Road

The primary need for the northern Road is to enable access from the Newcastle Inner-City Bypass directly to the John Hunter Health Campus (JHHC). The inclusion of a bypass to the JHHC forms a critical assumption and design feature of the Bypass (being delivered by Transport for NSW) to respond to a strategic need for direct access to the Hospital. The existing local road network in New Lambton Heights is currently at capacity which has ongoing impact on the ability of the JHHC to perform its critical care functions and limits the ability for the Hospital to grow to service community needs. The connection to the Bypass will enable greater accessibility to the Health Campus and reduce operational impacts on the local traffic network. It will also enable for an increase in capacity at the JHHC which is identified as a key strategy in the Greater Newcastle Metropolitan Plan 2036 "Grow health precincts and connect the health network".

The northern Road will also provide greater separation of traffic user flows and will free up the constrained ring road, which currently funnels all staff and public users around the Campus and past key locations, such as the main entry. The northern Road will enable the separation of staff and public to enable the Campus to functionally operate and to allow the ground plane experience to better reflect the needs of users.

As outlined above, there is a need to improve traffic circulation for the Health Campus holistically. There is an immediate need to connect to the Bypass and the delivery of the bypass includes construction of an interchange at the northern boundary of the Campus, providing the opportunity to provide a connection to the new road network around the site to improve traffic circulation to and from the new ASB.

The eastern Northern Road (Phase 2) will further integrate the Campus with the surrounding road network and will further improve traffic operation by reducing the demand on the ring road. The Phase 2 road is also required to enable greater access opportunities and will facilitate further growth and capacity for health uses within the Campus into the future. Accordingly, the proposal will facilitate future health uses on the site and is entirely consistent with the NSW State Priorities, Greater Newcastle Metropolitan Plan and Hunter Regional Plan by providing opportunities for future precinct activation and increased and improved health facilities.

A major design constraint for the site is the steep topography, which changes dramatically depending on the designated road alignment. As such the following design criteria have been considered in the design development:

- Sightlines – Due to the drastic changes in topography, small radius bends in the road alignment restrict sight lines such that compliance with Austroads cannot be achieved. This issue is particularly important on the approach to the proposed new ASB driveway where a relative straight approach is important to ensure oncoming vehicles have sufficient time to observe any queued vehicles at the intersection and yield accordingly. As such, a straighter road with softer large radius bends was deemed most appropriate from a road compliance and safety perspective.
- Road Gradients – Existing surface gradients across the precinct vary up to 25%, which is too steep to support low speed vehicular movements around the precinct. A maximum longitudinal gradient of 10% has been nominated for design purposes, with maximum 5% grades for queuing areas.
- ASB Access requirements – As discussed above, the Bypass will provide a new connection to the ASB, and the road network is required to connect to the interchange in order to improve traffic flows. Notwithstanding, it is estimated 40% of vehicles access the site following construction will do so from Lookout Road. As such, connection of the North Road to

Kookaburra Circuit to the east is also a critical element for the precinct in order to minimise congestion on Kookaburra Circuit.

The proposed road alignment for the northern link road is noted below.

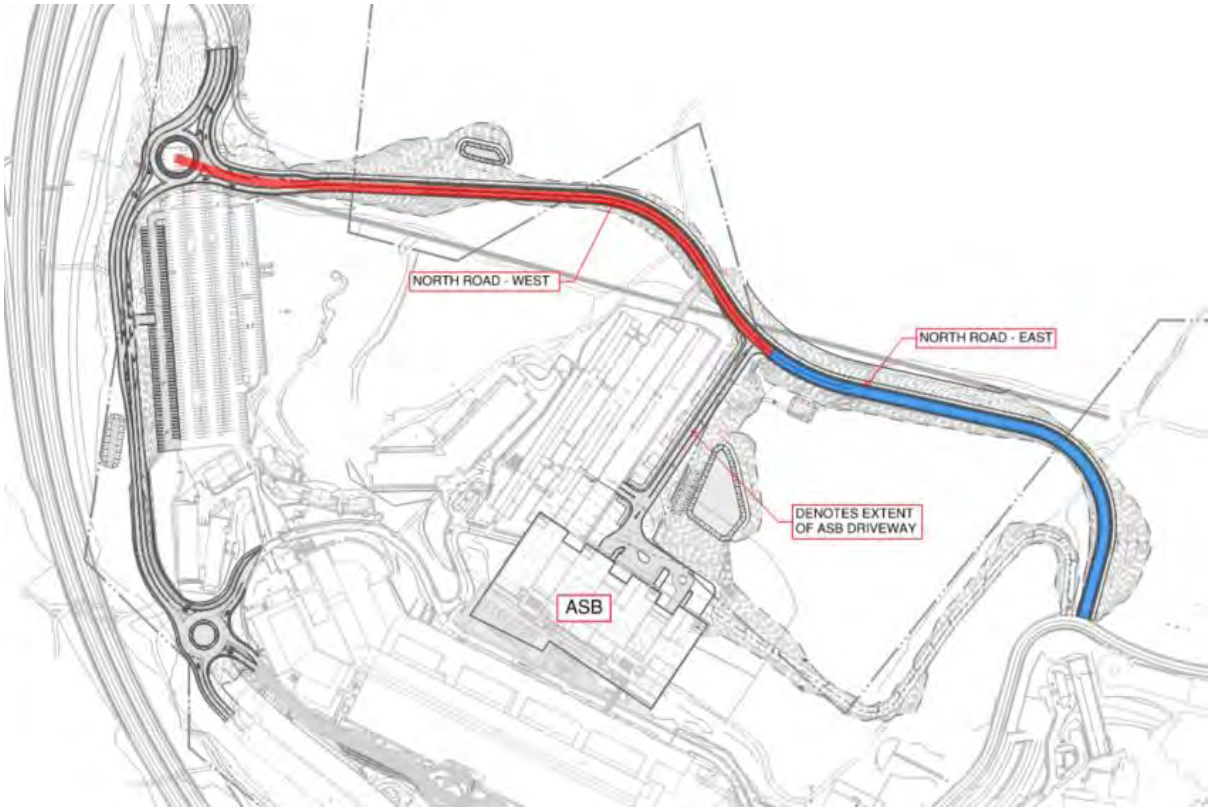

Figure 3 - Proposed North Road Alignment

The northern road alignment connects to the TfNSW interchange to the west, providing access from the bypass to the new hospital from the north, removing vehicles from Kookaburra Circuit. The intersection to the west is a new roundabout and has been coordinated with TfNSW.

There are some considerable changes in topography along the road alignment shown, and fill material is required to complete construction of the road, with the majority of imported fill being required for the eastern reaches. The development proposal has a shortfall in fill material from excavations across the development, as such fill material would need to be imported in order to facilitate road construction.

The north road will be delivered as part of a phased development, with the western portion of the road being completed as part of the initial project phase to meet the project timelines to deliver health services to the region. The north road – eastern phase will improve vehicular access to the ASB for vehicles entering the site from lookout road, reducing traffic movements and associated congestion issues from Kookaburra Circuit. The north road – east will also completed the campus road network to enable future stages of precinct development.

3.2. Western Access Road & Bypass Connection

Connection to the new TfNSW Inner-City Bypass is a crucial element for the road network as it will serve as the main access point for the majority of vehicles visiting the site post completion. Considerable early consultation has been undertaken with TfNSW during preparation of SSDA documentation in order to ensure coordination between both JHHIP and Bypass design packages. Additionally, seamless connection of the bypass to Kookaburra Circuit is important to deliver not only ambulances to the new ASB, but also visitors to the southern visitor carpark and main JHH entry. As such the JHHIP proposes a new main access road to the west of the existing at grade carpark as depicted below.

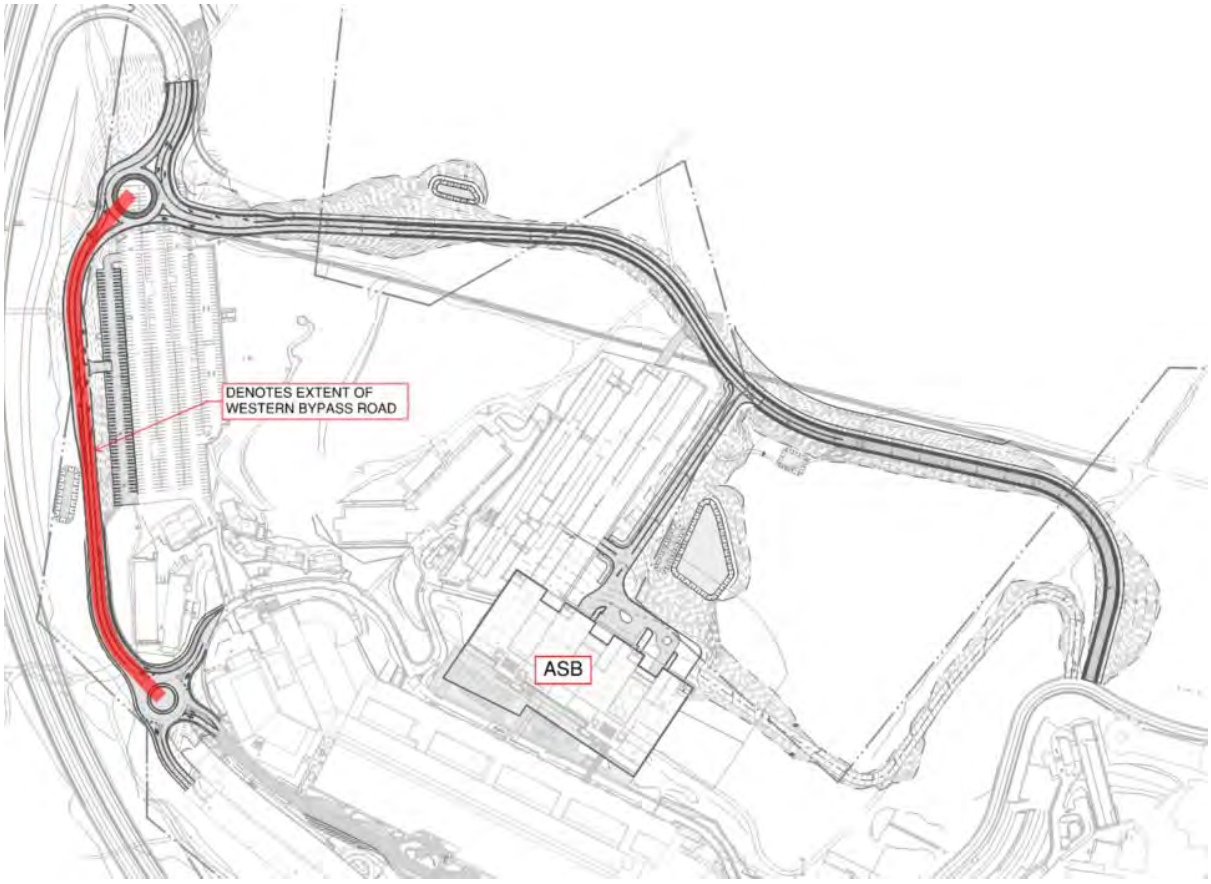

Figure 4 – Proposed Western Access Road Alignment

3.3. ASB Driveway

Connection to the ASB from the north road is provided by a new driveway running in a north/ south direction to the east of the existing at grade carpark. The driveway has been sized to cater for single lane movements in both directions for both passenger and service vehicle access, with road and verge widths also sufficient to provide compliant rural fire utility access to the building.

The driveway will service two access points to the ASB as well as a new access to the existing at grade carpark. A turning area is to be provided at the end of the driveway to provide a turning facility for vehicles that do not wish to enter the carpark. Additionally, direct access to a service and maintenance hardstand area will be provided from the new driveway such that safe off-road parking is provided for service vehicle.

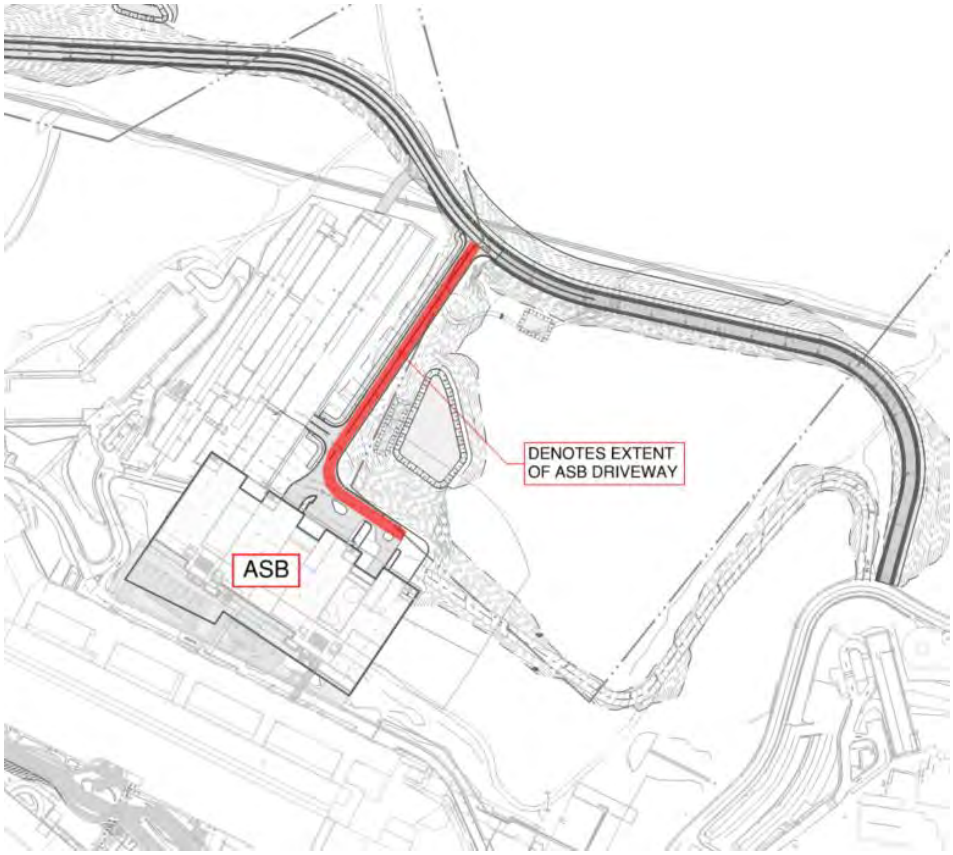

Figure 5 – Proposed ASB Driveway

3.4. Temporary Construction Access

It is noted that the existing John Hunter Hospital will remain fully operational throughout the course of construction activities, as such it is important to minimise any impact that construction traffic may have on the existing internal road network. In order to mitigate any internal road congestion and separate construction vehicles from other traffic areas, the existing fire trail located to the east of the ASB will be upgraded to provide a temporary construction access track at the commencement of construction activities. The track will provide an 8m wide gravel access connecting the ASB building pad to Jacaranda Drive to the east. The track will generally maintain existing site levels with minor excavation, clearing and filling required to support the 8m wide formation. It is noted that only minimal disturbance of existing vegetation is required to install the construction access as it is located over and existing bushfire trail and was previously used as an access road during the construction of HMRI.

The construction program for the JHHIP is indicatively expected to take 6 years for Phase 1A and 1B to be completed. The ring road is current at capacity servicing the operational needs of the Campus and cannot accommodate sustained construction traffic and accordingly an alternative solution is required to enable the construction program to be carried out, while also allowing the live Hospital operational environment to continue without interruption. The proposed temporary construction road is proposed on the same location as the existing (part cleared) fire trail to reduce environmental impacts, while enabling a viable construction access.

Additionally, it is not feasible for the construction access to be located along the proposed Northern Road alignment as access to the ASB will be disrupted during road construction. Postponing access to the ASB until the completion of North Road Construction in order to avoid installing the construction access will result in significant time delays to the ASB delivery which cannot be accommodated.

The alignment of the proposed construction access is provided below.

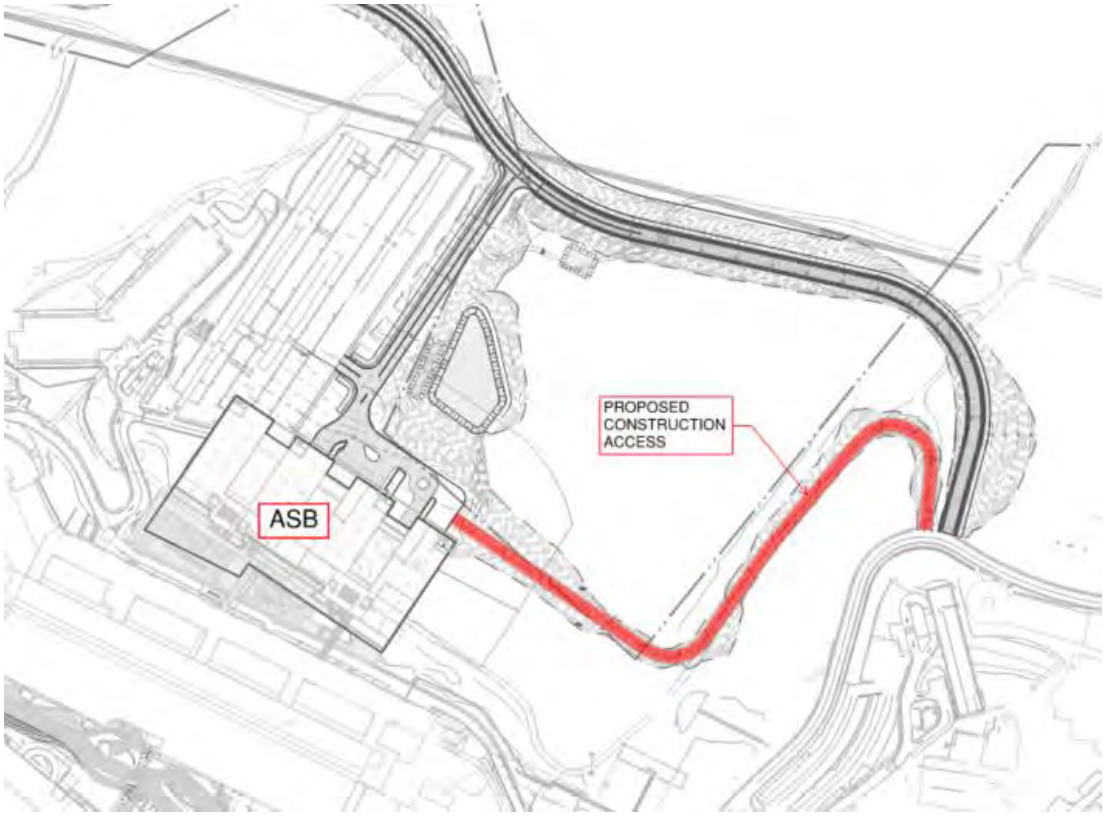

Figure 6 – Proposed Construction Access

3.5. Carpark No. 4 Extension

Construction of a new roundabout at the interface of the internal road network with the Bypass interchange requires the removal of approximately 66 existing parking spaces at the northern end of Carpark No.4. It is proposed that these parking spaces be re-instated by extending the existing at grade carpark to the west as noted in the figure below. The proposed carpark extension will provide approximately 130 new on grade parking spaces in close proximity to the new interchange. As part of the carpark extension, it is proposed to construct a new entry/exit driveway from the new road infrastructure to reduce the number of vehicle movements on Kookaburra Circuit. The driveway accessing the western bypass road will facilitate movements in all directions, whilst the driveway accessing the northern link road will facilitate left in/left out only in order to avoid vehicle queuing between the driveway and new roundabout. The proposed carpark modifications are noted in the figure below.

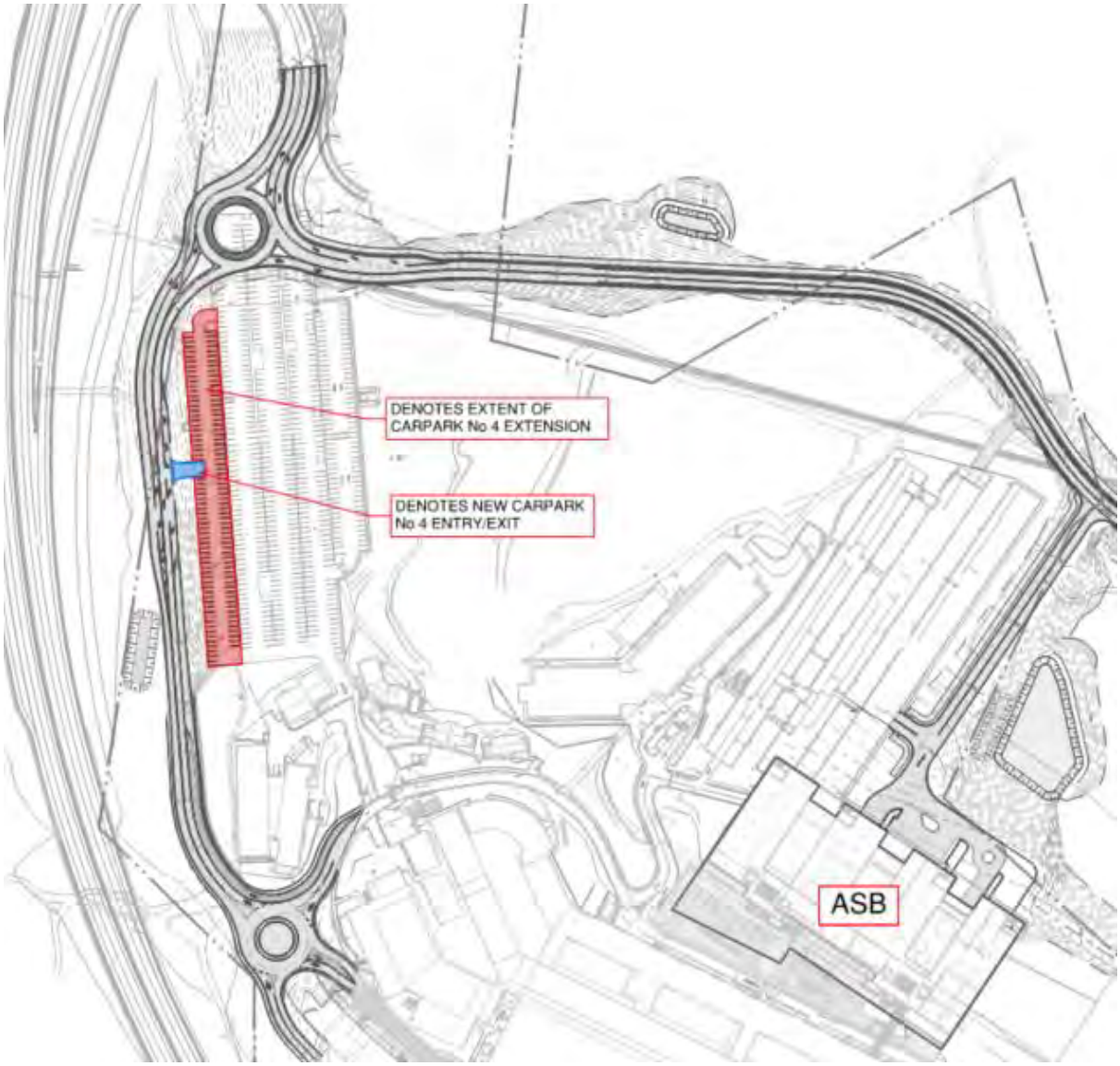

Figure 7 – Proposed Carpark No.4 Extension

4. Earthworks

Earthworks are required for the construction of both the new building and new access roads. The general parameters adopted in road and batter design which generate the fill requirements are as follows:

- Lane width – Nominally 3.5m
- Shoulders – Varies 0 – 2.0m
- Batters (both Cut & Fill) – 1:3
- Retaining Walls – Geogrid soil reinforced (subject to detailed design).

Preliminary design modelling estimates that the volume of fill material required to construct the proposed road network is in the order of 146,000m^3, the volume split between sections of the development are outlined below:

1. **Western Bypass Road.** This component of the project is located entirely on fill material, as the area falls away steeply towards the proposed inner-city bypass to the west. Fill material is required to lift the road to a level high enough to facilitate access to the existing Staff Carpark in the northern portion of the site as well as provide connection to Kookaburra Circuit in the southern reaches.
2. **Northern Roundabout.** The Northern roundabout is situated in an area almost entirely in cut, excavated material from this area will be used elsewhere around the site.
3. **Northern Access Road (Western Phase).** The western end of the northern access road requires fill material to reduce road gradients to manageable levels and maximum longitudinal road grades of 10%.
4. **Northern Access Road (Eastern Phase).** The eastern end of the northern access road requires fill material to reduce road gradients to manageable levels and maximum longitudinal road grades of 12%
5. **ASB Access Road.** Locating the ASB access road to the west of the existing at grade carpark means that fill material will be required to bring the road up to a level high enough to provide access to the carpark and to the new ASB.
6. **ASB Building Pad.** Cut material will be sourced from the ASB building pad for use in filling activities elsewhere across the site.
7. **Construction Access.** Minor filling and surface modifications will be required to upgrade the existing fire trail to support construction traffic.

In Summary, a net fill volume in the order of 113,000m^3 is required to deliver the road network and building pads for the initial phase of the development, and 33.500m^3 is required for the north road – east phase of the development.

An overall cut & fill plan is shown below, refer to Appendix B for further details.

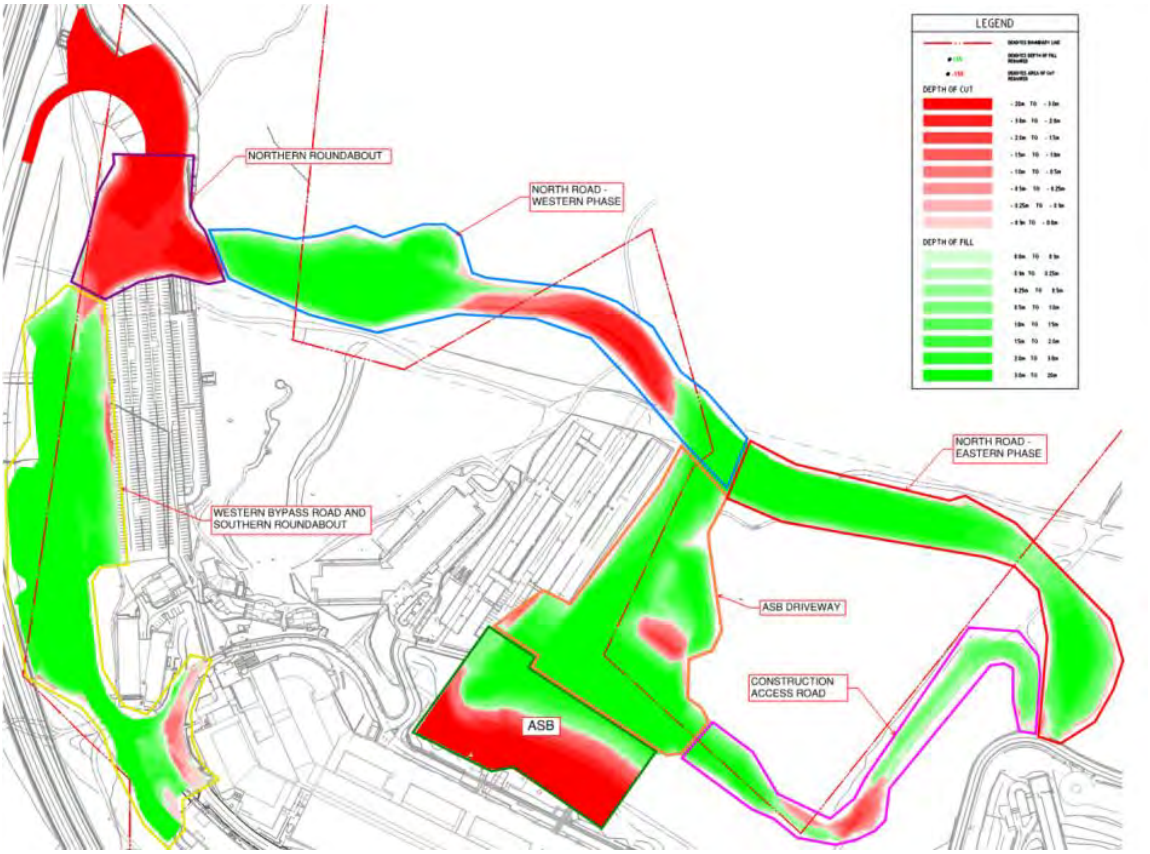

Figure 8 – Bulk Earthworks Plan – refer to appendices for details

As noted in Section 3.2, considerable early consultation has been undertaken with TfNSW to ensure earthworks in the western reaches of the site are coordinated with the bypass design package.

5. Proposed Stormwater Management

A number of stormwater drainage elements are being proposed as part of the project, including: drainage diversions, relocation an existing above ground stormwater detention basin, and new onsite detention and water quality improvement facilities. Each of these elements is described in further detail below.

5.1. Diversion of Existing Stormwater Drainage Network

The proposed ASB is situated across existing trunk stormwater drainage lines (up to. Ø525mm) which will be relocated so that the development site is free of stormwater infrastructure. Additionally, diversion of existing drainage around the ASB footprint will reduce the potential for erosion during construction. As such, it is proposed to divert existing stormwater pipes around the ASB pad to both the west and the east - refer below for further details. This will allow the site to be generally free of stormwater runoff from the upstream development.

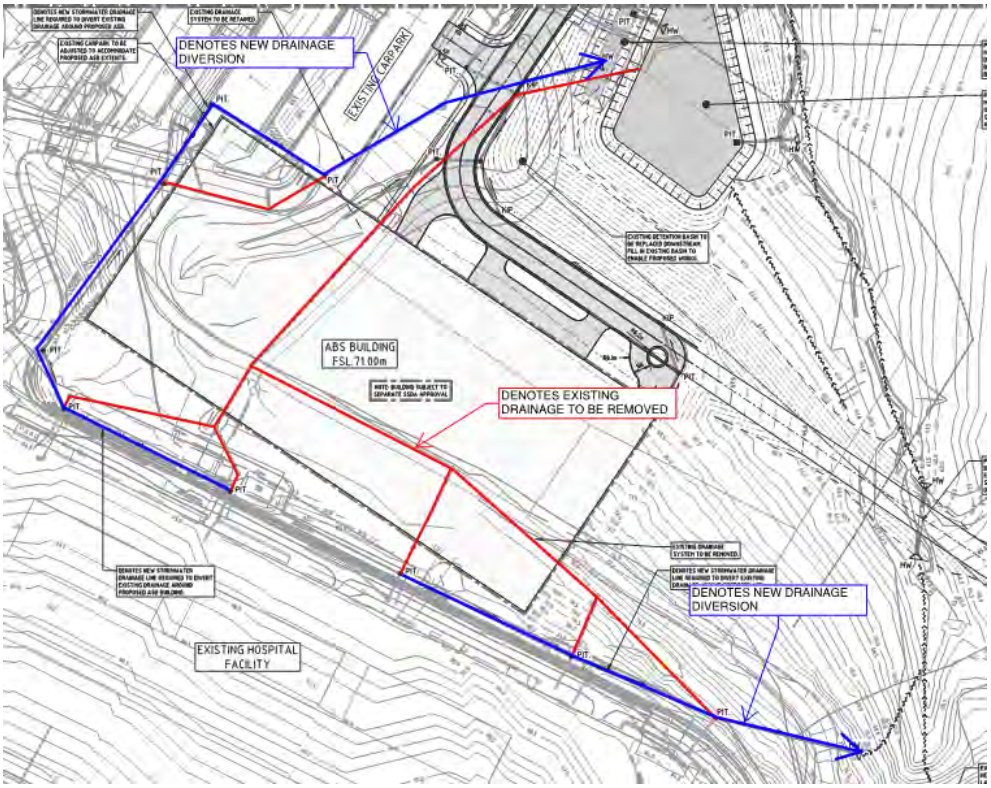

Figure 9 – Proposed Drainage Diversions

5.2. Relocation of Existing Detention Basin

The proposed development includes construction of a new access driveway from the north to the ASB basement carpark. The alignment of the driveway clashes with an existing detention basin which services HMRI, this basin will be replaced as part of the works. The volume of the new basin is to be increased to cater for both the existing HMRI development and additional hardstand areas from the proposed ASB and associated external pavement areas within the upstream catchment. Figure 10 below shows the proposed onsite detention (OSD) basin location (refer to Appendix B for larger plan).

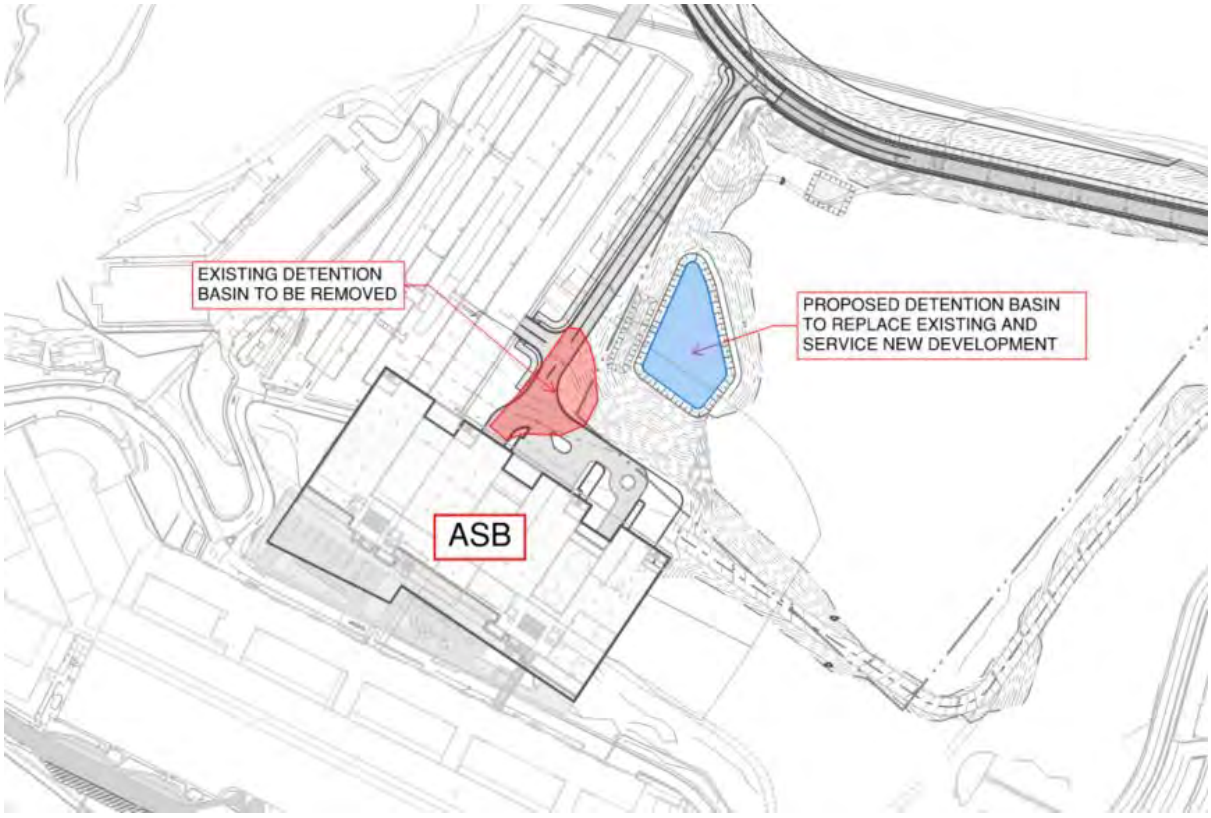

Figure 10 – HMRI Basin Relocation

5.3. Water Quality and Quantity Provisions

Due to the increased hardstand area resulting from new roads and ASB construction, multiple bio-filtration and onsite detention basins are proposed to reduce pollutant runoff and peak flows from the site. Further details on water quality and quantity provisions are discussed in Sections 5.6 & 5.7 of this report.

5.4. Proposed Drainage Network

A new drainage network is proposed to be installed in conjunction with the proposed road and ASB construction. The network will collect stormwater runoff from the proposed development area and convey captured stormwater to one of the proposed biofiltration and detention basins proposed for the site. In addition, two culvert crossings are proposed beneath the new road network in order to ensure major storms can be safely conveyed to downstream receiving waters.

5.5. Site Data

- Approximate Existing Site Area: 441,132 m^2.
- Approximate Proposed Works Area: 64,816 m^2.
- Proposed works Impervious Fraction: 50%.
- Roof Area: 9,431m^2.
- Approximate Treated Catchment: 38,330m^2.
- Approximate Un-treated Catchment: 23,786m^2 (majority road batters).
- Approximate catchment to Inner-city Bypass Stormwater Network: 2,700m^2.

5.6. Stormwater Quantity Assessment

Stormwater detention has been provided across the site to limit the post development event stormwater discharge from the site to that of the pre-development scenario for all storm events up to the 1 % AEP.

Site storage for the development has been designed in DRAINS to meet pre to post discharge and to satisfy Council's DCP stormwater requirements. To meet these requirements, the following stormwater provisions have been proposed:

- Three onsite detention (OSD) basins across the site to detain development peak flows for the various catchments found on site:
  - OSD Basin 1: 1,980m^3.
  - OSD Basin 2: 156m^3.
  - OSD Basin 3: 143m^3.

OSD Basin 1 is proposed to be constructed as part of the JHHIP project and has been designed to accept stormwater runoff from the proposed ASB development, HMRI, the existing on grade carpark, The ASB driveway and the eastern phases of the north road and a portion of the north road western phase. As the basin is being constructed in the initial phases there will be redundant capacity within the system such that it will accommodate runoff from the north road eastern phase when this portion of the road network is completed. The proposed basin outlet will be configured with an orifice plate suitable to service the initial phase in the first instance, with the orifice plate being removed and replaced when the eastern phase is complete.

These provision locations are shown indicatively in Figure 11 below.

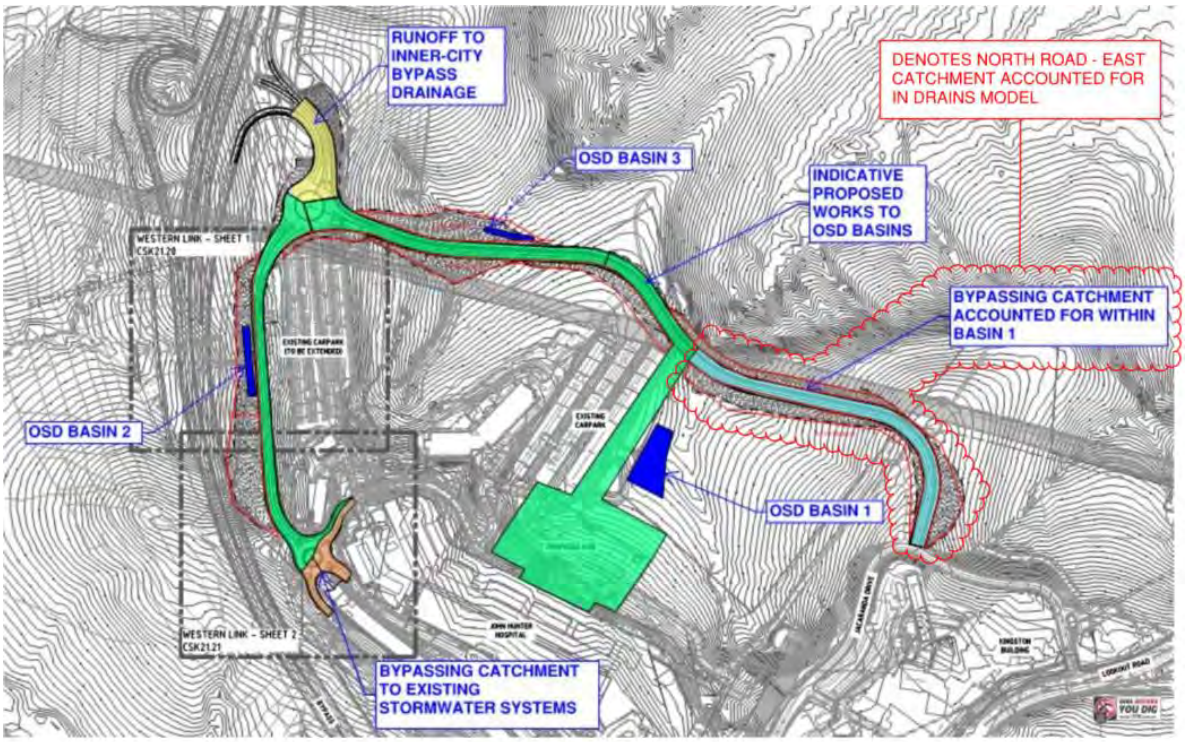

Figure 11 – Onsite detention basin locations

Results from the model for the three detention basins are provided in tables 2,3 and 4 below, inclusive of the contributing catchment from the north road – east.

Table 2 - OSD Basin 1 DRAINS results

Storm Event	Pre-development Peak discharge (m^3/s)	Post-Development Peak discharge (m^3/s)
1EY (1 Year ARI)	0.505	0.459
0.2EY (5 Year ARI)	1.570	1.340
10% AEP	2.160	1.570
5% AEP	2.690	2.050
2% AEP	3.550	3.250
1% AEP	4.200	4.120

Table 3 - OSD Basin 2 DRAINS results

Storm Event	Pre-development Peak discharge (m^3/s)	Post-Development Peak discharge (m^3/s)
0.2EY (5 Year ARI)	0.114	0.112
10% AEP	0.148	0.129
5% AEP	0.192	0.148
2% AEP	0.248	0.197
1% AEP	0.296	0.296

Table 4 - OSD Basin 3 DRAINS results

Storm Event	Pre-development Peak discharge (m^3/s)	Post-Development Peak discharge (m^3/s)
0.2EY (5 Year ARI)	0.101	0.101
10% AEP	0.132	0.116
5% AEP	0.171	0.133
2% AEP	0.221	0.155
1% AEP	0.264	0.264

Table 2, Table 3 and Table 4 above indicate the proposed stormwater management strategy is predicted to limit post developed flows to that of the pre developed scenario as well as achieve the stormwater discharge targets set out in the Council's DCP 2012. DRAINS model can be supplied upon request.

5.7. Stormwater Quality Assessment

Stormwater quality on-site is proposed to be managed through a treatment train approach to minimise any adverse impacts on the ecology of downstream watercourses and to meet Council's pollutant removal efficiency targets outlined below in Table 5.

Table 5 – Stormwater Quality Reduction Targets

Pollutant	Council Reduction Target (%)
Total Suspended Solids (TSS)	85
Total Phosphorus (TP)	65
Total Nitrogen (TN)	45
Gross Pollutants (GP)	90

The performance of the proposed stormwater management strategy was assessed against the selected targets using the conceptual software MUSIC (Version 6.3.0). The MUSIC model was developed in accordance with the "NSW MUSIC Modelling Guidelines" (BMT WBM, 2015) and the "City of Newcastle Stormwater and Water Efficiency for Development Technical Manual" (2019), using Council's MUSIC-link. The MUSIC-link was used to set up all default source node data, rainfall data and evapotranspiration data.

The MUSIC model catchment area was broken down into sub-catchments to effectively simulate the proposed treatment measures along the treatment train. The proposed north road-east phase was also included within the model to ensure all proposed works have been accounted for in the water quality provisions provided as part of the JHHIP project works. A screenshot of the MUSIC model can be seen below in Figure 12. The catchment areas included only the proposed works.

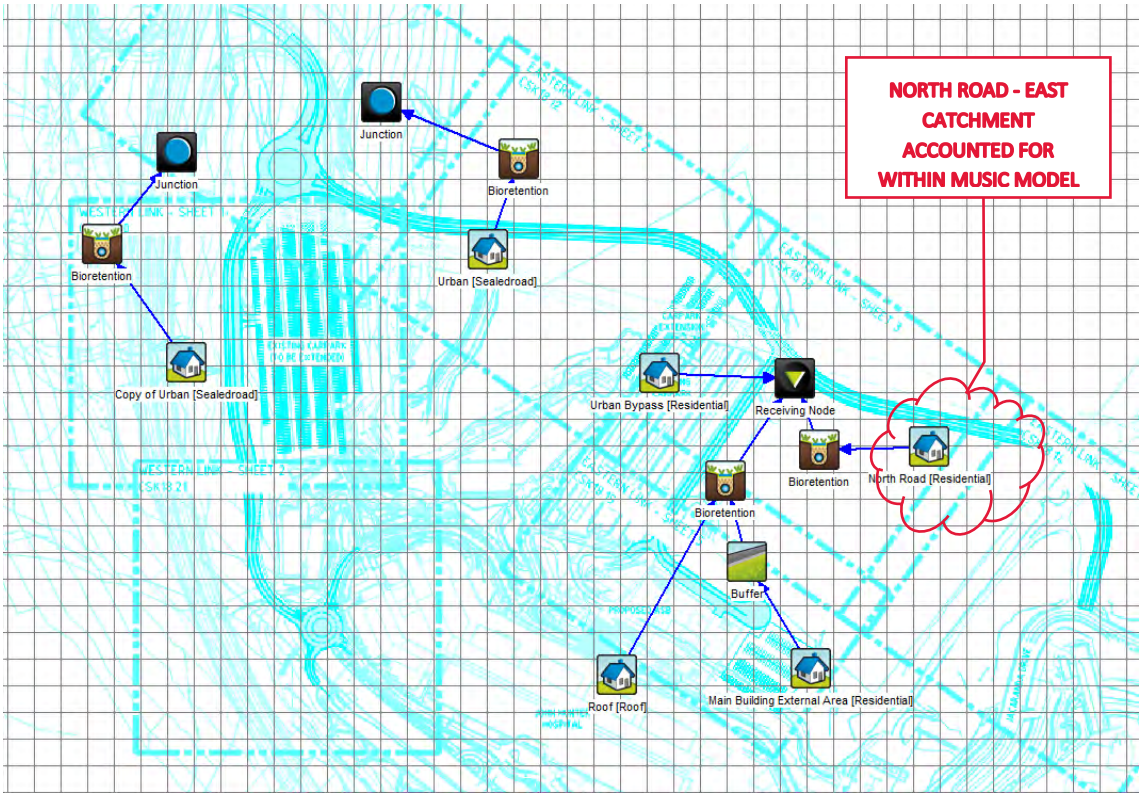

Figure 12 – MUSIC Model Schematic

The source nodes adopted to represent the development were the Urban Sealed Road node, Urban Residential node and Urban Roof node. The impervious percentage of the nodes was calculated from the architectural and civil drawings.

The stormwater treatment train for the treated portion of the site incorporates the following:

- Primary treatment will be provided by landscaping buffers.
- Tertiary treatment will be provided via four separate biofiltration basins across the site.

Descriptions of the treatment measures are detailed below:

Landscaping Buffer

Landscaping across the property shall be used as a buffer to filter stormwater while it infiltrates through the ground, before being collected by subsoil drainage and directed to the main stormwater network. This has been modelled using the Buffer node in MUSIC.

Biofiltration Basin

Biofiltration basins have been provided across the multiple catchments found on site. Details of the bio-filtration basin MUSIC node parameters can be seen in Appendix A. Approximate basin locations can be seen in Figure 13 below. Minimum biofiltration basin filter areas to be provided:

- Basin 1 – 180m^2.
- Basin 2 – 30m^2.
- Basin 3 – 30m^2.
- Basin 4 – 120m^2.

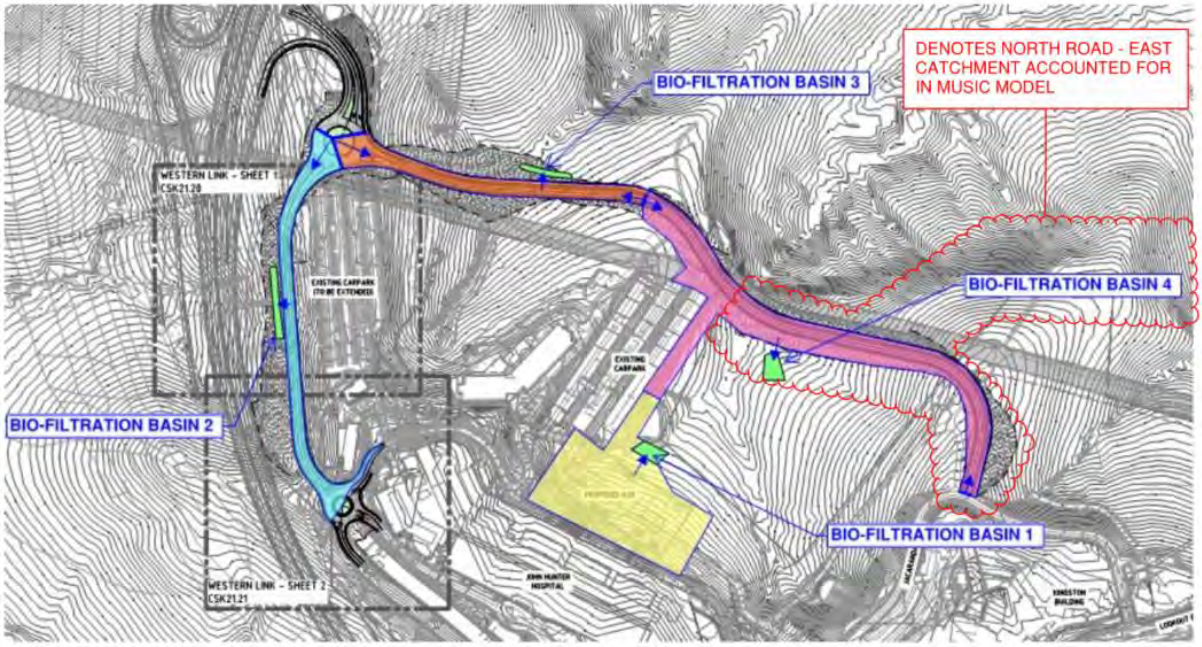

Figure 13 – MUSIC Model Schematic

Results

The results from the MUSIC modelling are presented in Table 6

Table 6 - MUSIC Model Result Summary

	Basin 1 & 4 Outlet Percentage Reduction	Basin 2 Outlet Percentage Reduction	Basin 3 Outlet Percentage Reduction	Target Objectives
Total Suspended Solids (TSS)	89.5 %	86.1 %	86.8 %	85 %
Total Phosphorous (TP)	65.8 %	73.9 %	75.2 %	65 %
Total Nitrogen (TN)	61 %	50.3 %	52 %	45 %
Gross Pollutants	100 %	100 %	100 %	90 %

Table 6 indicates that the proposed stormwater management strategy is predicted to achieve the load reduction targets set out in Council's DCP 2012, as estimated by MUSIC.

MUSIC Link files for the 3 receiving nodes have been included with this report in Appendix A. The MUSIC model can be provided upon request.

Two stormwater culverts are proposed along the internal road network in order to maintain existing flow regimes on site. Both culverts are proposed as part of the JHHIP project phase. Culvert locations and associated catchments areas can be seen in Figure 14 below.

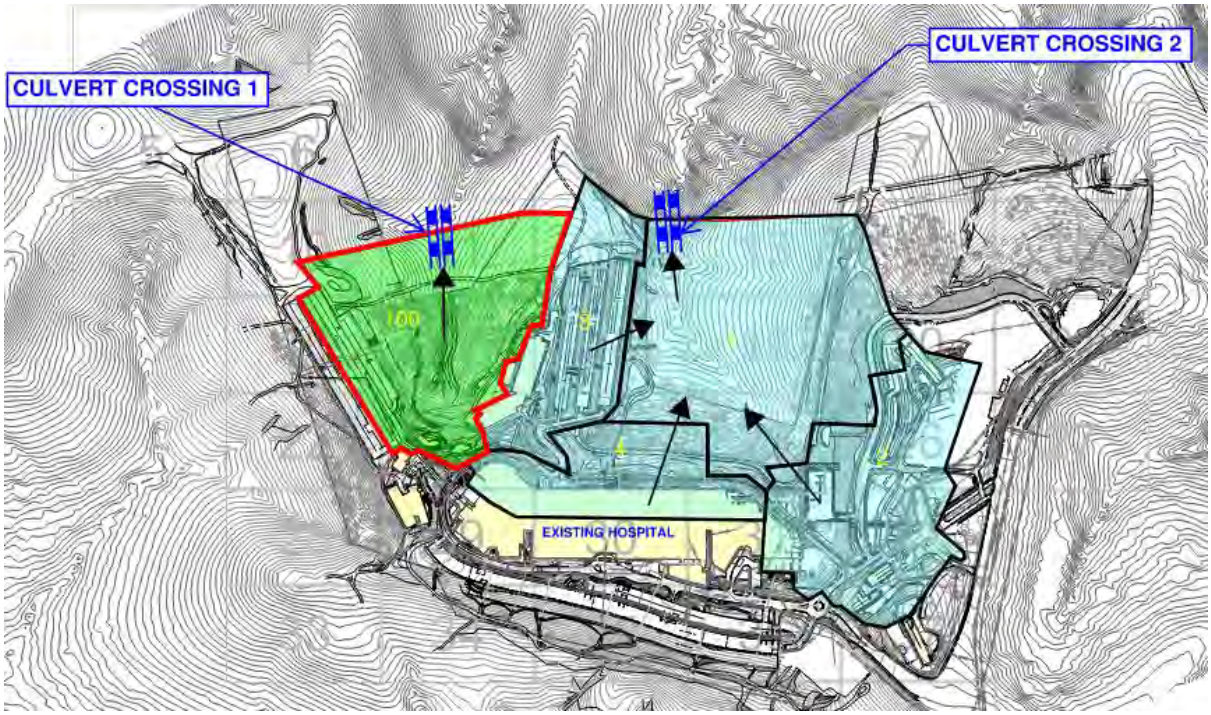

Figure 14 - Stormwater Culvert locations and Catchments

Preliminary culvert sizing has been undertaken utilising DRAINS software to predict catchment flows and 'hydraulics design of precast concrete conduits' (CPAA 1991) to provide initial culvert sizing for the 1% AEP design storm event. A blockage of 50% was accounted for. Note, detailed culvert design is to be undertaken during the CC stage.

Table 7 - Stormwater Culvert Sizing

	Culvert 1	Culvert 2
Catchment Area	6.83 Ha	22.87 Ha
1% AEP Peak flows (Q)	4.5 m^3/s	12.5 m^3/s
Minimum Culvert Diameter (D)	2 x Ø1650*	2 x Ø2550*
HW/D	1.03	1.02
HW Depth	1.70 (m)	2.61 (m)

* Note pipe sizes shown are as required to achieve nominated capacity. Pipe substitution for appropriately sized box culverts may be undertaken as part of the detailed design.

6. Flooding

In general, the site is located on a regional high point and therefore is not affected by large scale regional flooding. Multiple drainage gullies are located within the site which currently convey runoff from large storm events to their associated discharge locations, these are indicated as 'very low flood risk' as per Council's interactive flood mapping software (refer to Figure 15 below).

Figure 15 – Council flood risk mapping

Notwithstanding the above, Figure 16 below taken from Draft Newcastle Floodplain Risk Management Study Map Series 4 – 1% AEP Flood Impact Categories (BMT WBM 2012) indicates the site is not affected by the 1% AEP storm event.

Figure 16 – 1% AEP flood extent

Given the site is seen to be only affected by localised flooding (i.e. site runoff) the drainage measures being implemented as part of the development, i.e. onsite detention, stormwater diversions and new drainage infrastructure are seen to be sufficient to appropriately manage the localised flood risk found on site.

7. Soil, Water and Air

7.1. Soil and Water Management

In general, the Contractor shall be responsible for adequately managing/ controlling site stormwater runoff with the aim of preventing erosion and deposition, specifically within water ways or stormwater drains.

The general principles for management are to eliminate, isolate, minimise or control erosion, and therefore the potential for sediment deposition to have an effect on downstream environments.

The first step to ensure the sediment and erosion control strategy is successfully adopted, is awareness. It is therefore vital that all site personnel, including: engineers, foreman, leading hands, site managers, labours, machinery operators and administration personnel are aware of the sediment and erosion control plan. To achieve this site-wide awareness, the contractor shall undertake sediment and erosion control awareness and education as part of the site induction or general induction for all personnel.

All work is to be carried out in accordance with relevant ordinances and regulations; note in particular the requirements of Landcom's 'Managing Urban Stormwater, Soils and Construction' (the 'blue book'). The Contractor shall be responsible for adequately implementing the measures in these documents.

The successful contractor will be required to prepared a Construction Management Plan, which as a minimum shall include the following specific requirements for implementation on this site:

- Install sediment protection filters on all new and existing stormwater inlet pits in accordance with the typical detail of the 'blue book', including stormwater pits located within the existing road network in the vicinity of works.
- All stormwater devices in the designated route of vehicular access shall be protected from damage. All damage to stormwater devices during the works shall be repaired or replaced immediately, otherwise an interim drainage system installed until the full repair or replacement can be undertaken. In any event, all repair and replacement shall be undertaken prior to the completion of works.
- Sediment and Erosion Control measures shall be installed prior to the commencement of construction and regularly maintained in accordance with the Engineering drawings and specifications.
- Install a 'rumble strip' or 'shakedown' at all vehicle exist points to reduce the likelihood of sediment being trafficked offsite. Manually remove (by means other than washing into stormwater drains) sediment tracked offsite on the adjacent roads. The Contractor will monitor, and maintain as necessary, a sweep clean process of the pavement surface adjacent to the ingress and egress to the site on a daily basis.
- Construct and maintain all material stockpiles in accordance with detail SD4-1 of the 'blue book'.
- The Site Foreman (Contractor) shall be responsible for keeping a detailed written record of all erosion and sediment controls on site during the construction period. This record shall be updated on a daily basis and shall contain details on the condition of controls and any/ all maintenance, cleaning and breaches. This record shall be kept on site at all times and shall be made available for inspection by an authorised person during normal working hours.

- To reduce the likelihood of suspended solids entering downstream stormwater drains; flocculate, settle and discharge stored water from the temporary sediment ponds in accordance with the methodology outlined in the blue book.

A conceptual Erosion and Sediment Control Plan is contained within the civil drawings package in Appendix B. The intent of the concept plans is to demonstrate how the control of erosion and sediment can be managed in order to prevent the pollution of downstream waterways. It has been prepared in accordance with Council's DCP and Managing Urban Stormwater: Soils and Construction (Landcom, 2004). The concept plans should be updated prior to construction commencing to ensure the plan suits the proposed construction methodology. The plan should then continually be reviewed and updated as required throughout the construction period.

7.2. Site Constraints

Existing site constraints and erosion characteristics are outlined in Table 8 below.

Table 8 - Existing Site Constraints

Site Constraint or Characteristic	Value/Comment
Rainfall	1122mm/yr – mean annual rainfall at Williamtown Bureau of Meteorology weather station
Rainfall Zone	Zone 1 (Landcom's 'Managing Urban Stormwater'- Fig 4.9)
Slope Gradients	Varies <1 – 20%
Potential Erosion Hazard	Low for slopes less than 17%; high for slopes greater than 17% (Landcom's 'Managing Urban Stormwater'- Fig 4.6)
Soil Erodibility	K-factor = 0.016 Low - Moderate Erodibility based on proposed batter slopes
Calculated Soil Loss	377 Tonnes/Ha/Yr. Calculations have been detailed in Appendix B of this report.
Soil Loss Class	Class 4 –Moderate (Landcom's 'Managing Urban Stormwater'- Table 4.2)
Soil Texture Group	Type F
Soil Dispersivity	Emerson Class 1, 2 & 5
Runoff Coefficient	0.5
Disturbed Site Area	7.4Ha disturbance area

7.3. Dust Management

To ensure that dust generation is eliminated or reduced where possible and practical, all site operations shall be undertaken with consideration given to their potential to produce dust. A management strategy of *avoid* > *minimise* > *control* shall be implemented.

The first step to ensure the dust minimisation is successfully achieved, is awareness. It is therefore vital that all site personnel, including: engineers, foreman, leading hands, site managers, machinery operators, labours and administration personnel are aware of the dust minimisation strategy. To achieve this site-wide awareness, the contractor shall undertake dust minimisation awareness and education as part of the site induction or general induction for all personnel.

The Contractor shall instigate measures to minimise and control generation of dust from the site. These measures shall include, but not be limited to:

- Program works around periods of significant and adverse meteorological conditions.
- Install wind fences around stockpiles with a significant amount of fine particulates.
- Maintain vegetation across the site where possible, otherwise establish vegetation or seal disturbed site areas as soon as practical.
- Provide water trucks or sprinkling devices during construction as required to suppress dust, specifically for site vehicular traffic or dumping and filling operations.

7.4. Water Supply for the Life of Project

Water supply to the site is currently provided by Hunter Water Corporation (HWC), with numerous existing water mains traversing the site. Warren Smith & Partners (WSP), the projects Hydraulic Consultant, have consulted with HWC who have confirmed that the existing water supply to the site will be sufficient to service the proposed development for its serviceable life. Refer to WSP report for further details.

7.5. Site Water Balance

Basin sizing has been completed in accordance with the requirements of Landcom's 'Managing Urban Stormwater, Soils and Construction' (the 'blue book') to ensure sediment basins are sized for the appropriate storm events and disturbance area.

Stormwater quantity post development has also been considered, with a runoff routing model completed using DRAINS to ensure that the peak discharge leaving the site does not exceed pre-development flow rates – Refer to Section 5 for further details.

Given the above considerations we believe the site wide water balance requirements have been met.

7.6. Surface Water Monitoring

Surface water collected within proposed erosion and sediment control basins during construction will be subject to the following monitoring and testing requirements:

- Prior to any forecast weather event, likely to result in sediment laden runoff on the site, any existing detention basins/traps shall be dewatered to provide sufficient capacity to capture sediment laden water from the site.
- Any sediment laden water captured on-site must be treated to ensure it will achieve council's water quality objectives prior to its release from site. A sample of the released treated water must be kept on-site in a clear container with the sample date recorded.

- No aluminium-based products may be used to treat turbid water (flocculating/ coagulants) on-site without the prior written permission from an appropriate council officer. The applicant must have demonstrated ability to use such products correctly and without environmental harm prior to any approval.
- The chemical/ agent (flocculating/ coagulants) used in type d and type of basins to treat turbid water captured in the basin must be applied in concentrations sufficient to achieve council's water quality objectives (tss < 50mg/l, turbidity < 60 ntu, 6.5 < ph < 8.5) within the 5-day rainfall depth used to calculate the capacity of the basin, after a rainfall event.
- All manufacturer's instructions must be followed for the use of any chemicals/agents used on-site, except where approved by the responsible person or an appropriate council officer.
- Sufficient quantities of chemicals/ agents to treat turbid water (flocculating/ coagulants) must be placed such that water entering the basins/ sediment trap mixes with the chemicals/agents and is carried into the basin/ trap.
- Any basin must be dewatered as soon as practical, once water captured in the basin achieves council's water quality objectives.
- Inspect the sediment basins after each rainfall event and/ or weekly. Ensure that all sediment is removed once the sediment storage zone is full. Ensure that outlet and emergency spillway works are maintained in a fully operational condition at all times.

7.7. Groundwater Monitoring

RCA Australia undertook groundwater/seepage fieldwork investigations as outlined within geotechnical investigation report (ref# 14399-701/0) section 3.4. At the time of investigations, no groundwater or seepage was encountered in any of the test pits. Further groundwater investigations are proposed in the future due to the anticipated presence of low strength material associated with the Victorian Tunnel Seam. Refer to RCA Australia report for further details.

7.8. Salinity and acid Sulphate Soil Assessment and Management Strategies

RCA Australia undertook an Acid Sulfate Assessment as outlined within geotechnical investigation report (ref# 14399-701/0) section 4.7. The results of the assessment indicated a low potential for acid sulfate rock drainage. For further details and methodology refer to RCA Australia report.

8. Structural Design Proposal

The new ASB is to be located to the north of the existing John Hunter Hospital and to the southeast of the existing HMRI building. The existing Kookaburra Circuit road formation will be located between the existing hospital and the ASB, maintaining the existing road geometry at this location.

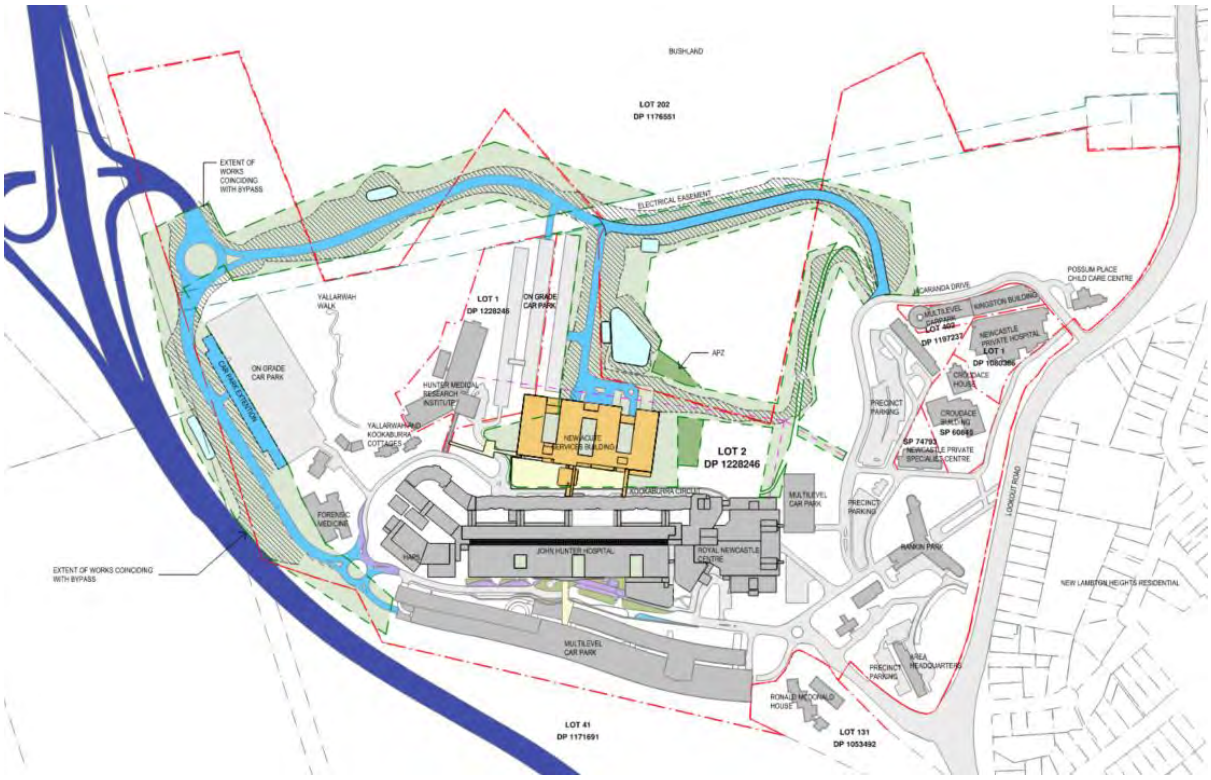

Figure 17 – Site Schematic

The ASB includes basement levels which will provide carparking and plant spaces for services. Link bridge connections will be provided from the ASB to HMRI and the existing John Hunter Wards Building.

9. Mines Subsidence

The site is underlain by three coal seams being the Victoria Tunnel, Nobby's and Borehole Seam.

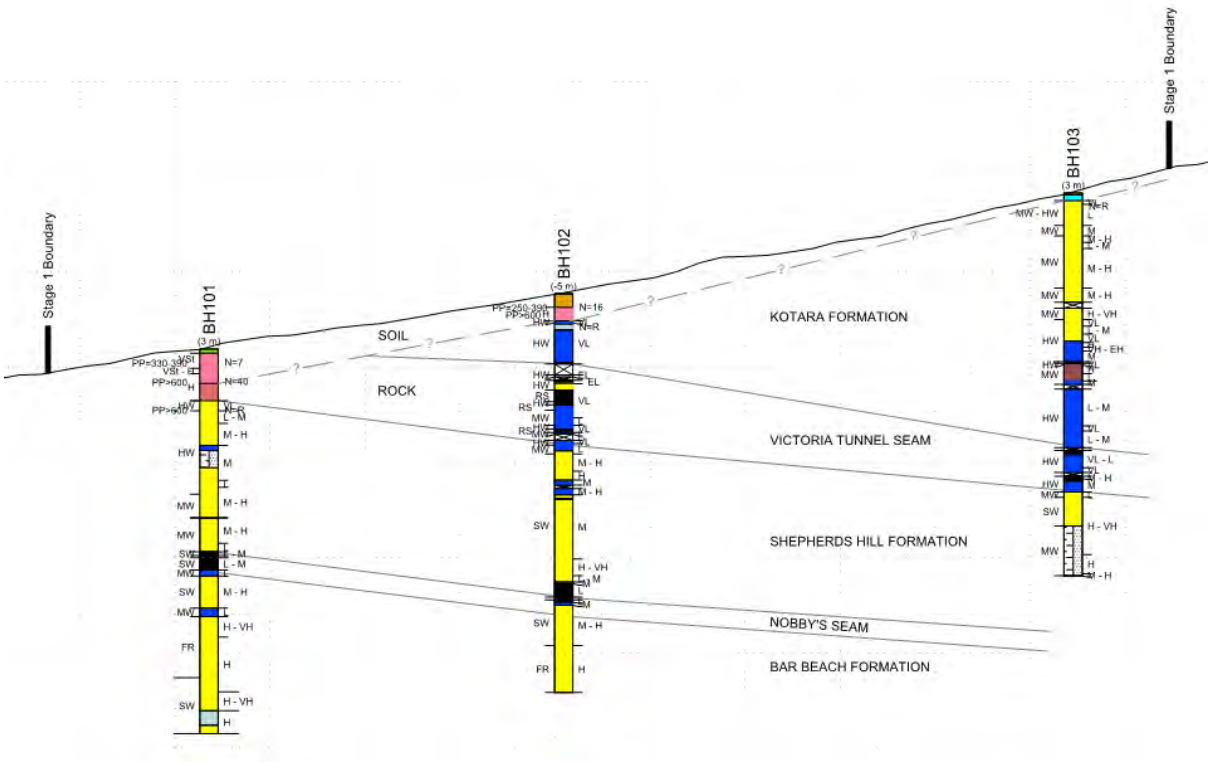

Figure 18 – Typical Site Section

Only the Borehole Seam has been mined. The Victoria Seam will most likely be exposed during excavation. The Nobby's seam falls between two layers of sandstone and will impact the foundation system.

The Geotechnical Consultant, RCA Australia, have undertaken a series of boreholes across the site to determine the condition of the abandoned mine workings beneath the site. This work involved not only drilling the boreholes but also down hole camera work and geophysics investigations. The borehole investigations confirmed the presence of three coal seams beneath the site including; the Victoria Tunnel Seam (approx. RL70.0), the Nobbys Seam (approx. RL 60.0) and the Borehole Seam (approx. RL -20.0). Of these seams only the Borehole Seam has been mined with investigations showing that the mine workings are partially collapsed and that a targeted grouting strategy would be required due to the size of the voids.

While the results of this investigation indicated that some subsidence had occurred the extent to which the abandoned workings had collapsed and the potential for further subsidence on the site was unable to be quantified. As a result, a preliminary finite element model of the workings was developed to explain the observations from the borehole data.

To summarise:

- There have been six boreholes drilled to the base of the workings. Four of the boreholes hit pillars and two hit bords (rubble and collapsed materials and intermittent voids found).
- RCA have stated that the findings of the investigation were consistent with the borehole information on the existing JHH site, the HMRI site and TfNSW investigations and that they are of the view that the workings have partially collapsed.
- The pillars are partially collapsed, and the overburden is at least partially fractured and goafed. This is confirmed by widespread water loss in the overburden and the presence of large cracks up to at least 17.5m from the surface.
- There are remnant voids present at and above the level of the mined seam at depths of between about 82m and 94m.
- The pillars encountered are a consistent height of between 2.62-2.73m.
- The workings are likely to be slightly shifted from that shown currently on the mine overlay plan. Refer Appendix C.

Based on the initial data collected, the following mine subsidence parameters were proposed by RCA:

- Subsidence = 100 to 450mm
- Horizontal Strain = 3.0mm/m (tension); 3.0mm/m (compression)
- Curvature = -0.3km to 0.3km
- Tilt = 2 to 9 mm/m

The design team have reviewed these parameters and confirmed that these parameters were not suitable for the design of the ASB and that remediation works would be required. These remediation works involve partial grouting of the mines.

The Mines Subsidence Strategy prepared by RCA recommends:

- Placement of grout in two out of every four bords across the building footprint and a 15m buffer (10 bords in total).
- Grout is proposed to be minimum 3MPa UCS grout placed via 125mm to 150mm diameter boreholes drilled at a nominal spacing of 15m to 20m along the bords.
- It is assessed that the total grout volumes required to meet design criteria could range between 6,000m^3 and 10,000m^3.

RCA have confirmed that a partial grouting strategy which involves filling two bords and then leaving two bords results in the following mine subsidence parameters:

- Subsidence = < 200mm
- Horizontal Strain = <2.0mm/m
- Curvature <0.1km
- Tilt < 2mm/m

Regarding the ASB design, the following design considerations will be considered when constructing in mine affected areas and noted the following in relation to the ASB:

"Mine subsidence effects include vertical and to a lesser extent horizontal ground movement, ground strains and tilt of the ground surface. Vertical subsidence on its own, if it were uniform across the site, would have little impact on a building structure. Damage is primarily caused by large differential settlements and ground strains. It is recommended, where possible, to isolate the building from the effects of the ground strains and design the building to cope with the differential settlement. Some grouting of the workings will usually reduce these parameters to acceptable levels. The work done to date indicates that partial grouting will reduce the impacts of mine subsidence".

Mitigation Measures for the building will include the following:

- All footings which support this structure will be isolated from the foundation material using a combination of high-density extruded polystyrene, expanded polystyrene and sand. Isolating the footings from the retaining structures using a combination of the elements mentioned above.
- Articulation of the ASB into three separate buildings. Each building will have permanent construction joints designed to accommodate horizontal strains.
- The joint is not expected to impact the building and cover plates will be required to ensure smooth transitions between buildings are achievable.
- Separating suspended slabs from the retaining structures using compressible foam and sealed using a flexible mastic sealant.
- Vertical control joints being incorporated into the design of the shoring/ retaining walls
- Vertical control joints being provided in all reinforced and unreinforced masonry walls.

All gravity services being provided with an additional grade of 0.4% above that required for design.

10. Geotechnical

The ASB building will be 11-storeys in total, including basement carparking cut into the side of the embankment on the north side of Kookaburra Circuit. The Geotechnical report prepared by RCA has revealed that the excavation will comprise of fill, residual clays, coal and rock. See Stratigraphic soil description below:

Table 9 – Description of Stratigraphic Units

Stratigraphic Unit	Description	Typical Characteristics/ Extent
Fill	Silty sand and gravelly sandy clay	Likely to be limited to the western end of the building pad.
Kotara Formation	Interbedded tuffaceous claystone, siltstone, with large beds of sandstone and conglomerate	The lower part of the formation typically comprises sequences of medium strength siltstone and sandstone. Where weathered the material is high plasticity and generally described as clay or silty clay.
Victoria Tunnel Seam	Coal	Typically, between 2m and 4m thick, low to medium strength coal with interbedded tuff, claystone/ siltstone and where weathered is of high plasticity.
Shepherds Hill Formation	Interbedded tuffaceous claystone, siltstone, and sandstone	Typically, between 7m and 10m thick, medium to high strength tuff, siltstone and sandstone.
Nobby's Seam	Coal	Ranging in thickness between about 0.8m and 1.2m, low strength, and where weathered is typically high plasticity.
Bar Beach Formation	Interbedded sandstone and conglomerate	Medium to high strength interbedded siltstones and sandstones, grading into high strength sandstone and conglomerate.

11. Shoring

The excavation for the basement levels will require retaining walls/ shoring structures. The Geotechnical report recommends that short term excavations in soil and rock may be constructed at maximum batters of 1H:1V.

Long term excavations will be retained by an engineered designed retaining wall. Based on the expected soil profile, the geotechnical report recommends that excavation depths greater than 2.0m in depth should be progressively retained. This includes contiguous piles walls or soldier walls through the soil and weathered rock and meshing and pattern rock bolting, meshing and dental shotcrete in moderately weathered to fresh rock. The Victoria Coal Seam will require rock bolted meshing and shotcrete covering. Installation of strip drains between the shotcrete and the rock face is recommended. Geotechnical parameters for the retaining wall/ shoring design can be found below:

Table 10 - Retaining Wall Parameters

Material	Geotechnical Parameters				
	Bulk Unit Weight (kN/m^3)	Cohesion c' (kPa)	Friction Angle ϕ' (degrees)	At Rest [1] Coefficient of Lateral Earth Pressure	Active [2] Coefficient of Lateral Earth Pressure
Angular 20mm aggregate backfill	21	0	40	0.63	0.22
Residual CLAY/ Sandy CLAY soils	19	5	25	0.58	0.4
Extremely to Low strength rock (Class V/IV)	21	5	25	0.65[3]	0.4
Medium to High Strength rock (Class III)	22	10	35	0.43	0.27

The excavation of the site will most likely involve the removal of rock. Rock removal may be done by specialist earthworks machinery. Impacts to the existing campus such as noise, dust and vibration will be considered to reduce the impact to the hospital's operations.

Shoring Plans and details can be found in Appendix D.

Appendix A – Music Link Reports

THE CITY OF NEWCASTLE

MUSIC-*link* Report

Project Details		Company Details	
Project:	JHHIP	**Company:**	Northrop Consulting Engineers
Report Export Date:	28/09/2020	**Contact:**	R Jeans
Catchment Name:	NL191366_MUSIC DA [rev3-no RWT]	**Address:**	Level 1 215 Pacific Highway Charlestown NSW 2290
Catchment Area:	3.833ha	**Phone:**	(02) 4943 1777
Impervious Area*:	52.63%	**Email:**	rjeans@northrop.com.au
Rainfall Station:	61078 WILLIAMTOWN		
Modelling Time-step:	6 Minutes		
Modelling Period:	1/01/1995 - 31/12/2008 11:54:00 PM		
Mean Annual Rainfall:	1125mm		
Evapotranspiration:	1735mm		
MUSIC Version:	6.3.0		
MUSIC-link data Version:	6.33		
Study Area:	Newcastle		
Scenario:	Newcastle		

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

Treatment Train Effectiveness

Node: Receiving Node	Reduction
Flow	3.63%
TSS	89.5%
TP	65.8%
TN	61%
GP	100%

Treatment Nodes

Node Type	Number
Bio Retention Node	4
Buffer Node	1

Source Nodes

Node Type	Number
Urban Source Node	6

Comments

Passing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Bio	Bioretention	Hi-flow bypass rate (cum/sec)	None	None	100
Bio	Bioretention	Hi-flow bypass rate (cum/sec)	None	None	100
Bio	Bioretention	Hi-flow bypass rate (cum/sec)	None	None	100
Bio	Bioretention	Hi-flow bypass rate (cum/sec)	None	None	100
Bio	Bioretention	PET Scaling Factor	2.1	2.1	2.1
Bio	Bioretention	PET Scaling Factor	2.1	2.1	2.1
Bio	Bioretention	PET Scaling Factor	2.1	2.1	2.1
Bio	Bioretention	PET Scaling Factor	2.1	2.1	2.1
Buffer	Buffer	Proportion of upstream impervious area treated	None	None	0.5
Receiving	Receiving Node	% Load Reduction	None	None	3.63
Receiving	Receiving Node	GP % Load Reduction	90	None	100
Receiving	Receiving Node	TN % Load Reduction	45	None	61
Receiving	Receiving Node	TP % Load Reduction	65	None	65.8
Receiving	Receiving Node	TSS % Load Reduction	85	None	89.5
Urban	Copy of Urban	Area Impervious (ha)	None	None	0.586
Urban	Copy of Urban	Area Pervious (ha)	None	None	0
Urban	Copy of Urban	Total Area (ha)	None	None	0.586
Urban	Main Building External Area	Area Impervious (ha)	None	None	0.436
Urban	Main Building External Area	Area Pervious (ha)	None	None	0.660
Urban	Main Building External Area	Total Area (ha)	None	None	1.097
Urban	North Road	Area Impervious (ha)	None	None	0.606
Urban	North Road	Area Pervious (ha)	None	None	0.874
Urban	North Road	Total Area (ha)	None	None	1.481
Urban	Roof	Area Impervious (ha)	None	None	0.974
Urban	Roof	Area Pervious (ha)	None	None	0
Urban	Roof	Total Area (ha)	None	None	0.974
Urban	Urban	Area Impervious (ha)	None	None	0.522
Urban	Urban	Area Pervious (ha)	None	None	0
Urban	Urban	Total Area (ha)	None	None	0.522
Urban	Urban Bypass	Area Impervious (ha)	None	None	0
Urban	Urban Bypass	Area Pervious (ha)	None	None	0.281
Urban	Urban Bypass	Total Area (ha)	None	None	0.281

Only certain parameters are reported when they pass validation

THE CITY OF NEWCASTLE

MUSIC-*link* Report

Project Details		Company Details	
Project:	JHHIP	**Company:**	Northrop Consulting Engineers
Report Export Date:	28/09/2020	**Contact:**	R Jeans
Catchment Name:	NL191366_MUSIC DA [rev3-no RWT]	**Address:**	Level 1 215 Pacific Highway Charlestown NSW 2290
Catchment Area:	0.586ha	**Phone:**	(02) 4943 1777
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Mean Annual Rainfall:	1125mm		
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MUSIC Version:	6.3.0		
MUSIC-link data Version:	6.33		
Study Area:	Newcastle		
Scenario:	Newcastle		

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

Treatment Train Effectiveness		Treatment Nodes		Source Nodes	
Node: Junction	**Reduction**	**Node Type**	**Number**	**Node Type**	**Number**
Flow	1.38%	Bio Retention Node	4	Urban Source Node	6
TSS	86.1%	Buffer Node	1		
TP	73.9%				
TN	50.3%				
GP	100%				

Comments

Passing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Bio	Bioretention	Hi-flow bypass rate (cum/sec)	None	None	100
Bio	Bioretention	Hi-flow bypass rate (cum/sec)	None	None	100
Bio	Bioretention	Hi-flow bypass rate (cum/sec)	None	None	100
Bio	Bioretention	Hi-flow bypass rate (cum/sec)	None	None	100
Bio	Bioretention	PET Scaling Factor	2.1	2.1	2.1
Bio	Bioretention	PET Scaling Factor	2.1	2.1	2.1
Bio	Bioretention	PET Scaling Factor	2.1	2.1	2.1
Bio	Bioretention	PET Scaling Factor	2.1	2.1	2.1
Buffer	Buffer	Proportion of upstream impervious area treated	None	None	0.5
Receiving	Receiving Node	% Load Reduction	None	None	3.63
Receiving	Receiving Node	GP % Load Reduction	90	None	100
Receiving	Receiving Node	TN % Load Reduction	45	None	61
Receiving	Receiving Node	TP % Load Reduction	65	None	65.8
Receiving	Receiving Node	TSS % Load Reduction	85	None	89.5
Urban	Copy of Urban	Area Impervious (ha)	None	None	0.586
Urban	Copy of Urban	Area Pervious (ha)	None	None	0
Urban	Copy of Urban	Total Area (ha)	None	None	0.586
Urban	Main Building External Area	Area Impervious (ha)	None	None	0.436
Urban	Main Building External Area	Area Pervious (ha)	None	None	0.660
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Urban	Roof	Total Area (ha)	None	None	0.974
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Urban	Urban	Area Pervious (ha)	None	None	0
Urban	Urban	Total Area (ha)	None	None	0.522
Urban	Urban Bypass	Area Impervious (ha)	None	None	0
Urban	Urban Bypass	Area Pervious (ha)	None	None	0.281
Urban	Urban Bypass	Total Area (ha)	None	None	0.281

Only certain parameters are reported when they pass validation

THE CITY OF NEWCASTLE

MUSIC-*link* Report

Project Details		Company Details	
Project:	JHHIP	**Company:**	Northrop Consulting Engineers
Report Export Date:	28/09/2020	**Contact:**	R Jeans
Catchment Name:	NL191366_MUSIC DA [rev3-no RWT]	**Address:**	Level 1 215 Pacific Highway Charlestown NSW 2290
Catchment Area:	0.522ha	**Phone:**	(02) 4943 1777
Impervious Area*:	100%	**Email:**	rjeans@northrop.com.au
Rainfall Station:	61078 WILLIAMTOWN		
Modelling Time-step:	6 Minutes		
Modelling Period:	1/01/1995 - 31/12/2008 11:54:00 PM		
Mean Annual Rainfall:	1125mm		
Evapotranspiration:	1735mm		
MUSIC Version:	6.3.0		
MUSIC-link data Version:	6.33		
Study Area:	Newcastle		
Scenario:	Newcastle		

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

Treatment Train Effectiveness		Treatment Nodes		Source Nodes	
Node: Junction	**Reduction**	**Node Type**	**Number**	**Node Type**	**Number**
Flow	1.55%	Bio Retention Node	4	Urban Source Node	6
TSS	86.8%	Buffer Node	1		
TP	75.2%				
TN	52%				
GP	100%				

Comments

Passing Parameters

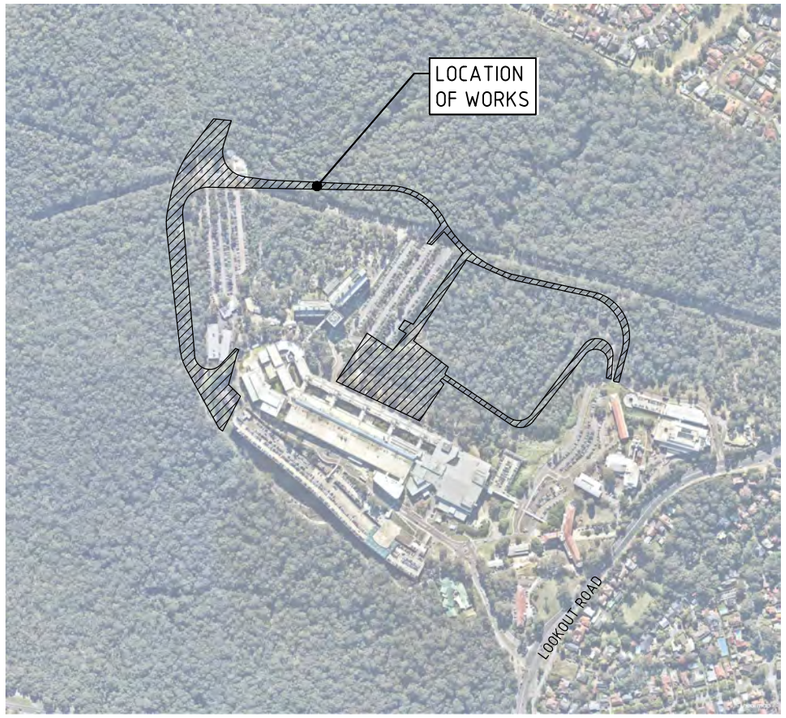
Node Type	Node Name	Parameter	Min	Max	Actual
Bio	Bioretention	Hi-flow bypass rate (cum/sec)	None	None	100
Bio	Bioretention	Hi-flow bypass rate (cum/sec)	None	None	100
Bio	Bioretention	Hi-flow bypass rate (cum/sec)	None	None	100
Bio	Bioretention	Hi-flow bypass rate (cum/sec)	None	None	100
Bio	Bioretention	PET Scaling Factor	2.1	2.1	2.1
Bio	Bioretention	PET Scaling Factor	2.1	2.1	2.1
Bio	Bioretention	PET Scaling Factor	2.1	2.1	2.1
Bio	Bioretention	PET Scaling Factor	2.1	2.1	2.1
Buffer	Buffer	Proportion of upstream impervious area treated	None	None	0.5
Receiving	Receiving Node	% Load Reduction	None	None	3.63
Receiving	Receiving Node	GP % Load Reduction	90	None	100
Receiving	Receiving Node	TN % Load Reduction	45	None	61
Receiving	Receiving Node	TP % Load Reduction	65	None	65.8
Receiving	Receiving Node	TSS % Load Reduction	85	None	89.5
Urban	Copy of Urban	Area Impervious (ha)	None	None	0.586
Urban	Copy of Urban	Area Pervious (ha)	None	None	0
Urban	Copy of Urban	Total Area (ha)	None	None	0.586
Urban	Main Building External Area	Area Impervious (ha)	None	None	0.436
Urban	Main Building External Area	Area Pervious (ha)	None	None	0.660
Urban	Main Building External Area	Total Area (ha)	None	None	1.097
Urban	North Road	Area Impervious (ha)	None	None	0.606
Urban	North Road	Area Pervious (ha)	None	None	0.874
Urban	North Road	Total Area (ha)	None	None	1.481
Urban	Roof	Area Impervious (ha)	None	None	0.974
Urban	Roof	Area Pervious (ha)	None	None	0
Urban	Roof	Total Area (ha)	None	None	0.974
Urban	Urban	Area Impervious (ha)	None	None	0.522
Urban	Urban	Area Pervious (ha)	None	None	0
Urban	Urban	Total Area (ha)	None	None	0.522
Urban	Urban Bypass	Area Impervious (ha)	None	None	0
Urban	Urban Bypass	Area Pervious (ha)	None	None	0.281
Urban	Urban Bypass	Total Area (ha)	None	None	0.281

Only certain parameters are reported when they pass validation

Appendix B – Civil Drawings

JOHN HUNTER HOSPITAL AND INNOVATION PRECINCT

LOOKOUT ROAD, NEW LAMBTON HEIGHTS
CIVIL SSDA PACKAGE



LOCALITY PLAN

DRAWING SCHEDULE

DRG No.	DRAWING TITLE
C001-DA	COVER SHEET, LOCALITY PLAN AND DRAWING SCHEDULE
C100-DA	SOIL AND WATER MANAGEMENT PLAN
C101-DA	SOIL AND WATER MANAGEMENT DETAILS
C102-DA	SOIL AND WATER MANAGEMENT NOTES
C200-DA	BULK EARTHWORKS PLAN
C300-DA	CIVIL WORKS ARRANGEMENT PLAN
C400-DA	ROAD SETOUT PLAN
C401-DA	ROAD TYPICAL SECTIONS
C501-DA	ROAD LONG SECTIONS - SHEET 1
C502-DA	ROAD LONG SECTIONS - SHEET 2
C503-DA	ROAD LONG SECTIONS - SHEET 3

DRAWN: L.STEEL DESIGNED: S.SPURR JOB MANAGER: C.SMITH VERIFIER: C.SMITH

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR DRAFT REVIEW	LS		CS	30.09.20
2	ISSUED FOR REVIEW	LS		CS	09.11.20
3	ISSUED FOR SCHEMATIC DESIGN	LS		CS	29.01.21
4	ISSUED FOR DRAFT SSDA	LS		CS	25.02.21
5	ISSUED FOR DRAFT SSDA	LS		CS	09.03.21
6	ISSUED FOR SSDA	LS		CS	31.03.21

CLIENT
NSW GOVERNMENT Health Infrastructure

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ARCHITECT
BVN

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Email newcastle@northrop.com.au ABN 81 094 433 100

PROJECT
JOHN HUNTER HOSPITAL AND INNOVATION PRECINCT LOOKOUT ROAD, NEW LAMBTON HEIGHTS N.S.W

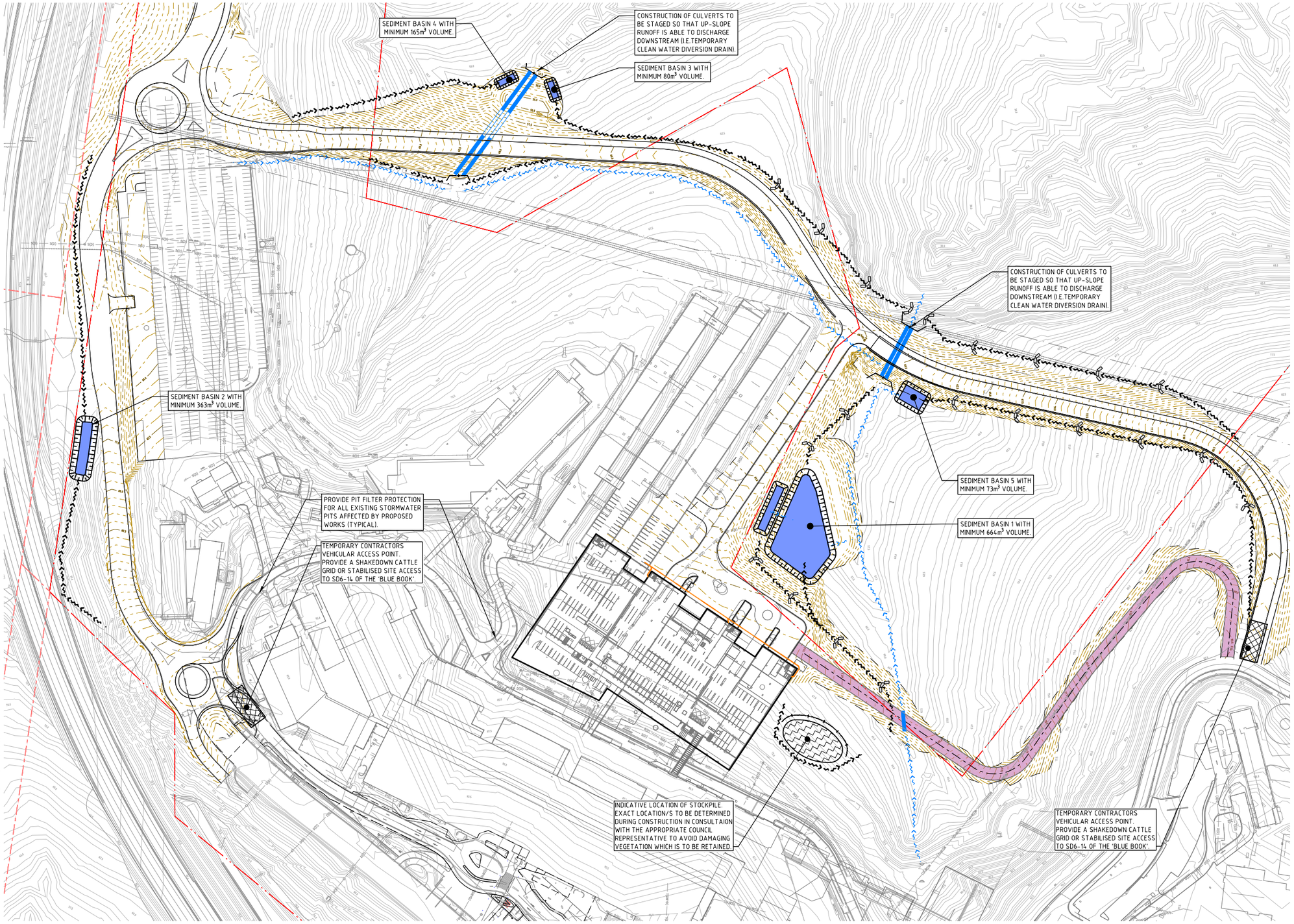
DRAWING TITLE
CIVIL ENGINEERING PACKAGE COVER SHEET, LOCALITY PLAN AND DRAWING SCHEDULE

JOB NUMBER
NL191366

DRAWING NUMBER
C001-DA

REVISION
6

DRAWING SHEET SIZE = A1



LEGEND

- DENOTES BOUNDARY LINE
- DENOTES EXISTING CONTOURS AT 1m INTERVALS.
- DENOTES EXISTING CONTOURS AT 0.5m INTERVALS.
- DENOTES SEDIMENT FENCE, REFER TO DETAIL ON DRAWING C101-DA.
- DENOTES SANDBAG SEDIMENT FILTER AND SEDIMENT SUMP. REFER TO DETAIL ON DRAWING C101-DA.
- DENOTES DIVERSION DRAIN (CLEAN)
- DENOTES DIVERSION DRAIN (DIRTY)
- DENOTES STOCKPILE, REFER TO DETAIL ON DRAWING C101-DA.
- DENOTES SEDIMENT BASIN, REFER TO DETAIL ON DRAWING C101-DA.
- DENOTES EXTENT OF PROPOSED CONSTRUCTION ACCESS TRACK.
- DENOTES STABILISED SITE ACCESS. REFER TO DETAIL ON DRAWING C101-DA
- DENOTES TEMPORARY WATERWAY CROSSING. REFER TO DETAIL ON DRAWING C101-DA

REFER TO SHEET C102-DA FOR EROSION AND SEDIMENT CONTROL NOTES

VERIFIER: C.SMITH
JOB MANAGER: C.SMITH
DESIGNED: S.SPURR
DRAWN: L.STEEL

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR REVIEW	LS		CS	09.11.20
2	ISSUED FOR SCHEMATIC DESIGN	LS		CS	29.01.21
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4	ISSUED FOR DRAFT SSDA	LS		CS	09.03.21
5	ISSUED FOR SSDA	LS		CS	31.03.21

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SCALE 1:1250 @ A1

0 10 20 30 40 50 60m

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PROJECT
JOHN HUNTER HOSPITAL AND INNOVATION PRECINCT LOOKOUT ROAD, NEW LAMBTON HEIGHTS N.S.W

DRAWING TITLE
CIVIL ENGINEERING PACKAGE

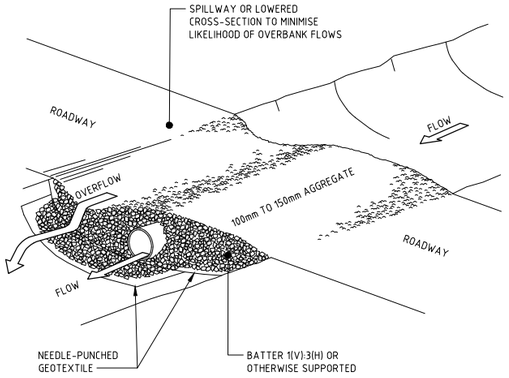
SOIL AND WATER MANAGEMENT PLAN

JOB NUMBER
NL191366

DRAWING NUMBER
C100-DA

REVISION
5

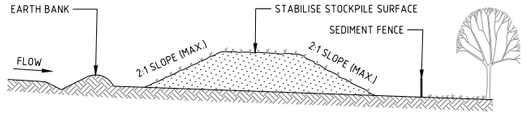
DRAWING SHEET SIZE = A1



CONSTRUCTION NOTES

1. PROHIBIT ALL TRAFFIC UNTIL THE ACCESS WAY IS CONSTRUCTED.
2. STRIP ANY TOPSOIL AND PLACE A NEEDLE-PUNCHED TEXTILE OVER THE BASE OF THE CROSSING.
3. PLACE CLEAN, RIGID, NON POLLUTING AGGREGATE OR GRAVEL IN THE 100mm TO 150mm SIZE CLASS OVER THE FABRIC TO A MINIMUM DEPTH OF 200mm.
4. PROVIDE A 3m WIDE CARRIAGEWAY WITH SUFFICIENT LENGTH OF CULVERT PIPE TO ALLOW LESS THAN A 3(H): 1 (V) SLOPE ON SIDE BATTERS.
5. INSTALL A LOWER SECTION TO ACT AS AN EMERGENCY SPILLWAY IN GREATER THAN DESIGN STORM EVENTS.
6. ENSURE THAT CULVERT OUTLETS EXTEND BEYOND THE TOE OF FILL EMBANKMENTS.

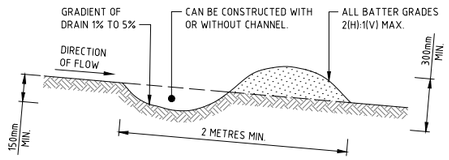
TEMPORARY WATERWAY CROSSING (SD 5-1)



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)

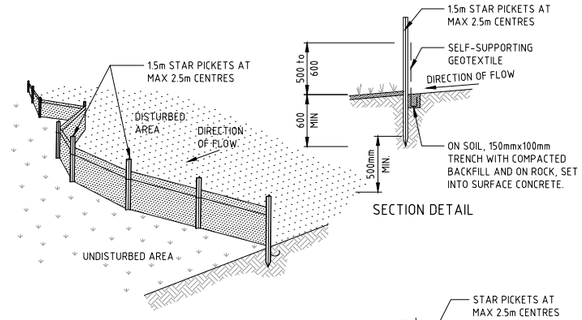


CONSTRUCTION NOTES

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.

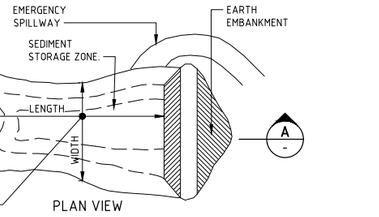
EARTH BANK - LOW FLOW (SD 5-5)



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)

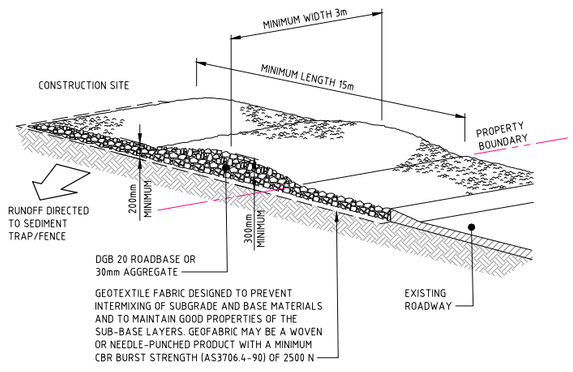


CONSTRUCTION NOTES

1. REMOVE ALL VEGETATION AND TOPSOIL FROM UNDER THE DAM WALL AND FROM WITHIN THE STORAGE AREA.
2. CONSTRUCT A CUT-OFF TRENCH 500mm DEEP AND 1200mm WIDE ALONG THE CENTRELINE OF THE EMBANKMENT EXTENDING TO A POINT ON THE GULLY WALL LEVEL WITH THE RISER CREST.
3. MAINTAIN THE TRENCH FREE OF WATER AND RECOMPACT THE MATERIALS WITH EQUIPMENT AS SPECIFIED IN THE SWMP TO 95 PER CENT STANDARD PROCTOR DENSITY.
4. SELECT FILL FOLLOWING THE SWMP THAT IS FREE OF ROOTS, WOOD, ROCK, LARGE STONE OR FOREIGN MATERIAL.
5. PREPARE THE SITE UNDER THE EMBANKMENT BY RIPPING TO AT LEAST 100mm TO HELP BOND COMPACTED FILL TO THE EXISTING SUBSTRATE.
6. SPREAD THE FILL IN 100mm TO 150mm LAYERS AND COMPACT IT AT OPTIMUM MOISTURE CONTENT FOLLOWING THE SWMP.
7. CONSTRUCT THE EMERGENCY SPILLWAY.
8. REHABILITATE THE STRUCTURE FOLLOWING THE SWMP.

(APPLIES TO 'TYPE D' AND 'TYPE F' SOILS ONLY)

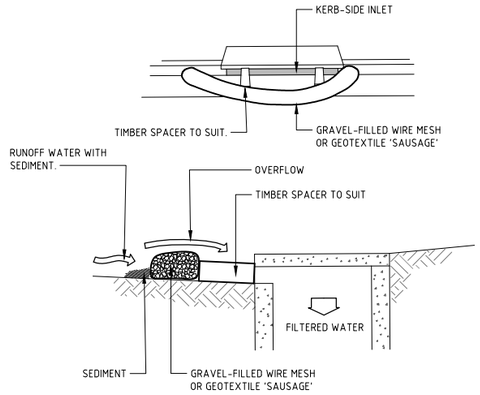
EARTH BASIN - WET (SD 6-4)



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)



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)

DESIGNED: S.SPURR
DRAWN: L.STEEL
JOB MANAGER: C.SMITH
VERIFIER: C.SMITH

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR REVIEW	LS		CS	09.11.20
2	ISSUED FOR SCHEMATIC DESIGN	LS		CS	29.01.21
3	ISSUED FOR DRAFT SSDA	LS		CS	25.02.21
4	ISSUED FOR DRAFT SSDA	LS		CS	09.03.21
5	ISSUED FOR SSDA	LS		CS	31.03.21

CLIENT: NSW GOVERNMENT Health Infrastructure

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

ARCHITECT: BVN

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SCALE 1:1250 @ A1 — 0 10 20 30 40 50 60m

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Email newcastle@northrop.com.au ABN 81 094 433 100

PROJECT: JOHN HUNTER HOSPITAL AND INNOVATION PRECINCT LOOKOUT ROAD, NEW LAMBTON HEIGHTS N.S.W

DRAWING TITLE: CIVIL ENGINEERING PACKAGE

SOIL AND WATER MANAGEMENT DETAILS

JOB NUMBER: NL191366

DRAWING NUMBER: C101-DA

REVISION: 5

DRAWING SHEET SIZE = A1

SOIL AND WATER MANAGEMENT CONTROL NOTES

1. THE ESCP/SWMP AND ITS ASSOCIATED EROSION AND SEDIMENT CONTROL MEASURES MUST BE CONSTANTLY MONITORED, REVIEWED, AND MODIFIED AS REQUIRED TO CORRECT DEFICIENCIES. COUNCIL HAS THE RIGHT TO REQUEST CHANGES IF, IN ITS OPINION, THE MEASURES THAT ARE PROPOSED OR HAVE BEEN INSTALLED ARE INADEQUATE TO PREVENT POLLUTION.
2. PRIOR TO ANY ACTIVITIES ONSITE, THE RESPONSIBLE PERSON(S) IS TO BE NOMINATED. THE RESPONSIBLE PERSON(S) WILL BE RESPONSIBLE FOR THE EROSION AND SEDIMENT CONTROL (ESC) MEASURES ONSITE.
3. THE APPROVED SWMP MUST BE AVAILABLE ON-SITE FOR INSPECTION BY COUNCIL OFFICERS WHILE WORK ACTIVITIES ARE OCCURRING.
4. ALL EROSION AND SEDIMENT CONTROL MEASURES MUST BE APPROPRIATE FOR THE SEDIMENT TYPE(S) OF THE SOILS ONSITE, IN ACCORDANCE WITH THE BLUE BOOK (MANAGING URBAN STORMWATER – SOILS AND CONSTRUCTION. LANDCOM, 2004), OR OTHER CURRENT RECOGNISED INDUSTRY STANDARD FOR EROSION AND SEDIMENT CONTROL FOR AUSTRALIAN CONDITIONS. THIS INCLUDES SEDIMENT TRAPS, TREATMENT OF CAPTURED WATER, AND LINING OF CHANNELS.
5. NO LAND-DISTURBING ACTIVITIES ON THE SITE SHALL OCCUR UNTIL ALL PERIMETER ESC MEASURES, SEDIMENT BASINS, AND ASSOCIATED TEMPORARY DRAINAGE CONTROLS, HAVE BEEN CONSTRUCTED AND ARE FULLY OPERATIONAL, IN ACCORDANCE WITH CURRENT BEST PRACTICE ESC. THIS IS 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.
6. ADDITIONAL ESC MEASURES MUST BE IMPLEMENTED, AND A REVISED SWMP IS TO BE SUBMITTED FOR APPROVAL TO THE CERTIFIER (WITHIN FIVE (5) BUSINESSDAYS OF ANY SUCH AMENDMENTS) IN THE EVENT THAT:
   (i) THERE IS A HIGH PROBABILITY THAT SERIOUS OR MATERIAL ENVIRONMENTAL HARM MAY OCCUR AS A RESULT OF SEDIMENT LEAVING THE SITE; OR
   (ii) THE IMPLEMENTED WORKS FAIL TO ACHIEVE COUNCIL'S WATER QUALITY OBJECTIVES SPECIFIED IN THESE CONDITIONS; OR
   (iii) SITE CONDITIONS SIGNIFICANTLY CHANGE; OR
   (iv) SITE INSPECTIONS INDICATE THAT THE IMPLEMENTED WORKS ARE FAILING TO ACHIEVE THE "OBJECTIVE" OF THE SWMP.
   (v) A COPY OF ANY AMENDED SWMP MUST BE FORWARDED TO AN APPROPRIATE COUNCIL OFFICER, WITHIN FIVE (5) BUSINESSDAYS OF ANY SUCH AMENDMENTS.
7. ALL REASONABLE AND PRACTICABLE MEASURES MUST BE TAKEN TO ENSURE STORMWATER RUNOFF FROM ACCESS ROADS AND STABILISED ENTRY/EXIT SYSTEMS, DRAINS TO AN APPROPRIATE SEDIMENT CONTROL DEVICE.
8. THE APPLICANT MUST ENSURE AN ADEQUATE SUPPLY OF ESC, AND APPROPRIATE POLLUTION CLEAN-UP MATERIALS ARE AVAILABLE ON-SITE AT ALL TIMES. THIS INCLUDES CHEMICALS/AGENTS TO TREAT TURBID WATER IN BASINS.
9. SEDIMENT DEPOSITED OFF SITE AS A RESULT OF ON-SITE ACTIVITIES MUST BE COLLECTED AND THE AREA CLEANED/REHABILITATED AS SOON AS REASONABLE AND PRACTICABLE.
10. NEWLY SEALED HARD-STAND AREAS (E.G. ROADS, DRIVEWAYS AND CAR PARKS) MUST BE SWEPT THOROUGHLY AS SOON AS PRACTICABLE AFTER SEALING/SURFACING TO MINIMISE THE RISK OF COMPONENTS OF THE SURFACING COMPOUND ENTERING STORMWATER DRAINS.
11. STOCKPILES OF ERODIBLE MATERIAL MUST BE PROVIDED WITH AN APPROPRIATE PROTECTIVE COVER (SYNTHETIC OR ORGANIC) IF THE MATERIALS ARE LIKELY TO BE STOCKPILED FOR MORE THAN 10 DAYS.
12. 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/SWMP;
13. PRIORITY MUST BE GIVEN TO THE PREVENTION, OR AT LEAST THE MINIMISATION, OF SOIL EROSION, RATHER THAN THE TRAPPING OF DISPLACED SEDIMENT.
14. MEASURES USED TO CONTROL WIND EROSION MUST 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.
15. THE APPLICATION OF LIQUID OR CHEMICAL-BASED DUST SUPPRESSION MEASURES MUST ENSURE THAT SEDIMENT-LADEN RUNOFF RESULTING FROM SUCH MEASURES (E.G. RUNOFF OF EXCESS WATER) DOES NOT CREATE A TRAFFIC OR ENVIRONMENTAL HAZARD.
16. PRIOR TO THE CONTROLLED DISCHARGE (E.G. DE-WATERING ACTIVITIES FROM EXCAVATIONS AND SEDIMENT BASINS) OF ANY WATER FROM THE SITE DURING CONSTRUCTION, THE FOLLOWING WATER QUALITY OBJECTIVES MUST BE ACHIEVED:
   a) TOTAL SUSPENDED SOLIDS (TSS) TO A MAXIMUM 50MG/L;
   b) TURBIDITY (NTUS) TO A MAXIMUM OF 60 NTU MEASURED BY A TURBIDITY METER;
   c) WATER PH BETWEEN 6.5 AND 8.5 UNLESS OTHERWISE REQUIRED BY THE COUNCIL; AND
   d) EC LEVELS NO GREATER THAN BACKGROUND LEVELS.
17. PRIOR TO ANY FORECAST WEATHER EVENT LIKELY TO RESULT IN SEDIMENT LADEN RUNOFF ON THE SITE, ANY EXISTING DETENTION BASINS/TRAPS SHALL BE DEWATERED TO PROVIDE SUFFICIENT CAPACITY TO CAPTURE SEDIMENT LADEN WATER FROM THE SITE PRIOR TO THE WEATHER EVENT.
18. ANY SEDIMENT-LADEN WATER CAPTURED ONSITE MUST BE TREATED TO ENSURE IT WILL ACHIEVE COUNCIL'S WATER QUALITY OBJECTIVES SPECIFIED IN THESE CONDITIONS, PRIOR TO ITS RELEASE FROM SITE. A SAMPLE OF THE RELEASED TREATED WATER MUST BE KEPT ONSITE IN A CLEAR CONTAINER WITH THE SAMPLE DATE RECORDED ON IT.
19. NO ALUMINIUM BASED PRODUCTS MAY BE USED TREAT TURBID WATER (FLOCCULATING/COAGULANTS) ONSITE WITHOUT THE PRIOR WRITTEN PERMISSION FROM AN APPROPRIATE COUNCIL OFFICER. THE APPLICANT MUST HAVE A DEMONSTRATED ABILITY TO USE SUCH PRODUCTS CORRECTLY AND WITHOUT ENVIRONMENTAL HARM PRIOR TO ANY APPROVAL.
20. THE CHEMICAL/AGENT (FLOCCULATING/COAGULANTS) USED IN TYPE D AND TYPE F BASINS TO TREAT TURBID WATER CAPTURED IN THE BASIN MUST BE APPLIED IN CONCENTRATIONS SUFFICIENT TO ACHIEVE COUNCIL'S WATER QUALITY OBJECTIVES, SPECIFIED IN THESE CONDITIONS, WITHIN THE X-DAY RAINFALL DEPTH USED TO CALCULATE THE CAPACITY OF THE BASIN, AFTER A RAINFALL EVENT.
21. ALL MANUFACTURERS INSTRUCTIONS MUST BE FOLLOWED FOR THE USE OF ANY CHEMICALS/AGENTS USED ONSITE, EXCEPT WHERE APPROVED BY THE RESPONSIBLE PERSON OR AN APPROPRIATE COUNCIL OFFICER.
22. ANY BASIN MUST BE DEWATERED AS SOON AS PRACTICAL, ONCE WATER CAPTURED IN THE BASIN ACHIEVES COUNCIL'S WATER QUALITY OBJECTIVES, SPECIFIED IN THESE CONDITIONS.
23. THE APPLICANT MUST 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.
24. 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 MUST HAVE SUFFICIENT CAPACITY TO CATER FOR ALL AREA DIRECTED TO THE BASIN(S).
25. ALL SEDIMENT BASINS MUST REMAIN FULLY OPERATIONAL AT ALL TIMES UNTIL THE BASIN'S DESIGN CATCHMENT ACHIEVES 70% GROUND COVERAGE, OR SURFACE STABILISATION ACCEPTABLE TO COUNCIL.
26. SETTLED SEDIMENT MUST BE REMOVED AS SOON AS REASONABLE AND PRACTICABLE FROM ANY SEDIMENT BASIN IN ACCORDANCE WITH THE BLUE BOOK.
27. ALL SEDIMENT CONTROL DEVICES (OTHER THAN SEDIMENT BASINS) MUST BE DE-SILTED AND MADE FULLY OPERATIONAL AS SOON AS REASONABLE AND PRACTICABLE AFTER RUNOFF-PRODUCING RAINFALL, OR IF THE SEDIMENT RETENTION CAPACITY OF THE DEVICE FALLS BELOW 75% OF THE DESIGN RETENTION CAPACITY.
28. PROCEDURES FOR INITIATING A SITE SHUTDOWN, WHETHER PROGRAMMED OR UN-PROGRAMMED, MUST INCORPORATE REVEGETATION OF ALL SOIL DISTURBANCES UNLESS OTHERWISE APPROVED BY COUNCIL. THE STABILISATION WORKS MUST NOT RELY UPON THE LONGEVITY OF NON-VEGETATED EROSION CONTROL BLANKETS, OR TEMPORARY SOIL BINDERS.
29. ALL ESC MEASURES MUST BE INSPECTED:
   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).
30. WRITTEN RECORDS MUST BE KEPT ONSITE OF ESC MONITORING AND MAINTENANCE ACTIVITIES CONDUCTED DURING THE CONSTRUCTION AND MAINTENANCE PERIODS, AND BE AVAILABLE TO COUNCIL OFFICERS ON REQUEST.
31. ALL SITE MONITORING DATA INCLUDING RAINFALL RECORDS, DATES OF WATER QUALITY TESTING, TESTING RESULTS AND RECORDS OF CONTROLLED WATER RELEASES FROM THE SITE, MUST 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 COUNCIL OFFICERS ON REQUEST.
32. WATER QUALITY SAMPLES FROM SEDIMENT BASIN(S) MUST BE TAKEN AT A DEPTH NO LESS THAN 200MM BELOW THE WATER SURFACE WITHIN THE BASIN.
33. ALL ENVIRONMENTAL INCIDENTS MUST BE RECORDED IN A FIELD LOG THAT MUST REMAIN ACCESSIBLE TO ALL RELEVANT REGULATORY AUTHORITIES ON REQUEST.
34. ALL MATERIALS REMOVED FROM ESC DEVICES DURING MAINTENANCE, OR DECOMMISSIONING, WHETHER SOLID OR LIQUID, MUST BE DISPOSED OF IN A MANNER THAT DOES NOT CAUSE ANY ONGOING EROSION OR POLLUTION HAZARD.
35. INSTALL SEDIMENT PROTECTION FILTERS ON ALL NEW AND EXISTING STORMWATER INLET PITS IN ACCORDANCE WITH EITHER THE MESH AND GRAVEL INLET FILTER DETAIL SD6-11 OR THE GEOTEXTILE INLET FILTER DETAIL SD6-12 OF THE 'BLUE BOOK'.
36. ESTABLISH ALL REQUIRED SEDIMENT FENCES IN ACCORDANCE WITH DETAIL SD6-8 OF THE 'BLUE BOOK'.
37. ALL TRENCHES INCLUDING ALL SERVICE TRENCHES AND SWALE EXCAVATION SHALL BE SIDE-CAST TO THE HIGH SIDE AND CLOSED AT THE END OF EACH DAYS WORK.
38. ALL VEGETATION TO BE REMOVED SHALL BE MULCHED ONSITE AND SPREAD/STOCKPILED AS DIRECTED BY THE SUPERINTENDENT.
39. ANY SURPLUS MATERIAL SHALL BE REMOVED FROM SITE AND DISPOSED OF IN ACCORDANCE WITH EPA GUIDELINES.
40. CONSTRUCT AND MAINTAIN ALL MATERIAL STOCKPILES IN ACCORDANCE WITH DETAIL SD4-1 OF THE 'BLUE BOOK' (INCLUDING CUT-OFF SWALES TO THE HIGH SIDE AND SEDIMENT FENCES TO THE LOW SIDE).
41. ENSURE STOCKPILES DO NOT EXCEED 2.0m HIGH. PROVIDE WIND AND RAIN EROSION PROTECTION AS REQUIRED IN ACCORDANCE WITH THE 'BLUE BOOK'.
42. PROVIDE WATER TRUCKS OR SPRINKLER DEVICES DURING CONSTRUCTION AS REQUIRED TO SUPPRESS DUST.
43. ONCE CUT/FILL OPERATIONS HAVE BEEN FINALIZED ALL DISTURBED AREAS THAT ARE NOT BEING WORKED ON SHALL BE RE-VEGETATED AS SOON AS IS PRACTICAL, ALTERNATIVELY SPECIFIED EROSION AND SEDIMENT CONTROL MEASURES ARE TO BE RETAINED.

GROUND COVER FACTORS

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

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

REVEGETATION

TEMPORARY SEED MIX

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

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

SEDIMENT BASIN CALCULATION

THE SITE IS LOCATED WITHIN THE NEWCASTLESOIL LANDSCAPE, WHICH HAS THE FOLLOWING PROPERTIES (IN ACCORDANCE WITH TABLE C13 OF THE "BLUE BOOK"):

- SEDIMENT TYPE F
- SOIL HYDROLOGY GROUP A
- K-FACTOR OF 0.016 (WORST CASE)

THE SIZING OF THE SEDIMENT STORAGE VOLUME OF THE SITES PROPOSED SEDIMENTATION BASINS WERE CALCULATED BY APPLYING THE REVISED UNIVERSAL SOIL LOSS EQUATION (RUSLE) METHOD:

SOIL LOSS = R K LS P C

WHERE; R = RAINFALL EROSIVITY FACTOR = 2590

2 YEAR, 6 HOUR STORM INTENSITY = 10.9 mm/hr

LS = SLOPE LENGTH/GRADIENT FACTOR = 0.7

K = SOIL ERODIBILITY FACTOR = 0.016

P = EROSION CONTROL PRACTICE (P-FACTOR) = 1.3 (TYPICAL)

C = GROUND COVER (C-FACTOR) = 1.0 (TYPICAL FOR STRIPPED SITE)

THE REMAINING VARIABLES ARE PRESENTED WITHIN THE TEMPORARY SEDIMENT BASIN CAPACITY TABLE.

THE SETTLING ZONE VOLUME OF THE BASIN WAS CALCULATED FOR A 2 MONTHS SOIL LOSS AS CALCULATED BY THE RUSLE METHOD:

SETTLING ZONE VOLUME = 10 CV RX-DAY, Y-%ILE x CATCHMENT AREA
WHERE RX-DAY, Y-%TILE = 30.5 mm/hr
[5 DAY, 80th PERCENTILE RAINFALL EVENT, NEWCASTLE]

TOTAL BASIN VOLUME

SITE	C_V	TOTAL CATCHMENT AREA (ha)	SETTLING ZONE VOLUME (m^3)	SEDIMENT STORAGE VOLUME (m^3)	TOTAL BASIN VOLUME (m^3)
SEDIMENT BASIN 1	0.5	3.29	502	162	664
SEDIMENT BASIN 2	0.5	2.3	350	13	363
SEDIMENT BASIN 3	0.5	0.49	74	6	80
SEDIMENT BASIN 4	0.5	0.84	128	37	165
SEDIMENT BASIN 5	0.5	.047	72	1	73

VERIFIER: C.SMITH
JOB MANAGER: C.SMITH
DESIGNED: S.SPURR
DRAWN: L.STEEL

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR REVIEW	LS		CS	09.11.20
2	ISSUED FOR SCHEMATIC DESIGN	LS		CS	29.01.21
3	ISSUED FOR DRAFT SSDA	LS		CS	25.02.21
4	ISSUED FOR DRAFT SSDA	LS		CS	09.03.21
5	ISSUED FOR SSDA	LS		CS	31.03.21

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ARCHITECT: BVN

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SCALE 1:1250 @ A1

0 10 20 30 40 50 60m

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PROJECT: JOHN HUNTER HOSPITAL AND INNOVATION PRECINCT LOOKOUT ROAD, NEW LAMBTON HEIGHTS N.S.W

DRAWING TITLE: CIVIL ENGINEERING PACKAGE
SOIL AND WATER MANAGEMENT NOTES

JOB NUMBER: NL191366
DRAWING NUMBER: C102-DA
REVISION: 5
DRAWING SHEET SIZE = A1

LEGEND

DENOTES BOUNDARY LINE.

1.55 DENOTES DEPTH OF FILL REQUIRED

-1.50 DENOTES AREA OF CUT REQUIRED

DEPTH OF CUT

- 20m TO - 3.0m
- 3.0m TO - 2.0m
- 2.0m TO - 1.5m
- 1.5m TO - 1.0m
- 1.0m TO - 0.5m
- 0.5m TO - 0.25m
- 0.25m TO - 0.1m
- 0.1m TO - 0.0m

DEPTH OF FILL

0.0m TO 0.1m
0.1m TO 0.25m
0.25m TO 0.5m
0.5m TO 1.0m
1.0m TO 1.5m
1.5m TO 2.0m
2.0m TO 3.0m
3.0m TO 20m

SITE EARTHWORKS NOTES

PRIOR TO COMMENCEMENT OF EARTHWORKS ENSURE THAT ALL SEDIMENT AND EROSION CONTROL MEASURES ARE INSTALLED AS PER SOIL AND WATER MANAGEMENT GUIDELINES.

THE APPROXIMATE SITE EARTHWORKS VOLUMES ARE BASED ON FINISHED SURFACE TO NATURAL SURFACE.

- CUT: 60,990m³
- FILL: 207,065m³
- NET: 146,075m³ (DEFICIT)

NOTE:
THE ABOVE VOLUMES ARE BASED ON SUPPLIED SURVEY DATA AND ASSUMED PAVEMENT AND BULK EARTHWORKS DEPTHS, AS SUCH ARE APPROXIMATE ONLY, THE CONTRACTOR SHALL SATISFY THEMSELVES AS TO THEIR ACCURACY.

THE ABOVE VOLUMES DO NOT INCLUDE A STRIPPING ALLOWANCE, SERVICE TRENCHING OR DETAILED EXCAVATION.

DESIGNED: S.SPURR
DRAWN: L.STEEL
JOB MANAGER: C.SMITH
VERIFIER: C.SMITH

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CLIENT
NSW GOVERNMENT Health Infrastructure

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ARCHITECT
BVN

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PROJECT
JOHN HUNTER HOSPITAL AND INNOVATION PRECINCT LOOKOUT ROAD, NEW LAMBTON HEIGHTS N.S.W

DRAWING TITLE
CIVIL ENGINEERING PACKAGE

BULK EARTHWORKS PLAN

JOB NUMBER
NL191366

DRAWING NUMBER
C200-DA

REVISION
6

DRAWING SHEET SIZE = A1