Executive Summary

Taylor Thomson Whitting (NSW) has been engaged by Health Infrastructure to provide civil engineering design services for Concord Hospital Phase 1 development.

The Concord Hospital Redevelopment Stage 1 consists of:

- A new Clinical Services Building (CSB)
- A Multi-Storey Car Park and a temporary on grade car park
- Associated works – existing building alterations, minor road realignments, loading docks and landscaping works.

This report covers the water and soil aspects relevant to the site based on information known at the time of report production.

This report is to support the Environmental Impact Assessment which addresses Section 78A(8) of the Environmental Planning and Assessment Act and Schedule 2 of the Environmental Planning and Assessment Regulation 2000, both which are noted in the Secretary’s Environmental Assessment Requirements (SEARS).

The SEARs requires the Environmental Impact Assessment to address the following specific matters:

- Contamination
  - Assess and quantify any soil and groundwater contamination and demonstrate that the site is suitable for the proposed use in accordance with SEPP 55
- Sediment, Erosion and Dust Control
  - Detail measures and procedures to minimise and manage the generation and off-site transmission of sediment, dust and fine particles.
- Drainage
  - Detail drainage associated with the proposal, including stormwater and drainage infrastructure
  - Detail measures to minimise operational water quality impacts on surface waters and groundwater
  - Respond to SEARS inputs from Council
- Flooding
  - Assess any flood risk on site (detailing the most recent flood studies for the project area) and consideration of any relevant provisions of the NSW Floodplain Development Manual (2005), including the potential effects of climate change, sea level rise and an increase in rainfall intensity.
- Ecologically Sustainable Development (ESD)
  - Detail how ESD principles (as defined in clause 7(4) of Schedule 2 of the Environmental Planning and Assessment Regulation 2000) will be incorporated in the design and ongoing operation phases of the development
  - Demonstrate that the development has been assessed against a suitably accredited rating scheme to meet industry best practice
  - Include a description of the measures that would be implemented to minimise consumption of resources, water (including water sensitive urban design) and energy.
- Additional Requirements
  - Stormwater Concept Plan
  - Sediment and Erosion Control Plan
1. Introduction

This SSDA report seeks consent for the proposed redevelopment of Concord Repatriation General Hospital to improve and replace outmoded facilities to meet the substantial growth in clinical service demand across the hospital’s catchment:

- Concept approval is sought for the redevelopment indicatively comprising 82,000sq m GFA, to be undertaken in two (2) stages including:
  - Clinical Services Building (CSB) and multi storey carpark (Stage 1); and
  - Acute Services Building (ASB) and multistorey carpark (Stage 2).

- Detailed approval is sought for the Stage 1 construction of the proposed CSB (44,000sq m GFA) and the construction of a multi-storey car park located to the north of Hospital Road.

Detailed development approval for the proposed Stage 2 works will be completed at a later date and does not part of this SSDA. The Concept redevelopment has an indicative delivery timeframe of 25 years. The Stage 1 Detailed works are estimated to be completed by end 2021.

The proposed Concept redevelopment is in accordance with the concept architectural package prepared by Jacobs.

The proposed Stage 1 detailed development (CSB and multistorey carpark) is in accordance with the architectural drawings prepared by Jacobs.

The areas in the below staging plans have been assessed and are included within this report.
2. Existing Site

Concord Repatriation General Hospital is located at 1H Hospital Road, Concord. The site is situated on a peninsula on Parramatta River and contains an existing hospital as shown in Figure 1. It is located within the Canada Bay Local Government Area. The site falls to the north and the southeast with crest shown approximately in Figure 1.

Figure 1 Locality Plan (Google Maps)

Figure 2 Aerial Photo 18/01/2018 (Nearmap)
3. Soil and Contamination

3.1 Typical Ground Conditions

The geotechnical report undertaken by Douglas Partners (DP) in April 2016 and Preliminary Site Contamination Investigation in June 2016 have been reviewed. These reports can be found in Appendix A. The inferred geology at the proposed multi-storey carpark is typically:

- Asphalitic concrete – pavement surface
- Filling – comprising of basaltic gravel of depths of up to 0.1m to 0.15m, variable clay and sand filling
- Clay and Silty Clay – typically firm to very stiff, orange-brown clay, ironstone gravel, shaly clay from approximately 2.0m depth to 2.5m
- Shale – extremely low and very low strength, with medium and high strength iron-cemented bands (bands were absent at BH 2 and BH 3)
- Sandstone and laminite - from depths of 4.0m to 5.1m, typically medium and high strength rock with some very low and low to medium strength bands

The inferred geology at the proposed tower buildings is typically:

- Filling – comprising of asphalitic concrete and concrete pavement surfaces at some locations, variable filling including gravelly sand, clayey silt and silty clay between depths of 0.2m and 0.5m, and up to 1.4m
- Clay – stiff and very stiff clay, some shaly clay to depths of up to 2.6m, for some locations
- Shale and Laminite – extremely low and very low strength, fragmented to fractured, light grey brown shale and laminite, with some low to high strength iron-cemented bands to depths of 0.3m to 5.85m, low to medium strength to depths of 2.83 to 7.5m, medium and fractured to slightly fractured to depths of 5.6m to 8.2m, then high strength shale and laminite stone in some locations
- Sandstone – medium then coarse grained, slightly fractured and unbroken sandstone from depths of 7.5m to 9.2m in some locations, high strength and very high strength bands

3.2 Site Contamination

The preliminary site contamination investigation completed by Douglas Partners in June 2016, notes the following potential sources and types of contaminants at the proposed development site.

<table>
<thead>
<tr>
<th>Potential Source of Contamination</th>
<th>Chemicals of Concern</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1: Historical agricultural/Recreational activities</td>
<td>Heavy metals, PAH, TRH and BTEX, PCB, heavy metals, TRH and BTEX</td>
</tr>
<tr>
<td>S2: Historical filling associated with levelling the site, in particular, in the hospital car park</td>
<td>Heavy metals, TRH, BTEX, PAH, PCB, OCP, asbestos</td>
</tr>
<tr>
<td>S3: Storage of dangerous goods (hazardous substances) in particular within the loading dock area</td>
<td>TRH and BTEX</td>
</tr>
<tr>
<td>S4: Hospital buildings constructed of hazardous building material</td>
<td>Asbestos, lead-based paint and PCB</td>
</tr>
<tr>
<td>S5: The main hospital car park with potential for leakage of engine oil and/or petrol penetrating into the ground</td>
<td>Heavy metals, TRH and BTEX</td>
</tr>
</tbody>
</table>

The report prepared by DP states the site is considered suitable for the proposed development subject to the following recommendations:

- Identify the content and capacity of the underground storage tanks in the loading zone and the area currently under construction;
- Carry out supplementary soil testing in proximity to an underground fuel or waste tanks;
- Prepare a supplementary contamination report on the soil condition in vicinity of the underground fuel or waste tanks and provide advice on removal of underground storage tanks (if required); and,
- Prior to demolition, removal of asbestos containing building material by a qualified asbestos removal contractor to avoid cross-contaminating the surface soils with asbestos and appropriate removal of any other hazardous building materials such as lead paint.

A qualified Environmental Consultant should be engaged if any signs of environmental concern from the remaining area of the site is identified during excavation (e.g. Asbestos debris, unknown soils/fill). The appointed contractor should have in place an unexpected finds protocol to document the procedures to manage such indicators of environmental concern.

3.3 Groundwater

Proposed multi-storey carpark

The Geotechnical report undertaken by Douglas Partners (DP) in April 2016, reported no groundwater observations were noted during augering of boreholes at the proposed multi-storey carpark. The report also notes that it is considered likely that the permanent groundwater level is within the rock, some seepage should be expected through the soils, particularly at interfaces between layers, particularly following periods of rainfall.

The Geotechnical report undertaken by Douglas Partners (DP) in April 2016, reported no groundwater observations were noted during augering of boreholes at the proposed tower buildings. Groundwater was measured at 4.2m depth in one borehole (B17) within the shale.

3.4 Acid Sulphate Soils

The Geotechnical report undertaken by Douglas Partners (DP) in April 2016 noted the soil samples obtained at the location of the proposed multi-storey carpark were tested for the presence of acid sulphate within the soil.

The report notes, excavation into the acid sulphate soil is likely to be limited to piling excavation and has assumed disturbance of less than 1000 tonnes. In addition, the acid sulphate soil test results at this site, are below the action criteria for disturbance of less than 1000 tonnes of soil and a management plan is therefore not needed assuming:

- Pile diameters of 0.6m to 0.9 m diameter on an 8m by 8m grid; and
- No significant excavation is required into alluvial clays (or no excavation into clays below RL 5m) for earthworks
The results can be found in Douglas Partners’ report in Appendix A.

The Geotechnical report undertaken by Douglas Partners (DP) in April 2016 note the soil samples obtained at the location of the proposed tower buildings were tested for the presence of acid sulphate within the soil.

The report notes excavation into the acid sulphate soils at the proposed tower site may occur during basement excavation works in the vicinity of BH 17.

There is approximately 2400 tonnes of excavation required for the basement at the proposed tower building, which exceeds 1000 tonnes.

As the excavation works is in excess of 1000 tonnes, it is recommended that further assessments are carried out by DP to determine whether a management plan is needed.

The results can be found in Douglas Partners’ in Appendix A.
4. Stormwater

City of Canada Bay Council has provided input to the SEARS documents relating to stormwater. TTW and Health Infrastructure met with Council on 27/04/2018 to discuss and agree on the approach to stormwater management at the site.

This section outlines the response to each of the points in the stormwater section of their response.

**Drainage Engineering Comments:**

- A stormwater assessment should be carried out to assess the impact on existing facilities and public infrastructure in general due to redevelopment of the site. The assessment should determine the capacity of receiving drainage systems, overland flow paths for storms up to 1 in 100 year event and estimation of water surface profile along the nominated flowpath to ensure minimum freeboard of 300mm can be achieved for all habitable areas. An assessment report consisting of analysis, findings and recommendations should be prepared to support the proposal. It is recommended that Council’s Development Control Plan – Appendix 2 “Engineering Specification” be used a guideline for design parameters to determine the peak flow using Hydrological Methods.

TTW has prepared a flood report that responds to the above: “Flood Study and Infrastructure Review” dated 15/03/2018. As noted in the report, “The Hospital’s location on the peninsula isolates it from impacting on other properties.”

- An Onsite Detention system (OSD) should be implemented on site to limit the site discharge into the existing drainage system. Site Specific Methods such as DRAINS can be used to calculate the OSD requirement for the area marked for redevelopment. The general criteria for the site specific method is to limit post development discharge during 1 in 100 year storm event back to a pre-developed (green field storm) discharge in 5 year ARI storm event. Sectional details for Onsite Detention system(OSD) should be included in a Stormwater Concept Plan. OSD details should also show Discharge Control pits (DCPs), surface and invert levels, dimensions, silt & gross pollutant traps, access openings, step iron etc.

The stormwater design does not include any OSD. The proposed stormwater systems do not discharge to Council’s stormwater system, but directly to Parramatta River / Sydney Harbour. OSD would provide no benefit to the site or surrounding environment.

- Rainwater re-use system should be installed on site in accordance with BASIX requirements or as per Council’s “Engineering Specification”. Minimum Council’s rainwater re-use requirement is 5,000L for the subject site. Council’s Engineering Specification can be downloaded from our web site at www.canadabay.nsw.gov.au

It is important for the hospital to minimise infection risks across all aspects of the project through both design and operational measures. Storage and reticulation of rainwater introduces an unacceptable risk to the hospital in this regard. The environmental benefit of rainwater re-use at the site is outweighed by the risk of contamination. There is no proposed rainwater re-use system.

The site has been modelled using MUSIC to review the proposed stormwater quality treatment measures required. A combination of a GPT a tank containing 100x Stormwater360 P690 cartridges can meet the reduction targets for the main works on the southern side of hospital road. This may be altered to two smaller tanks, to be determined as the design progresses.

### Table 1 Southern outlet MUSIC modelling results

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Load Reduction</th>
<th>Load Reduction Target (Canada Bay Council)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross Pollutants</td>
<td>99%</td>
<td>70%</td>
</tr>
<tr>
<td>Total Suspended Solids</td>
<td>83.0%</td>
<td>80%</td>
</tr>
<tr>
<td>Total Phosphorus</td>
<td>65.5%</td>
<td>45%</td>
</tr>
<tr>
<td>Total Nitrogen</td>
<td>45.2%</td>
<td>45%</td>
</tr>
</tbody>
</table>

In addition, the proposed stormwater system for the MSCP includes a dispersion trench to provide some stormwater infiltration and mimic the existing situation. The dispersion trench reduces the risk of erosion in the bushland by spreading the stormwater out rather than installing a concentrated stormwater outlet.

### Table 2 MSCP outlet MUSIC modelling results

<table>
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<th>Pollutant</th>
<th>Load Reduction</th>
<th>Load Reduction Target (Canada Bay Council)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross Pollutants</td>
<td>99%</td>
<td>70%</td>
</tr>
<tr>
<td>Total Suspended Solids</td>
<td>84.5%</td>
<td>80%</td>
</tr>
<tr>
<td>Total Phosphorus</td>
<td>65.7%</td>
<td>45%</td>
</tr>
<tr>
<td>Total Nitrogen</td>
<td>47.0%</td>
<td>45%</td>
</tr>
</tbody>
</table>

4.1 Sediment, Erosion and Dust Controls


4.2 Stormwater Discharge Points to Parramatta River/Sydney Harbour Approvals

The hospital redevelopment is an integrated development. Council will refer to Roads and Maritime Services (RMS), Property NSW and the Office of Water. Alternatively, we can submit directly to RMS and the Office of Water to seek approval for the activity.

Our design seeks to minimise the impact on the receiving environment. No works are proposed beyond the line of the sea wall.
5. Responses to Office of Environment and Heritage Submission

The NSW Office of Environment and Heritage (OEH) prepared a response to the exhibition of the hospital redevelopment (Susan Harrison 9/10/2018). The following responds to the OEH submission:

<table>
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<tr>
<th>OEH Comments dated 9/10/2018</th>
<th>Response</th>
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</thead>
<tbody>
<tr>
<td>(The Soil and Water report) states that 'the proposed multi-deck car park on the north side of Hospital Road can similarly meet stormwater quality targets through the use of a proprietary stormwater treatment device'. There is no details of the water his device is an how runoff from the development to the north of Hospital Road is to be treated. Further, this report state the preliminary site contamination investigation completed by Douglas Partners in June 2016, notes potential sources and types of contaminates in the at the proposed development site in section 3.2 of the Soil and Water Report include at the 'main hospital car park with potential for leakage of engine oil or petrol penetrating into the ground' with contaminant types being heavy metal, TRH and BTEX.</td>
<td>PoW report includes for an Oily Water Separator for carpark and loading dock areas prior to discharge. This is typically required where there is a high concentration of hydrocarbons or the risk of a spill. The water quality treatment train proposed for this site includes a GPT and a proprietary Stormwater360 &quot;Stormfilter&quot; system. The Stormfilter was selected as it will remove oily water at the levels anticipated on a carpark such as that proposed on this development. The treatment train is designed to meet the requirements of the DCP through the removal gross pollutants, sediment and nutrients (nitrogen and phosphorus), plus oils as per the above. This is the same level of treatment as the POW proposed system in principle.</td>
</tr>
<tr>
<td>A similar SSD of the Prince of Wales Hospital redevelopment included a hydrocarbons trap or separator to treat runoff generated. The nominated proprietary product will be specifically design to provide high removal efficiencies of suspended solids and their associated pollutants, oil, and floatables over a wide range of flow rates. OEH recommends a similar approach for the redevelopment of Concord Hospital.</td>
<td>The above mitigation measures are required to ensure the proposal is consistent with the E2 Objectives of the zone, and the following policies: Sydney Environmental Plan (Sydney Harbour Catchment) 2005 Parramatta River Estuary Coastal Zone Management Plan (2013) Eastern City District Plan (March 2018) Coastal Management SEPP</td>
</tr>
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PoW report includes for an Oily Water Separator for carpark and loading dock areas prior to discharge. This is typically required where there is a high concentration of hydrocarbons or the risk of a spill.

The water quality treatment train proposed for this site includes a GPT and a proprietary Stormwater360 "Stormfilter" system. The Stormfilter was selected as it will remove oily water at the levels anticipated on a carpark such as that proposed on this development.

The treatment train is designed to meet the requirements of the DCP through the removal gross pollutants, sediment and nutrients (nitrogen and phosphorus), plus oils as per the above. This is the same level of treatment as the POW proposed system in principle.

The hospital redevelopment has been designed to meet the DCP requirements for stormwater discharges from the site. In doing so, the redevelopment will have a beneficial impact on stormwater quality when compared to the existing conditions.

The southern discharge point has been located at the existing council discharge point to minimise the impact on existing vegetation (mangroves).

The northern discharge point is via a dispersion trench. This provides the treated stormwater an opportunity to infiltrate into the surrounding soils, and where the discharge rate exceeds the infiltration rate, stormwater is discharged over a wide area (not concentrated) to match the existing conditions and minimise the impact on the downstream EEC.

The location and extents of the dispersion trench will be adjusted during the detail design stage to avoid constraints such as trees, tree roots or other sensitive parts of the EEC. Further adjustments can be made on site in this regard if required.
### 6. Ecologically Sustainable Development (ESD)

ESD principles (as defined in clause 7(4) of Schedule 2 of the Environmental Planning and Assessment Regulation 2000) have been incorporated in the design and ongoing operation phases of the development.

<table>
<thead>
<tr>
<th>Clause 7(4) of Schedule 2 of the Environmental Planning and Assessment Regulation 2000</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) the precautionary principle, namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation; in the application of the precautionary principle, public and private decisions should be guided by:</td>
<td>Where possible, existing vegetation is retained. Where new stormwater discharges are proposed through the sea wall, disturbance to existing mangroves will be minimised as much as practicable.</td>
</tr>
<tr>
<td>(i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and (ii) an assessment of the risk-weighted consequences of various options,</td>
<td>A soil and erosion control plan (drawing 171496-NEWB-CV-DRG-SKC102) has been prepared to minimise the risk of sediments entering the receiving environment. In the ongoing operation phase of the development, stormwater will be managed as per Section 3 of this report, minimising the impact on the receiving environment.</td>
</tr>
<tr>
<td>(b) inter-generational equity, namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations</td>
<td>As per the above, stormwater will be treated before discharge to the harbour. Stormwater treatment devices will reduce the impact of the redevelopment on an on-going basis.</td>
</tr>
<tr>
<td>(c) conservation of biological diversity and ecological integrity, namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration,</td>
<td>Existing vegetation including mangroves will be maintained as much as practicable.</td>
</tr>
<tr>
<td>(d) improved valuation, pricing and incentive mechanisms, namely, that environmental factors should be included in the valuation of assets and services, such as: (i) polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement, (ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste, (iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.</td>
<td>The hospital will be responsible for the both the installation and on-going maintenance of the stormwater quality improvement devices.</td>
</tr>
</tbody>
</table>

As noted in Section 4, storage and re-use of rainwater is not suitable in a hospital environment. Consumption of water can be minimised through the use of drought tolerant plants in landscaped areas. The Landscape SD report prepared by Site Image Landscape Architects notes “Where possible native low water use species have been selected.”

Measures implemented to reduce energy consumption are outlined in the “Concord Hospital Phase 1 Redevelopment NCC Section J Compliance Report” Prepared by Wood and Grieve Engineers.
7. Appendix A - Geotechnical Reports
8. Appendix B – SSDA Civil Report