Sydney Football Stadium Redevelopment

Construction Soil and Water Management Plan (CSWMP)

Lendlease Buildings

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1 Introduction

This Construction Soil and Water Management Plan (CSWMP) has been developed to provide a strategy to assure the requirements of the Project Infrastructure Approval (Stage 1), associated environmental documentation and contract requirements are satisfied to ensure successful delivery of the Sydney Football Stadium Redevelopment (SFSR) during the construction phase of the project.

This CSWMP has been developed by Aurecon for the Stage 1 Works Builder Lend Lease.

1.1 Background

The CSWMP addresses the specific conditions set out by the requirements found within the Development Consent Section 4.38 of the Environmental Planning and Assessment Act 1979 Schedule 1 and forms part of the Construction Environmental Management Plan (CEMP).

The plan specifically addresses the Section B16 conditions (found below) of the Development Consent which forms the basis of this plan and follows the guiding principles set out by Australian and Council Standards;

B16. The Applicant must prepare a Construction Soil and Water Management Plan (CSWMSM) and the plan must address, but not be limited to the following:
   a) be prepared by a suitably qualified expert, in consultation with Council;
   b) describe the details of all erosion and sediment controls to be implemented during construction;
   c) provide a plan of how all construction works will be managed in a wet-weather events (i.e. storage of equipment, stabilisation of the Site);
   d) provide a summary of any ground investigations completed to date;
   e) detail all off-Site flows from the Site and ensure that sediment is not mobilised in stormwater flows leaving the site; and
   f) describe the measures that must be implemented to manage stormwater and flood flows for small and large sized events, including, but not limited to 1 in 1-year ARI, 1 in 5-year ARI and 1 in 100-year ARI;
   g) detail the proposed stormwater disposal and drainage from the development, designed in accordance with, but not limited to the Australian and Council’s Stormwater Management Code as follows:
      i) Australian Rainfall and Runoff – A Guide to Flood Estimation, Volumes 1 and 2 (1987);
      ii) SA/NZS 3500.3.2 National Plumbing and Drainage Part 3.2: Stormwater Drainage – Acceptable Solutions;
   h) details demonstrating that fine particulates from demolition works would not be entrained in stormwater runoff and adversely impact on Kippax Lake, the underlying groundwater resources and other downstream properties.

(Source: Development Consent, Environmental Planning and Assessment Act 1979 Schedule 1)

This Plan is developed using but not limited to the following design standards and guidelines,

i. Australian Rainfall and Runoff – A Guide to Flood Estimation, Volumes 1 and 2 (1987);

ii. SA/NZS 3500.3.2 National Plumbing and Drainage Part 3.2: Stormwater Drainage – Acceptable Solutions;


In addition to the above standards and guidelines, appraisal of the NSW State Government’s Flood Prone Lands Policy (as outlined in the NSW State Government’s Floodplain Development Manual) has also been conducted. The CSWMP main objectives are outlined in Section 2 of this Plan.
1.2 Reading the Report

The Section B16 conditions are addressed in the following report sections:

Condition B16 a) – Produced by Aurecon on behalf of Lend Lease

Condition B16 b) – Refer to sub-section 2.1

Condition B16 c) – Refer to sub-section 2.2

Condition B16 d) – Refer to section 3

Condition B16 e) – Refer to sub-section 4.1

Condition B16 f) – Refer to sub-section 4.2

Condition B16 g) – Refer to sub-section 4.3

Condition B16 h) – Refer to section 5

2 Erosion and Sediment Control Objectives

The site is bordered by Moore Park Road to the North, the National Rugby League building and existing stadium car park to the West, the Sydney Cricket Ground (SCG) to the South and Paddington Lane to the East. The site gently slopes from Moore Park Road (50mAHD) in the general direction of the SCG and onto Driver Avenue (43mAHD) to the South West.

The erosion and sediment controls will provide prevention and mitigation measures to minimise and manage the possible impacts on water quality during construction. The objectives of these controls are but not limited to the following:

- To avoid erosion, contamination and sedimentation occurring, resulting from construction or demolition activities with a concentration on controls to minimise dust and vehicular mud-tracking,
- To control the quality of stormwater leaving the construction site, so that no unacceptable impact will intrude upon the natural watercourses and/or existing stormwater drains,
- Erosion and sediment controls are to be effective and properly maintained at all times,
- Water management for collected /retained stormwater to achieve acceptable water quality criteria,
- To monitor the effects of activities and the effectiveness of mitigation measures,

2.1 Erosion and Sediment Controls Descriptions

The control systems to be installed as part of the erosion and sediment control (refer to Appendix A – ESCP & Details) are as follows;

**Diversion Bank**

A diversion bank is a compacted ridge of soil used to intercept concentrated water flows and return the water back to natural overland sheet flows.

**Temporary Construction Exit**

The temporary construction exit ensures excess soil and other materials do not leave the site from vehicles wheels and tracks.

**Fabric Socking Kerb Inlet Sediment Trap**
Fabric socks filtrate course sediments and prevent them from entering the stormwater system. There orientation allows the collection of sediment on the up-stream side of the stormwater in-let pit. During larger rainfall events, the sock allows larger flows to bypass and enter the stormwater system.

**Typical Sedimentation Basin**

A sediment basin is a purpose-built dam designed to collect and settle sediment-laden water. It consists of an inlet chamber, a primary settling pond, a decant system and a high-flow emergency spillway.

**Straw Bale Sedimentation Filter**

Straw bales are suitable for low flows of water. These are used to reduce the flow velocity of site run-off. Straw bales do not filter sediment-laden water but act as a barrier to restrict the flow of such sediment-laden water.

**Sediment Fence**

Sediment fences are an efficient and widely accepted sediment barrier for construction sites and is a specially manufactured geotextile sediment fence. Sediment fences act like dams - trapping the sediment while allowing water to leave the site. They are effective in retaining suspended solids coarser than 0.02 mm.

**Swale**

A drainage swale is a shaped and sloped depression in the soil surface used to convey runoff to a desired location.

A plan showing the location and layout of erosion and sediment control measure is shown in Appendix A

### 2.2 Construction Works Management in Wet Weather

The CSWMP contributes to improved construction productivity, by protecting internal site access for wet weather conditions with provision of drainage controls, diversion of upslope run-on and progressive surface stabilisation.

The Builder will always be aware of the weather forecast and make provision for erosion mitigation measures with the strategic location and orientation of erosion and sediment control measures as the site evolves during construction.

Such measures include and are not limited to the following:

- Stabilisation of exposed earth banks e.g. the use of erosion control mats,
- Locate sediment control structures where they are most effective and efficient,
- Check and maintain erosion and sediment controls prior to and following large rainfall events,
- Minimise earth movement during extended periods of wet weather,
- Minimise falls and slopes across the site so that a concentration of rainfall run-off does not occur,
- Minimise soil disturbance and compact service trenches as soon as reasonably possible,
- Delay removing vegetation or beginning earthworks until just before the start of building activities.
  Preserve grassed areas and vegetation where possible,
- Preserve existing site drainage patterns,
- Stockpiling will be placed at known highpoints and covered in plastic sheeting,
- No cutting or demolition of concrete to occur during or just prior to heavy rain,
- Prevent run-on from upstream catchments using physical barriers (e.g. prevent run-on from Moore Park Road from entering the site at the NE corner),
- Provide an effective major stormwater system economical in terms of capital, operational and maintenance costs, incorporating water quality controls.
3 Ground Investigations

The following section provides a summary of any known ground investigations completed to date.

3.1 Ground Investigations

Two geotechnical and contamination investigations have been undertaken on the project site for the development / redevelopment of Sydney Football Stadium to date. The details of the investigations are shown in Table 3-1.

Table 3-1 Previous ground investigations on the project site

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<tr>
<th>Project</th>
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<th>Date</th>
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<td>Sydney Football Stadium Redev.</td>
<td>Geotechnical and Contamination</td>
<td>Douglas Partners</td>
<td>Jul 2018</td>
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<tr>
<td>Sydney Football Stadium Dev.</td>
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<td>Arup</td>
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Numerous other ground investigations have also been undertaken in surrounding areas of the project site where relevant test results have been incorporated into the geotechnical model of the project site. These investigations include:

- Australian Rugby Development Centre to the west of the SFS (Douglas Partners, 2015);
- The Sheridan Building to the west of the SFS (Douglas Partners, May 2007);
- Bradman and Noble Stands at the SCG (Douglas Partners, 2009 to 2014);
- Victor Trumper Stand at the SCG (Douglas Partners);
- Daily Messenger scoreboard and screen at the SCG (Douglas Partners, 2007);
- Replica scoreboard at the SCG (Douglas Partners, 2007);
- Refurbishment works at the SFS (Douglas Partners, 2012);
- Eastern Distributor (Douglas Partners, various projects);
- Fox Studios redevelopment of the former Showgrounds (Douglas Partners, various projects); and
- Proposed NRL Headquarters (Jeffery and Katauskas, 2010).

3.2 Soil and Geotechnical Conditions

The following section is presented for information only and informs the reader as to the underlying site soil and rock condition.

3.2.1 Regional Geology and Hydrogeology

The *Sydney 1:100,000 Scale Geological Series Sheet* indicates the site is underlain by Quaternary-aged marine sands, with Triassic-aged Hawkesbury Sandstone to the north and east of the site. The marine sands are transgressive dunes that comprise fine to medium-grained sand with podsolns. Hawkesbury Sandstone typically comprises medium to coarse-grained quartz sandstone with minor shale and laminite lenses. An extract from the geological map is shown in Figure 3.1.
The marine sands are typically underlain by Pleistocene sand deposits (commonly known as 'Botany Sands') to a depth of 10 to 30 m below ground, over the Pleistocene aged clay beds units. The Great Sydney Dyke that runs between Waverly and Rozelle has not been recorded within the site, but it is located close to the site.

The marine sands at Moore Park form the upstream end of the Botany Aquifer which is a considerable groundwater resource between Paddington and Botany Bay. Groundwater is understood to be in the order of 3 m below the playing surface in the current stadium.

3.3 Groundwater

The groundwater level varies across the site. It was measured at RL 40.9 m AHD in the North-Eastern corner towards Moore Park Road which is close to the bedrock surface. The measured groundwater level drops to RL 34.5 m AHD in the South-Eastern corner and RL 32.7 m AHD in the South-Western corner; both levels are within the natural sand profile. This equates to depths below existing ground level within the site of approximately 7 to 11 metres.

The groundwater is associated with two aquifers beneath the site, being the Botany Sands Aquifer and the Hawkesbury Sandstone Aquifer, with the site primarily interacting with the Botany Sands Aquifer. This aquifer is a considerable groundwater resource that runs between Paddington and Botany Bay and is locally recharged by rainfall infiltration in the large surrounding open space areas of Centennial and Moore Park. It is noted that SCSGT is licensed to use 20 ML per year of bore water extracted from the Botany Sands aquifer for playing field irrigation across the existing SFS and SCG.
4 Off-Site Flows from the Site

This section addresses the management of stormwater from the site following detention within the detention/sedimentation ponds and the controlled discharge during larger rainfall events that will exceed the detention capacity of the ponds.

4.1 Off-Site Flows from Site

On-site overland flows will be directed into one of two (minimum number of ponds) located at the lower end of the site via temporary swales and localised gradients. Each detention pond will double as a settling pond and will be periodically desilted. The frequency of desilting will be related to rainfall volumes and time of year.

Detained stormwater run-off will be allowed to settle over a period or settle more rapidly with the use of a flocculant. Controlled decanting to the existing stormwater infrastructure in Driver Avenue will be via a pump-out pit at the low point of the detention/settling pond. The level of the detention pond will be monitored so that capacity of the pond is maximised. The location of the pump-out pit and rising main is located on the ESCP Appendix A.

4.2 Stormwater and Flood Flow Management

The measures implemented to manage stormwater and flood flows for small and large ARI events include but are not limited to the following examples as categorised by Schedule 1 B16;

1IN1 YEAR ARI

For lesser rainfall events which occur more regularly, the measures used to control, convey and detain these on-site flows are addressed in section 2.1 of this report. They include diversion banks, fabric socks, sediment fencing and swales to direct flow to the detention ponds where the run-off will be allowed settle before any discharge to existing external stormwater system can occur. The capacity of the ponds will not be compromised as periodic decanting will be conducted.

1IN5 YEAR ARI

These rainfall events are less frequent but will produce a greater run-off velocity and stormwater volume. Measures to prevent sediment-laden run-off from leaving the site include but are not limited to the straw bales and sediment fencing located at the perimeter of the site to contain and direct flows back into the site. Detention/sedimentation ponds maximum capacities will be maintained where practically possible so as to maximise the detention volume of each ponds for larger ARI rainfall events such as the 1in5 year ARI.

1IN100 YEAR ARI

The 1in100 year ARI is a very low frequency event that will produce a much higher run-off velocity and stormwater volume. During such events, erosion and sediment control measures will be exceeded and run-off from the site is likely. Run-off from the site will be controlled using the straw bale and sediment fencing to govern the spillway point located at the low end of the site. This low point also corresponds with the location of the large detention pond. Flow will be directed away from the SCG and past the Kippax Lake so that any sediment-laden run-off does not impact on either site.

The detention pond will be located outside the Moore Park 1in100 year ARI flood level so that sediment from the site will not enter flood waters during such rainfall events.

4.3 Stormwater Disposal and Drainage

Prior to discharge from the pond(s) a sufficient period of time shall pass so that the top 300-600mm of the sedimentation pond is clear from all suspended solids. In the event that a discharge becomes necessary
without suspended sediment settling to the floor of the pond, suitable flocculating agent shall be added to the pond to expedite the process (reducing turbidity).

Treated stormwater from the pond will discharge through an anti-vortex (trash rack) device similar to that shown on the following figure with water in excess of storage capacity directed via and emergency spillway to the existing overland flow route.

**Construction Notes**

1. Remove all vegetation and topsoil from under the dam wall and from within the storage area.
2. Form a cut off trench under the centreline of the embankment 600 mm deep and 1,200 mm wide, extending to a point on the undercourse wall above the river alluvial.
3. Maintain the trench free of water and recompress the materials with equipment as specified in the SWMP to 50 percent Standard Proctor Density.
4. Select fill according to the SWMP that is free from roots, wood, rock, large stones or foreign material.
5. Prepare the site under the embankment by ripping to at least 100 mm to help bond the compacted fill to the existing subgrade.
6. Spread the fill in 100 mm to 150 mm layers and compact it at optimum moisture content following the SWMP.
7. Install the pipe outlet with seepage coffers as specified in the SWMP and Standard Drawing G-3b.
8. Form batter grades at 2%(H):1(V) upstream and 3%(H):1(V) downstream or as specified in the SWMP.

**Figure 4-1 Anti-Vortex Device**

No contaminated or treated site waters (surface, collected groundwater or contaminated construction waters) are permitted to enter the existing stormwater system. All works should be undertaken in a manner that ensures the protection of water quality objectives and environmental values. Oily water with high levels of hydrocarbons will not be permitted to discharge into the stormwater system.

## 5 Demolition Works Dust Management

### 5.1 Dust Suppression and Water Monitoring

To minimise dust emissions from the site, the Builder will re-use water stored in the detention/sedimentation ponds throughout the demolition and bulk earthworks stages of the project for dust suppression and soil compaction. This will help manage the spread of fine particles entrained in stormwater and will reduce the need to use potable water sources during this construction phase.
Dust monitoring stations will also be utilised to manage fine particles within the site (refer to the Construction Air Quality Sub-Plan or CAQMSP).

The Builder must regularly monitor run-off stormwater within the detention/sedimentation ponds and check for toxic impurities so as not to discharge these impurities in the Council drainage system or groundwater aquifer. In the event that the run-off stored in the ponds is deemed unsafe (e.g. oily water), the Builder must dispose of the water to a facility capable of treating the water.

5.1.1 Site Water Testing Prior to Discharge

Jar testing will be conducted to determine the chemical dosing requirements of sediment ponds. Suitable flocculant and/or coagulant is likely to vary with different soil types. This variation will be identified from the jar testing or other equivalent industry standards.

Water samples collected from the sediment pond will be tested before discharge to verify that the suspended solid content is below recommended levels. Sufficient water testing will be conducted to enable a site-specific calibration between suspended solids concentrations (mg/L) and NTU turbidity readings. Water quality will as a minimum reach 50 mg/L or less prior to discharge.

5.2 Management of Fine Particles from Entrained Stormwater Run-Off

Fine particles from the demolition works will be suppressed by use of dust suppression (water spray). The use of sediment fences and straw bales will also minimise low travelling dust caused by water and wind actions from leaving the site and adversely impacting Kippax Lake and neighbouring properties.

Fine particles held within the detention/sedimentation ponds will be periodically decanted and disposed of off-site to a suitably licensed landfill.

Heavy duty plastic lining within the detention/sedimentation ponds will prevent finer particles from entering the aquifer/groundwater table.

EROSION AND SEDIMENT CONTROL (ESC) ASSUMPTIONS

The SFSR ESC strategy assumes that:

- No works, such as the commencement of earthworks or removal of vegetation, will be performed until all appropriate erosion and sediment controls have been installed.
- ESC controls will be inspected periodically to ensure adequate performance and prompt maintenance and repair of any issues.

These assumptions have been incorporated into the CSWMP drawing(s) in Appendix A.
Appendix A – ESCP & Details
NOTES

1. THIS DRAWING IS INDICATIVE ONLY AND ILLUSTRATES THE DESIGNERS' CONSIDERATIONS OF TEMPORARY SOIL AND WATER MANAGEMENT. THIS APPROACH MAY BE ADAPTED BY THE CONTRACTOR AT THEIR DISCRETION SUBJECT TO COMPLIANCE WITH GOOD PRACTICE AND 'THE BLUE BOOK'.

2. STOCKPILING AND STORAGE OF TOPSOIL AND TURF TO BE LOCATED AT THE UNIVERSITY'S DISCRETION OR REMOVED OFF SITE.

3. CONTRACTOR TO VERIFY THE LOCATION AND DEPTH OF IN-GROUND SERVICES BEFORE DISTURBING GROUND.

4. TREE REMOVAL AND DEMOLITION WORKS TO BE IN ACCORDANCE WITH ARCHITECTURAL DRAWINGS.

5. ACCESS TO THE SITE TO BE DISCUSSED AND AGREED WITH THE INFRASTRUCTURE NSW PRIOR TO SITE WORKS COMMENCEMENT.

LEGEND

- RUGBY AUSTRALIA BUILDING
- RUGBY LEAGUE CENTRAL
- MOORE
- DRIVE
- ROAD
- STRAW BALES AROUND EXISTING TREE
- STORM WATERS AROUND EXISTING TREE
- RISING MAIN
- LEGEND
- FLOW DIRECTION
- PROPOSED TEMPORARY CONSTRUCTION EXIT
- PROPOSED TEMPORARY SEDIMENT FENCE
- EXTENTS OF BASEMENT CONSTRUCTION
- SITE BOUNDARY
- TEMPORARY SWALE
- PUMP OUT PIT
- DIVERSION BANK
- STRAW BALES
- TEMPORARY SEDIMENT BASIN, REFER TO DETAILS
- JERSEY KERB (600mm)
- APPROXIMATE OUTLINE OF EXISTING SCG BASEMENT
- APPROXIMATE OUTLINE OF EXISTING SCG BASEMENT

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Job No
Drawing Status
Discipline
Scale at A0
Drawing No
Issue Date
By
Chkd
Appd

A0 Full Size
Scale 1:500

For Information

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EROSION & SEDIMENT CONTROL PLAN

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