MUSWELLBROOK BESS PROJECT

Water Assessment

Prepared for:

Firm Power Pty Ltd

SLR Ref: 630.30335.00000-R02
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BASIS OF REPORT

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
630.30335.00000-R02-v0.5	29 July 2022	Stephane Peignelin / Emily Curtis	Paul Delaney	Paul Delaney
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630.30335.00000-R02-v0.3	1 July 2022	Stephane Peignelin / Emily Curtis	Paul Delaney	Paul Delaney

EXECUTIVE SUMMARY

This Water Assessment is for a proposed state significant development located at 20-24 Sandy Creek Road, Muswellbrook (Lots 11 & 12 DP839233 and Lot 15 DP905479) (The Project) and has been prepared for inclusion in the Environmental Impact Statement for The Project. The Project involves establishing a new Battery Energy Storage System (BESS) adjacent to Ausgrid existing substation.

The assessment seeks to identify potential water impacts on The Project, and then outline requirements for water management and construction methods that can satisfactorily mitigate the identified potential impacts. Water quality related issues identified in the Secretary's Environmental Assessment Requirements (SEARs) SSD-29704663 have been addressed. This assessment should be read in conjunction with related assessments, in particular SLR report '630.30343-R01-Muswellbrook BESS Final' prepared on July 1st, 2022.

The site is located with the catchment of Sandy Creek, which is a slightly disturbed environment in terms of water quality. Both construction and operational activities have potential for environmental impact on the downstream environment. However, with rigorous implementation of environmental controls and management practices, these risks can be satisfactorily mitigated during both the construction and operational phases.

Construction Phase

Construction activities have high potential for short term adverse impacts on the surrounding environment, including temporary disturbance of land soils and sediments generation. However, these potential impacts can be effectively mitigated with environmental controls, and with rigorous management during construction, the environmental impacts are likely to be short term and manageable. Environmental controls and management during construction will include:

- A Construction Environmental Management Plan (CEMP) will detail environmental controls and processes during construction;
- Potential water quality impacts during the construction includes erosion of site soils, and the transport of sediment and turbid water into the natural flow path immediately north of The Project. The CEMP will include an Erosion and Sediment Control Plan (ESCP), which, at a minimum will prescribe limiting the area and time for disturbed areas (staging the work), sediment controls including sediment sumps (including appropriate drainage), clean water diversions and sediment fencing. Minimum requirements for the ESCP are detailed in this assessment; and
- All fuels and other chemicals used during construction must be stored in a bunded area away from any flowpath; appropriate spill kits will be located on site at all times; and a spill management plan will be included in the CEMP.

Operational Phase

The Project doesn't involve operational activities other than maintenance of the BESS. The facility will include infrastructure such as batteries and transformers which include materials with potential to cause pollution if there are events which lead to leakage. However, since all of this infrastructure will include design features such as bunding there is negligible risk of leakage reporting to the environment.

EXECUTIVE SUMMARY

Minor earthworks disturbances associated with facility maintenance are possible during the operational phase but are unlikely to have any impact on overall site water quality. Erosion and sediment control measures will be implemented as warranted in accordance with the guidelines Managing Urban Stormwater: Soil & Construction (Landcom 2004) (this is further discussed in this assessment) to minimise any potential for sediment export.

Environmental Management practices will be documented in an Operational Environmental Management Plan (OEMP). Key aspects that will be included are:

- Training of staff in acceptable work practices and operation of the environmental controls, spill management and reporting requirements
- Hazardous materials stored within bunds and under roof
- Requirements for maintenance and cleaning of water quality controls
- Monitoring and reporting requirements

Additional measures such as the following will also help mitigate any impacts from maintenance activities:

- Access tracks across the site will be unsealed with potential for dust creation. This could potentially result in an increase in turbidity and sediment loads in downstream waterbodies. This potential impact is mitigated by the low traffic volumes and the following measures:
    - A site speed limit of 40km/hr to reduce dust generation.
    - Application of binders to road surfaces to reduce dust will be used if dust generation is an issue during the operational phase.
- Scour protection and/or level spreaders at discharge points.

Flooding Assessment

The environmental impact of The Project on flooding and water resources is considered to be low risk and readily manageable. The site contains one ephemeral drainage path parallel to the northern site boundary. The flooding assessment suggests that:

- The flood hazard to persons within The Project is low.
- The site hydrology shows The Project has negligible effect to downstream flow conditions.
- The Project will not affect flood behaviour.

Closure Phase

At the closure phase of The Project surface infrastructure will be removed and the site regraded to grades compatible with the closure land-use. Topsoil will be replaced and the surface revegetated. An ESCP will be prepared as part of a decommissioning and rehabilitation plan to manage the closure activities.

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1 Introduction

1.1 Purpose of this Document

Firm Power is seeking planning approval for a Battery Energy Storage System facility at Muswellbrook. **Figure 1** below shows the Project locality and study area.

SLR has prepared this surface water assessment as a technical study to append the Environmental Impact Assessment required to accompany the development application. The report provides an environmental assessment of the surface and groundwater aspects of the proposed project during the construction, operation, and decommissioning phases of the project.

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Coordinate System: GDA 1994 MGA Zone 56

Date Drawn: 15/07/2022
Project Number: 630.30335

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Site Locality and Study Area

FIGURE 1

1.2 Project Description

The proposed Muswellbrook Battery Energy Storage System (BESS) is a 150MW/300MWh stand-alone battery to be located on a 4.94ha site located at 20-24 Sandy Creek Road, Muswellbrook (Lots 11 & 12 DP839233 and Lot 15 DP905479). The Project is located approximately 3 kilometres north-northeast of Muswellbrook in NSW.

The site is currently used for the purpose of hosting the existing Ausgrid Muswellbrook substation, which is located centrally within the site. Existing 132 kV and 33 kV powerlines traverse the site, extending from the eastern and western sides of the substation and following an east-west and north-south alignment.

The Muswellbrook BESS includes the following key infrastructure:

- Enclosed lithium-ion batteries;
- Power conversion systems including associated switchgear, protection and control equipment, transformers and enclosures for housing equipment;
- Underground power and fibre optic cabling interconnecting the equipment;
- Grid connection equipment including main power transformer, switchgear, protection and control equipment, metering, reactive power equipment, filtering equipment, auxiliary/earthing transformers and enclosures/buildings for housing equipment;
- Underground or overhead 132kV sub-transmission lines to connect the BESS to the Muswellbrook substation;
- Earthing and lightning protection systems;
- Site office, storage area/enclosure, internal access tracks, on-site parking, security fencing, CCTV, lighting and temporary construction laydown area;
- Vegetation screening and noise walls; and
- Utilisation of existing site access arrangements.

During the operational phase activities on site will generally involve monitoring, testing and maintenance activities. The site will be monitored and controlled remotely with a few people coming to site periodically for the other activities.

Firm Power has advised that following BESS end of life, all above ground infrastructure will be removed, and the site returned to a stable state.

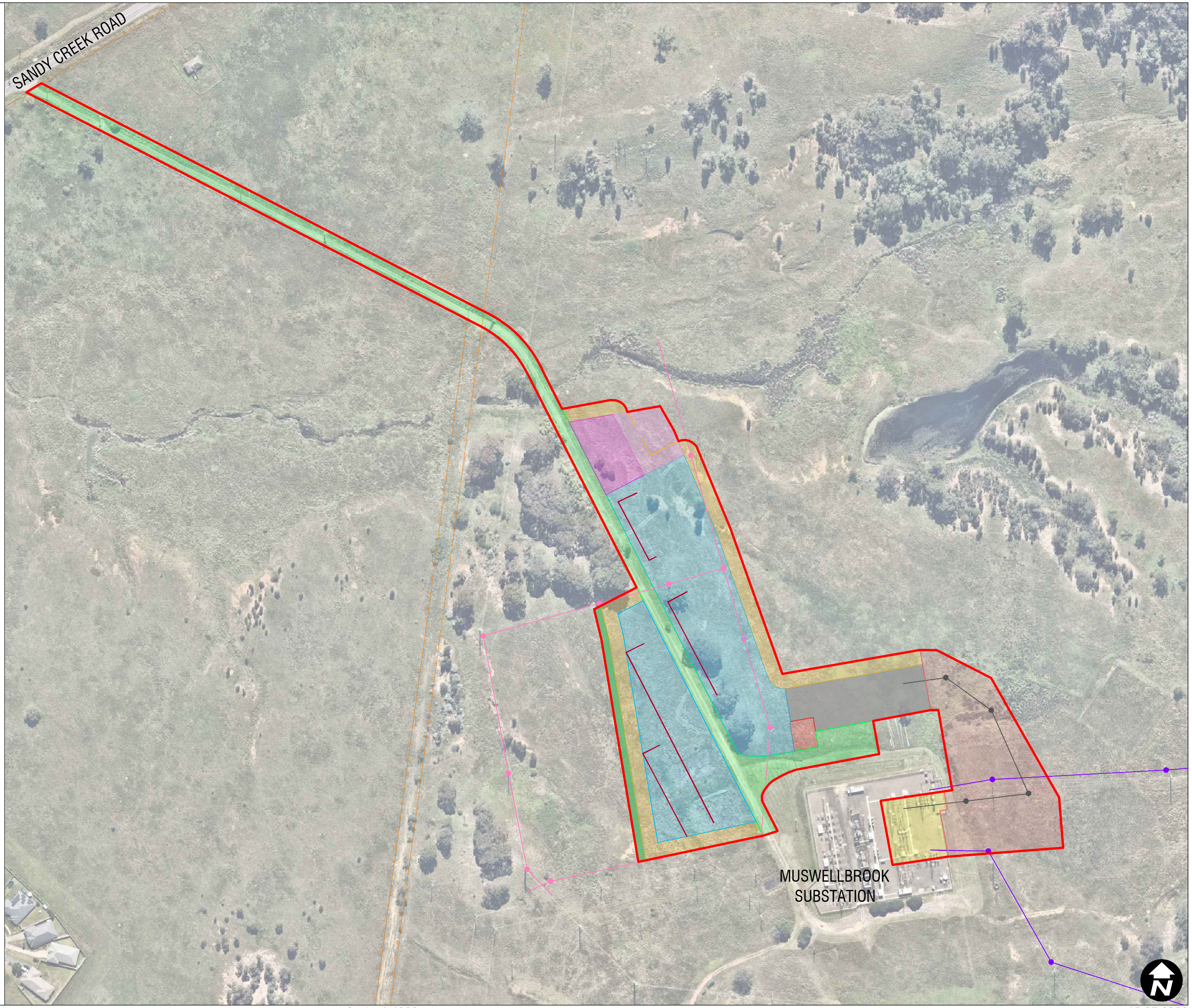
The proposed arrangement of infrastructure and facilities is shown on **Figure 2**.

NOTES:

1. AREAS AND DETAILS SHOWN ARE CONCEPTUAL.
2. DRAWING IS COLOUR CODED. PRINT COPIES IN COLOUR.
3. CLEARANCES OF BESS INFRASTRUCTURE TO EXISTING AUSGRID OVERHEAD LINES TO BE IN ACCORDANCE WITH NS220 OR EXISTING LINES RELOCATED/UNDER GROUNDED.
4. ONLY SELECTED OVERHEAD LINES SECTIONS IN PROXIMITY TO PROJECT AREA SHOWN. LOCATIONS ARE APPROXIMATE.
5. SHEARED ACCESS ROUTE TO BE DEVELOPED SUCH THAT IT IS SUITABLE FOR PROJECT NEEDS.
6. GRID CONNECTION ROUTE TO BE DETERMINED FOLLOWING SITE INVESTIGATIONS AND STUDIES.
7. INDICATIVE AREA INSIDE AUSGRID'S EXISTING SUBSTATION WHERE EQUIPMENT WOULD BE INSTALLED TO ENABLE CONNECTION OF THE BESS TO THE GRID. TO BE CONFIRMED DURING DETAILED DESIGN.
8. FUTURE WORKS BY AUSGRID NOT PART OF MUSWELLBROOK BESS SCOPE.
9. FOLLOWING COMPLETION OF CONSTRUCTION, AN ASSET PROTECTION ZONE AND ACCESSWAY AREA WILL BE IMPLEMENTED AROUND OPERATIONS AND MAINTENANCE COMPOUND AREA AND BATTERY. INVERTER TRANSFORMER AND SWITCHGEAR AREA AS SHOWN BY THE DASHED LINE.

LEGEND

- DEVELOPMENT SITE
- SHARED ACCESS ROUTE (NOTE 5)
- SUBSTATION AREA
- TEMPORARY CONSTRUCTION COMPOUND (NOTE 9)
- OPERATIONS AND MAINTENANCE COMPOUND AREA
- BATTERY, INVERTER, TRANSFORMER AND SWITCHGEAR AREA
- ACCESSWAYS AND ASSET PROTECTION ZONE
- AUSGRIS FUTURE INFRASTRUCTURE (NOTE 8)
- GRID CONNECTION INVESTIGATION AREA (NOTE 6)
- INDICATIVE CONNECTION ROUTE (NOTE 6)
- WORKS AREA IN EXISTING SUBSTATION (NOTE 7)
- EXISTING 132kV OVERHEAD LINES (NOTE 4)
- EXISTING 33kV OVERHEAD LINES (NOTE 4)
- CADASTRAL BOUNDARIES
- NOISE WALL
- SCREENING VEGETATION



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PROJECT OVERVIEW

FIGURE 2

1.3 Assessment Methodology

This assessment has been prepared to address the requirements of the SEARs. The assessment was completed by desktop assessment to define existing conditions, an identification of potential impacts, and then identification of project features to mitigate and manage those impacts.

2 Requirements

2.1 SEARs

The proposal is a State Significant Development, and the Department of Planning, Industry and Environment (DPIE) has issued Secretary's Environmental Assessment Requirements (SEARs). SEARs relevant to this study and where they are addressed are listed in **Table 1.**

Table 1 SEARs requirements and where addressed

Relevant SEARs Requirements	Report Section where addressed
Groundwater and groundwater dependent ecosystems.	Section 7
Existing surface and groundwater.	Section 3 and 4
Water Quality Objectives (as endorsed by the NSW Government) that represent the community's uses and values for the receiving waters. Indicators and trigger values/criteria for the environmental values identified at (c) in accordance with the ANZECC (2000) Guidelines for Fresh and Marine Water Quality and/or local objectives, criteria or targets endorsed by the NSW Government.	Section 5
The nature and degree of impact on receiving waters for both surface and groundwater, demonstrating how the development protects the Water Quality Objectives where they are currently being achieved, and contributes towards achievement of the Water Quality Objectives over time where they are currently not being achieved. Effects of proposed stormwater and wastewater management during and after construction. Identification of proposed monitoring of hydrological attributes. Mitigating effects of proposed stormwater and wastewater management during and after construction on hydrological attributes such as volumes, flow rates, management methods and re-use options.	Section 6 and 7
Identification of proposed monitoring of water quality.	Section 11
Changes to environmental water availability, both regulated/licensed and unregulated/rules-based sources of such water.	Section 10
Effects to downstream rivers and water-dependent fauna and flora including groundwater dependent ecosystems.	Section 6

Relevant SEARs Requirements	Report Section where addressed
Impacts to natural processes and functions within rivers, wetlands, estuaries and floodplains that affect river system and landscape health such as nutrient flow, aquatic connectivity and access to habitat for spawning and refuge (e.g. river benches).	Section 6
Flooding assessment.	Section 9

2.2 Relevant Legislation

2.2.1 NSW Protection of the Environment Operations Act 1997

The NSW Protection of the Environment Operations Act 1997 (POEO act) is administered by the Environment Protection Authority (EPA). Since the proposed activity is not a 'scheduled activity' an Environment Protection License is not required.

Notwithstanding that site activities do not require an environment protection license, the POEO Act imposes a strong duty of care not to pollute or cause pollution of waters, and to maintain and operate any pollution control equipment installed at the premises in a proper and efficient condition or manner.

2.2.2 NSW Water Management Act 2000

The NSW Water Management Act 2000 enables allocation of water for the environmental health of NSW's rivers and groundwater systems, while also providing licence holders with secure access to water and the opportunity to trade water.

No change to water entitlements is proposed as part of The Project.

2.3 Standards and Guidelines

The following standards and guidelines are relevant to the proposed development:

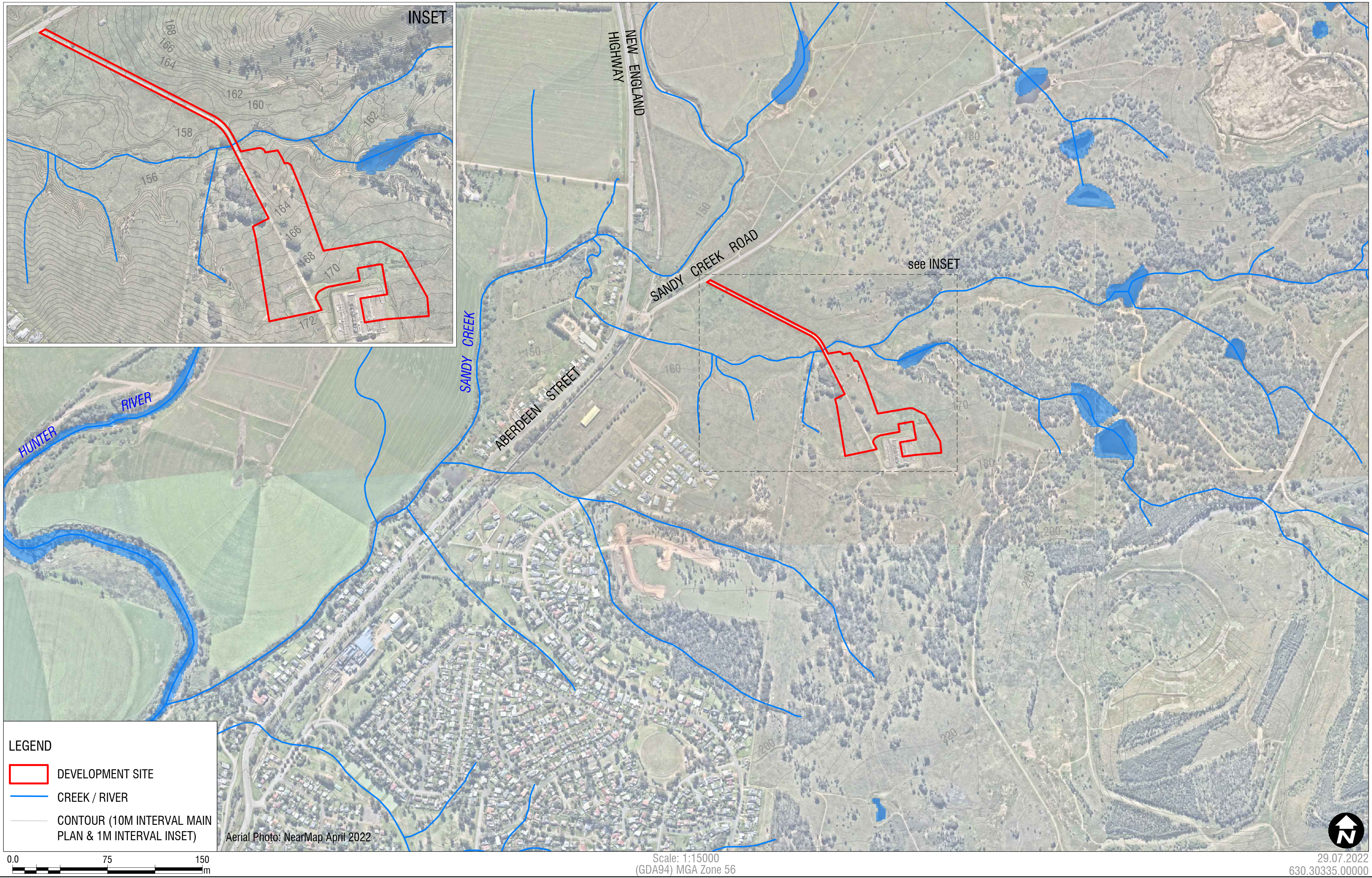
- Managing Urban Stormwater: Soils & Construction (Landcom 2004).
- Floodplain Development Manual: The management of flood liable land (FDM 2005).
- Liquid Chemical Storage, Handling and Spill Management: Review of Best Practice Regulation (DEC 2005).
- Storing and Handling liquids: Environmental Protection: Participant's Manual (DEC 2007).

3 Existing Water Environment and Site Soils

3.1 Site Topography and Drainage Patterns

A LiDAR topographical survey across The Project was provided by Firm Power. Contextual topography surrounding The Project was obtained from the ELVIS Leica-Geosystems Airborne Digital Sensor supplied by NSW Spatial Survey.

The Site has a tributary drainage path which intersects with Sandy Creek and ultimately the Hunter River further downstream. This tributary is located directly downstream of the proposed development and runs from east to west at a slope of 1.4%. Several overland flow paths join the watercourse within The Project. The grade through this ephemeral watercourse is very gentle, with drainage slope of 2%. These drainage paths are shown in **Figure 3** below.



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WATERCOURSES SURROUNDING DEVELOPMENT SITE

FIGURE 3

Elevations across The Project vary from approximately 174 mAHD in the southwest, to 158 mAHD on the northwest boundary, indicating a maximum fall of around 16 m over a distance of 0.4 km. Elevations undulate in the centre of the site, associated with areas of vegetation.

3.2 Site Soils

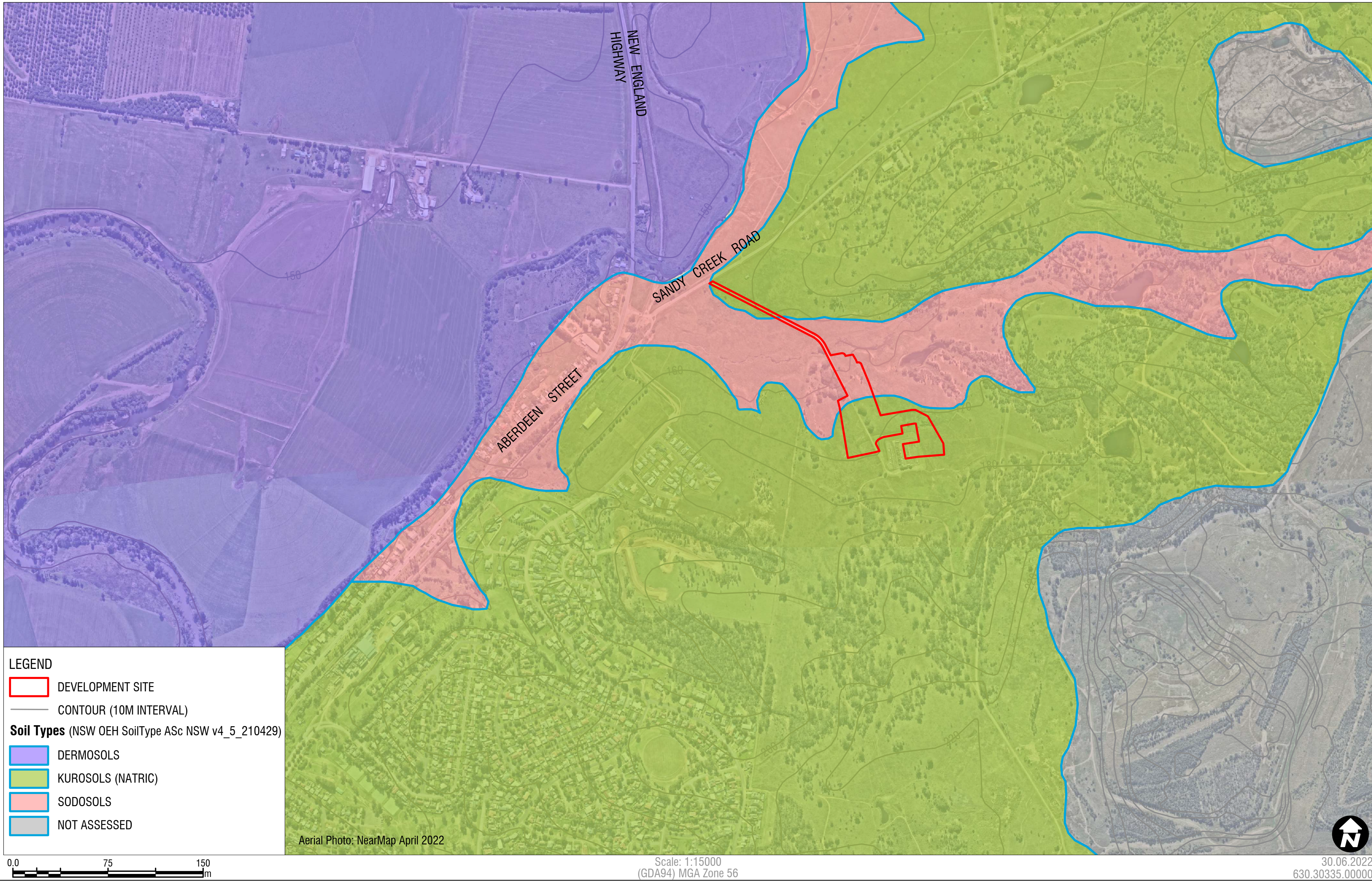
Information on site soils was obtained from the NSW Office of Environment and Heritage (OEH) website. Site soils are shown on **Figure 4**.

The soil landscape over the Site is comprised of two predominant soil type areas: Donald's Gully and Dochra.

The Donald's Gully (dnz) soils in the north of the site contain moderately deep to deep (50 - <150 cm), imperfectly to poorly drained Brown, Yellow and Grey Sodosols and Natric Kurosols (Solodic Soils and Soloths) dominate slopes and drainage plains. Moderately deep to very deep (50 - 500 cm), imperfectly drained Chromosols (Grey Brown and Yellow Podzolic Soils and Non-calcic Brown Soils) also occur within the area. Minor sheet erosion is extensive in the area, although occurrences of moderate sheet and gully erosion is rare (NSW OEH, 2018).

The Dochra (dot) soils in the south of the site are dependent on the slope of the terrain. Crests to midslopes are moderately deep (50 - <100 cm), moderately well-drained Eutrophic Subnatric Brown Sodosols (Solodic Soils). Moderately deep (50 - <100 cm) well drained Acidic-Sodic Magnesic Brown Dermosols (Soloths) may also occur where texture contrast is not well developed. Sheet erosion is extensive on many hillslopes in cleared areas, whilst most drainage lines in cleared areas are subject to significant gully erosion. Many subsoils are highly dispersible and erodible (NSW OEH 2018).

Please refer to SLR report '630.30343-R01- Muswellbrook BESS Final' prepared on July 1st, 2022, for more information on the soils present on-site.



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SITE SOILS

FIGURE 4

3.3 Salinity

Information on site salinity was obtained from the NSW Government online database SEED (SEED 2022). The salinity mapping from SEED suggest salinity is not a known occurrence at The Project.

Please refer to SLR report '630.30343-R01- Muswellbrook BESS Final' prepared on July 1st, 2022, for more information on the soils present on-site.

4 Climate Information

4.1 Rainfall

The closest Bureau of Meteorology (BOM) station to The Project recording daily rainfall is Muswellbrook (St. Heliers). This station is approximately 6.6 km to the north of The Project and has 22 years of consistent rainfall records. The BOM station at Aberdeen (Rossgole) provides historical data, recording the 74 years of rainfall data preceding the use of the station at Muswellbrook. Rainfall for The Project is based on BOM data at the Aberdeen station. **Table 2** shows the distances to, and lengths of data record at each of these stations.

Table 2 Rainfall stations within the surrounding area

Station	Station Number	Distance from Project (km)	Data available
Aberdeen (Rossgole)	061065	20.2	1926-present day
Muswellbrook (St. Heliers)	061374	6.6	2000-present day

Average annual rainfall at Aberdeen, is 743.2 mm. There is not a substantial seasonal variance in rainfall during average years, with the driest months in June-September having 40% less rainfall than the wettest months from November-February. Average monthly and annual average rainfall depths are shown in **Table 3**.

Table 3 Average monthly rainfall depths at Aberdeen (Rossgole) (Station 0610065)

Month	Average Rainfall (mm)
January	88.0
February	81.0
March	70.1
April	51.4
May	49.6
June	56.4
July	43.8
August	43.5
September	47.3
October	63.0
November	70.9
December	78.4
Average Yearly Rainfall	**743.2**

There can be considerable fluctuation in the depth of rainfall from year to year. The lowest recorded annual rainfall was 378 mm, and the highest annual rainfall was 1417.2 mm. In particular there are very high differences in summer rainfall between dry and wet years. For example, the 10^{th} percentile rainfall in April is 4 mm, while the 90^{th} percentile rainfall is 110.9 mm.

Rainfall statistics in **Table 4** show the mean and annual monthly rainfalls, as well as information for lowest, median, and highest recorded months/years, and the 5th, 10th, 90th and 95th percentile months/years. Data accessed from the BOM website, 22nd March 2022.

Table 4 Detailed Monthly and Annual Rainfall Depths

Statistics	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean	88.0	81.0	70.1	51.4	49.6	56.4	43.8	43.5	47.3	63.0	70.9	78.4	743.2
Lowest	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0	378.0
5th %ile	14.0	6.2	5.2	1.8	2.6	10.8	2.0	5.3	5.6	8.1	7.8	13.7	445.5
10th %ile	20.6	8.9	11.9	4.0	8.7	13.4	7.4	7.4	12.4	11.1	18.2	22.3	476.2
Median	75.1	63.5	53.2	40.8	33.6	41.2	35.7	34.5	37.3	60.8	57.6	68.8	734.0
90th %ile	186.6	164.1	155.3	110.9	101.3	111.2	85.2	81.8	88.2	123.1	141.6	161.7	949.8
95th %ile	213.4	195.0	171.2	154.5	140.5	147.1	105.7	105.4	107.8	141.5	156.7	180.8	1020.7
Highest	303.5	413.2	234.2	193.9	238.5	287.2	172.8	188.5	144.8	208.6	308.6	245.2	1417.2

Intensity Frequency Duration (IFD) information for the site was sourced from the Bureau of Meteorology (BOM) website (2016 IFD data), accessed 22nd March 2022. Rainfall depths (mm) for various Annual Exceedance Probabilities (AEPs) and durations are shown in **Table 5** below.

Table 5 BOM 2016 Rainfall Depths – Frequent to Rare Storms

Duration	Annual Exceedance Probability (Average Recurrence Interval)		
	10% (1 in 10)	2% (1 in 50) AEP	1% (1 in 100) AEP
30 min	27.8	38.8	44.0
1 hour	34.8	48.0	54.0
2 hour	42.1	57.4	64.4
3 hour	47.2	64.1	71.8
6 hour	58.5	79.7	89.4
12 hour	75.1	103	117
24 hour	98.4	138	156
48 hour	127	180	205
72 hour	143	203	231
96 hour	152	216	246
120 hour	156	223	254
144 hour	159	226	258
168 hour	159	227	258

4.2 Climate Change and Effect on Rainfall

There is now widespread acceptance that human activities are contributing to observed climate change. Climate change (warming) has the potential to increase the prevalence and severity of rainfall extremes and needs to be considered in flood planning for long term projects. The State of Climate 2020 report published jointly by *CSIRO and the Bureau of Meteorology* indicates that for the southeast of Australia:

- There is very high confidence in continued substantial increases in projected mean, maximum and minimum temperatures, with a corresponding decline in mean annual rainfall depths.
- There is high confidence that there will be future increase in the intensity of extreme rainfall events.

In a warming climate, rainfall depths in extreme events are expected to increase mainly due to a warmer atmosphere being able to hold more moisture (Sherwood et al., 2010). Since the facility has a long design life, climate change may be significant.

Australian Rainfall and Runoff (ARR 2016) identifies a method called 'simplified method' to estimate the impact of climate change on rainfall depth.

The simplified method allows incorporating the effects of climate change in design rainfall and flood estimation, by modelling of the 0.5% (1 in 200) AEP in lieu of the 1% (1 in 100) AEP event. For a 24-hour rainfall event this would represent an increase in rainfall of 11% (1% AEP = 156mm to 0.5 % AEP = 173mm).

5 Water Quality

5.1 Existing Water Quality

No existing water quality data is available for The Project. Given the highly ephemeral nature of The Project channels, and the low impact of the proposal, it is intended for the proposal to include best practice water quality control measures, with an ongoing water quality monitoring regime to be assessed against the Australian and New Zealand Water Quality Guidelines (ANZG 2018) water quality criteria.

5.2 Water Quality and River Flow Objectives

The NSW Water Quality Objectives are the agreed environmental values and long-term goals for NSW's surface waters. Water Quality Objectives for most catchments in NSW are published on the Department of Environment Climate Change and Water website (http://www.environment.nsw.gov.au/ieo/).

The Project's contributing catchment is located to the west of Sandy Creek and is part of the catchment for the Hunter River. During rainfall events, runoff from the site drains to a tributary of Sandy Creek via culverts under the New England Hwy.

The relevant agreed environmental values and river flow objectives for **Uncontrolled Streams** within the Hunter River Catchment are detailed in **Table 6**.

Table 6 Environmental values and river flow objectives for Uncontrolled Streams **within the Hunter River Catchment**

Water Quality Objectives	River Flow Objectives
Aquatic Ecosystems	Protect pools in dry times
Visual Amenity	Protect natural low flows
Livestock Water Supply	Manage groundwater for ecosystems
Homestead water supply	Maintain wetland and floodplain inundation
Irrigation water supply	Minimise effects of weirs and other structures
Secondary contact recreation - not relevant to this study	Maintain natural flow variability - not relevant to this study
Primary contact recreation - not relevant to this study	Protect important rises in water levels - not relevant to this study
Drinking water at point of supply-Disinfection only - not relevant to this study	
Drinking water at point of supply-Clarification and disinfection - not relevant to this study	
Drinking water at point of supply-Groundwater - not relevant to this study	
Aquatic foods (cooked) - not relevant to this study	

River flow objectives suggest that the natural and existing regime of flows from The Project should be retained as far as practically compatible with other requirements, mimicking natural flow patterns as closely as possible. Additional damming or harvest of surface water on site should be minimised.

5.3 ANZG 2018 Default Water Quality Trigger Values

The Australian and New Zealand Water Quality Guidelines (ANZG 2018) advocate a risk-based approach to water quality assessment and management. That is, the intensity of assessment of current water quality status or impacts on water quality should reflect the risk of impacts on the achievement/protection of the water quality objective.

For Protection of Aquatic Ecosystems in NSW, and for irrigation water used in primary production, the ANZG 2018 Guidelines refer back to the Australian and New Zealand Environment and Conservation Council (ANZECC) & Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) (2000) default trigger values for major physico-chemical stressors, which are used to assess whether the condition of an ambient water body supports the environmental values. These values, summarised in **Table 7**, provide typical values which if exceeded warrant investigation, and could adversely impact downstream environments and/or water uses.

The trigger values shown in Table 7 provide default trigger values, and water quality should be investigated if monitoring results exceed these values.

With regards to the preservation of water quality for the purposes of livestock drinking water the revised guidelines will be published via the following weblink, (http://www.waterquality.gov.au/anzguidelines/guideline-values/default/primary-industries/stock-water-guidance), and may need to be referenced in the OEMP.

Table 7 Trigger Values – Environment and Irrigation Water

Parameter	Default Trigger Value for NSW lowland rivers for aquatic ecosystems in slightly disturbed ecosystems
Total Phosphorous TP (mg/L)	0.05
Total Nitrogen TN (mg/L)	0.5
Ammonium NH_4^+ (mg/L)	0.02
Total Suspended Solids	50mg/L - Professional Judgement
Turbidity (NTU)	6-50
Salinity	125-2200µS/cm
pH	6.0 – 8.0
Pesticides	Concentrations in discharge water should not exceed the crop injury threshold values in Table 4.2.12 of the ANZECC 2000 Guidelines
Heavy metals and metalloids	Concentrations in discharge water should not exceed the STV values in Table 4.2.10 of the ANZECC 2000 Guidelines
Thermotolerant coliforms (cfu/100mL)	<1000

5.4 Monitoring Regime

SLR recommend that water quality monitoring initially comprise monthly sampling of site discharge for a period of 2 years, at a location downstream of the site stormwater system discharge and upstream of flows along Sandy Creek. The frequency of ongoing monitoring should be reviewed after completion this initial 2-year monitoring period.

SLR do not envisage any issues with water quality discharging from the site. To provide improved surety a monitoring program is proposed to verify that there isn't any water quality impact. If monitored water quality exceed the trigger value listed in the table then this should be reported to the EPA and an investigation commenced to identify appropriate remedial actions.

6 Impact Assessment – Surface Water

6.1 Construction Phase

The primary risk to surface water quality during construction is ground disturbance associated with site earthworks. Construction works will expose site soils and there is potential for erosion to mobilise sediments into receiving watercourses. Without appropriate controls there is potential for an increase in turbidity and nutrient loads in the receiving watercourses which may cause water quality and ecological impacts.

The potential for erosion will be mitigated by the following factors:

- Construction activities will be sequenced, such that the disturbance area at any one time will be minimised as far as practicable.
- Construction areas will be progressively rehabilitated as installation of batteries proceeds across the site. Rehabilitation may include revegetation or other types of stable surfacing as appropriate to the end land-use.
- Gentle grades, and a combination of vegetation and surface cover across the site reduce the potential for erosion or sediment transport.

With the implementation of standard erosion and sediment control measures in accordance with Managing Urban Stormwater: Soils and Construction, Volume 1, 4th Edition (Landcom 2004) the potential environmental impact is considered very low and manageable.

A site wide Erosion and Sediment Control Plan (ESCP) will be prepared as part of the Construction Environmental Management Plan (CEMP) for The Project. The ESCP will be prepared in accordance with Landcom (2004), known as 'the Blue Book', and Volume 2A Installation of Services (DECC 2008a). Mitigation measures and site management practices will include:

- Staging of construction works and progressive rehabilitation to limit the disturbed area. Staging of the construction is to be determined at detail design stage of The Project.
- Establishment of 'no go areas' to prevent unnecessary disturbance of site soils by construction vehicles in site areas outside of the construction footprint.
- Stabilisation of table drains alongside access tracks using vegetation, and rock check dams.
- Installation of sediment fences around the perimeter of disturbance areas.
- Installation of a sediment traps with level spreaders at locations where site overland flow paths discharge to the adjacent existing landform.
- Install a shaker pad at the site exit to reduce mud or clay on vehicle wheels being tracked onto external roads.
- Appropriate site storage of hydrocarbons within bunded areas, and documented spill response procedures.
- Inspection of erosion and sediment control measures following heavy rainfall.
- Water quality monitoring and reporting requirements.
- Providing an appropriate level of resourcing for environmental management and monitoring.

Calculations on sediment generation rates by SLR in accordance with Urban Stormwater: Soils and Construction, Volume 1, 4th Edition (Landcom 2004) indicate that the estimated annual rate of sediment generation is less than 150 m^3, per construction stage, and does not require a sediment basin. However, as noted above, small sediment traps with a level spreader should be installed at locations where there is concentrated flow of runoff reporting the downstream natural landform.

6.2 Operational Phase

Soil disturbance during operation of the battery systems would be minimal and limited to maintenance activities, which will involve very small, localised disturbance areas on an infrequent basis - for example periodic maintenance of BESS infrastructure and access to the site by vehicles. Water quality impacts from these minor disturbances is unlikely to have any significant impact on overall site water quality. Erosion and sediment control measures will be implemented to minimise the potential for sediment export. These measures would be developed on a case-by-case basis in accordance with the Landcom (2004) guidelines and are likely to include measures such as sediment fencing, sediment traps, and progressive stabilisation with vegetation.

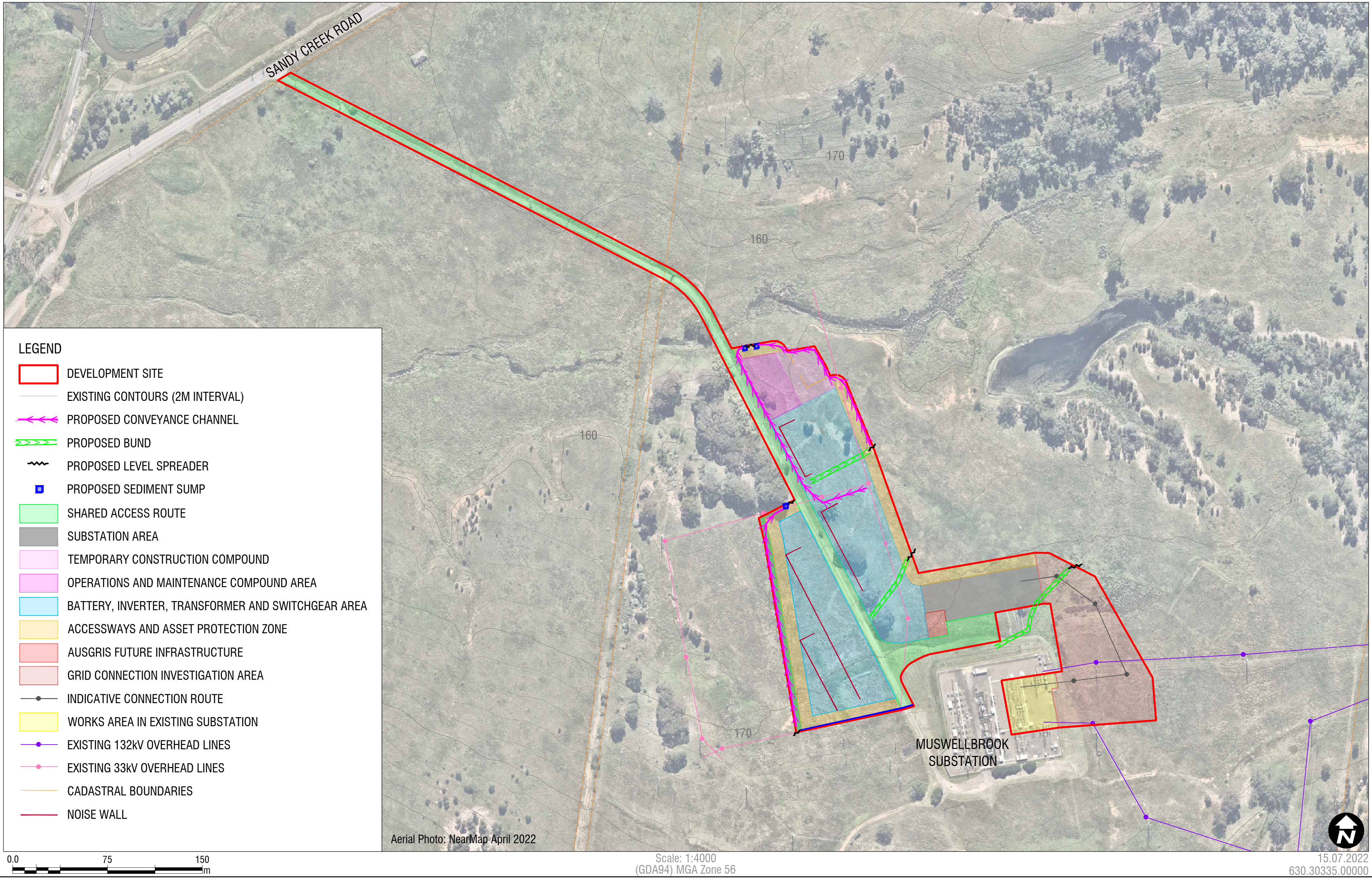
Concentrated runoff from the surface of battery enclosures falling onto the ground has some potential to cause localised erosion beside the concrete hardstand of the systems. This potential impact should be mitigated by placement of an erosion resistant surface below the edges of battery enclosures, such as reinforced concrete or a layer of crushed rock.

Access tracks across the site will be unsealed, and there is potential for dust creation, mainly when tracks are traversed by site vehicles. Dusts deposited on the ground can be easily washed away during rainfall, increasing the turbidity and sediment loads in downstream waterbodies. This potential impact is mitigated by the low traffic volumes that will utilise the site once established. Additional controls will include:

- A site speed limit of 40km/hr to reduce dust generation.
- When necessary, the application of binders to road surfaces to reduce dust.

At locations where the site stormwater drains discharge, scour protection and/or level spreaders should be included to mitigate the potential for localised erosion.

Figure 5 below shows an indicative strategy to manage surface water at the site as discussed above. Please note that this strategy is conceptual only to provide context and will need revising at detail design stage. Please refer to **Appendix A** for typical detail of level spreaders.



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CONCEPTUAL SURFACE WATER MANAGEMENT

FIGURE 5

6.2.1 Muswellbrook Bypass

The Muswellbrook Bypass is at the concept design phase and construction may be concurrent with The Project. The proposed Muswellbrook bypass has an alignment to the northwest of The Project, and crosses Sandy Creek upstream of The Project. At present there is limited detailed design information available on this project. A cursory review of surface water related matters indicates that there is limited potential for cumulative impact, due to:

- The alignment of the bypass crossing Sandy Creek upstream of The Project, therefore there is no potential for increases in flood levels due to afflux from waterway crossings;
- There being minor potential for increased flows along Sandy creek downstream of the bypass; and
- The Muswellbrook bypass concept design flood assessment (BMT 2021) indicates that there is a reduction in flow depth downstream of the proposed Muswellbrook bypass design.

6.3 Closure Phase

At the closure phase of The Project surface infrastructure will be removed and the site regraded to grades compatible with the closure land-use. Topsoil will be replaced and the surface revegetated.

During this phase it is likely that there will be broadscale disturbance of site soils, and there is a risk of soil erosion until an effective vegetative cover is established to stabilize the surface. Potential impacts of erosion include reduced water quality in receiving watercourses, ecological impacts associated with increased sediment load, and a potential loss of future land productivity if topsoil is eroded.

Typical NSW Department Planning and Environment conditions and rehabilitation objectives include:

- A safe, stable, and non-polluting site.
- Decommissioned and removed battery systems.
- Restoring land use capability to its pre-existing use.
- Ensure public safety in the community at all times.

An ESCP will be prepared for the closure phase of The Project, and should consider controls such as:

- Staging of works to limit disturbance area.
- Perimeter sediment controls.
- Temporary drainage works such as contour banks to limit the lengths of overland flow.
- The use of cover crops and/or mulches to provide temporary ground cover.

6.4 Storage and Use of Hydrocarbons and Chemicals

The storage and use of hydrocarbon fuels and other chemicals on site present a potential risk if spilled substances contaminate site soils or are mobilised and spread to the downstream receiving environment. Chemicals used onsite during both the construction and operational phases may include fuels, lubricants and (minimally) herbicides.

Accidental spill or discharge of hydrocarbons, such as fuels and oils in vehicles and/or earthmoving equipment, has potential to contaminate downstream waterbodies or groundwater.

The batteries proposed on site will be enclosed within a weatherproof enclosure. It is expected that the battery cells will be comprised of all solid components. However, if the batteries do contain chemical fluids, then the enclosure will include bunding to provide full internal containment. Site operation procedures will include regular inspection of batteries which will identify any issues with leakage and prompt remedial action to remove any associated hazard.

Electrical infrastructure on site such as transformers are often oil filled. This infrastructure will be designed, constructed, and maintained in accordance with contemporary standards to mitigate risks associated with oil leakage. Controls will include bunding adequate to contain 110% of the volume of contained oil plus an allowance for rainfall. Any oily water removed from bunds must be disposed off-site at a suitably licensed waste facility.

The risk of hydrocarbon contamination will be mitigated by:

- Storage of chemicals in accordance with Australian Standards.
- Storage of hydrocarbon fuels within bunded storage areas.
- Bunding of substations, transformers or other infrastructure that utilise oil.
- Minimise usage of herbicides and avoid spraying when rain is predicted.
- A Spill Response Plan, including emergency response and EPA notification procedures.

Requirements for the storage and use of hydrocarbon fuels and other chemicals on site will be documented in both the Construction and Operational Management Plans.

Overall, with the implementation of suitable controls these risks are low and considered readily manageable.

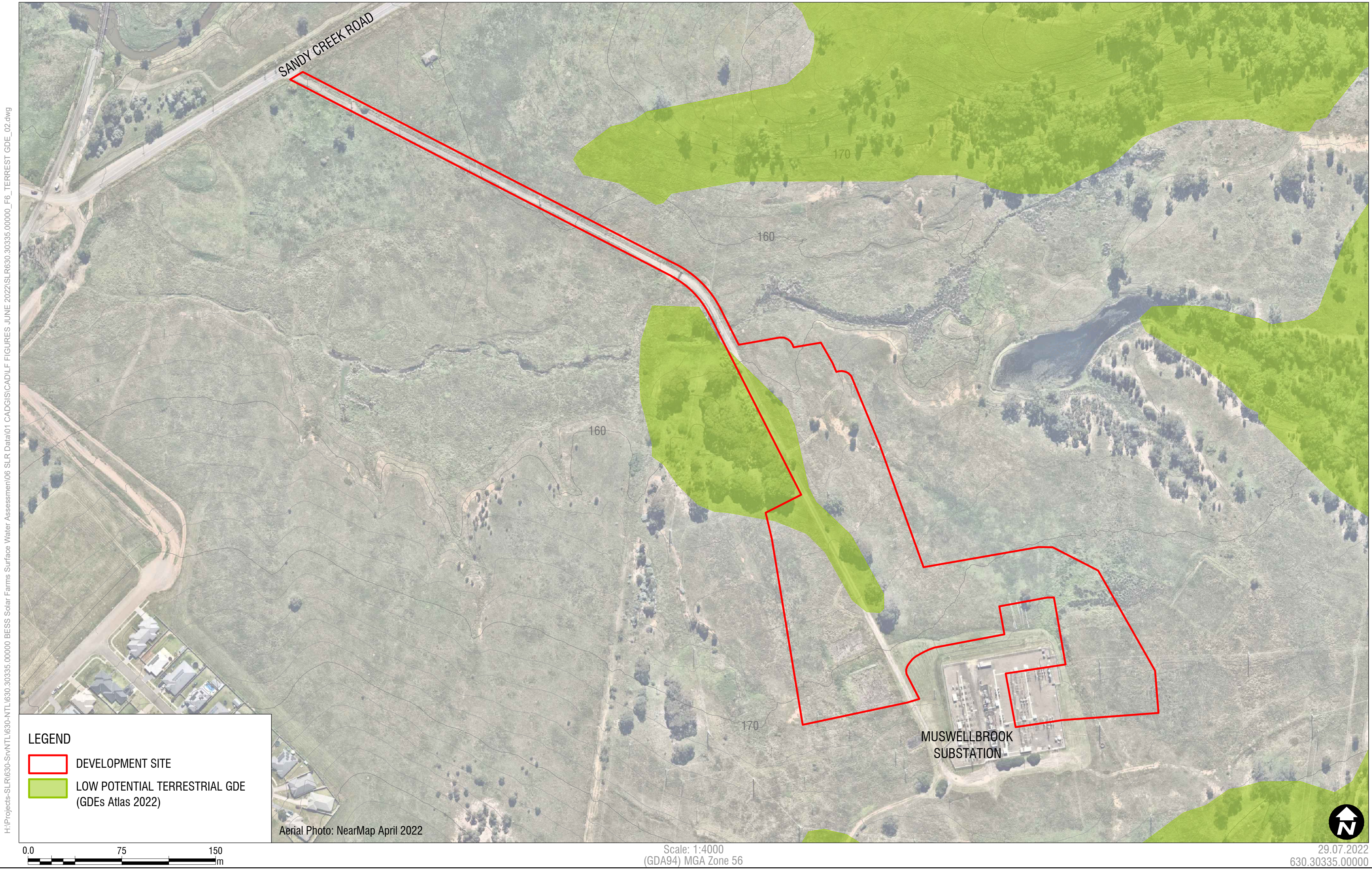
7 Impact Assessment – Groundwater

7.1 Groundwater Dependent Ecosystems (GDEs)

Groundwater is important in sustaining Groundwater Dependent Ecosystems (GDEs), including aquatic and terrestial ecosystems such as springs, wetlands, rivers and forests. GDEs can include aquatic ecosystems which rely on the surface expression of groundwater, and terrestial ecosytsems which rely on the subsurface presence of groundwater.

The Groundwater Dependent Ecosystems Atlas (GDEs Atlas 2022) indicates that there is a low potential for terrestrial GDEs to the northwest of The Project, which partly extends into the project area as shown on **Figure 6**. The data used by the Atlas for The Project location is indicated as being sourced from a regional study. Further assessment on-site might be required to verify the presence of terrestrial GDEs at the site and proposed mitigation measures. The area of mapped GDE located within the project area may be impacted by any changes to the existing surface in this area.

Refer to **Section 7.3** for existing groundwater information nearing The Project.



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LOW POTENTIAL TERRESTRIAL GDE MAPPING

FIGURE 6

7.2 Groundwater Vulnerability

The Project isn't located within an area mapped as having groundwater vulnerability as shown on **Figure 7** below.

0 1.5 3 km

Scale: 1:65,000 at A4
Coordinate System: GDA 1994 MGA Zone 56

Date Drawn: 28/07/2022
Project Number: 630.30335.00000

Data Source:

SLR

GROUNDWATER VULNERABILITY MAPPING

FIGURE 7

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7.3 Existing Water Users

Review of existing bore data was undertaken using Water NSW real time water data online tool. **Table 8** below shows the bores information collected.

Table 8 Existing bore information

ID	Licence	Depth (m)	Water Depth (m)	Owner	Strata Description	Location to site
GW200715	20WA216982	251.7	62.5	Mines	During the drilling process, conglomerate, sandstone, siltstone and coal was encountered.	3.5km northwest
GW201055	20WA216928	253	71.72	Private	-	3.5km northwest
GW027410	-	12.2	8.2	Private	-	1km northeast (Sandy Creek)
GW011360	20CA208023	7.9	4.9	Private	During the drilling process, loam, clay and sandy loam was encountered.	1km northeast (Sandy Creek)
GW043981	-	9.1	1.8	Private	-	2km east (Sandy Creek/Hunter River)
GW053534	-	15	4	Private	-	4km west (Hunter River)
GW037480	-	9.9	8.9	Private	During the drilling process, topsoil, sandy clay, sandy silt and clay was encountered.	6km southeast
GW014357	20BL009639	16.5	11.6	Other Govt	-	3.5km northwest (Hunter River)
GW202484	20BL173282	7.5	5.8	Private	-	3km southwest (Hunter River)

As shown above, the groundwater tables reported from the existing bores generally becomes shallower the closer to Sandy Creek or the Hunter River. Inversely, the groundwater table is generally reported deeper the further away from watercourses the bore is located.

Review of the existing groundwater data available from bores nearing The Project suggest that there isn’t enough information within close proximity to The Project in order to establish the depth of the groundwater table at the site.

7.4 Assessment

The Project is not likely to have any impact on groundwater resources. Impacts to groundwater during construction and operation of the battery systems are unlikely to occur due to:

- The pattern of surface drainage and associated groundwater recharge will remain unchanged.
- Soil infiltration across the broader surface of the site will be unchanged due to The Project earthworks including benching (which will slow surface runoff velocities) and compacting (which will increase surface runoff velocities). As a result, the rates of groundwater recharge will be unaffected.
- The Project earthworks will include minor cut and fill to create benches and trenching for electrical and stormwater infrastructure. These activities are not envisaged to have any significant impact on groundwater.
- It is noted that there is a low potential for some terrestrial GDEs existing within The Project footprint. It is recommended that further investigation might be required to verify the presence of terrestrial GDEs at the site and proposed mitigation measures.

8 Site Hydrology

It is understood that the proposed development will involve constructing concrete pads for the BESS and benching of the site in order to place the BESS on level ground. An increase in site imperviousness is likely to increase the volume of runoff discharging from the Project Area. However, discharge rates are mitigated by proposed benching of the site which will reduce site slopes and the velocities of overland flows. Hydrological modelling as detailed in the next section indicates that there is no material increase in discharge rates from the Project Area towards Sandy Creek, nor along Sandy Creek as a result of the Project.

No dams are proposed on site as part of this Project.

9 Flood Behaviour

9.1 Existing

The existing runoff characteristics of the proposal site include pervious gentle slopes consisting of predominantly grassland with some scattered trees. An existing access track intersects the site with a culvert under the downstream tributary. A few shallow gullies exist at the lower end of the site and concentrate surface flows to the downstream tributary.

9.2 Hydrology and Flooding Methodology

There are no existing flood studies which cover The Project. However, the Worley Parsons *Hunter River Flood Study (Muswellbrook to Denman)* 2014 has determined hydrological parameters for the catchment of the tributary adjacent to The Project and provides boundary conditions for flooding in the downstream Sandy Creek. These conditions have been adopted as part of this assessment.

Assessment of the flow of surface water across The Project has been carried out in accordance with Chapter 6, Book 1 of the online version of the Australian Rainfall and Runoff 2016 (ARR 2016) guideline.

Hydrological and hydraulic modelling has been carried out using XPRAFTs and XP-SWMM 1D/2D software to estimate the peak flows and flood behaviour for the existing and developed site scenarios.

9.3 Critical Duration Storms

In November 2016 the Institution of Engineers introduced a revised protocol for hydrological assessment of catchments. The former procedure required the hydrologist to determine the storm duration which generates the greatest peak flow downstream of the catchment by simulating a common rainfall temporal pattern (percentage rainfall fallen over time) for each duration storm.

The revised procedure now requires 10 different temporal patterns to be tested for each duration and each magnitude storm. The maximum of the means of each 10 temporal patterns (referred to as an ensemble) is considered the critical duration storm for the catchment.

The following graphs shows the range of peak flows within the tributary immediately downstream of the Site for 200 storms simulated for both the 1% and 1 in 200 (0.5%) AEP magnitude storms to determine the critical duration storm.

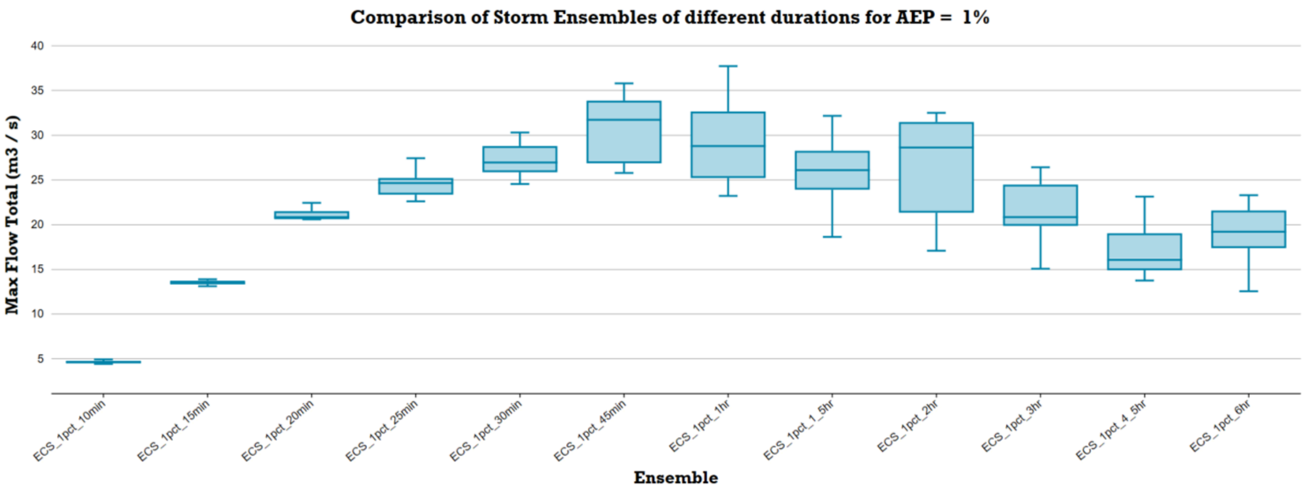

Figure 8 1% AEP storm event peak flow ranges for each ensemble of temporal patterns

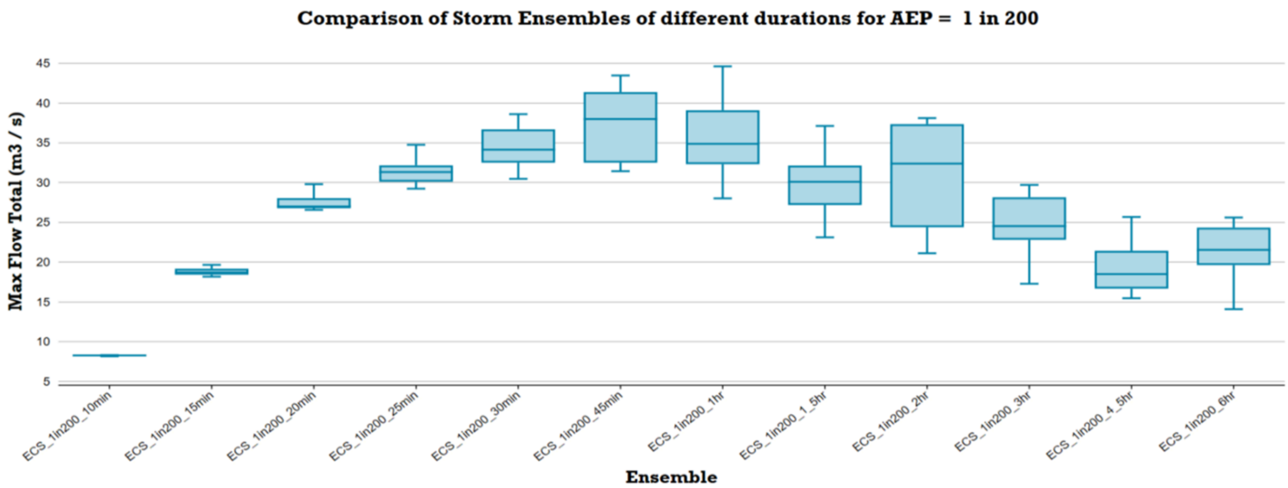

Figure 9 1 in 200 AEP storm event peak flow ranges for each ensemble of temporal patterns

Table 9 Critical duration storms

Magnitude Storm	Critical Duration
1% AEP	45 min
1 in 200 AEP	45 min

9.4 Drainage and Obstructions to Flow

The site is expected to be benched to allow the battery systems to be constructed on an even grade. The battery systems are expected to be mounted within enclosures located on individual concrete slabs with surrounding access tracks. A small operations compound will be located to the north, as well as the battery system substation. Therefore, an increase in imperviousness at the site is expected. Some localised ponding is likely to occur on flattened surfaces of battery areas and access tracks following heavy rainfall.

9.5 Site inundation, Discharges, Flood Levels and Velocities

The topography is such that discharge from the site occurs at the northern boundary with flow to the downstream tributary. Shallow sheet flow occurs across majority of The Project; shallow gullies concentrate some of these flows and are directed to the north. The site is not located within the 1% or 1 in 200 AEP extent and hence inundation from the downstream Sandy Creek Tributary is not expected at The Project. However, inundation of the existing access track does occur.

Site inundation has been simulated to account for pre and post development changes to runoff characteristics for the 1% and 1 in 200 AEP flood events using XPSWMM two-dimensional software. The proximity of the site to the Sandy Creek Tributary necessitates two-dimensional analysis.

The model includes the entirety of the Sandy Creek Tributary Catchment to the New England Highway to account for any backwater effects of flooding within Sandy Creek and the Hunter River.

It is envisaged that the development will involve minor changes to the topography which may have minor localised effects on flow paths and depth within The Project footprint. To account for changes as a result of the development hydrological parameters of infiltration and roughness have been assessed.

The existing and post development model outputs for both the 1% and 1 in 200 AEP flood events are shown on **Figure 10**, **Figure 11**, **Figure 12** and **Figure 13**.

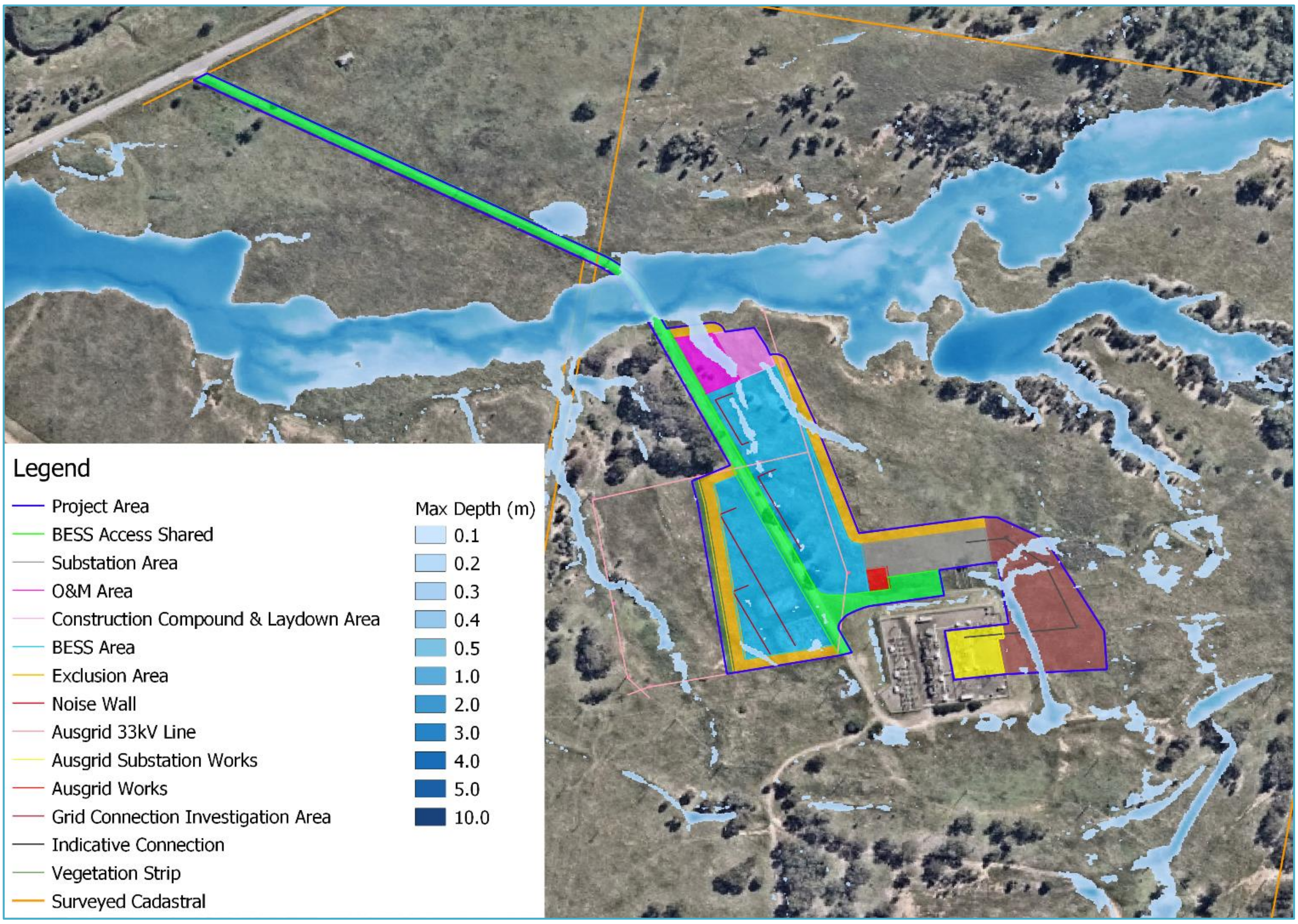

Figure 10 Existing inundation during a 1% AEP flood

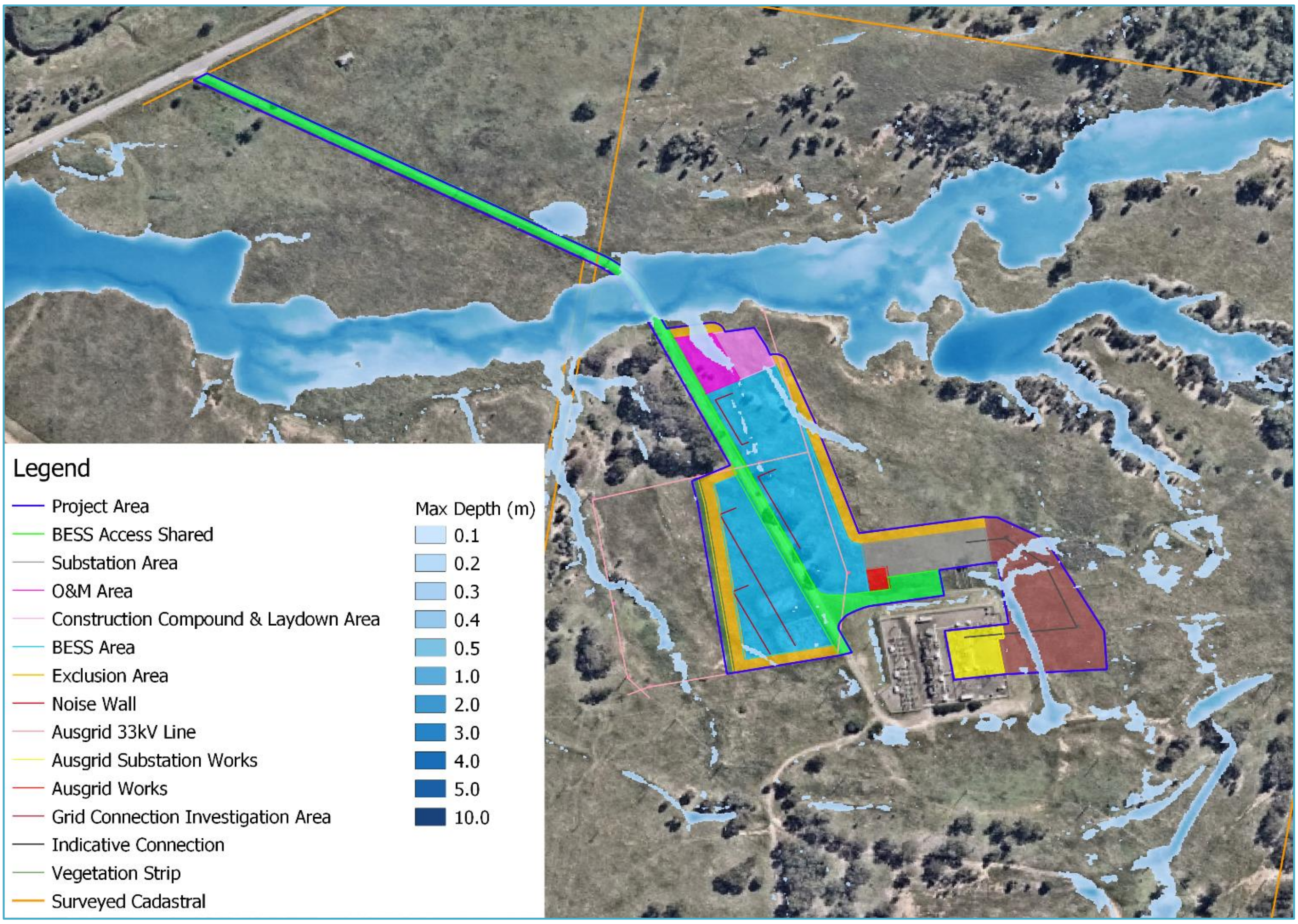

Figure 11 Post development inundation during a 1% AEP flood

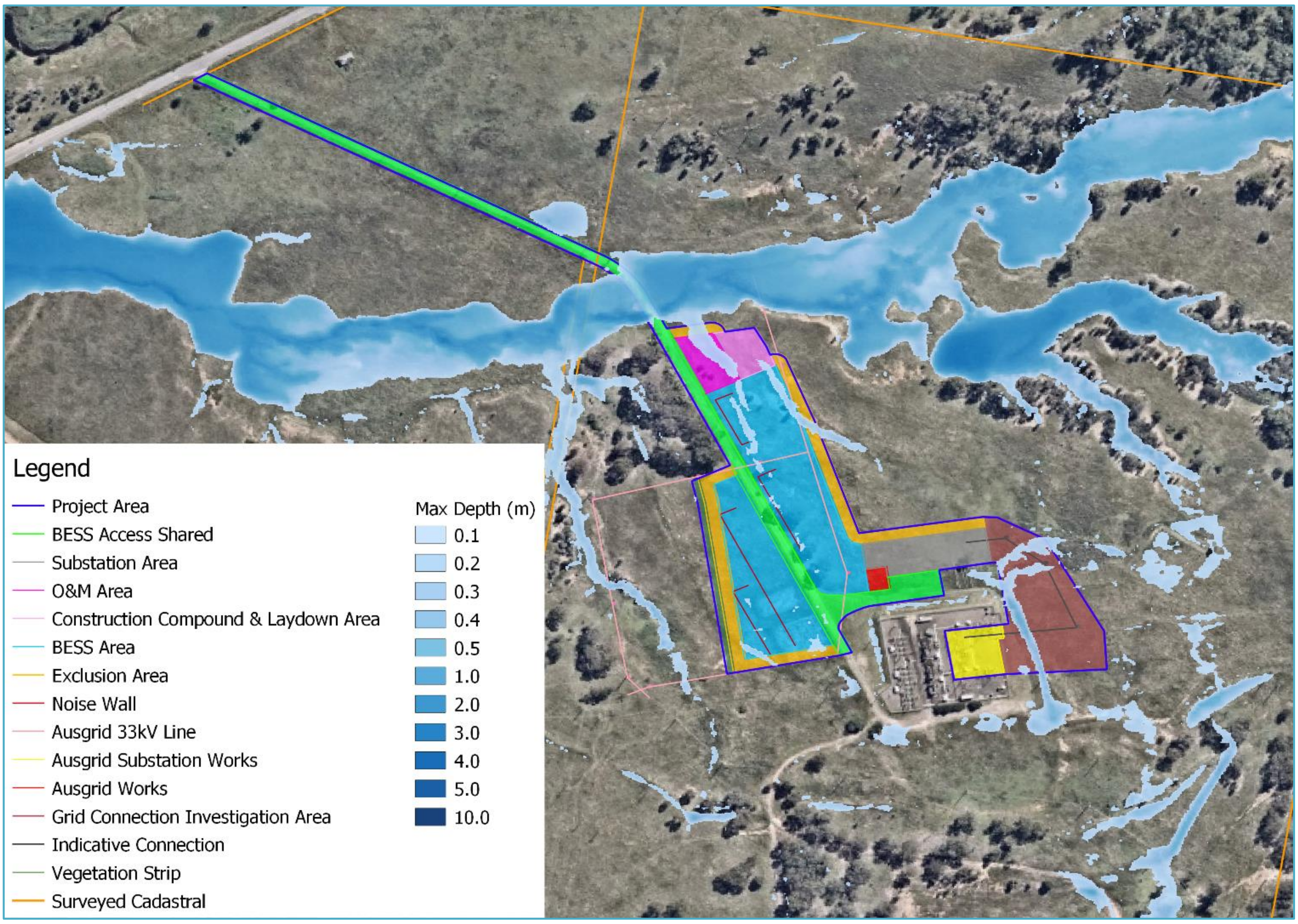

Figure 12 Existing inundation during a 0.5% AEP flood

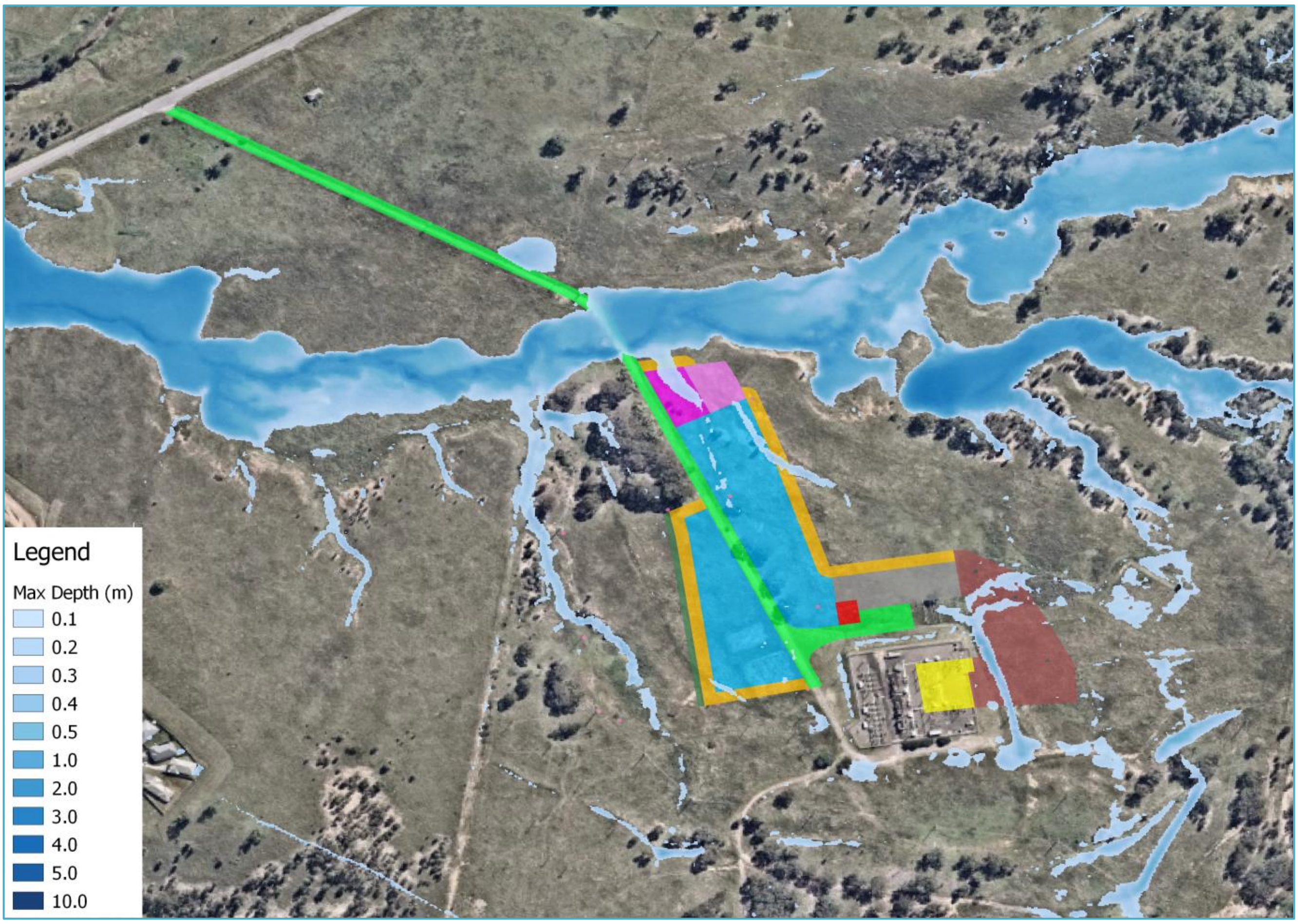

Figure 13 Post development inundation during a 0.5% AEP flood

9.5.1 Pre and Post Development Flows Downstream of Site

As discharge from the northern boundary of The Project occurs in multiple locations, it was necessary to apply a flow trace vector across the complete northern boundary on both the eastern and western sides of the site. These vectors sum all flow rates as it crosses the vector at any point in time.

The following table summarises the calculated peak flows for the existing and developed scenarios downstream of the Site (at the northern site boundaries and within the downstream tributary);

Table 10 Change in Peak Flow from the Site

AEP	Peak flow (m^3/s) for existing site	Peak flow (m^3/s) for developed site	Change (%)
Northern Boundary (East)			
1% AEP	1.96	1.96	0.0%
1 in 200 AEP	2.20	2.20	0.0%
Northern Boundary (West)			
1% AEP	0.75	0.80	0.0%

AEP	Peak flow (m^3/s) for existing site	Peak flow (m^3/s) for developed site	Change (%)
1 in 200 AEP	0.85	0.89	0.0%
Sandy Creek Tributary			
1% AEP	50.76	50.77	0.0%
1 in 200 AEP	56.59	56.60	0.0%

The results of hydrological modelling indicate that the proposed development does not have any significant hydrological impact on flows downstream of the Site.

9.5.2 Pre and Post Development Velocities Downstream of Site

Velocity was compared at the site outlets, a location central to each of the discharge locations was used to compare simulations. The following table summarises the effect of the development.

Table 11 Change in Peak Velocities from the Site

AEP	Peak velocity (m/s) for existing site	Peak velocity (m/s) for developed site	Change (%)
Northern Boundary (East)			
1% AEP	0.81	0.81	0.0%
1 in 200 AEP	0.86	0.86	0.0%
Northern Boundary (West)			
1% AEP	0.40	0.43	0.0%
1 in 200 AEP	0.42	0.45	0.0%
Sandy Creek Tributary			
1% AEP	2.02	2.02	0.0%
1 in 200 AEP	2.08	2.08	0.0%

The proposed development does not notably change flood velocities downstream of the Site. There are very minor increases in the modelled velocities near the northern boundary, but these are very unlikely to cause any erosion since the velocities and associated shear stresses are very low.

9.5.3 Pre and Post Development Depth Downstream of Site

To evaluate the effect of the development on the flood level within the Sandy Creek Tributary and potential downstream areas depth was compared at a location downstream of the site outlets. The following table summarises the effect of the development.

Table 12 Change in Peak Depth from the Site

AEP	Peak depth (m) for existing site	Peak depth (m) for developed site	Change (%)
Sandy Creek Tributary			
1% AEP	1.29	1.29	0.0%

AEP	Peak depth (m) for existing site	Peak depth (m) for developed site	Change (%)
1 in 200 AEP	1.35	1.35	0.0%

The proposed development does not change the flow depth within the Sandy Creek Tributary downstream of The Project.

9.6 Hazard Rating

Figure 14 shows the product of velocity and depth in graphical format, known as the hazard rating. ARR 2016/19 defines the range of hazard vulnerability curves which gives a general classification of flood hazards, **Table 13** provides a summary of these hazard categories.

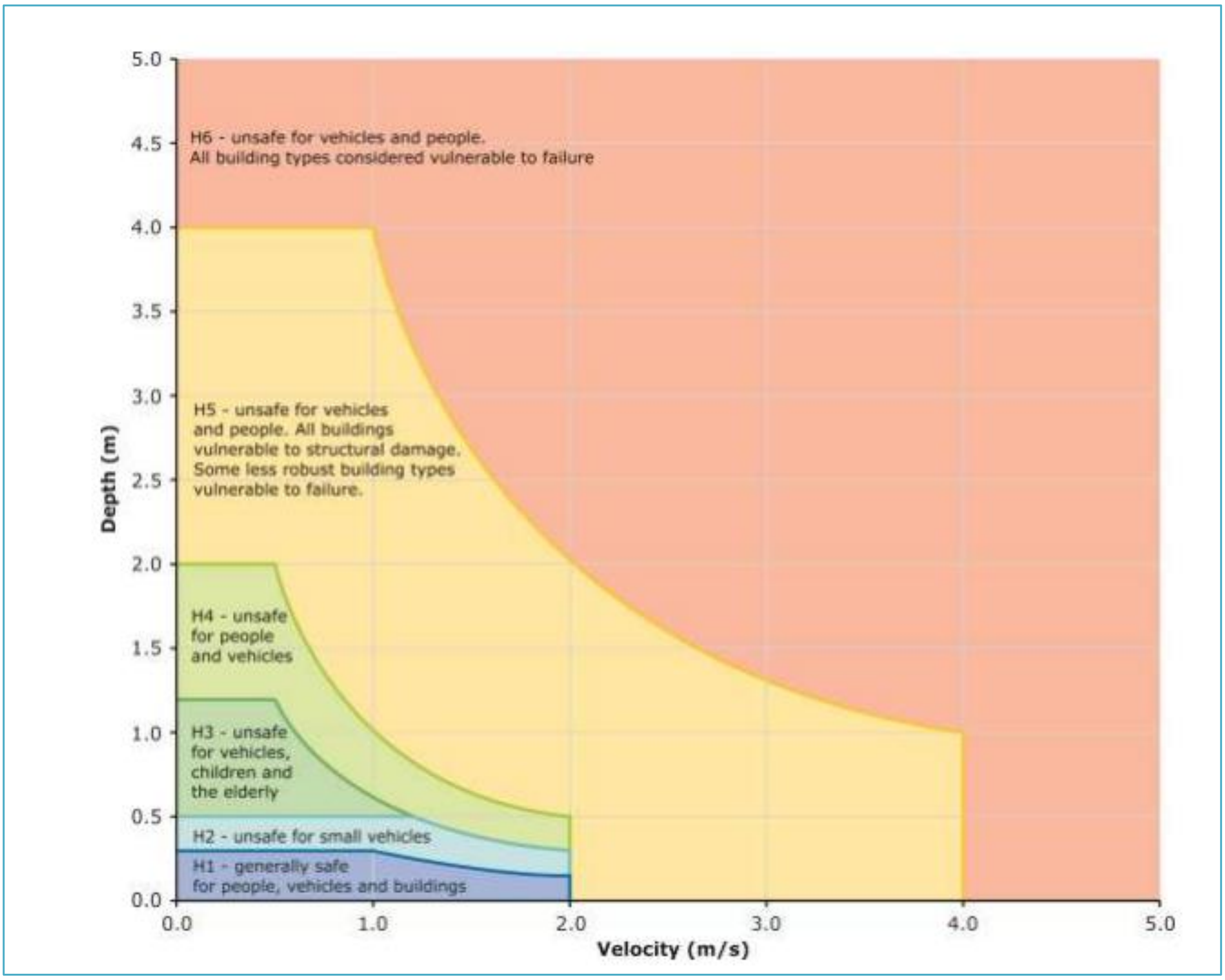

Figure 14 General flood hazard vulnerability curves

Table 13 Combined Hazard Curves – Vulnerability Threshold Classification Limits

Hazard Vulnerability Classification	Description	Classification Limit (D x V)	Limiting Still Water Depth (D)	Limiting Velocity (V)
		(m^2/s)	m	m/s
H1	Generally safe for vehicles, people buildings	≤ 0.3	0.3	2.0
H2	Unsafe for small vehicles	≤ 0.6	0.5	2.0
H3	Unsafe for vehicles, children and the elderly	≤ 0.6	1.2	2.0
H4	Unsafe for vehicles and people	≤ 1.0	2.0	2.0
H5	Unsafe for vehicles and people. All building types vulnerable to structural damage. Some less robust building types vulnerable to failure.	≤ 4.0	4.0	4.0
H6	Unsafe for vehicles and people. All building types considered vulnerable to failure.	≥ 4.0	-	-

Figure 15 displays the hazard ratings for The Project.

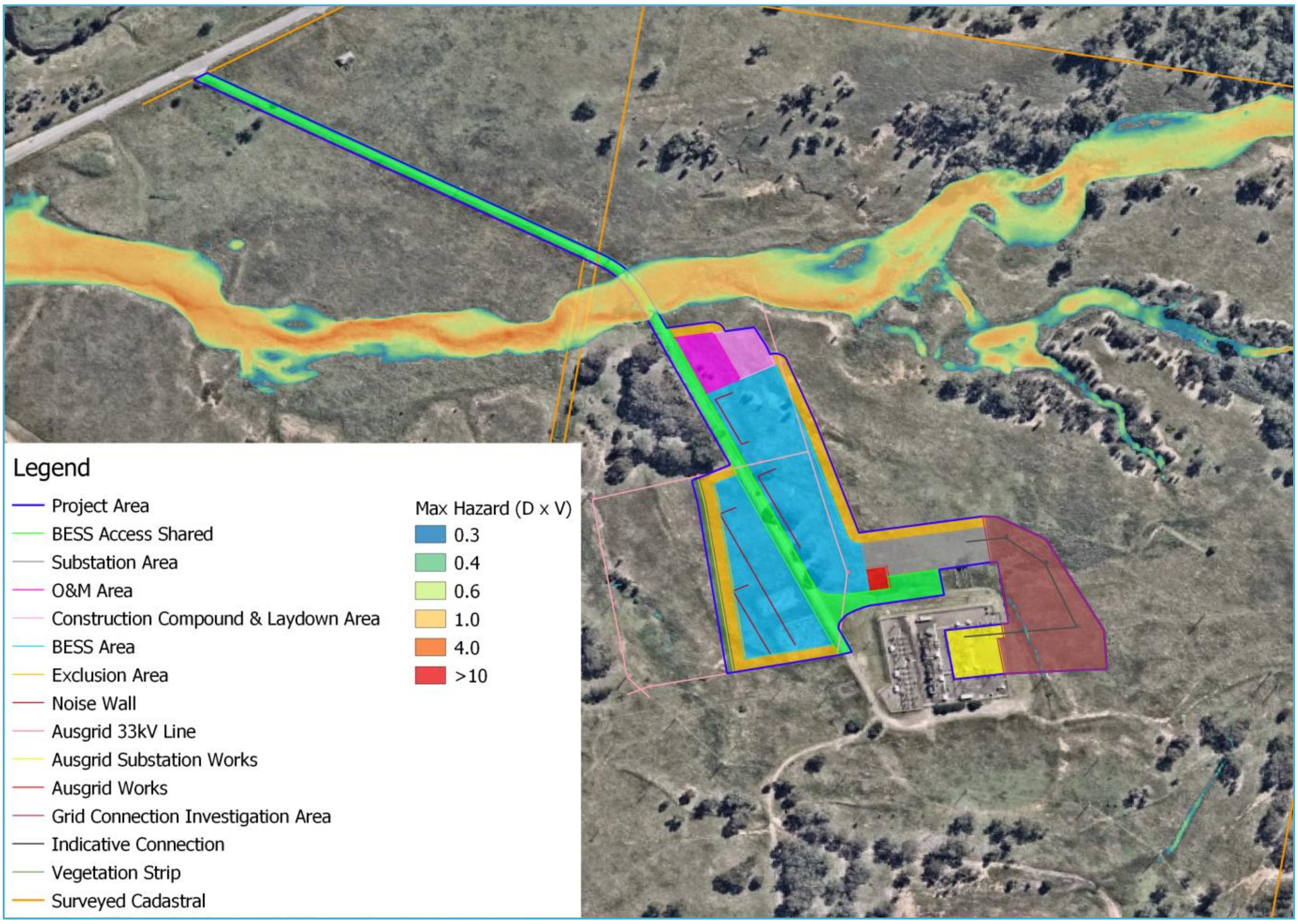

Figure 15 Post development hazard rating during a 1% AEP Flood

Majority of the site has a hazard rating that does not exceed the low (H1) category. A small drainage line at the southern end of the site which diverts flow around the existing Ausgrid site shows conditions in the H2 category (unsafe for small vehicles).

Flows within the Sandy Creek Tributary are shown to overtop the site access track during the 1% AEP flood. A high hazard rating in the H5 Category occurs at this location, and this rating indicates that the risk during a flood event is significantly high and would be considered unsafe for both vehicles and people. Hence this track would not be suitable for site entry or egress during a flood event. Given the usage of this track involves a low 'population at risk' the flood risk may be managed by including the following measures:

- Staff/contractor awareness that the track is flood prone at this location in extreme events and is hazardous to cross; and that the site will provide a safe refuge from flood events until the peak has subsided.;
- Installation of flood warning signs and depth markers; and
- Preparation of a flood management plan for The Project.

9.7 Risk to Property

All electrical infrastructure susceptible to damage from inundation and batteries will be located well clear of the 0.5% AEP flood envelope.

Where the BESS enclosures are situated in site locations that may encounter localised overland flow, the BESS enclosures will be elevated above the surrounding ground. During the detailed design phase of The Project, the layout, and details of project infrastructure such as batteries and substations will be developed in further detail and reviewed to ensure that there are appropriate levels of flood immunity in accordance with relevant standards.

10 Water Supply

10.1 Construction Phase

Water will be used during the construction phase earthworks for dust suppression. This water will be brought to site in water tankers.

Construction water requirements for The Project have been estimated at 20,000L per day. This water will be tankered into site.

The construction of the battery systems themselves will not use any water. Wastewater during construction will be captured and removed from site for off-site treatment.

Potable water may be transported to site in bottles for use by the construction workforce.

10.2 Operational Phase

During operation of the battery system, water will be utilised for the following purposes:

- Potable water for site offices.
- Cleaning of batteries.
- Dust suppression on site access roads.
- Topping up a firefighting water tank.

Demands for non-potable water may be met by several methods which are under consideration, including:

- Small domestic scale water tanks collecting roof water at site facilities.
- Supplementary water as required via water trucked to site and stored in a water tank.

Potable water requirements may be met via reticulated water supply near The Project or trucked into site to refill domestic scale water tanks.

Operational water requirements for The Project have been estimated at 100L per day.

The proposal will include a static water tank for fire-fighting purposes. This water would only be used for firefighting and not for potable water supply nor for general non-potable site water use. The tank levels would be topped up as required from non-potable water supply sources as outlines above.

Toilet facilities will involve waterless toilets which are emptied annually, or other similar system in accordance with the requirements of Muswellbrook Shire Council.

The details for provision of potable water, grey water and wastewater infrastructure would be confirmed during the detailed design phase of The Project. Water use approval is not required for State Significant Developments under section 89J (1)(g) of the EP&A Act.

11 Monitoring, Licensing and Reporting

11.1 Construction Environment Management Plan (CEMP)

A CEMP will be prepared during the detailed design phase of The Project, and will outline the environmental measures, monitoring and reporting required to ensure satisfactory environmental performance. Minimum requirements for inclusion within the CEMP include:

- Water quality monitoring during the construction phase, will be carried out as described below for the OEMP.
- An Erosion and Sediment Control Plan (ESCP) for construction activities that is consistent with the measures outlined in this report and the EIS.

11.2 Operational Environment Management Plan (OEMP)

An OEMP will be prepared during the detailed design phase of The Project, and will outline the environmental measures, monitoring and reporting required to ensure satisfactory environmental performance.

Minimum requirements for inclusion within the OEMP include:

- Document requirements for monitoring and reporting on water quality.
- A procedure for erosion and sediment controls for ground disturbance activities.
- Requirements for storage and use of hydrocarbons and chemicals, and a spill response plan.

12 Summary of Proposed Mitigation Measures

A summary of the proposed mitigation measures for The Project is presented in **Table 14**.

Table 14 Proposed Mitigation Measures

Potential Impact	Mitigation Measures	Location in Report
Flooding	• Staff/ Sub-contractor awareness. • Installation of flood warning signs and depth markers along access road crossing of Sandy Creek • Flood management plan.	**Section 9.6, 9.7**
Localised overland flows	• All BESS enclosures will be elevated above surrounding the ground. Elevation will be increased where there are localised overland flow paths running across the site areas with BESS enclosures	**Section 9.6, 9.7**

Potential Impact	Mitigation Measures	Location in Report
Erosion and sediment controls	• Limiting the area and time of disturbed areas. • Gentle grades, and a combination of progressive revegetation and surface cover across the site once disturbed. • Sediment sumps (including appropriate drainage). • Clean water diversions and sediment fencing. • Erosion Sediment Control Plan (ESCP).	**Section 6.1**
Spillage of hydrocarbons, chemicals, and fuel	• Regular inspection of batteries which will identify any issues with leakage, spill response plan. • Storage of chemicals in accordance with Australian Standards. • Storage of hydrocarbon fuels within bunded storage areas. • Bunding of substations, transformers or other infrastructure that utilise oil. • Minimise usage of herbicides and avoid spraying when rain is predicted. • A Spill Response Plan, including emergency response and EPA notification procedures.	**Section 6.4**
Monitoring, licensing, and reporting during construction and operation	• Accident documentation. • Water quality compliance with SEARs • Construction Environmental Management Plan (CEMP). • Operational Environmental Management Plan (OEMP). • Regular inspection of batteries which will identify any issues with leakages • A Spill Response Plan, including emergency response and EPA notification procedures.	**Section 11**
Traffic, dust generation	• Speed limit of 40km/hr on site. • Application of binders to road surfaces as required.	**Section 6.2**
Closure, decommissioning	• Erosion Sediment Control Plan (ESCP). • Temporary ground cover and revegetation after removal of BESS.	**Section 6.3**
Terrestrial Groundwater Dependant Ecosystems (low potential)	• Further investigation on the low potential terrestrial GDEs is recommended.	**Section 7.1, 7.4**
Wastewater disposal	• Wastewater during construction will be captured and removed from site for off-site treatment. • Toilet facilities will involve waterless toilets that are emptied off-site.	**Section 10.1, 10.2**

Potential Impact	Mitigation Measures	Location in Report
Water Quality	• Water quality compliance with SEARs • CEMP including an ESCP for construction activities • OEMP to identify requirements for water quality monitoring and reporting • Progressive rehabilitation off surfaces as installation and removal of batteries proceeds across the site.	**Section 6.1, 6.2, 6.3**

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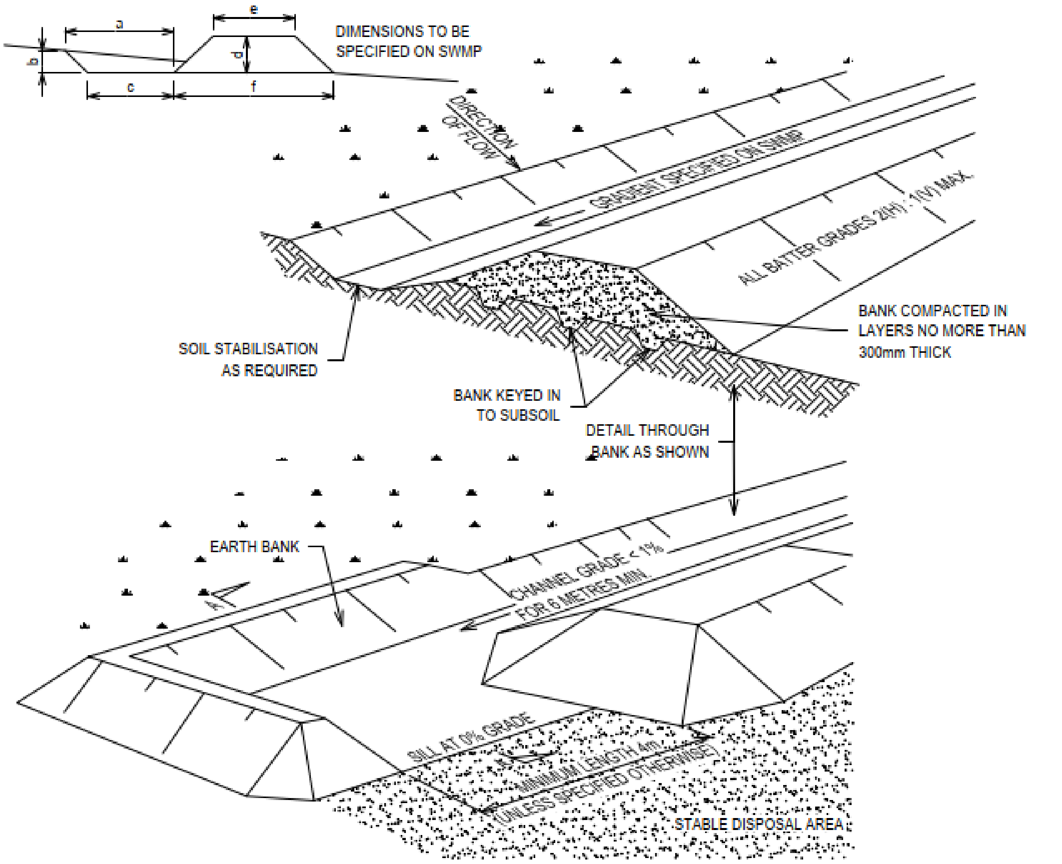
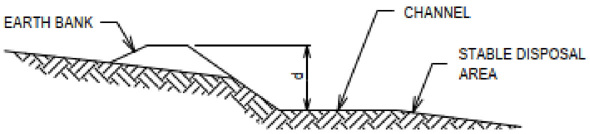
APPENDIX A

Level Spreader Typical Detail



LEVEL SPREADER (OR SILL)



SECTION A-A

CONSTRUCTION NOTES:

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

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